Welsh Government

M4 Corridor around Newport

Land Contamination Assessment Report Annex D CL-15 & CL20, Stephenson Street Industrial Estate Area and Mir Steelworks

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CVJV/AAR
3rd Floor
Longross Court,
47 Newport Road,
Cardiff
CF24 0AD

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1 Introduction

1.1 Background

1.1.1 This report relates to an area of land potentially affected by contamination (CL15) known as the 'Stephenson Street Industrial Estate' hereinafter referred to as the Site. It also includes the marginally impacted parts of the 'Mir Steelworks and Associated Waste Disposal Site' formerly referred to in the 2014 Preliminary Sources Study Report (PSSR) (Ove Arup & Partners, 2014) as CL20.

1.1.2 The Site is located between chainage 10,450 and 11,900 (Figure 1).

1.2 Reporting Context

1.2.1 The Site has been assessed as part of ground investigations and monitoring associated with the wider works for the M4 Corridor around Newport (M4CaN) (hereafter referred to as the 'Scheme') and informs the baseline for the environmental impact assessment (EIA) for the Scheme. The EIA is reported in the M4CaN Environmental Statement (ES) published in March 2016 and the Land Contamination Assessment Reports formed an annex to Appendix 11.1 of the chapter on Geology and Soils.

1.2.2 A subsequent phase of investigation has been undertaken since the publication of the March 2016 ES. The additional data, herein referred to as the 2016 Additional Ground Investigation, have been incorporated into the summary tables, risk assessment, conceptual site model and associated text of this report where relevant. The conclusions and recommendations have also been refined to reflect the improved understanding of status of the site and associated risk. Therefore this report replaces the original CL-15 report published in Appendix 11.1 of the March 2016 ES.

1.2.3 In 2014, a Preliminary Sources Study Report (PSSR) was prepared as an initial land contamination appraisal (Ove Arup & Partners, 2014) as part of Design Manual for Roads and Bridges (DMRB) Stage 2 Assessments for a number of potential route options. This identified a number of individual areas that may have been affected by contamination as a result of historical activities at the Site. In addition, this report draws upon the 2015 Supplementary Ground Investigation report on behalf of the Welsh Government (Geotechnical Engineering, 2015) and the 2016 Additional Ground Investigation. This report relates to the area defined on the Site Plan Figure 1.

1.2.4 The overarching rationale and approach for the assessment of areas of land along the proposed new section of motorway with potential contamination is detailed in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES).

1.3 Objectives

1.3.1 The key objectives of this report are as follows:

- Undertake a risk assessment of the Site and determine whether potential risks to human health or controlled waters could exist based upon the Scheme.

- Identify the need for further assessment or investigation in order to refine potential land contamination risks and inform the need for remediation/mitigation.
- To provide the information required under DMRB HD22/08 (Highways Agency, 2008).

1.4 Report Structure

1.4.1 The remainder of this report is structured as follows:

- Section 2: Site Location and Description – This section summarises the Site description.
- Section 3: The Scheme – This section details the new section of motorway alignment and associated features at the Site.
- Section 4: Site History – This section summarises the history of the Site based on historical maps and historical land photographs.
- Section 5: Environmental Setting – This section summarises the Site description, published geology, hydrology and hydrogeology and any relevant environmental information presented in the 2014 PSSR document.
- Section 6: Summary of Ground Investigation Works – This section describes the previous and supplementary investigations undertaken at the Site.
- Section 7: Ground Conditions– This section describes the main findings of the intrusive site investigation including the ground conditions encountered and any significant visual or olfactory evidence of contamination identified.
- Section 8: Contamination Assessment – This section describes the findings of the Tier 1 and Tier 2 contamination risk assessment based upon potential contamination sources, potential receptors and potential contaminant linkages and presents the human health and controlled waters screening assessments.
- Section 9: Refine Conceptual Site Model – This section presents the Conceptual Site Model (CSM) for the Site and identifies potential contaminant linkages, based upon the findings of the data presented within Sections 2 to 7.
- Section 10: Conclusions and Recommendations - This section provides conclusions concerning the likelihood of land contaminant associated with the Site affecting the Scheme and requirements for remediation / mitigation.
- Section 11: References – This section details the key reference documents referred to within the text.
- Section 12: Glossary – This section details the key terms and acronyms used throughout the report.

2 Site Location and Description

2.1.1 The Site is located north east of the tidal estuary of the River Usk and approximately 250 m south of the A48. It is centred at National Grid Reference ST326 855. The location and layout of the Site are presented on Figure 1.

2.1.2 The Site comprises a number of industrial buildings, the Felnex and Stephenson Street industrial estates, docks and associated hardstanding, together with areas of rough vegetation. The Site also incorporates the northern part of the Mir Steelworks (CL-20 in the PSSR). CL20 includes industrial units, storage areas and sewage treatment works generally occupying the western half of the site and waste disposal lagoons comprising the eastern half of the site. The permanent land take encroaches upon the north western tip of CL20 only in an area comprising banks of the River Usk and the temporary construction works footprint encroaches upon the northern tip of CL20 currently occupied by the access road and car park.

2.1.3 In the west, the new section of motorway will pass over the River Usk. In the east of the Site the new section of motorway will pass over a north south trending railway line and parallel to this Corporation Road. Two sets of overhead powerlines traverse across the northern end of the Site, passing east west.

2.1.4 A walkover survey was undertaken in January 2014. The Site was accessed to the south of the Site via Corporation Road and a public footpath. A filled dock was noted to the south of the footpath and a number of ponds, marked as deep water were noted within the wooded area to the north of the pathway.

2.1.5 During the 2016 Additional Ground Investigation, works were undertaken within Marshalls block paving manufacturing plant and Bird Port, both located in the southern part of the Site. Storage of bricks and paving slabs on pallets covered a large portion of the Marshalls site with an area of wasteland to the west bounding the River Usk and the manufacturing plant itself and aggregate yard located centrally. A large mound of broken glass was noted northeast of Bird Port adjacent to the railway line.

2.1.6 The steelworks part of the Site is located over 20 m south of the proposed new section of motorway at approximate chainage 11,000 and the associated waste disposal lagoon approximately 50 m to the south at approximate chainage 11,000 to 11,900.

2.1.7 Beyond the railway lines to the eastern end of the Site lies Solutia Chemical Works. Details related to this area can be found in the Land Contamination Assessment Report CL17 (Appendix 11.1 of the March 2016 ES).

3 The Scheme

3.1.1 The Site is situated at approximate chainage 10,450 to 11,200.

3.1.2 The new section of motorway would be constructed on a viaduct across the industrial estate area which will be supported by piers founded on piles. Wider areas of temporary land take are proposed north and south of the viaduct to support the construction phase of the scheme. The potential pier locations for the viaduct are shown in Figure 1.

3.1.3 The westernmost pier of the River Usk Crossing is located within the Newport Docks area but outside the Stephenson Street Industrial Estate. There will be no construction in the wetted channels of the River Usk, Details related to the River Usk Pier area can be found in the Land Contamination Assessment Report CL18 (Appendix 11.1 of the March 2016 ES).

3.1.4 The main alignment of the new section of motorway in the vicinity of the steelworks would be positioned on a piled viaduct leading to an earth embankment. No construction activities would take place within the steelworks area although a small wooded area north of the existing steelwork yard is to be included within the land take for landscaping purposes.

3.1.5 The permanent and temporary land areas take are shown in Figure 1.

4 Site History

4.1 Site History

4.1.1 The 2014 PSSR historical searches have been based on Ordnance Survey plans, literature reviews, information provided by British Steel, Natural Resources Wales (NRW), Newport City Council and aerial photographic interpretation.

4.1.2 This is supplemented by a review of historical maps obtained in 2015 from Welsh Government. Relevant extracts are presented in Appendix 6.

4.1.3 A summary of the Site history is presented in Table 1 below.

Table 1: Site History

Date	Use	Source of information
1843 - 1893	The Site comprises agricultural fields traversed by a number of drainage ditches / reens. Coldharbour Farm buildings are present in the centre and Picklane Farm in the east. The Site is bound to the west by the River Usk and to the south by Julian's Pill. Alexandra Docks and associated infrastructure are located on the western bank of the River Usk approximately 250 m from Site.	1:10,560 Historical Mapping
1891 - 1912	Two docks ('Union Dry Docks') have been developed in centre of the Site, including a pumping house, electric light station and piers. Union Dry Dock cottages have been developed to the north of the docks, with a pond adjacent. The Great Western Railway (East Usk Branch) now bounds the Site to the east and runs into the southern section of Site, terminating in the centre of the southern section.	1:10,560 Historical Mapping
1904 - 1939	A recreational ground ('Coronation Park') is located in the northwest corner of the Site. Further jetties have been developed around the docks in the centre. A footpath runs along the Site's western boundary and between the cottages and the docks. The railway construction has continued and now runs north - south through the whole of the southern section of the Site. A road running east-west (Stephenson Street) now bounds the Site to the north. An iron works in the north has expanded and is located 50 m from the Site.	1:10.560 Historical Mapping
1947 - 1949	Large industrial buildings and a reservoir appear under development to the west of the railway line in the southern section of Site. Neither farm is evident and are assumed demolished. Further development around the docks area in the centre of Site is indicated by earthworks.	Aerial photography

Date	Use	Source of information
1964 – 1965	Coronation Park has expanded across the north of the Site. The areas to the north and south of the docks are marked as marshy ground. The buildings and infrastructure around the docks have been developed to include a Petrol Depot with associated tanks and pipelines. Allotment Gardens are identified adjacent to the cottages and six further ponds of varying size are located in the eastern area of the Site. Overhead electricity wires cross the northern part of the Site east-west with two onsite supporting masts. Union Dry Dock Cottages referred to as Slipway Cottages. In the south of the Site an Aluminium works has been constructed to the west of the railway line including a sluice reservoir with a sluice conduit feeding from the south of the building, sports ground, allotment gardens, a number of tanks including filter tanks, electrical substation, sewage treatment works, and large industrial buildings. To the east of the railway line are associated sludge beds and a spoil heap. A number of works and non-specific industrial buildings have been developed to the east of the Site, approximately 50 m away on the other side of the railway.	1:10,560 Historical Mapping & 2014 PSSR
1969 - 1971	Further infrastructure has been developed in the Docks area of the Site including cranes, tanks, hoppers, electrical transformer, a conveyor, slag heap and refuse tip. The 2014 PSSR identifies a scrap yard adjacent to the slag heap. Further recreation infrastructure is located in the northern part of the site, within Coronation Park.	1:1,250 Historical Mapping
1970 - 1973	No significant change	1: 10,000 Historical Mapping
1979	A number of industrial buildings, tracks and spoil heaps are now shown present in the north of the Site. Works with associated broken ground / spoil heaps have been developed in the place of the Slipway Cottages in the central area of the Site. An area of broken ground which appears to be a depression is located on the western boundary, south of Coronation Park. The 2014 PSSR identifies this as Tidal Ponds.	Aerial Photography
1981	Evidence of infilling can be seen in the west of the Site where part of the River Ebbw was located. It looks as though car containers are being stored in this area. Industrial processes are shown to the west of the north dock and north of the south dock. Industrial / commercial works have expanded in the northern area of the Site.	2014 PSSR Aerial photography
1985 - 1996	The Felnex Industrial Estate, which includes a Depot associated road network and jetty, is located on the western boundary. Marshy ground is no longer marked and four ponds in the central area of the Site appear to have been infilled. A Container Terminal is identified in the Docks area. Reevesland Industrial Estate has been developed to the east of the Site. A works has been built on the area of the refuse tip around the docks.	1 : 10,000 Historical Mapping

Date	Use	Source of information
1991	Further buildings have been developed in the Felnex Industrial Estate. Tanks and storage containers are identified in the eastern area of the Industrial Estate. A heap of what appears to be aggregate is identified within the compound adjacent to the Jetty on the western boundary. An area of hardstanding associated with the Works in the western area of the Site has been removed. The ground in this area appears roughly vegetated. In the southern part of the Site, two sludge beds associated with the steelworks appear to have been infilled and vegetated.	
2006	Areas of rough vegetation in the central area of the Site with evidence of potential tipping activity. A strip of hardstanding approximately 250 m x 25 m is located in the east of the Site, covering an area where two ponds were formerly located. Heaps of waste materials are identified in this area. A heap of black material, potentially coal, and other waste heaps are identified adjacent to the southern Dock, in the former container terminal area. A rectangular pond has been excavated in the western area of the Site. Infrastructure associated with the Industrial Estate has expanded in the central eastern area. The southern part of the Site is still in use as active steelworks and appears to have been expanded (2014 PSSR dates expansion as 1993 and 2002). Two sludge beds adjacent to the railway line in the south east of Site have been infilled and are vegetated. A large tank has been constructed on the eastern side of the railway line. The sports ground in the centre of the site has been developed during an extension of the steelworks main industrial unit and is now shown as hardstanding.	Aerial Photography
2009 - 2010	The majority of the Site is now under industrial use, with the exception of an area of rough vegetation along the eastern boundary and Coronation Park in the northwest corner. An area of ground adjacent to the docks appears to have been infilled and heaps (possibly aggregate) are identified in this area.	Aerial Photography
2014	No significant change	Aerial Photography

Note: Potential sources of contamination have been underlined. Those within the temporary and permanent land take are shown in bold.

4.1.4 The sources of information presented above supplement those used in the 2014 PSSR. In particular, the 2006 aerial image identified further stockpiling of materials and extensions to existing industrial units and hardstanding in the central area of the Site. Relevant extracts of the photographs are presented in Appendix 6.

4.1.5 In addition to Table 1, the 2014 PSSR (Ove Arup and Partners, 2014) identifies from study of Ordnance Survey (OS) maps a spoil heap in the central western corner of the Site and two electrical substations in the northern area of the Site. The dates of these maps were not provided within the PSSR report.

4.1.6 All identified potential sources of contamination are shown in Figure 1.

4.1.7 Historically there is the potential for the Site to have been bombed during World War II which is described in detail within the 2014 PSSR (Ove Arup and Partners, 2014) and also the Explosive Ordnance Threat Assessment Report (Bactec, 2014) which categorises the site as a high risk with respect to unexploded ordnance.

5 Environmental Setting

5.1 Geology

5.1.1 British Geological Survey (BGS) data indicate that the Site is underlain by Tidal Flat Deposits overlying bedrock of the Mercia Mudstone Group.

5.1.2 It is expected that the Site is overlain by fill materials associated with the docks construction.

5.2 Hydrology

5.2.1 The River Usk bounds the Site to the west and a number of small ponds and drainage channels are present across the Site. A reservoir and sludge beds are also present south of CL15 associated with the steelworks (CL20).

5.3 Hydrogeology

5.3.1 Natural Resources Wales (NRW) classifies the Mercia Mudstone Group as a Secondary B Aquifer. Tidal Flat Deposits in the Newport area have been classified as a Secondary (undifferentiated) Aquifer.

5.3.2 The Site does not lie within a Groundwater Source Protection Zone (SPZ). However, the parts of the western boundary of the Site lie within a groundwater vulnerability zone, classified as a minor aquifer with high leaching potential.

5.4 Environmental Information

5.4.1 The 2014 PSSR identifies the following information within the study area as reported by NRW.

- Two significant pollution incidents with water and land impacts and one significant impact pollutant incident with air impact have been recorded within the Site boundary which are set out in Table 2. Twelve minor impact pollutant incidents and two no impact pollutant incidents have been recorded within the Site boundary.
- In addition, eight pollution incidents, with either a minor impact on air or minor and significant impact on water in relation to the Usk River due to release of oils and fuels/chemicals are identified in the southern part of the Site.
- One major air impact, two significant air and water impacts, three minor impacts and three no impact pollutant incidents were recorded within 300 m of the Site boundary.
- There is one discharge consent recorded within the Site boundary, (central western area of the Site) in relation to Newport Felnex Industrial Estate.
- Within 300 m of the Site, two discharge consents have been recorded along the western Site boundary adjacent to the River Usk.
- One abstraction licence pertains to CL-20, approximately 500 m southeast of CL-15. It relates to the abstraction of surface water for evaporative

cooling of Mir Steelworks. The abstraction takes place from the lagoon within the site boundary.

- A landfill is located approximately 270 m southeast of the Site within CL-20, known as 'Sloblands'. It is an active authorised landfill facility accepting industrial waste originating from the Mir Steelworks.

Table 2: Natural Resources Wales - Significant Pollution Incidents within the Site

Date	Impact to air	Impact to land	Impact to water	Pollutant	Location
8/7/2005	Significant	No impact	No impact	Organic chemical products	NE of the Site, adjacent to the Felnex Industrial
6/9/2010	Minor	Significant	Significant	Oils and fuels	N, adjacent to the River Usk and Felnex Industrial Estate
4/5/2011	No impact	Significant	Significant	Pollutant not identified	N, adjacent to the River Usk and Felnex Industrial Estate

5.4.2 Information obtained from NRW in 2015 indicates that a surface water abstraction licence previously reported as active in the PSSR has since been revoked. No further information is considered relevant since the 2014 PSSR.

5.4.3 Residual level of potential contamination may be present associated with these historical pollution incidents.

6 Scope of Investigations

6.1 General

6.1.1 Five intrusive ground investigations have been undertaken within the Site.

6.1.2 For the purpose of meeting the requirements of Volume 4, Section 1, Part 2 of the DMRB (HD22/08 – Managing Geotechnical Risk – 2008 (Highway Agency, 2008), the historical data used to support the 2014 PSSR have been differentiated from additional 2015 Supplementary Ground Investigation data (Geotechnical Engineering, 2015) and the 2016 Additional Ground Investigation.

6.2 Scope of Works

6.2.1 The various intrusive ground investigations undertaken within the Site area are summarised in Table 3.

Table 3: Site Investigation Summary

Date	Contractor	Site Location	Boreholes	Trial Pits	Sampling
1997	Norwest Holst	South	BHG2, BHG3, BHG4	-	Soil
2000	Exploration Associates	South	CH24, CH25, CH26, CH27, CH28, CH29, CH30, CH31, CH32	-	Soil, leachate and groundwater
2008	Norwest Holst	South	-	STPG01, STPG02	Soil and leachate
2015	Geotechnical Engineering Limited	South	BH423, BH424, BH425, BH426	TP410, TP411	Soil
2016	RPS	Centre and South	WSM4CANA014, BHM4CAN024, BHM4CAN025, BHM4CAN026, BHM4CANA023, BHM4CANA024, BHM4CANA025, BHM4CANA026, BHM4CANA028, BHM4CANA029, BHM4CANA030, BHM4CANA031, BHM4CANA032, BHM4CANA033	-	Soil, leachate and groundwater

6.2.2 The 2016 Additional Ground Investigation undertaken by RPS specifically targeted some of the previously identified data gaps as well as enabling the verification of the risk levels at the Site and need for remedial measures to be considered. The scope of the 2016 Additional Ground Investigation included the following.

- The former refuse tip (Site 19 in Figure 1).
- Groundwater contamination (focussing on potential risks from offsite migration of PCBs in groundwater from Solutia Chemical Works). This has included investigation of both shallow groundwater within the Made Ground and deep groundwater within the Mercia Mudstone.
- The ground gas regime relating to the Made Ground.
- The proposed pier footprints.
- Ground conditions and contamination status to the north of the alignment within the temporary construction land take areas.

6.2.3 The well construction details of boreholes installed on the Site are summarised in Table 4.

Table 4: Summary of Borehole Construction Details

Borehole ID	Diameter (mm)	Total Drilled Depth (m)	Top of Slotted Well Casing / Gravel Pack (m bGL)	Base of Slotted Well Casing / Gravel Pack (m bGL)	Targeted Geology
BHG2	Assumed 50	45	Unspecified	13.5	Tidal Flat Deposits / Glaciofluvial Deposits
BHG3	Assumed 50	40.5	Unspecified	19.7	Mercia Mudstone
BH423	35	60	15	18	Glaciofluvial Deposits
	50		25	40	Mercia Mudstone
BH425	35	54.4	11.8	12.3	Glaciofluvial Deposits
	50		20	30	Mercia Mudstone
BH426	35	54.5	1	2	Made Ground
	50		4	13	Tidal Flat Deposits
BHM4CAN024	50	14.9	0.5	1.8 / 2.5	Made Ground / Tidal Flat Deposits
BHM4CAN025	50	50	21.5	45	Mercia Mudstone

6.3 Surface Water Quality Monitoring

6.3.1 Surface water quality monitoring was not undertaken during the previous ground investigations of the Site.

6.4 Field Testing

6.4.1 During the 2007 investigation a photo-ionisation detector (PID) was used on selected soil samples to identify the presence of volatile organics. The monitoring results did not identify any elevated results above background.

6.5 Groundwater and Ground Gas Monitoring

6.5.1 A summary of the groundwater sampling, groundwater monitoring and ground gas monitoring is shown in Table 5.

Table 5: Summary of Monitoring Rounds

Location Ref.	Number and date of rounds	Monitoring details	Notes
BHG2	4 no. 27th November 1997, 3rd December 1997, 11th December 1997, 17th December 1997	Groundwater level	
BHG3	5 no. 15th November 1997, 25th November 1997, 3rd December 1997, 11th December 1997, 17th December 1997	Groundwater level	
BH423 (35 mm)	4 no. 28th April 2015, 6th May 2015, 11th May 2015, 19th May 2015	Groundwater level and sampling Ground Gas	Gas monitoring in the shallow 35 mm installation only.
BH423 (50 mm)			
BH425 (35 mm)	4 no. 28th April 2015, 6th May 2015, 12th May 2015, 19th May 2015	Groundwater level and sampling Ground Gas	Gas monitoring in the shallow 35 mm installation only.
BH425 (50 mm)			
BH426 (35 mm)	3 no. 28th April 2015, 6th May 2015, 12th May 2015	Groundwater level & sampling Ground Gas	Gas monitoring only undertaken during the 12th May round.
BH426 (50 mm)			
BHM4CAN024 (50 mm)	3 no. 4th May 2016, 18th May 2016, 1st June 2016	Groundwater level & sampling Ground Gas	
BHM4CAN025 (50 mm)	3 no. 4th May 2016, 18th May 2016, 1st June 2016	Groundwater level & sampling Ground Gas	

6.6 Laboratory Chemical Testing

6.6.1 Laboratory chemical analytical results are presented in Appendices 3 - 5.

6.7 Review of Available Data

6.7.1 The majority of ground investigation sample locations on the Site are situated along and immediately south of the new section of the motorway alignment. Since the Supplementary Ground Investigation was undertaken (Geotechnical

Engineering, 2015), the proposed motorway alignment has been subject to change and includes a wider area of temporary land take in which sample data from the 2016 Additional Ground Investigation are now available, particularly targeting the former refuse tip in this area (Site 19 in Figure 1).

6.7.2 A number of the 2016 Additional Ground Investigation locations have been installed to provide additional gas and groundwater monitoring data, the latter targeting shallow groundwater within the Made Ground and deep groundwater within the Mercia Mudstone. Additional hydrocarbon and PCB analysis has been obtained for f soil, leachate and groundwater for completeness.

6.7.3 Proposed permanent land take areas to the south of the proposed new section of motorway alignment (including a water treatment area) are understood to encompass a spoil heap and an infilled pond. The 2016 Additional Ground Investigation proposed locations in these areas but were not progressed due to access constraints at the time.

6.7.4 This report does not include an assessment of the following.

- Proposed location of a Water Treatment Area - there are no data on contamination and ground conditions in this area which is located on an area of infilled ground.
- Containment details of the sludge pits within the Mir Steelworks site - which are currently unknown.

7 Ground Conditions

7.1 Geology

7.1.1 The geological logs for all available exploratory holes on the Site are provided in Appendix 1. The observed geological sequence is consistent with that discussed in the 2014 PSSR report and is summarised in the following sections. Information from the Supplementary Ground Investigation (Geotechnical Engineering, 2015) and the 2016 Additional Ground Investigation has also been used.

Made Ground

7.1.2 Made Ground was encountered in the majority of exploratory holes with thicknesses generally around 1.4 m across the area investigated but ranging between 0.3-3.1 m as summarised in Table 6.

7.1.3 Made Ground is commonly present as a coarse material comprising slag, brick, concrete, limestone and ash. Further man-made inclusions including clinker, charcoal, coal, ceramic, plastics, paper and timber were also noted.

7.1.4 Made Ground within the area historically identified as a refuse tip was recorded at 1.7 m thickness (BHM4CANA029) and 1.8 m thickness (BHM4CAN024). The composition of the Made Ground at these locations could not be readily distinguished from elsewhere on Site though with a predominance of ash sands.

7.1.5 Made Ground consisting of clay with varying proportions of sands and gravels were noted to a lesser extent across the Site.

Superficial Deposits

7.1.6 Unconsolidated Tidal Flat Deposits were encountered beneath the Made Ground. These comprise soft or very soft grey silty clays with occasional plant fibres noted in the upper horizons. Occasional patches of pseudo fibrous peat were noted within the upper horizons of the Tidal Flat Deposits encountered within BHM4CANA024 and BHM4CANA032.

7.1.7 Thick laminae of fine sand were noted within the clays encountered within BH423 between 13.2 and 15 m bGL. A sand horizon with rare fragments of fibrous organic material or frequent shells was encountered beneath this, between 15 and 16.45 m bGL. This borehole is located on the banks of the River Usk.

7.1.8 The Tidal Flat Deposits encountered within BHM4CANA25 comprise a silty sand with shell fragments. This borehole is located close to the banks of the River Usk.

7.1.9 The Tidal Flat Deposits encountered within BHM4CANA024 comprise a very soft silt, becoming very sandy below 11.5 m bGL. This borehole is located at the eastern end of the alignment.

7.1.10 Sand and gravel material considered to represent Glaciofluvial Deposits (although referred to as River Terrace Deposits or Fluvial Alluvium in the exploratory holes predating the 2016 Additional Ground Investigation) was found to underlie the predominantly fine and cohesive Tidal Flat Deposits in some boreholes, particularly in closest vicinity to the River Usk. The Glaciofluvial Deposits are considered to be continuous and up to 6.7 m in thickness at the

western end of the Site (BHM4CANA033) adjacent to the River Usk, but rapidly thinning and becoming discontinuous eastwards principally of borehole BH424. The formation was found to be absent at BH424, BH425, BHG3, BHG4, BHM4CANA024, BHM4CANA023, BHM4CANA024, BHM4CANA026, BHM4CANA028, BHM4CANA030, BHM4CAN032, BHM4CANA025 and BHM4CANA031, and 1.0 m or less in thickness in BHG2, BHM4CAN026 BHM4CANA029 and BH426.

Solid Geology

7.1.11 Below the Tidal Flat or Glaciofluvial deposits the Mercia Mudstone Group typically was encountered and described as stiff or very stiff, reddish brown, fissured clay becoming very weak to moderately strong.

7.1.12 The formation is found at 11.4-16.1 m bGL (-4.44 to -8.13 m AOD) beneath much of the Site, deepening to 20.8 m bGL (-13.49 m AOD) associated with the river bed of the River Usk (BHM4CANA033) at the western end.

Geological Sequence Summary

7.1.13 The general geological sequence identified during the previous ground investigations is summarised in Table 6.

Table 6: Summary of Geological Sequence

Unit	Description	Thickness Range (m)	Basal depth (m bGL)
Made Ground (hardstanding)	Concrete / tarmacadam / red brick paving	0.10-0.3	0.10-0.3
Made Ground	Predominantly coarse includes ash, slag, brick, metal, plastic, glass, ceramic, concrete and limestone	0.3-3.1	0.7-3.1
Superficial Deposits (Tidal Flat Deposits)	Silty clay, organic in places with occasional gravel and a sand horizon within BH423.	10.3-16.6	10.4-18.2
Superficial Deposits (Glaciofluvial Deposits)	Sand & Gravel	Absent-6.7	11.4-20.8
Mercia Mudstone (Mudstone)	Stiff and very stiff red brown clay becoming very weak to moderately strong mudstone	>42	>54.5

7.2 Visual and Olfactory Evidence of Contamination

7.2.1 In addition to man-made inclusions within the Made Ground noted above the following visual and olfactory evidence of contamination was encountered during intrusive investigations on the site;

- A slight hydrocarbon odour noted within Made Ground encountered between 0.5 mbgl and 1.65 mbgl (BHM4CAN024), becoming strong below 0.75 mbgl. An oily sheen was noted on the groundwater.

- A 'slightly fishy' odour was noted within Made Ground encountered between 1.2 m bgl and 1.4 m bgl (BHM4CAN025).
- A slight hydrogen sulphide odour was reported together with a ground gas emission noted at 14 m bgl within BHM4CANA029.

7.2.2 Full details and observations noted during the drilling and trial pitting are presented on the exploratory logs attached in Appendix 1.

7.3 Groundwater Monitoring

Groundwater Encountered During Investigation

7.3.1 All groundwater strikes encountered are detailed on the geological logs provided in Appendix 1. These are summarised below.

Table 7: Summary of Groundwater Level Data During Investigation

Location	Strike Depth (m bGL)	Geological Formation	Level after 20 minutes (m bGL)	Comment
BHG2	13.2	Glaciofluvial Deposits	8.9	Fast flow
CH26	0.65	Made Ground	0.65	-
CH32	0.1	Made Ground	0.1	-
STPG01	0.4	Made Ground	-	Fast flow
BH423	1.2	Tidal Flat Deposits	0.54	-
BH424	1.1	Made Ground	1.1	-
BH425	1.8	Made Ground	1.7	-
BH426	0.2	Made Ground	0.2	-
BHM4CAN024	0.4	Made Ground	0.3	-
	12.7	Mercia Mudstone	10.6	-
BHM4CAN025	0.5	Made Ground	0.4	-
BHM4CAN026	0.8	Made Ground	0.7	-
	5.2	Tidal Flat Deposits	4.6	-
	12	Glaciofluvial Deposits	8.4	-
	41	Mercia Mudstone	5.0	-
BHM4CANA023	0.8	Made Ground	0.6	-
	11.8	Mercia Mudstone	7.7	--
BHM4CANA024	0.7	Made Ground	-	-
	7.6	Tidal Flat Deposits	6.9	-
	16.3	Mercia Mudstone	12.7	-
	19.1	Mercia Mudstone	5.4	-
	39.6	Mercia Mudstone	6.1	-
BHM4CANA025	1.1	Made Ground	0.83	-
BHM4CANA026	1.8	Tidal Flat Deposits	1.3	-

Location	Strike Depth (m bGL)	Geological Formation	Level after 20 minutes (m bGL)	Comment
	11	Tidal Flat Deposits	-	-
BHM4CANA028	0.8	Made Ground	0.6	-
BHM4CANA029	0.6	Made Ground	0.4	-
	17	Mercia Mudstone	-	-
BHM4CANA030	0.9	Made Ground	0.8	-
	14	Mercia Mudstone	11.5	-
BHM4CANA031	3.5	Tidal Flat Deposits	1.75	-
BHM4CANA032	1.1	Tidal Flat Deposits	0.7	-
	12.7	Mercia Mudstone	12.2	-
BHM4CANA033	0.4	Made Ground	0.2	-
	14.1	Glaciofluvial Deposits	10.7	-

7.3.2 Groundwater was not encountered in any other boreholes and trial pits.

7.3.3 During the drilling of BHM4CANA029 a significant artesian water strike was encountered at a depth of approximately 17 m bgl, within the weathered bedrock (Mercia Mudstone). This can be attributed to temporary methane degassing of the borehole at this depth.

Groundwater Level during Monitoring Rounds

7.3.4 The groundwater level dataset gathered on Site is provided in Appendix 2 and summarised in Table 8.

Table 8: Summary of Groundwater Level Data During Monitoring

Location	Installation	Depth of response zone (m bGL) and Geological Formation	No. Measurements	Min Depth (mbGL)	Max Depth (mbGL)	Comments
BHG2	50 mm (not specified on log)	12.5-14 Tidal Flat Deposits / Glaciofluvial Deposits	4	3.98	5.72	-
BHG3	50 mm (not specified on log)	16-20 Mercia Mudstone	5	3.12	5.21	-
BH423	35 mm	15-18 Glaciofluvial Deposits	4	5.18	7.4	-
	50 mm	25-40 Mercia Mudstone	4	5.27	6.90	-
BH425	35 mm	11.8-12.3 Glaciofluvial Deposits	4	2.10	7.24	-
	50 mm	20-30 Mercia Mudstone	4	5.30	6.73	-
BH426	35 mm	1-2 Made Ground	3	0.1	0.5	-
	50 mm	4-13 Tidal Flat Deposits	3	0.7	1.77	Slow recharge
BHM4CAN024	50 mm	0.5-2.5 Made Ground / Tidal Flat Deposits	3	0.36	0.54	-
BHM4CAN025	50 mm	21.5-45 Mercia Mudstone	3	6.9	7.1	-

Groundwater Summary

7.3.5 The main groundwater body on the Site is within the granular Glaciofluvial Deposits and the Mercia Mudstone which are confined by the overlying Tidal Flat Deposits. The Tidal Flat Deposits are therefore considered to be an aquitard that inhibits the vertical migration of groundwater and support perched groundwater in more permeable material where present.

7.3.6 Discontinuous perched groundwater is evident within the upper formation of the Tidal Flat Deposits. These are considered to represent discrete bodies within limited vertical or lateral flow.

7.3.7 Perched water was also identified during the intrusive works and subsequent monitoring within the Made Ground. The water levels measured within the Made Ground are greater than water levels within the underlying groundwater bearing units, most notably the Glaciofluvial Deposits and Mercia Mudstone Group. This confirms the perched nature of groundwater in the Made Ground and demonstrates a perennial, downward vertical hydraulic potential.

7.3.8 The groundwater conditions encountered on the Site are consistent with the hydrogeological conceptual model presented in the Baseline Water Environment Report (Appendix 16.2 of the ES).

7.4 Gas Monitoring

7.4.1 The gas monitoring dataset collected during each of the four monitoring rounds is summarised on the summary field data sheets provided in Appendix 2. The maximum gas concentrations (minimum for oxygen) are presented in Table 9.

Table 9: Summary of Gas Monitoring Data

Location ID and Geological Formation	Flow (l/hr)	VOCs (ppm)	CH_4 (%/vol)	Peak LEL (%)	CO_2 (%/vol)	O_2 (%/vol)	CO (ppm)	H_2S (ppm)
	Max.	Max.	Max.	Max.	Max.	Min.	Max.	Max.
BH423 (Glaciofluvial Deposits)	0	3.3	1	24.2	0.3	19.8	0	0
BH425 (Glaciofluvial Deposits)	0	2.3	67.5	>>>	3.3	5.3	22	0
BH426 (Made Ground)	0	0	74.1	>>>	0.3	0.2	0	0
BHM4CAN024 (Made Ground / Tidal Flat Deposits)	0	-	20.2	>>>	0.4	3.1	9	0
BHM4CAN025 (Mercia Mudstone)	-0.1	-	3.2	1	0.2	17.2	2	0

7.4.2 It is of note that during the drilling of BHM4CANA029 methane emissions were encountered at a depth of 14 m bGL (initial readings of 50 %) and 17 m bGL within the Mercia Mudstone, the latter coinciding with the artesian water upsurge discussed previously.

8 Contamination Assessment

8.1 Introduction

8.1.1 The following sections provide details of the assessment of land contamination at the Site.

8.1.2 The conceptual site model presented within the 2014 PSSR has been reviewed and updated based on data from the Supplementary Ground Investigation (Geotechnical Engineering, 2015), the 2016 Additional Ground Investigation and the design of the new section of motorway. The main alterations to the 2014 PSSR model are summarised as follows.

8.1.3 New contamination source (identified as perched water body within the Made Ground.

- New ground gas source identified (Made Ground and superficial deposits).
- Revision of the geological Site model.
- Update of the source/pathway/receptor linkages taking account of the above and more detailed assessments.

8.2 Preliminary Risk Assessment

Potential Sources

8.2.1 The Made Ground was identified within the 2014 PSSR as a potential source of contamination based on the Site's historical and current uses including industrial processes such as of various infill processes, timber yards, fuel depot, scrap yard, electrical substations, steelworks, aluminium works, sludge lagoons, sewage treatment plant, railway line and industrial estates. The potential contamination sources are shown in Figure 1.

8.2.2 A former refuse tip and backfilled ponds also represent discrete areas of possible contamination.

8.2.3 Where present, the perched water body within the Made Ground is considered to represent a potential source rather than a receptor.

8.2.4 The Made Ground and superficial deposits represent potential gas sources.

8.2.5 Confined groundwater from within the Glaciofluvial Deposits and Mercia Mudstone is potentially brackish and may contain anthropogenic contaminants of concern.

8.2.6 Landfill gas generation in the Slobsland landfill area is most likely to occur outside the study area, and is unlikely to impact on the new section of motorway crossing the northern edge of CL20, immediately adjacent to this site. However, there is potential for gas migration from this area on the alignment located immediately to the north.

8.2.7 A known off site source of contamination (PCBs) is present at Solutia Chemical Works.

Potential Receptors

8.2.8 Receptors during the construction and operational stages of the new section of motorway have been considered.

Construction

- Construction workers during site development works.
- General public/workers adjacent to construction works.
- Groundwater within the Glaciofluvial Deposits and Mercia Mudstone.
- Surface waters – The River Usk and impounded water within the docks.

Operational

- Maintenance workers.
- General public end users.
- General public/workers adjacent to the permanent land take.
- Groundwater within the Glaciofluvial Deposits and Mercia Mudstone.
- Surface waters – The River Usk and impounded water within the docks.

Potential Pathways

8.2.9 Pathways during the construction and the operational stages of the new section of motorway have been considered.

- Dermal contact, ingestion, inhalation pathways of potentially contaminated soils possible during development and maintenance works.
- Dermal contact, ingestion, inhalation pathways possible for general public end users and adjacent general public/workers. The latter pathway will be from soil dust only.
- Accumulation of ground gas within confined spaces during the earthworks.
- Lateral migration of leachate and/or contaminated impacted perched water within the Made Ground directly into surrounding surface water bodies or via subsurface drainage.
- Downward vertical migration of leachate and/or impacted perched water within the Made Ground in the main groundwater bodies.
- Downward vertical migration of impacted leachate and/or impacted perched water within the Made Ground into the main groundwater bodies and subsequent lateral migration to surface water bodies.
- Vertical or lateral migration of ground gas associated with Made Ground / superficial deposits potential sources.
- Upward migration of ground gases along piles.
- Creation of potential new pathways for shallow contamination to migrate along piles and foundations from the Made Ground, through the Tidal Flat Deposits and into Glaciofluvial Deposits and/or Mercia Mudstone.

8.2.10 The groundwater level dataset suggests that upward, vertical migration from the Glaciofluvial Deposits/Mercia Mudstone Group into Made Ground is not an active pathway within the Site.

8.2.11 Although perched water contained within the Made Ground is unlikely to be laterally continuous across the Site, owing to the lithological and depth variability of this unit across the Site, it has been considered a possible generic pathway for this assessment.

Preliminary Risk Evaluation

8.2.12 Source pathway receptor linkages were considered in the 2014 PSSR using the historical data available up to 2008. With review of the other data described herein, the following risk evaluation has been re-considered and includes the following.

- The new section of motorway is to be carried via a viaduct and high embankment some 4 m or more above ground level. Motorway users will be within an open environment with no proposed structures or other confined spaces. Pathways linkages to M4 users during its operation are therefore limited to air born dust.
- The Site has been subject to a range of potential contaminating uses. Off-site sources associated with Solutia Chemical Works are also identified.
- Potential risk from landfill gas/leachate migration from Sloblands landfill located south of the alignment.
- CL17 presents a potential off site source of PCBs.
- Proposed piers will encapsulate Made Ground reducing exposure pathways to motorway end users / maintenance workers. However, remaining areas (outside pier locations) are to comprise both soft and hardstanding.
- Superficial Deposits are classified as non-productive and overlie a Secondary B Aquifer associated with the mudstone.
- There are no nearby abstractions for potable water in or within the vicinity of the Site.
- The cohesive Tidal Flat Deposits which are over 10 m thick hydraulically separate the Made Ground from the underlying aquifer units. Thus, the main groundwater body is confined by the Tidal Flat Deposits which provide a layer of protection to the aquifer.
- Perched groundwater within the Tidal Flat Deposits is not considered a water resource as it is likely to be brackish in nature and is insufficiently permeable to support reliable yields..
- Piled foundations may create potential pathways to the lower aquifer, that may allow increased infiltration of perched water from the Made Ground, given the generally downward hydraulic potential expected on the site. Some contaminants in the soil matrix of the Made Ground appear to be leachable.
- High recorded concentrations of ground gases which may migrate laterally and vertically including upward migration along the proposed piles.

- Earthworks for the construction of the pier foundations may constitute confined spaces in which ground gases may accumulate.
- The proposed water treatment area (WTA) is to receive surface water from the viaduct and will be lined to prevent downward infiltration. Discharge of waters is to be controlled under a discharge consent and the WTA is neither considered as a source or receptor in this report.

8.3 Human Health Risk Assessment

8.3.1 The rationale and approach for the human health (tier 2) screening assessment is detailed in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES). Soil chemical analysis results and the findings of the generic tier 2 human health risk assessment are presented in Appendix 3. All exceedances within Made Ground are summarised in Table 10.

Table 10: Summary of Human Health Soil Screening Exceedances (Made Ground)

Determinant	Units	Range	Screening Criteria	No. samples exceeding Screening Criteria (Total number of results)	Locations of exceedances
pH	pH units	7.9 – 12.2	6-9	24 (33)	BHG3, CH24, CH25, CH28, CH29, CH30, CH31, CH32, STPG01, BH424, BH425, BH426, BHM4CAN025, BHM4CAN026, BHM4CANA023, BHM4CANA029, BHM4CANA031, BHM4CANA032, BHM4CANA033
Chromium	mg/kg	4.96 - 2,410	33	15 (33)	BHG2, BHG3, CH24, CH27, CH30, CH31, CH32, STPG01, BH424, BH426, BHM4CANA023, BHM4CANA025, BHM4CANA029
Polycyclic Aromatic Hydrocarbons (PAH) [screen]	mg/kg	9.3 - 191	1.1	12 (13)	BHG3, CH24, CH25, CH26, CH27, CH28, CH29, CH30, CH31, CH32
PCB – Aroclors	mg/kg	0.2 – 0.5	0.24	1 (3)	CH32
PCB (vs Aroclor 1254)	mg/kg	0.062 – 0.61	0.24	1 (2)	STPG01

8.3.2 Alkaline soil conditions have been identified within Made Ground across the Site typically associated with ash, slag, concrete and limestone gravel.

8.3.3 Although exceedances of chromium are identified throughout the Made Ground, the criterion relates to the hexavalent form. The majority of the results are considered to be within normal background data range (<95 mg/kg) and therefore, are not considered to represent a contaminant of concern. However nine isolated samples, with no apparent pattern exceed this background range with maximum of up to 2,410 mg/kg. Seven samples have been analysed for the more toxic hexavalent form of chromium and all have returned concentrations of ≤0.4 mg/kg. The highest speciation test relates to Made Ground in STPG01 with a total chromium concentration of 1,900 mg/kg and associated hexavalent chromium of 0.4 mg/kg (remaining concentrations reported at below the Limit of Detection (LOD)). The latter is well below the criteria of 33 mg/kg. It is therefore, considered that chromium represents a low risk to human health. Further consideration of chromium is also provided in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES).

8.3.4 Total PAH analysis from the 1997 to 2007 studies indicates the presence of PAHs in Made Ground across the site. However, the results of speciated PAH analysis in the most recent investigations (principally the Supplementary Ground Investigation (Geotechnical Engineering, 2015) and the 2016 Additional Ground Investigation) demonstrate the absence of any exceedances against their respective criteria, supporting a low risk to human health in relation to PAHs on the site.

8.3.5 Total PCB analysis undertaken as part of early investigations (i.e. 2007 and before) identified concentrations of PCBs above the screening criterion of 0.25 mg/kg in 2 of the 5 samples analysed. These samples were taken from locations CH32 and STPG01 situated in the east of the site, adjacent to the Solutia Chemical Works (CL-17). Additional speciated PCB analysis was undertaken as part of the Supplementary Ground Investigation (Geotechnical Engineering, 2015) and the 2016 Additional Ground Investigation. In the 10 samples analysed the measured PCB concentration did not exceed the analytical LOD in any sample. The risk associated with PCBs across the site is indicated to be low, although it will have to be investigated further in the event of soils being generated / exposed in the east of the site adjacent to CL17. PCBs are considered further within the CL17 report with further speciated PCB analysis undertaken on soils encountered across the southern portion of the Site potentially affected by the Scheme. Results identify concentrations to comprise less toxic congeners again indicating relatively low risk.

8.3.6 Low to moderate hydrocarbon concentrations have been observed with a maximum recorded Total Petroleum Hydrocarbons (TPH) concentration of 1,190 mg/kg. The observed concentrations are not indicative of gross contamination of soils by petroleum hydrocarbons and remain below screening criteria. Additional speciated TPH analysis has been undertaken in the most recent investigations (principally the Supplementary Ground Investigation (Geotechnical Engineering, 2015) and 2016 Additional Ground Investigation). A total of 17 samples have been subject to speciated analysis, including BTEX compounds, with no assessment criteria exceeded, although typically low concentrations of longer chain aromatic and aliphatic hydrocarbons are observed. The results confirm the low risk to human health posed by petroleum

hydrocarbons on the site. TPH on the site is therefore considered to represent a low risk to human health.

8.3.7 Asbestos was not detected in any of the 15 samples analysed across the Site.

8.3.8 In summary, with the possible exception of PCBs adjacent to the CL17 site, the previous ground investigations have identified levels of contamination within Made Ground that are at tolerable levels of risk for the construction of the new section of motorway in respect to human health.

8.3.9 All exceedances within natural ground relative to the appropriate assessment criteria are summarised in in Table 11 (natural ground).

Table 11: Summary of Human Health Soil Screening Exceedances (Natural Ground)

Determinant	Units	Range	Screening Criteria	No. samples exceeding Screening Criteria (Total number of results)	Locations of exceedances
pH	pH units	7.3 – 11.1	6 – 9	2 (10)	CH28, BH426
Chromium	mg/kg	14 - 84	33	8 (10)	BHG4, CH24, CH25, CH27, STPG01, STPG02, BH423, BH426
PAH (screen)	mg/kg	<10 - 71	1.1	2 (4)	CH25, CH28

8.3.10 Eight samples of natural soils had total chromium concentrations above the screening criteria of 33 mg/kg. However, as discussed previously the screening criteria is for hexavalent chromium rather than total chromium. The maximum chromium concentration (STPG02 – 84 mg/kg) has been speciated with a concentration of hexavalent chromium below laboratory limit of detection. It is therefore considered that chromium levels represent a low risk to human health.

8.3.11 Only total PAH was analysed in soils and was compared against the conservative screening criteria (1.1 mg/kg). Elevated concentrations are identified for two samples at the interface with the Made Ground. Greater concentrations were detected within samples from the overlying Made Ground at the same locations, indicating a vertical migration of PAH contaminants.

8.3.12 PCBs were identified at trace level in STPG01 (1.2 m depth) with a concentration of 0.025 mg/kg which is below screening criterion. The concentration also indicates limited vertical migration of the contaminant as the concentration in the Made Ground at the same location was higher.

8.4 Controlled Waters Screening Assessment

8.4.1 The rationale and approach for the controlled waters (Tier 1) screening assessment is detailed in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES), with the groundwater and soil leachate chemical results presented in Appendices 4 and 5, respectively. All exceedances of the

relevant assessment criteria are summarised in Table 12 and Table 13 for soil leachate and groundwater respectively.

8.4.2 Where an Environmental Quality Standard (EQS) is dependent on water hardness (i.e. some heavy metals), the hardness of the surface water receptor would normally be used. The Baseline Water Environment Report (Appendix 16.2 of the March 2016 ES) indicates surface water to be generally moderately hard with hardness in a range of 100 to 150 mg/l as calcium carbonate. Therefore, EQSs within this water hardness range have been used for screening purposes.

Soil Leachate Results

8.4.3 Nine soil samples were subjected to leachate analysis. The majority of the soil leachate results were all below the applied screening criteria, with the exception of the contaminants listed in Table 12.

Table 12: Controlled Waters Screening Exceedances - Soil Leachate

Determinant	Units	Range	EQS	DWS[1]	No. exceeded EQS Screening Criteria (Total number of results)	Location (formation)	No. exceeded DWS Screening Criteria (Total number of results)	Location (formation)
Arsenic	µg/l	<1 – 44.5	50	10	0 (10)	-	2 (10)	BH425, BHM4CANA032 (Made Ground)
Cadmium	µg/l	<0.08 – 2.5	0.15	5	1 (10)	TP410 (Made Ground)	0 (10)	-
Chromium	µg/l	<1 - 160	-	50	-	-	1 (12)	STPG01 (Made Ground)
Copper	µg/l	2.5 – 39	10	2,000	4 (12)	CH31, STPG01, TP410, BHM4CANA029 (Made Ground)	0 (12)	-
Lead	ug/l	<0.5 – 1.55	1.2	10	1 (10)	BHM4CANA032 (Made Ground)	0 (10)	-
Antimony	µg/l	<1 - 19	-	5	-	-	2 (4)	STPG02 (Made Ground), STPG01 (Tidal Flat Deposits)
Selenium	µg/l	<1 - 13	-	10	0 (10)	-	3 (10)	BH426, TP410, BHM4CANA032 (Made Ground)

Determinant	Units	Range	EQS	DWS[1]	No. exceeded EQS Screening Criteria (Total number of results)	Location (formation)	No. exceeded DWS Screening Criteria (Total number of results)	Location (formation)
pH	pH units	8.3 – 11	6 - 9	6.5 - 10	5 (8)	CH31, CH32, BHM4CAN025, BHM4CANA029, BHM4CANA032 (Made Ground)	4 (8)	CH31, BHM4CAN025, BHM4CANA029, BHM4CANA032 (Made Ground)

8.4.4 The identified exceedances indicate leachable concentrations of heavy metals are not widespread. It's considered that the occasional and typically small exceedance of assessment criteria for arsenic, chromium, selenium and copper do not constitute a significant or unacceptable risk to controlled water, particularly as there are no potable water abstractions at or near the Site and the principal aquifer is identified to be brackish / saline. The concentrations of these contaminants are below EQS.

8.4.5 The pH of leachate from Made Ground is typically elevated and exceeds the EQS criteria in 5 of the 8 samples analysed. Elevated pH may theoretically pose a risk to nearby controlled surface waters where pathways facilitate a quantitatively significant direct discharge.

8.4.6 Certain laboratory detection levels in samples used in previous ground investigations for cadmium, mercury, cyanide and some PAHs are higher than the screening criteria. However for the purposes of a water quality screening exercise this is considered acceptable.

8.4.7 The results of leachate analysis suggest that the general quality of Made Ground identified on the site does not represent a high risk with regards to generation of low quality perched groundwater therein.

Groundwater Results

8.4.8 Sixteen groundwater samples from previous ground investigations were obtained for chemical analysis. Many of the groundwater results were below the screening criteria, with the exception of the contaminants in Table 13.

Table 13: Controlled Waters Screening Exceedances - Groundwater

Determinant	Units	Range	EQS	DWS	No. exceeded EQS Screening Criteria (Total number of results)	Location (formation)	No. exceeded DWS Screening Criteria (Total number of results)	Location (formation)
Perched Water: Made Ground								
Chloride	mg/l	273 - 377	250	250	3 (3)	BHM4CAN024 (MG/TFD)	3 (3)	BHM4CAN024 (MG/TFD)
Copper	µg/l	<0.85 - 19	10	2,000	1 (4)	CH32 (Made Ground)	0 (4)	-
Lead	µg/l	0.233 - 10	1.2	10	1 (4)	CH32 (Made Ground)	0 (4)	-
Nickel	µg/l	1.82 - 9	4	20	1 (4)	CH32 (Made Ground)	0 (4)	-
Cadmium	µg/l	<0.1 - 0.294	0.15	5	2 (4)	BHM4CAN024 (MG)	0 (4)	-
Mercury	µg/l	<0.01 - 0.3	0.07	1	1 (4)	CH32 (Made Ground)	0 (4)	-
Fluoranthene	µg/l	0.17 - 0.32	0.0063	-	4 (6)	CH32 (Made Ground), BHM4CAN024 (MG)	0 (6)	-
pH	pH units	7.87 - 10.8	6-9	6.5-10	1 (4)	CH32 (Made Ground)	1 (4)	CH32 (Made Ground)
Phenol Index	mg/l	0.06	(0.0077)[1]	-	1 (1)	CH32 (Made Ground)	0 (1)	-
Ammoniacal Nitrogen as N	mg/l	2.47 - 2.65	0.6	-	3 (3)	BHM4CAN024 (MG)	-	-
Benzo(a)pyrene	µg/l	<0.05 - 0.0382	0.00017	0.01	3 (4)	BHM4CAN024 (MG)	2 (4)	BHM4CAN024 (MG)
Benzo(b)fluoranthene	µg/l	<0.05 - 0.056	0.017	0.1	2 (4)	BHM4CAN024 (MG)	0 (4)	-
Benzo(ghi)perylene	µg/l	<0.05 - 0.1	0.0082	0.1	1 (4)	BHM4CAN024 (MG)	0 (4)	-
PCB- ARO	µg/l	0.8	Detect	Detect	1 (1)	CH32	1 (1)	CH32
Discontinuous Groundwater: Tidal Flat Deposits								
Chloride	mg/l	1100 - 2300	250	250	3 (3)	BH426 (TFD)	3 (3)	BH426 (TFD)
Arsenic	µg/l	7.2 - 19	50	10	0 (3)	-	2 (3)	BH426 (TFD)
Nickel	µg/l	5.7 - 20	4	20	3 (3)	BH426 (TFD)	0 (3)	-
Boron	µg/l	1800 - 3000	2000	1000	1 (3)	BH426 (TFD)	3 (3)	BH426 (TFD)
Copper	µg/l	2.2 - 13	10	2,000	1 (3)	BH426 (TFD)	0 (3)	-
Selenium	µg/l	7.3 - 17	-	10	0 (3)	-	2 (3)	BH426 (TFD)
Chloride	mg/l	1100 - 2300	250	250	3 (3)	BH426 (TFD)	3 (3)	BH426 (TFD)
Ammoniacal Nitrogen as N	mg/l	3.9 - 10	0.6	-	3 (3)	BH426 (TFD)	0 (3)	-

Determinant	Units	Range	EQS	DWS	No. exceeded EQS Screening Criteria (Total number of results)	Location (formation)	No. exceeded DWS Screening Criteria (Total number of results)	Location (formation)
Total Cyanide	mg/l	<0.05 – 0.05	0.001	0.05	1 (3)	BH426 (TFD)	0 (3)	-
Aquifer: Glaciofluvial Deposits / Mercia Mudstone								
Chloride	mg/l	280 - 5720	250	250	9 (9)	BH425, BHM4CAN025	9 (9)	BH425 (GFD & MMG), BHM4CAN025 (MMG)
Arsenic	µg/l	4.8 - 31	50	10	0 (15)	-	12 (15)	BH423 (GFD & MMG), BH425 (GFD & MMG), BHM4CAN025 (MMG)
Boron	µg/l	480 - 4200	2000	1000	7 (12)	BH423 (GFD & MMG), BH425 (GFD & MMG)	10 (12)	BH423 (GFD & MMG), BH425 (GFD & MMG)
Chromium	µg/l	<1 - 53	-	50	0 (15)	-	1 (15)	BH425 (MMG)
Copper	µg/l	4.8 - 29	10	2,000	7 (15)	BH423 (GFD & MMG), BH425 (GFD & MMG)	0 (15)	-
Lead	ug/l	<1 - 2.09	1.2	10	1 (15)	BHM4CAN025 (MMG)	0 (15)	-
Nickel	µg/l	3.1 - 20.9	4	20	11 (15)	BH423 (GFD & MMG), BH425 (GFD & MMG) BHM4CAN025 (MMG)	1 (15)	BHM4CAN025 (MMG)
Selenium	µg/l	6.1 - 53.2	-	10	0 (15)	-	13 (15)	BH423 (GFD & MMG), BH425 (GFD & MMG) BHM4CAN025 (MMG)
Cadmium	µg/l	<0.08 – 2.32	0.15	5	4 (15)	BH425 (GFD) , BHM4CAN025 (MMG)	0 (15)	-
Ammoniacal Nitrogen as N	mg/l	0.65 - 45	0.6	-	10 (10)	BH423 (GFD & MMG), BH425 (GFD & MMG)), BH426 (Tidal Flat Deposits)	0 (10)	-
Benzo(a)pyrene	µg/l	<0.1 - 0.092	0.00017	0.01	3 (9)	BHM4CAN025 (MMG)	3 (9)	BHM4CAN025 (MMG)
Benzo(b)fluoranthene	µg/l	<0.1 - 0.171	0.017	0.1	3 (9)	BHM4CAN025 (MMG)	1 (9)	BHM4CAN025 (MMG)
Benzo(k)fluoranthene	µg/l	<0.054 -	0.017	0.1	1 (9)	BHM4CAN025 (MMG)	0 (9)	-

Determinant	Units	Range	EQS	DWS	No. exceeded EQS Screening Criteria (Total number of results)	Location (formation)	No. exceeded DWS Screening Criteria (Total number of results)	Location (formation)
		0.0617						
Benzo(ghi)perylene	µg/l	<0.1-0.1	0.0082	0.1	3 (9)	BHM4CAN025 (MMG)	0 (9)	-
Fluoranthene	µg/l	<0.1 - 0.0745	0.0063	-	3 (9)	BHM4CAN025 (MMG)	0 (9)	-

Note: [1] based on phenol criteria

8.4.9 The groundwater screening assessment includes data from three rounds of monitoring undertaken in 2015 (Boreholes BH423, BH425 and BH426) and three rounds undertaken following the 2016 Additional Ground Investigation (Borehole BHM4CAN024 and BHM4CAN025). Groundwater samples have been obtained from perched water within the Made Ground (4 No.), perched groundwater within the Tidal Flat Deposits where encountered (3 No.) as well as the underlying aquifer within the Glaciofluvial Deposits and Mercia Mudstone (9 No.).

8.4.10 Gross contamination of groundwater has not been identified in any of the water bearing units sampled on the site.

8.4.11 Groundwater from the Made Ground exceeds the EQS for copper, lead, nickel, cadmium and mercury . These exceedances are generally of low level and not widespread therefore the associated risk is considered low.

8.4.12 Laboratory detection levels for some PAHs are higher than screening criterion within the data set. Certain individual PAHs are shown to exceed the EQS in perched waters within CH32 and to a greater extent in BHM4CAN024. Hydrocarbon impaction of the Made Ground and perched water within the latter was observed, located in an area historically identified as a refuse tip. The elevated concentrations are considered a potential source of contamination rather than pollution of a receptor. The pH of perched water from Made Ground exceeds the EQS criteria in 1 of the 4 samples analysed. Elevated pH may theoretically pose a risk to nearby controlled surface waters where pathways facilitate a quantitatively significant direct discharge. This sample also exceeds the DWS.

8.4.13 Elevated hydrocarbon concentrations (TPH of 14,000 µg/l) and trace concentration of PCBs have also been recorded associated with the single sample of perched water within the Made Ground (CH32).

8.4.14 For groundwater encountered within the Tidal Flat Deposits and the underlying aquifer units (i.e. Glaciofluvial Deposits and Mercia Mudstone) the following observations have been made when considering EQS criteria:

- Exceedance of EQS for boron, copper, nickel cadmium, ammoniacal nitrogen and certain PAHs.
- A single exceedance of the EQS for lead (BHM4CAN025 in round 1) although with reduced concentrations reported in rounds 2 and 3.
- The elevated chloride concentrations indicate that both the perched groundwater and the aquifer are brackish.

- Certain laboratory detection levels for mercury, lead, some PAHs, Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs) are higher than their respective applied screening criteria within the dataset.

8.4.15 However, typically small exceedances of EQSs in some samples from these units do not represent a risk to surface water considering the length and characteristic of the pathway to those receptors.

8.4.16 Within the perched groundwater of the Tidal Flat Deposits and the aquifer bodies within the Glaciofluvial Deposits and Mercia Mudstone, arsenic, selenium, boron and chloride were typically identified exceeding DWS criteria. Chromium and nickel were also found exceeding on one occasion (BH425 in round 1 and BHM4CAN025 in round 2). Within BHM4CAN025 exceedances of benzo(a)pyrene were found during all monitoring rounds and round 1 for benzo(b)fluoranthene, though in each consecutive round concentrations of each are shown to reduce. It is notable however that as the groundwater has elevated salinity and cannot therefore be used for potable water supply, the exceedances are considered tolerable.

8.4.17 Round 2 for BH426 gave TPH of 400 µg/l within the TFD perched groundwater and round 1 for BHM4CAN025 within Mercia Mudstone aquifer gave TPH of 72 µg/l, with the last round <LOD. These concentrations are indicated to be transient and of localised impact.

8.4.18 Generally the water quality in the perched groundwater and aquifer is considered to be similar but more deteriorated than the water quality seen in the Made Ground.

8.5 Ground Gas Risk Assessment

8.5.1 The ground gas data available for the site are provided in Appendix 2 and summarised in Table 9. The ground gas data available relate to three boreholes drilled and monitored during the Supplementary Ground Investigation in 2015(BH423, BH425 and BH426) and the borehole BHM4CAN024 and BHM4CANA025 constructed as part of the 2016 Additional Ground Investigation. Borehole BH423 and BH425 have response zones within the Glaciofluvial Deposits (15 - 18 m bGL and 11.8 - 12.3 m bGL respectively) and borehole BH426 within the Made Ground (1 - 2 m bGL). Of the four monitoring rounds available (only one round is available for BH426 due to high water level). The well within borehole BHM4CAN024 provides gas data for the Made Ground / Tidal Flat Deposits and the well within BHM4CAN025 provides gas data for the bedrock (i.e. Mercia Mudstone). Based on the available data, the following observations have been made.

- No monitoring was undertaken during low barometric pressure (less than 1000 mb), with the lowest conditions being 1004 mb (applicable to 2015 supplementary Ground Investigation monitoring). As such worst case atmospheric conditions for potential ground gas generation may not have been monitored.
- Gas flow was generally recorded absent/low or negative which indicates the ground is not generating large volumes of ground gas.

- Methane has been recorded as nil or up to 1 % in BH423 during all 4 no. rounds, which is below or at the screening criteria of 1 %.
- In BH425, methane was recorded at 0.1 % on the first round. However, on the two following rounds, the initial concentrations were recorded as 50 - 67.5 % with a clear decrease at each 1 minute interval reading with concentrations at 9.9-12.2 % after 10 minutes. These concentrations are above the screening criterion of 1 %.
- In BH426, methane was identified to a maximum of 74.1 % during the single monitoring round. This is above the screening criteria of 1 %.
- In BHM4CAN024, methane was recorded up to 20.2 %. Concentrations reached their peak within the first minute and were shown to decrease thereafter to between 1.6 and 3.9 %, remaining above the screening criterion of 1 %.
- In BHM4CAN025, methane was recorded up to 3.2 % (one monitoring occasion) with a maximum of 0.3 % recorded on the two other occasions. Concentrations generally remaining stable over time.
- Carbon dioxide is identified between 0-3.3 % in all borehole wells monitored which is below the screening criteria of 5 %.
- Traces of Volatile Organic Compounds of up to 3.3 ppm have been recorded.
- Hydrogen sulphide was not detected throughout the monitoring.
- Carbon monoxide was recorded absent on all monitoring rounds for BH423 and BH426. The first monitoring round for BH425 identified a maximum of up to 22 ppm, falling to 7 ppm on the second monitoring round, 1 ppm on the third and nil on the fourth. The maximum recorded concentration is below the Workplace Exposure Limit of 30 ppm.
- Carbon monoxide was recorded up to a maximum of 9 ppm in BHM4CAN024 reducing to zero over time and 2 ppm in BHM4CAN025. The maximum recorded concentration is below the Workplace Exposure Limit (WEL) of 30 ppm.
- Oxygen has been recorded to be at relatively normal levels (ambient) in BH423 with concentrations between 19.8 - 20.7 %. However it is recorded at lower levels in BH425, BH426, BHM4CAN024 and BHM4CAN025 with a minimum of 5.3 %, 0.2 %, 3.1 % and 17.2 % respectively.

8.5.2 All gas results are presented in Appendix 2.

8.5.3 Within the Made Ground, the available data relate to the eastern end of the route alignment. They identify elevated methane concentrations, negligible gas flows and trace level of carbon dioxide with ambient or depleted oxygen conditions. These are considered representative of typical brownfield sites with low gas generation potential.

8.5.4 Frequent organic material is noted within the Made Ground encountered at BH426 which could be the origin of the elevated CH_4 levels. However given the limited data set available for this borehole (due to high water levels) the source of the elevated CH_4 concentrations is inconclusive. The location is also noted to be approximately 150 m north west of Solutia and the PCB cell identified as a potential gas source.

8.5.5 Significantly elevated concentrations of CH_4 within BH425 (recorded on three monitoring occasions) appear to be associated with a thin horizon of Glaciofluvial Deposits described as 'coarse gravel with wood'.

8.5.6 The presence of methane within the Glaciofluvial Deposits and in particular at BH425 is considered to be associated with the presence of natural organic material (peat) within the formation. The absence of gas flow and the recorded decrease in the concentration with time indicate a low gas flux with limited ground gas being generated.

8.5.7 Elevated methane identified within BHM4CAN024 screened within the Made Ground may potentially be attributed to hydrocarbon impaction of the Made Ground and perched water observed at this location.

8.5.8 Slightly elevated CH_4 was identified within BHM4CAN025 screened within the Mercia Mudstone during the final monitoring round only. It is of note that elevated CH_4 was reported during the drilling of BHM4CAN025 at 38 m bGL. Elevated CH_4 was also reported during the drilling of BHM4CANA029 at 14 m bGL and 17 m bGL, the latter coinciding with a significant upsurge of water. The bedrock is saturated and the source/mechanism for elevated ground gas within this borehole is unknown potentially representing 'pockets' of trapped methane.

8.5.9 As discussed within paragraph 7.4.2 during the drilling of BHM4CANA029 methane concentrations of up to 50 % were identified.

8.5.10 The presence of organic matter within the Glaciofluvial Deposits has not been widely identified elsewhere along the route of the new section of motorway (Geotechnical Engineering, 2015).

8.5.11 A gas risk assessment for the Scheme has been undertaken and is set out in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES).

8.6 Summary

8.6.1 Made Ground and natural soils have been shown to have elevated chromium concentrations. However, the speciation indicates these are not of the more toxic hexavalent chromium form and thus are considered to be at tolerable levels in relation to human health.

8.6.2 In general PAHs in soils comprising Made Ground and underlying natural soils is not considered a significant risk to human health.

8.6.3 Localised elevated PCBs near the boundary with Solutia Chemical Works (CL17) have been identified within the Made Ground and perched water. Further pre-construction sampling of proposed excavations in this area will be needed to establish if appropriate measures are needed to protect human health, determine acceptability of reuse of these soils and appropriate water management measures. Analysis of soil samples obtained across CL17 has identified that concentrations comprise mainly of less toxic congeners indicating low risk to human health.

8.6.4 Widespread high pH in the Made Ground is recorded and is likely to be associated with the presence of slag material in the Made Ground.

8.6.5 Leachable heavy metals have been identified from the Made Ground.

8.6.6 Exceedances of EQSs and DWSs are prevalent within the perched water, perched groundwater and underlying aquifers. When considering metals and inorganics, the water quality in the perched groundwater and aquifer is considered to be similar but generally more deteriorated than the perched water quality observed in the Made Ground. The groundwater and aquifer water quality is considered to be at background levels of this area of Newport associated with heavy industrial legacy. As such the Site may not be the sole cause for water quality deterioration although its contribution may not be ruled out.

8.6.7 Localised hydrocarbon contamination in groundwater was identified in the two monitoring points targeting the perched water within the Made Ground (CH32 and BHM4CAN024).

8.6.8 Elevated methane levels and depleted oxygen levels with low gas flows have been identified. The results indicated that limited ground gas is being generated in Made Ground and natural soils. Hydrocarbon impaction of soils and perched waters within an area historically identified as a refuse tip may be the source of elevated methane identified within BHM4CAN024.

9 Refined Conceptual Site Model

9.1.1 The incorporation of data from the 2015 Supplementary Ground Investigation and 2016 Additional Ground Investigation has enabled the original CSM presented in the 2014 PSSR to be updated. Relevant contaminant (Source-Pathway-Receptor) linkages are considered within the refined CSM. The assessment is based on the new section of motorway during construction and operational phases.

9.1.2 The CSM representing general ground conditions, overall layout of the new section of motorway and relevant source/pathway/receptors (each of which having a specific alpha-numerical symbol attached) are presented in Figure 2 and is described in Table 14.

Table 14: Site Conceptual Model

Contamination Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
On site: Elevated metals, TPH, PCBs, PAH originating from a number of industrial processes including Made Ground, fuel depot, scrap yard, slag heap, backfilled ponds, steelworks, refuse tip and railway sidings. Off site: Solutia Chemical Works (CL-17)	**Construction**					
	Construction Workers (B)	Direct dermal (1)	Low	Moderate	Moderate to low	The human health risk assessment suggests a low risk to human health with respect to soil contamination with possible exception of PCBs along the boundary with CL17; Furthermore exposure duration will be short term only. Prior to construction, a specific risk assessment will be required in line with Construction (design and management) (CDM) and Health & Safety guidance. This will enable safe methodology and appropriate level of Personal Protective Equipment (PPE) to be put in place. As such, all risks will be duly considered and suitably mitigated to protect construction workers. The concentrations within the Made Ground soils are not foreseen to represent abnormal constraints to construction workers health and safety over and above those typical of a brown field site. Construction works associated with piling which will require piling mat to be in place. This will reduce potential for exposure to contaminated soils and dust. Construction workers may be exposed to ground gas potentially during the excavation works in any confined spaces. Gas data shown to exceed the screening threshold. New pathways for gas migration may be created through placement of piles. Any construction works within confined space would require specified risk assessment, control measures and appropriate PPE.
		Ingestion (3)	Low	Moderate	Moderate to low	
		Inhalation of soil dust (2)	Low	Moderate	Moderate to low	
		Inhalation of ground gas or vapours (2)	Low	Moderate	Moderate to low	

Contamination Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
	Aquifer (Da) within the Glaciofluvial Deposits and/or Mercia Mudstone	Vertical migration (4)	Unlikely	Moderate	Low	Displacement of contaminants in soils and perched water in Made Ground possible during piling. This is subject to selected piling technique and a foundation risk assessment will be required. Thick mantle of predominantly soft low permeability Tidal Flat Deposits overlying Aquifer, reducing risk of downward migration. During excavations of localised hydrocarbon contaminated perched water control measures will be required. The aquifer has elevated metal, inorganic and organic contaminants but the levels appear similar to levels in the perched waters in the TFD and are considered at background levels Pre-construction investigations will be required to characterise PCB contamination status of Made Ground and Natural soils adjacent to CL17.
	Surface Waters (E)	Saturated flow within perched water and groundwaters (4)	Unlikely	Low	Very low	The River Usk and associated docks are the surface water receptor. Discontinuous water within the Made Ground and perched groundwater within the Tidal Flat Deposits are likely to be in hydraulic continuity with the river therefore contamination migration via lateral saturated flow from the area of piling is possible. However, the proposed piling works in this area are unlikely to result in significant alteration to this long and discontinuous lateral pathway, hence the associated risk is unchanged. Lateral migration of groundwater in the saturated aquifer represents a low risk to surface water owing to length of this pathway and limited contamination identified in the Made Ground. A

Contamination Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
						foundations risk assessment will further reduce residual risk associated with this pathway. During excavations the Discovery Strategy shall mitigate any risk associated with localised hydrocarbon contaminated soils / perched water should this be encountered during construction..
		Contaminated surface water run-off (5)	Unlikely	Moderate	Low	Surface water run-off may deteriorate the quality of surface water and thus construction process may need to adopt surface water control and management. Leachable metals identified within the soils. Application of appropriate surface water run-off control measures during the works is considered sufficient to break this potential pollutant linkage.
	Offsite users during construction works (C)	Dermal contact with dust (1)	Low	Low	Very low	During construction there is the possibility of dermal contact and inhalation of soil dust, short term exposure only. Dust suppression measures will be needed during construction works. Adjacent off-site receptors present associated with industrial activities (low sensitivity). Some gas data shown to exceed the screening threshold both within Made Ground and in natural soils. Works are not anticipated to alter gas regime of the ground beneath. Receptors located within open space or within buildings offsite to the construction activity. Construction works associated with piling which will require piling mat to be in place. This will
		Ingestion of soil dust (3)	Low	Low	Very low	
		Inhalation of soil dust (2)	Low	Low	Very low	

Contamination Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
		Inhalation of ground gas or vapours (2)	Unlikely	Low	Very low	reduce potential for exposure. Pre-construction investigations will be required to characterise PCB contamination status of Made Ground and natural soils adjacent to CL17.
Peat / organic rich soils within Tidal Flat Deposits and/or Glaciofluvial Deposits	Construction workers (B)	Inhalation of ground gas/ explosion (2)	Low likelihood	High	Moderate	No peat deposits identified but occasional patches of pseudo fibrous peat within the TFD and organic rich Glaciofluvial Deposits were encountered. Methane concentrations are elevated but have low gas flow. New pathways could be created with piles and appropriate pile design is required to mitigate risk. Construction to be largely within open space. Any construction works within confined space would require specific risk assessment, control measures and appropriate PPE. Piling installation could result in explosive risks during operation and risk assessment and gas mitigation controls will be needed.
	Offsite users during construction works (C)	Inhalation of ground gas/ explosion (2)	Unlikely	High	Moderate to low	No peat deposits identified but occasional patches of pseudo fibrous peat within the TFD and organic rich Glaciofluvial Deposits were encountered. Methane concentrations are elevated but have low gas flow. New potential pathways could be created with piles and appropriate pile design is required to mitigate risk. Adjacent off-site receptors present associated with industrial activities. Limited potential for lateral gas migration given the presence of low permeability Tidal Flat Deposits to shallow depth.

Contamination Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
	Operation					
On site: Elevated metals, TPH, PCBs, PAH originating from a number of industrial processes including Made Ground, fuel depot, scrap yard, slag heap, backfilled ponds, steelworks, refuse tip and railway sidings. Off site: Solutia Chemical Works (CL-17)	Maintenance Workers (B)	Direct dermal (1)	Unlikely	Low	Very low	Pre-construction investigations will be required to characterise PCB contamination status of Made Ground and Natural soils adjacent to CL17. Maintenance workers may come into contact with Made Ground materials remaining in situ outside the pier footprints. Areas outside the piers are likely to receive topsoil cover and vegetation establishment or some form of hardstanding, reducing potential of exposure. Exposure duration will be short term only. Site specific risk assessment and method statement will be required in line with health and safety legislation. This will enable safe methodology and appropriate level of appropriate PPE to be put in place. As such all risks will be duly considered and suitably mitigated for instance during future excavation required during maintenance. Current contamination status is not foreseen to represent abnormal constraints to maintenance workers health & safety over and above those typical of a brown field site.
		Ingestion (3)	Unlikely	Low	Very low	
		Inhalation of soil dust (2)	Unlikely	Low	Very low	
		Inhalation of ground gas or vapours (2)	Unlikely	Low	Very low	Gas data shown to exceed the screening thresholds. Maintenance works to be within open space. Any works within confined space would require specified risk assessment, control measures and appropriate PPE to meet legislative requirements. Further investigations are required to delineate any potential contamination and verify the risks.

Contamination Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
	Future motorway users (A) and off-site users (C)	Direct dermal (1)	Unlikely	Low	Very low	Pre-construction investigation will be required to characterise PCB contamination status of Made Ground and natural soils adjacent to CL17. Areas outside the piers are likely to receive topsoil cover and vegetation establishment or some form of hardstanding, reducing potential of exposure. Adjacent off-site receptors present associated with industrial activities. Exposure duration will be short term only for M4 users which are to be elevated from ground level (viaduct). Low gas flow identified. Additional monitoring required to verify risks.
		Ingestion (3)	Unlikely	Low	Very low	
		Inhalation of soil dust (2)	Unlikely	Low	Very low	
		Inhalation of ground gas or vapours (2)	Unlikely	Low	Very low	
On site: Elevated metals, TPH, PCBs, PAH originating from a number of industrial processes including Made Ground, fuel depot, scrap yard, slag heap, backfilled ponds, steelworks, refuse tip and railway sidings. Off site: Solutia Chemical	Aquifer (Da) within the Glaciofluvial Deposits and/or Mercia Mudstone	Vertical migration (4)	Unlikely	Moderate	Low	Piles potentially acting as a preferential pathway for contaminants in soils and perched water in Made Ground to underlying aquifer. Thick mantle of predominantly soft, low permeability Tidal Flat Deposits overlying Aquifer, reducing risk of downward migration. The aquifer has elevated metal and inorganic contaminants but the levels appear similar to levels in the perched waters in the TFD and are considered to represent background levels. Hard/vegetative cover will reduce infiltration and thus leaching potential. Subject to foundation works risk assessment to confirm the absence of risk to controlled waters. Pre-construction investigations will be required to characterise PCB contamination status of Made Ground and natural soils adjacent to CL17.

Contamination Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
Works (CL-17)	Surface waters; River Usk (E)	Leaching / migration of contaminants to surface waters (4)	Unlikely	Low	Very low	Water within the Made Ground and perched groundwater within the Tidal Flat Deposits are likely to be in hydraulic continuity with the river, therefore contamination migration via saturated flow from the area of piling is possible and a foundation risk assessment is required. Pre-construction investigations will be required to characterise PCB contamination status of Made Ground and Natural soils adjacent to CL17.
Peat / organic rich oils within Tidal Flat Deposits and/or Glaciofluvial Deposits	Maintenance Workers (B)	Inhalation of ground gas/ explosion (2)	Unlikely	High	Moderate to low	No peat deposits identified but occasional patches of pseudo fibrous peat within the TFD and organic rich Glaciofluvial Deposits were encountered. Methane concentrations are elevated but have low gas flow. New potential pathways could be created with piles and appropriate pile design is required to mitigate risk. Maintenance work to be largely within open space. Piling installation could result in explosive risks during operation and risk assessment and gas mitigation controls will be needed.
	Future motorway users (A) and off-site users (C)	Inhalation of ground gas/ explosion (2)	Unlikely	High	Moderate to low	Exposure duration will be short term only for M4 users which are to be elevated from ground level (viaduct). Additional monitoring required to more fully quantify risks.

10 Conclusions and Recommendations

10.1 Conclusions

10.1.1 Ground investigations have been undertaken at the Site to assess risks from land contamination associated with the construction and operation of the new section of motorway including human health and controlled waters risks.

10.1.2 Widespread gross contamination associated with the historical use of the Site has not been identified. The localised areas of contamination that have been identified confirm the need for a discovery strategy when working on this site.

10.1.3 The dataset gathered through multiple phases of investigation and associated monitoring has enabled control measures and mitigations required to facilitate the construction and ongoing operation of the new section of motorway to be identified.

10.1.4 Elevated methane was identified within the bedrock in one location however the source of this ground gas is unclear. Elevated methane levels and depleted oxygen levels with low gas flows have been identified. The results indicated that limited ground gas is being generated in Made Ground and natural soils.

10.1.5 Further ground gas monitoring has identified elevated methane concentrations within an area historically used as a refuse tip. This may potentially be associated with an area of notable hydrocarbon impaction within soils and perched waters. Elevated methane has also been encountered within the bedrock during drilling and during subsequent monitoring. This is likely to be associated with 'pockets' of trapped methane and not considered to represent a significant gas source.

10.1.6 The majority of excavated materials are likely to be suitable for reuse within the construction phase subject to development of a remediation strategy including reuse criteria and adoption of a Material Management Plan. Remediation is anticipated to be needed in the area of hydrocarbon contamination such as that encountered CH32.

10.1.7 Elevated concentrations of some heavy metals, PAHs and PCBs will require the adoption of health and safety control measures to protect construction workers. Pre-construction investigation will be required to characterise PCB contamination status of Made Ground and Natural soils adjacent to CL17. However, it is not expected that the level of mitigation will be over and above those typically required for brownfield sites.

10.1.8 During the construction phase, specific mitigation measures will be required to prevent inhalation pathways of dust to the general public off site receptors. The placement of construction and piling mats will further reduce inhalation, dermal and ingestion pathways. A suitable water management strategy will also be required to prevent impact to surface waters from run-off during construction.

10.1.9 During the operational phase, the piers, landscaping and hardstandings will cover the majority of the Site which will effectively remove dermal and ingestion exposure pathways to future site users and off site general public receptors. In addition hard cover will significantly limit the infiltration of rainwater through the soils and potentially leaching any soil contaminants into the groundwater.

10.1.10 Adoption of piled foundations could provide potential new pathways which may lead to contaminants in soils and perched groundwater within the Made Ground and Tidal Flat Deposits to enter the currently confined aquifer within the Glaciofluvial and Mercia Mudstone. However, risk associated with this is generally considered low considering the limited contamination identified in the Made Ground, the brackish / saline nature of the deep aquifer (i.e. non-potable) and the characteristics of the pathway to potential surface water receptors. However use of appropriate piling methodologies and implementation of a discovery strategy during construction woks, will further reduce risks associated with this pathway

10.1.11 The shallow and deep aquifers are identified to be impacted with metals, organic and inorganic contaminants which may reduce surface water quality if the piling pathways allow direct or indirect linkage. Potential effects associated with piling shall be managed through piling risk assessments and discovery strategy during the construction phase.

10.1.12 During operation, maintenance workers involved with excavations into potentially contaminated materials within the footprint of the new section of motorway will require adoption of safety controls including risk assessments and method statements to manage potential exposure to contaminated soils and waters.

10.2 Recommendations

10.2.1 Ground investigation and subsequent assessment has indicated the need for a remedial strategy to be implemented.

10.2.2 At this stage, the strategy is anticipated to include but is not limited to the following.

- Foundation works and piling risk assessment to mitigate residual risk to controlled waters with due consideration of relevant Environment Agency guidance (Environment Agency, 2001 and Environment Agency, 2002.
- Pre-construction investigation will be required to characterise PCB and possible TPH contamination status of Made Ground and Natural soils adjacent to CL17, as indicated in the dataset for borehole CH32 and STPG01.
- Dealing with unexpected contamination.
- Verification sampling to confirm suitability for soils for re-use or verify imported topsoils.
- Control measures to prevent risks to construction workers and the general public during construction.

10.2.3 The remediation strategy should include a remediation options appraisal, remediation implementation plan and remediation verification plan.

10.2.4 The remediation strategy should be supported by a Scheme wide Material Management Plan prepared in accordance with CL:AIRE Code of Practice (CL:AIRE, 2011).

11 References

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12 Glossary

BF	Blast Furnace
BGS	British Geological Survey
BOD	Biochemical Oxygen Demand
BOS	Basic Oxygen Slag
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CAT	Cable Avoidance Tool
CDM	Construction Design Management
CH_4	Methane
CLEA	Contaminated Land Exposure Assessment
CO_2	Carbon Dioxide
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CSM	Conceptual Site Model
DMRB	Design Manual for Roads and Bridges
DO	Dissolved Oxygen
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standard
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
ES	Environmental Statement
ESG	Environmental Scientifics Group
EQS	Environmental Quality Standard
FTIR	Fourier Transform Infrared (spectroscopy)
GAC	Generic Assessment Criteria
GRO	Gasoline Range Organics
LEL	Lower Explosive Limit
LOD	Limit of Detection
mAOD	Metres Above Ordnance Datum
mb	Millibars
mbGL	Metres below Ground Level

MTBE	Methyl Tert-butyl Ether
NRW	Natural Resources Wales
ORP	Oxidation Reduction Potential
O_2	Oxygen
OS	Ordnance Survey
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCSM	Preliminary Conceptual Site Model
PID	Photo Ionisation Detector
PPE	Personnel Protection Equipment
PSSR	Preliminary Sources Study Report
SGVs	Soil Guideline Values
SSAC	Site Specific Assessment Criteria
SSSI	Site of Special Scientific Interest
SVOCs	Semi-Volatile Organic Compounds
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbon
TPH CWG	Total Petroleum Hydrocarbon Criteria Working Group
UKAS	United Kingdom Accreditation Service
VOCs	Volatile Organic Compounds
WEL	Workplace Exposure Limit
WFD	Water Framework Directive
UXO	Unexploded Ordnance Survey

Figures

Site	Historical/Existing Potential Contaminant Source
1	Felnex Industrial Estate North
2	Felnex Industrial Estate West
3	Felnex Industrial Estate South
4	Tanks
5	**Stephenson Street Industrial Estate**
6	**Depot**
7	**Works & Infilled Ground**
8	Docks
9	**Petrol Depot with Oil Tanks & Buildings**
10	Container Terminal / Raised Area of Tipping
11	Spoil Heap
12	Infilled Ground / Old Pond
13	Tidal Ponds
14	Works
15	Factory Works
16	Electrical Sub-station
17	**Former Pond (Infilled Ground)**
18	Electrical Sub-station
19	**Refuse Tip**
20	**Slag Heap**
21	**Scrap Yard & Depot (Railway Sidings on Embankment)**
22	Infilled Ground
23	Refuse Tip
24	Docks
25	Pumping House & Electric Light Station
26	Earthworks / Excavations
27	Aluminium Works, Tanks
28	Works
29	Filter Tank
30	Reservoir
31	Sludge Pits / Spoil Heap / Sloblands Landfill

NOTE: Contaminant source areas in permanent or temporary land take shown in **Bold**

Legend

- Permanent Highway Land within Fenceline (including Water Treatment Areas)
- Other Permanent Land Take
- Temporary Construction Land
- Easement Only
- Proposed Water Treatment Area
- Potential Area of Land Contamination based on 2014 PSSR
- CL-20: Mir Steel Works
- Other Potential Area of Land Contamination
- Site Features from 2014 PSSR
- Tank Location from 2014 PSSR
- Permit Boundary
- Permit Location

Investigation Locations

2015-2016 (RPS)
- Borehole
- Window Sample
- Hand Dug Pit

2015 (Geotechnical Engineering)
- Borehole
- Trial Pit

2008 (WSP)
- Borehole
- Trial Pit

2007 (Norwest Holst)
- Trial Pit
- Window Sample

2000 (Exploration Associates)
- Trial Pit
- Window Sample

1997 (Norwest Holst)
- Borehole
- Monitoring Well Installation

Llywodraeth Cymru
Welsh Government

Appendix R11.1 Annex D CL-15

Site Plan for CL-15

Figure: 1	Revision: 1
Date: September 2016	Status: At Issue
Drawn: RJJ	Checked: FB

Scale: A3 @ 1:6,500

0 105 210 m

N

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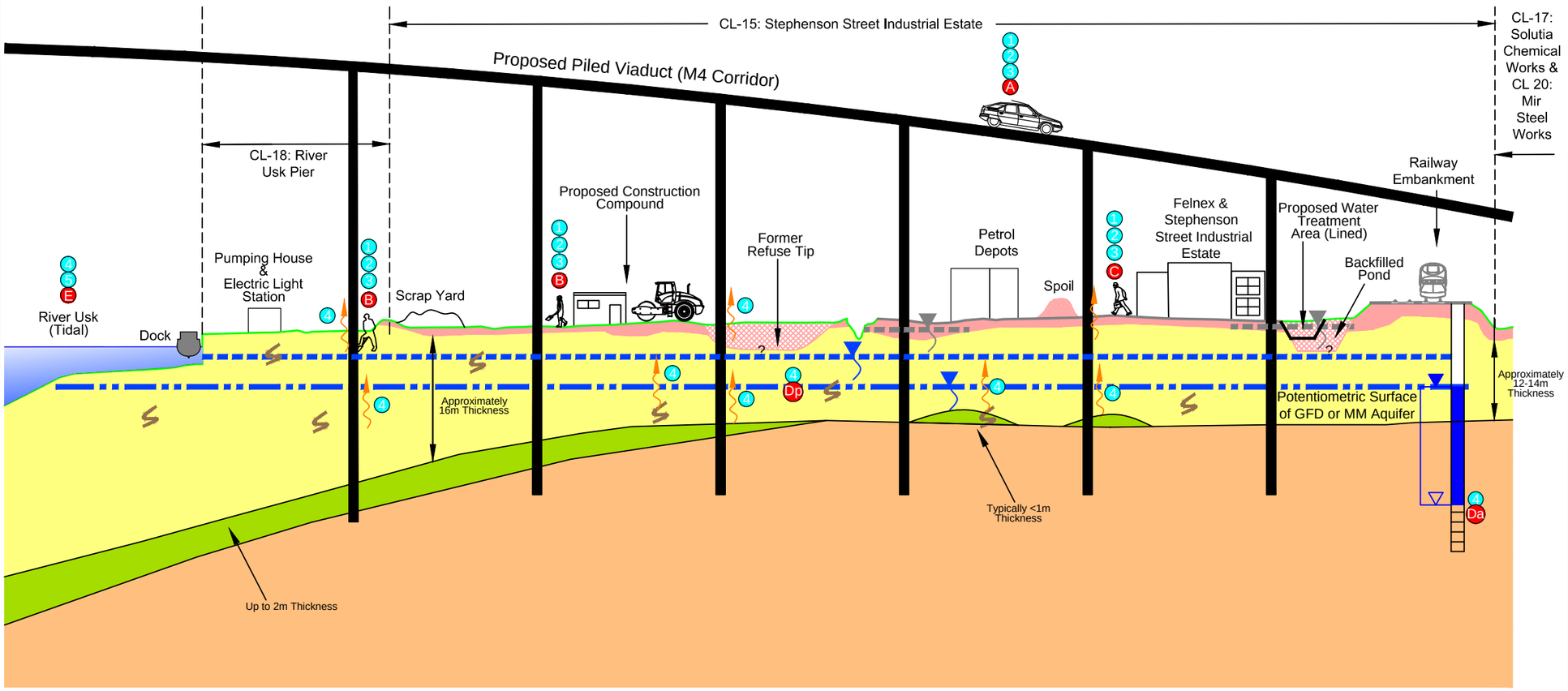
dwg ref: JER6591_Figure1_CL15SitePlan

dwg ref: JER6591_Figure1_CL15SitePlan Contains Ordnance Survey data © Crown copyright and database right 2015

CL-15 Stephenson Street Industrial Estate



Ground conditions based on available information

Legend

- Stockpile / Fill Material
- Made Ground - MG
- Tidal Flat Deposits - TFD
- Glaciofluvial Deposits - GFD
- Organic Matter within TFD & GFD
- Mercia Mudstone - MM
- Proposed Piled Pier
- Hardstanding
- Rough Grassland
- No Information Available
- Perched Water (MG)
- Perched Groundwater (Top of TFD)
- Groundwater (GFD and MM)
- Gas Migration Pathway

Potential Receptors

- A Humans On-Site (M4 User)
- B Humans On-Site (Construction/Maintenance)
- C Humans Off-Site (Site Neighbours)
- Dp/Da Groundwater (Aquifer)
- E Surface Water

Potential Pathways

- 1 Dermal Contact
- 2 Inhalation
- 3 Ingestion
- 4 Leaching / Migration
- 5 Surface Run Off

Potential Sources of Contamination

Possible contamination present on site associated with :

On-Site

- Potential contamination associated with previous industrial uses including; timber yards, coal sidings, fuel works and railway land
- Steelworks

Off-Site

- Potential for off-site sources of contamination to be present associated with industrial estate and Solutia Chemical Works (Cl-17)

NOTE
Drawing refined from PSSR Drawing Reference M4-OA-17-00DR-Z-XX-0119 (April 2014)

Llywodraeth Cymru
Welsh Government

Appendix R11.1 Annex D CL-15

Conceptual Site Model for CL-15

Figure: 2	Revision: 1
Date: September 2016	Status: At Issue
Drawn: RJJ	Checked: FB

Not to Scale

dwg ref:JER6591_Figure2_CL15ConceptualSiteModel

dwg ref: JER6591_Figure2_CL15ConceptualSiteModel

Appendices

Appendix 1

Exploratory Borehole Records

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG2** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332787.0 E 185468.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	8.00m AOD
Client	Welsh Office	Drillers	T.W/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	20/11/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
18/11/1997	1800	14.80	14.50	Dry	
19/11/1997	0800	14.80	14.50	8.40	
19/11/1997	1800	16.60	15.00	Dry	
19/11/1997	1800	31.50	16.25	10.68	
20/11/1997	0800	31.50	16.25	6.31	
20/11/1997	1530	45.00	16.25	10.32	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
13.30	13.40	0.75	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	16.60	150	15.50

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
18/11/1997	0000	13.20	8.90	20	fast	0.00	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
16.50	45.00	mist	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	C	N=16 (6,7,4,3,4,5)
7.00	S	N=2 (1,0,1,0,1,0)
13.50	C	N=37 (7,8,11,10,7,9)
14.80	S	N=55 (5,6,10,16,14,15)
16.30	S	56/225mm (7,8,16,16,24)
25.60	S	50/75mm (5,20,50)
39.00	S	99/225mm (6,6,21,28,50)

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG2** Sheet 1 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332787.0 E 185468.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	8.00 m AOD
Client	Welsh Office	Drillers	T.W/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	20/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring				Blow count to drive UI00	SPT N & depth		Install-ation
MADE GROUND: Blackish brown slightly clayey silty sandy sub-angular gravel of brick, clinker, slag and rubble with occasional cobbles.				B	1.00	-	1.50		C16	1.00 1.45	
		1.30	6.70								
Stiff brown mottled grey occasionally thinly laminated CLAY. (Estuarine Alluvium)				D	1.80						
				U	2.00	-	2.50	(30)			
				D	2.50						
		2.70	5.30								
Soft becoming very soft grey CLAY. (Estuarine Alluvium)				U	3.00	-	3.50	(11)			
				D	3.50						
---at 3.50m organic				U	4.00	-	4.50	(9)			
				D	4.50						
				U	5.00	-	5.50	(8)			
				D	5.50						
---from 5.50m dark grey				U	6.00	-	6.50	(9)			
				D	6.50						
---at 7.00m very soft									S2	7.00 7.45	
				D	7.50						
---from 7.50 to 10.00m very silty				U	8.00	-	8.50	(9)			
				D	8.50						
				D	9.50	-	10.00	(13)			
				U	9.50						
				D	10.00						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG2** Sheet 2 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332787.0 E 185468.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	8.00 m AOD
Client	Welsh Office	Drillers	T.W/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	20/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Soft becoming very soft grey CLAY. (Estuarine Alluvium)			D 10.00			
			D 10.70			
			U 11.00 - 11.50	(14)		
			D 11.50			
			D 12.20			
			U 12.50 - 13.00			
			D 13.00			
---from 13.00m dark grey mottled black organic very silty	13.20	-5.20				
			B 13.50 - 14.00		C37 13.50	
Dense grey slightly silty sandy sub-rounded siliceous GRAVEL with many cobbles. (Fluvial Alluvium)	14.00	-6.00			13.95	
Greyish green mottled reddish brown highly to completely weathered MUDSTONE, very weak to weak. (Mercia Mudstone Group)			B 14.50 - 15.00 U 14.50 - 14.75	(100)	S55 14.80 15.25	
			B 15.50 - 16.00			
---from 16.30m reddish brown mottled greyish green slightly to moderately weathered moderately strong to strong	16.60	-8.60			S56/225mm 16.30 16.68	
---from 16.50 to 16.65m moderately to highly weathered weak			16.50 - 18.00	TCR 93, SCR 57, RQD 8, FI		
Reddish brown thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)						
---from 16.90 to 17.15m with very closely spaced thick laminations to very thin beds of calcite			18.00 - 19.50	TCR 98, SCR 69, RQD 42		
---from 17.35 to 17.50m moderately to highly weathered moderately weak						
---from 17.60 to 18.00m green highly						

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG2** Sheet 3 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332787.0 E 185468.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	8.00 m AOD
Client	Welsh Office	Driller	T.W/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	20/11/1997
		Core bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			19.50 - 21.00	100	73	35			
---from 21.00m moderately to highly weathered weak completely fractured	21.33	-13.33							
Reddish to purplish brown occasionally mottled green medium bedded moderately to highly weathered silty slightly sandy MUDSTONE, weak to moderately weak with extremely to very closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			21.00 - 22.60	90	13	0			
---from 21.33 to 21.50m completely fractured									
---from 21.70 to 21.90m completely fractured									
---from 22.20 to 22.30m completely fractured									
---from 22.60 to 22.80m completely fractured			22.60 - 24.00	96	54	30			
---from 23.05 to 23.78m slightly to moderately weathered moderately weak with medium spaced sub-horizontal to inclined fractures planar rough tight	24.60	-16.60					5		
---from 23.78 to 24.30m weak completely fractured			24.00 - 25.60	94	51	30	7	S50/75mm 25.60 25.83	
Reddish brown occasionally mottled green medium to thickly sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak with medium spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			25.60 - 27.10	100	73	45	7		
---from 27.10 to 27.40m moderately to highly weathered weak to moderately weak	27.40	-19.40					5		
Reddish brown occasionally mottled green medium to thickly sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, very weak to weak locally moderately strong with medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			27.10 - 28.40	100	96	58	5		
---from 28.40 to 28.62m moderately to highly weathered very weak completely fractured							NI		
			28.40 - 30.00	95	83	65	5		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG2** Sheet 4 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332787.0 E 185468.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	8.00 m AOD
Client	Welsh Office	Driller	T.W/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	20/11/1997
		Core bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green medium to thickly sub-horizontally bedded slightly to moderately weathered silty MUDSTONE, very weak to weak locally moderately strong with medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)							NI		
			30.00 - 31.50	100	83	49	6		
---from 31.00 to 33.10m with closely to medium spaced thin to thick laminations and gravel size pockets of calcite							NI		
---from 31.50 to 31.75m moderately to highly weathered weak completely fractured			31.50 - 33.10	94	55	43	4		
---from 32.80 to 33.10m highly weathered very weak completely fractured	33.10	-25.10					NI		
Reddish brown mottled greyish green very thinly to thinly sub-horizontally bedded moderately weathered MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			33.10 - 34.60	100	97	90	9		
			34.60 - 36.00	100	96	57	4		
---from 35.50 to 35.70m moderately to highly weathered completely fractured							NI		
---from 36.00 to 36.30m completely fractured weak							4		
---at 36.30m sub-horizontal fracture with calcite infill			36.00 - 37.60	100	88	25	NI		
---from 36.50 to 37.10m completely fractured weak							1		
---from 37.30m sub-horizontal fracture with calcite infill							NI		
---from 37.60 to 37.80m completely fractured weak							2		
			37.60 - 39.00	93	79	54	NI		
							3	S99/225mm 39.00	
---from 39.00 to 39.30m moderately to highly weathered completely fractured							NI	39.38	
---from 39.30 to 39.90m no recovery			39.00 - 39.90	33	0	0	NA		
							NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG2** Sheet 5 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332787.0 E 185468.2 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Knebel 77	Ground Level	8.00 m AOD
Client	Welsh Office	Driller	T.W/E.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	18/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	20/11/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green very thinly to thinly sub-horizontally bedded moderately weathered MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)				39.90 - 40.50	100	83	50	NI 2		
---from 40.50 to 41.60m moderately to highly weathered weak				40.50 - 42.00	80	67	20	10 NI NA		
---from 41.60 to 41.70m moderately to highly weathered weak completely fractured										
---from 42.00 to 42.40m completely fractured				42.00 - 43.50	100	73	47	NI 6 NI		
---from 43.20 to 43.50m completely fractured										
---at 43.40m calcitic				43.50 - 45.00	90	73	0	NI 6 NA		
---from 43.50 to 44.20m completely fractured										
---from 44.40 to 44.65m inclined fracture (50°) planar rough tight (calcite infill)										
---from 44.85 to 45.00m no recovery		45.00	-37.00							
Borehole complete at 45.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHG3
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners			Date Completed	11/11/1997

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	15.80	150	15.50
120	40.05	140	30.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=4 (1,2,1,1,1,1)
4.00	S	N=1 (0,0,1,0,0,0)
6.50	S	N=1 (1,0,1,0,0,0)
9.00	S	N=2 (1,0,1,0,1,0)
12.00	S	N=1 (0,0,1,0,0,0)
15.00	S	N=2 (1,0,0,0,1,1)
15.76	S	95/95mm*
16.95	C	50/70mm (16,9,50)
18.35	C	127/200mm (7,13,35,42,50)
19.35	C	116/200mm (13,12,28,38,50)
20.35	C	50/65mm (9,16,50)
22.90	C	75/115mm*
25.50	C	50/60mm (20,5,50)
26.50	C	97/220mm (4,4,8,39,50)
27.50	C	20/223mm*
27.72	C	50/60mm (17,8,50)
30.80	C	75/150mm (9,16,25,50)
33.30	C	78/145mm (6,14,28,50)
34.30	C	50/75mm (19,6,50)
35.55	C	78/145mm (8,15,28,50)
36.55	C	N=89 (,9,17,27,36)
39.05	C	50/50mm (19,6,50)
40.05	C	50/60mm (7,9,50)

* Seating blows only.

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	COMBINED HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No.
BHG3
Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners			Date Completed	11/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
30/10/1997	1800	8.00	7.50	Dry	
31/10/1997	0800	8.00	7.50	7.80	
31/10/1997	1800	15.80	15.50	10.10	
04/11/1997	1300	18.35	18.55	4.45	
04/11/1997	1800	18.35	15.50	Dry	
05/11/1997	0800	18.35	17.55	4.50	
05/11/1997	1800	21.90	19.35	6.20	
06/11/1997	0800	21.90	19.35	5.00	
06/11/1997	1800	30.00	19.35	8.10	
10/11/1997	0800	30.00	19.35	5.10	
10/11/1997	1800	35.55	30.00	6.80	
11/11/1997	0800	35.55	30.00	5.15	
11/11/1997	1800	40.05	30.00	5.80	

DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
15.80	40.05	foam	100%	92.0

CABLE PERCUSSION DETAILS

Hard Strata from depth	Hard Strata to depth	Hours	Remarks
0.00	0.40	1.00	
0.40	0.60	0.75	
15.60	15.80	1.00	

NB All depths in metres, all diameters in millimetres,
water strike rise time in minutes, chiselling time in hours.

Form	COMBINED HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG3** Sheet 1 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00 m AOD
Client	Welsh Office	Drillers	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	11/11/1997
		Core Bit	P.C.D		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
MADE GROUND: Black sandy clayey slag and brick fill.				D 0.20 B 0.30 - 0.70			
		0.70	7.30				
Soft becoming very soft grey mottled brown sandy very silty CLAY with occasional thin laminations of greyish blue silt. (Estuarine Alluvium)				D 0.80 U 1.00 - 1.45	(10)		
				D 1.50 D 1.75			
				B 2.00 - 2.45 D 2.00		S4 2.00 2.45	
---from 2.75 to 3.75m becoming slightly organic				D 2.75 U 3.00 - 3.45	(7)		
				D 3.50 D 3.75			
---at 4.00m becoming very soft and slightly sandy				B 4.00 - 4.45 D 4.00		S1 4.00 4.45	
---at 4.75m becoming slightly organic				D 4.75 B 5.00 - 5.40 U 5.00 - 5.40	(5)		
				U 5.50 - 5.95	(4)		
---at 6.00m becoming grey mottled black				D 6.00 D 6.25			
				B 6.50 - 6.95 D 6.50		S1 6.50 6.95	
				D 7.25 U 7.50 - 7.95	(5)		
		8.00	0.00	D 8.00			
Very soft grey mottled black organic CLAY. (Estuarine Alluvium)				D 8.50			
---at 9.00m becoming slightly sandy				B 9.00 - 9.45 D 9.00		S2 9.00 9.45	
				D 10.00			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG3** Sheet 2 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00 m AOD
Client	Welsh Office	Drillers	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	11/11/1997
		Core Bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	TCR	SCR	RQD	FI	SPT N & depth	Installation
Very soft grey mottled black organic CLAY. (Estuarine Alluvium)			D 10.00							
			U 10.50 - 10.95	(4)						
			D 11.00							
			D 11.50							
			B 12.00 - 12.45						S1 12.00 12.45	
Soft dark grey slightly sandy very silty CLAY. (Estuarine Alluvium)	13.00	-5.00	D 13.00							
			U 13.50 - 13.95	(5)						
			D 14.00							
---at 14.50m becoming mottled black			D 14.50							
			B 15.00 - 15.45						S2 15.00 15.45	
	15.60	-7.60								
Brown mottled greyish green highly to moderately weathered sandy MUDSTONE, very weak to weak. (Mercia Mudstone Group)	15.80	-7.80	B 15.76						S95/95mm* 15.76	15.86
Greyish green mottled reddish brown thinly to medium sub-horizontally bedded highly weathered MUDSTONE, moderately weak to moderately strong with extremely closely to very closely spaced horizontal to vertical fractures irregular rough tight to open. (Mercia Mudstone Group)			15.80 - 16.95		32	10	0	NA	C50/70mm 16.95	17.17
---from 15.80 to 16.03m completely fractured			16.95 - 17.95		0	0	0	NA		
	17.95	-9.95								
---from 16.17 to 16.95m no recovery			17.95 - 18.35		100	88	0	NI 7	C127/200mm 8.35	
---from 16.95 to 17.95m no recovery	18.35	-10.35						NI		18.70
Greyish green mottled reddish brown sub-horizontally bedded completely weathered MUDSTONE, weak to moderately weak with extremely closely spaced sub-horizontal to vertical fractures irregular rough tight to open. (Mercia Mudstone Group)			18.35 - 19.35		15	5	0	NA	C116/200mm 9.35	19.70
			19.35 - 20.35		0	0	0	NA		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG3** Sheet 3 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00 m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	11/11/1997
		Core bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Installation
Reddish brown mottled greyish green thinly to medium sub-horizontally bedded moderately to highly weathered MUDSTONE, very to moderately weak with closely to medium spaced sub-horizontal to inclined discontinuities planar rough tight. (Mercia Mudstone Group)								C50/65mm 20.35 20.57	
			20.35 - 21.35	25	5	0	NI NA		
---from 20.35 to 20.60m completely fractured									
			21.35 - 21.90	0	0	0	NA		
---from 20.60 to 21.35m no recovery									
---from 21.35 to 21.90m no recovery									
			21.90 - 22.90	0	0	0	NA		
---from 21.90 to 22.90m no recovery								C75/115mm*22.90	
---from 22.90 to 23.10m highly weathered								23.02	
			22.90 - 23.90	100	87	79	5		
			23.90 - 24.60	100	79	31	0		
---from 24.60 to 24.80m completely fractured							NI		
			24.60 - 25.50	22	0	0	NA		
---from 24.80 to 25.50m no recovery								C50/60mm 25.50	
---from 25.50 to 26.50m no recovery								25.71	
			25.50 - 26.50	0	0	0	NA		
								C97/220mm 26.50	
---from 26.50 to 26.77m completely fractured							NI	26.87	
			26.50 - 27.50	27	0	0	0		
---from 26.77 to 27.50m no recovery								C20/223mm*27.50	
---from 27.50 to 27.70m highly weathered completely fractured							NI	27.72	
	27.90	-19.90					4	C50/60mm 27.72	
			27.50 - 28.50	63	25	0		27.93	
Reddish brown thinly to medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)							NI		
			28.50 - 30.00	22	0	0	NI		
	30.00	-22.00							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG3** Sheet 4 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00 m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	11/11/1997
		Core bit	P.C.D		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Installation
Reddish brown thinly to medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)	30.00	-22.00	30.00 - 30.80	0	0	0	NA	C75/150mm 30.80	
Reddish brown medium bedded completely weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)			30.80 - 31.80	90	15	0	NI	31.10	
---from 31.25m moderately to highly weathered			31.80 - 33.30	40	20	0	7 0	C78/145mm 33.30	
---from 31.65m occasionally mottled greyish green slightly to moderately weathered			33.30 - 34.30	0	0	0	NA	33.60	
---from 31.75m very closely spaced sub-horizontal discontinuities planar rough tight			34.30 - 34.55	100	60	0	NI	C50/75mm 34.30 34.53	
			34.55 - 35.55	0	0	0	NA	C78/145mm 35.55	
			35.55 - 36.55	0	0	0	NI	35.85 C89 36.55	
Reddish brown occasionally mottled greyish green medium bedded moderately weathered silty MUDSTONE, moderately weak with closely spaced horizontal to sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)	36.55	-28.55	36.55 - 37.55	97	56	17	4 NI	37.00	
---from 37.15 to 37.55m moderately to highly weathered weak completely fractured	37.55	-29.55	37.55 - 39.05	65	39	11	1 NI 8	C50/50mm 39.05	
---from 37.25 to 37.45m slightly calcitic								39.25	
Reddish brown thinly sub-horizontally bedded slightly weathered silty MUDSTONE, moderately strong with very closely to closely spaced horizontal to sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)			39.05 - 40.05	0	0	0	NI		
---from 37.67 to 37.79m completely fractured									

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG3** Sheet 5 of 5

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333196.2 E 185387.5 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	8.00 m AOD
Client	Welsh Office	Driller	C.A/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	30/10/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	11/11/1997
		Core bit	P.C.D		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown thinly sub-horizontally bedded slightly weathered silty MUDSTONE, moderately strong with very closely to closely spaced horizontal to sub-horizontal discontinuities planar rough tight. (Mercia Mudstone Group)		40.05	-32.05						C50/60mm 40.05 40.26	
Borehole complete at 40.05 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
0.00-0.50	TO		08/02 2000 DRY	
0.50-0.75	B			
0.75-1.00	TO			
1.00-1.50	TO			
1.50-2.00	B			
2.00-2.50	TO			
3.00		NIL	DRY	

Strata

Description	Depth (Thickness)	Level
MADE GROUND: Compact brown slightly clayey silty fine to coarse sand with occasional to some sub-angular fine to coarse gravel of brick,chert,coal,slag and ash with occasional sub-angular cobbles of sandstone	G.L. (0.75)	7.41
Firm grey brown slightly organic slightly sandy very silty CLAY	0.75 (1.25)	6.66
Soft to firm grey mottled brown very silty CLAY no recovery 2.50m - 3.00m	2.00 (1.00)	5.41
End of Borehole.	3.00	4.41

Legend

Equipment: Hand Held Window Sampler

Borehole Dia (mm) / Casing Dia (mm)
80 to 1.00m
60 to 3.00m

Groundwater
No. Struck Behaviour Sealed
No groundwater encountered

Ground Level 7.41 m OD
Coordinates 332622.32 mE
185515.17 mN

Drilled by DC
Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Borehole CH24(1 of 1)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
0.00-0.50	TO		05/02 2000 DRY	
0.50-0.80	B			
0.80-1.10	TO			
1.10-1.80	B			
1.80-2.30	TO			
3.00		NIL	DRY	

Strata

Description	Depth (Thickness)	Level
MADE GROUND: Compact brown and grey sandy very silty very clayey sub-rounded to sub-angular fine to coarse gravel of brick,slag, sandstone and limestone	G.L.	7.61
	(0.80)	
Firm to stiff grey mottled brown very silty CLAY	0.80	6.81
....becoming soft to firm below 1.80m.	(2.20)	
End of Borehole.	3.00	4.61

Legend

Equipment: Hand Held Window Sampler

Borehole Dia (mm) / Casing Dia (mm)
80 to 1.00m
60 to 3.00m

Groundwater

No. Struck	Behaviour	Sealed
	No groundwater encountered	

Ground Level 7.61 m OD
Coordinates 332754.50 mE
185473.49 mN

Drilled by DC
Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Borehole CH25(1 of 1)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			08/02 0000 DRY	
0.30-0.65	TO			
0.65-1.00	T	NIL	0.65	
1.00				

Strata

Description	Depth (Thickness)	Level
MADE GROUND: Strong grey intact re-inforced concrete.	G.L.	7.19
	0.30	6.89
MADE GROUND: Moderately compact grey slightly sandy silty slightly clayey sub-angular to angular fine to coarse gravel of sandstone, brick and quartz with some cobbles of sndstone	(0.70)	
End of Borehole.	1.00	6.19

Legend

Equipment: Hand HeldWindow Sampler

Borehole Dia (mm) 80 to 1.00m

Casing Dia (mm)

Groundwater

No.	Struck	Behaviour	Sealed
1	0.65	Rose to 0.65m in 20 mins .65/.65/.65 in 5/10/15 mins	

Ground Level 7.19 m OD
Coordinates 332824.91 mE
185489.35 mN

Drilled by DC
Logged by DC
Checked by AF

Remarks Concrete core 202mmø to a depth of 0.30 (1hr)
Refusal at 1.00m (Possible cobbles??) Insufficient amount of water for same

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Borehole CH26(1 of 1)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			08/02 0000 DRY	
0.55-0.90	TO			
1.10-1.50	TO			
2.00-2.50	TO			
3.00		NIL	DRY	

Strata

Description	Depth (Thickness)	Level
MADE GROUND: Strong grey re-inforced concrete.	G.L.	6.78
	0.25	6.53
MADE GROUND: Moderately compact brown sandy angular to sub-angular fine to coarse gravel of limestone and brick	0.55	6.23
MADE GROUND: Moderately compact dark grey black very silty slightly clayey fine sand with occasionl to some sub-angular fine to coarse gravel of sandstone and slag	0.90 1.10	5.88 5.68
MADE GROUND: Firm grey very silty clay with occasional sub-angular fine to medium gravel of coal and ash	(1.90)	
Firm grey very silty CLAY from 2.00 Becoming soft to firm		
.....	3.00	3.78
End of Borehole.		

Legend

Equipment: Hand Held Window Sampler

Borehole Dia (mm) / Casing Dia (mm)
80 to 1.00m
60 to 3.00m

Groundwater

No. Struck	Behaviour	Sealed

No groundwater encountered

Ground Level 6.78 m OD
Coordinates 332877.57 mE
185472.83 mN

Drilled by DC
Logged by DC
Checked by AF

Remarks Concrete core 202mmø to a depth of 0.25 (1.5 hrs)

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Borehole CH27(1 of 1)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			08/02 2000 DRY	
0.27-0.72	TO			
1.40-1.90	B			
1.90-2.50	TO			
2.50-3.00	TO			
3.00		NIL	DRY	

Strata

Description	Depth (Thickness)	Level
	G.L.	7.89
MADE GROUND: Strong grey intact re-inforced concrete	0.27	7.62
MADE GROUND: Compact brown slightly clayey very silty fine to medium sand with some sub-angular to sub-rounded fine to coarse gravel of quartz,sandstone,mudstone,coal,slag and ash with occasional cobbles of slag	(1.13)	
	1.40	6.49
MADE GROUND: Moderately compact slightly clayey slightly silty fine to medium sand with some to much angular to sub-angular fine to coarse gravel of sandstone	(0.50)	
	1.90	5.99
Soft to firm grey mottled brown slightly sandy very silty CLAY From 2.30 becoming firm to stiff	(1.10)	
	3.00	4.89
End of Borehole.		

Legend

Equipment: Hand Held Window Sampler

Borehole Dia (mm) / Casing Dia (mm)
202 to 0.27m
80 to 1.27m
60 to 3.00m

Groundwater

No. Struck	Behaviour	Sealed

No groundwater encountered

Ground Level 7.89 m OD
Coordinates 332926.36 mE
185443.98 mN

Drilled by DC
Logged by DC
Checked by AF

Remarks Concrete core 202mmφ to a depth of 0.27m (1hr)

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Borehole CH28(1 of 1)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
0.20-0.30	TO		08/02 0000 DRY	
0.40-0.50	TO			
0.50		NIL	DRY	

Strata

Description	Depth (Thickness)	Level
MADE GROUND: Strong grey intact re-inforced concrete.	G.L.	8.04
	0.20	7.84
MADE GROUND: Moderately compact grey sandy sub-angular fine to coarse gravel of limestone (sub-base)	0.30	7.74
	0.40	7.64
MADE GROUND: Strong to weak grey concrete.	0.50	7.54
MADE GROUND: Compact dark grey slightly silty slightly clayey sandy angular to sub-angular fine to medium gravel of sandstone,slag and limestone		
End of Borehole.		

Legend

Equipment: Hand Held Window Sampler

Borehole Dia (mm) / Casing Dia (mm)
202 to 0.20m
80 to 0.30m
100 to 0.40m

Groundwater

No. Struck	Behaviour	Sealed
	No groundwater encountered	

Ground Level 8.04 m OD
Coordinates 332956.17 mE
185427.60 mN

Drilled by DC
Logged by DC
Checked by AF

Remarks Refusal at 0.50m (possible cobbles?)

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Borehole CH29(1 of 1)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
0.00-0.50	TO		08/02 0000 DRY	
0.50-1.00	B			
1.00-1.50	TO			
1.50		NIL	DRY	

Strata

Description	Depth (Thickness)	Level
MADE GROUND: Compact brown slightly clayey slightly silty fine sand with much angular to sub-angular fine to coarse gravel of chert, brick, sandstone and slag with occasional cobbles of sandstone from 0.75m becoming moderately compact	G.L. (1.50)	8.23
End of Borehole.	1.50	6.73

Legend

Equipment: Hand Held Window Sampler

Borehole Dia (mm) Casing Dia (mm)
80 to 1.00m
60 to 1.50m

Groundwater
No. Struck Behaviour Sealed

No groundwater encountered

Ground Level 8.23 m OD
Coordinates 333037.64 mE
185405.50 mN

Drilled by DC
Logged by DC
Checked by AF

Remarks Hole refusal at 1.50m (possible wooden sleepers?)

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Borehole CH30(1 of 1)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
0.00-0.40	T		08/02 0000 DRY	
		NIL	DRY	
0.40				

Strata

Description	Depth (Thickness)	Level	Legend
	G.L.	7.96	
MADE GROUND: Very compact grey black slightly silty sandy slightly clayey sub-angular fine to coarse gravel of slag,ash,sandstone and coal with occasionl cobbles of sandstone	(0.40)		
End of Borehole.	0.40	7.56	

Equipment: Hand Held Window Sampler

Borehole Dia (mm) 80 to 0.40m

Casing Dia (mm)

Groundwater

No. Struck Behaviour Sealed

No groundwater encountered

Ground Level 7.96 m OD
Coordinates 333206.82 mE
185368.33 mN

Drilled by DC
Logged by DC
Checked by AF

Remarks Hole refusal at 0.40m (could not penertrate gravels)

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project

M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Borehole CH31(1 of 1)

Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
0.00-0.35	T		08/02 0000 DRY	
0.35-1.00	TO			
0.10	W			
		NIL	0.10	
1.00				

Strata

Description	Depth (Thickness)	Level
	G.L.	8.13
MADE GROUND: Moderately compact red brown slightly sandy slightly silty slightly clayey angular to sub-angular fine to coarse gravel of sandstone, limestone and brick with occasional to some cobbles of sandstone	0.35	7.78
	(0.65)	
MADE GROUND: Firm to stiff brown slightly sandy very silty clay with occasional sub-angular fine to coarse gravel of coal and ash	1.00	7.13
End of Borehole.		

Legend

Equipment: Hand Held Window Sampler

Borehole Dia (mm) 80 to 1.00m

Casing Dia (mm)

Groundwater

No.	Struck	Behaviour	Sealed
1	0.10	Rose to 0.10m in 20 mins .10/.10/.10 in 5/10/15 mins	

Ground Level 8.13 m OD
Coordinates 333267.59 mE
185318.45 mN

Drilled by DC
Logged by DC
Checked by AF

Remarks Refusal at 1.00m (possible wooden sleepers?)

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Borehole CH32(1 of 1)

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

Hole ID.
STPG01
Sheet 1 of 1

Contract No.	F15056	Method	Machine Excavated	Coordinates	333190.21 E
Project	New M4 - Second Preliminary Ground Investigation				185378.09 N
		Equipment	JCB 3CX	Ground Level	7.84m AOD
Client	Transport Wales, Welsh Assembly Government			Date Started	21/11/2007
		Logged by	WA	Date Completed	21/11/2007
Consultant	Ove Arup & Partners Ltd				

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		Remarks
MADE GROUND: Dark grey very clayey sandy angular to subangular fine to coarse gravel sized fragments of clinker, slag, plastic, ash , limestone and housebricks with medium cobble content. Cobble sized fragments are subangular of limestone and brick.				ES1 D2 B3	0.30 0.30 0.30	
MADE GROUND: Brown slightly gravelly slightly sandy clay. Gravel sized fragments are subangular to rounded fine to coarse of mixed lithologies including siltstone.		1.00	6.84	ES4 D5	1.00 1.00	
Firm locally soft grey slightly sandy CLAY. (Estuarine Alluvium)		1.20	6.64	ES6 D7 B8 ES9 D10	1.20 1.20 1.20 1.30 1.30	
Firm locally soft bluish grey slightly sandy CLAY. (Estuarine Alluvium)		2.30	5.54	B11 D12 ES13 D14 B15	2.20 2.20 2.30 2.30 2.30	
				D16	3.30	
				B17	3.80	
				D18	4.30	
Trial pit complete at 4.50 m.		4.50	3.34			

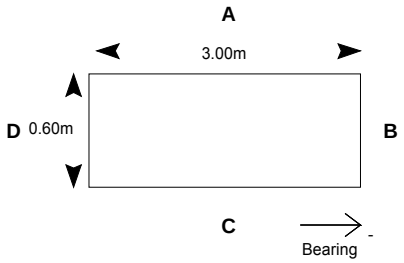
Stability: All faces stable

Shoring: None used

Groundwater: Water strike at 0.40m on face D - fast

Remarks: 1.Trial pit complete at 4.50m.

Sketch Plan of Trial Pit



NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form	ARIAL TP LOG
Version	3.06
Revised	17/12/2007

Norwest Holst Soil Engineering Ltd.

HAND VANE AND HAND PENETROMETER TESTS

Hole ID.
STPG01
Data Sheet

Contract No.	F15056	Method	Machine Excavated	Coordinates	333190.21E
Project	New M4 - Second Preliminary Ground Investigation				185378.09 N
		Equipment	JCB 3CX	Ground Level	7.84m AOD
Client	Transport Wales, Welsh Assembly Government			Orientation	Vertical
		Logged by	WA	Date Started	21/11/2007
Consultant	Ove Arup & Partners Ltd			Date Completed	21/11/2007

Hand Vane				Hand Penetrometer		
Depth	Test No	Peak	Remoulded	Depth	Test No	Result
1.00	01	100.0	0.0			
1.00	02	80.0	0.0			
1.00	03	40.0	0.0			
2.00	04	110.0	90.0			
2.00	05	100.0	70.0			
2.00	06	120.0	100.0			
3.00	07	80.0	60.0			
3.00	08	80.0	80.0			
3.00	09	60.0	30.0			
4.00	10	40.0	10.0			
4.00	11	20.0	0.0			
4.00	12	30.0	0.0			

NOTES: All depths in metres, all diameters in millimetres, test results in kPa.

Form	ARIAL HAND VANE/PEN
Version	3.03
Revised	18/01/2007

Norwest Holst Soil Engineering Ltd.

TRIAL PIT LOG

Hole ID.
STPG02
Sheet 1 of 1

Contract No.	F15056	Method	Machine Excavated	Coordinates	333246.74 E
Project	New M4 - Second Preliminary Ground Investigation				185332.34 N
		Equipment	JCB 3CX	Ground Level	7.87m AOD
Client	Transport Wales, Welsh Assembly Government			Date Started	26/11/2007
		Logged by	WA	Date Completed	26/11/2007
Consultant	Ove Arup & Partners Ltd				

Description of Strata	Legend	Depth Below G.L.	Datum Level	Sampling		Remarks
MADE GROUND: Reddish brown clayey very sandy angular to subangular fine to coarse gravel sized fragments of siltstone, concrete and brick.				ES1	0.30	
				D2	0.30	
				B3	0.30	
MADE GROUND: Grey brown slightly sandy clay.		0.60	7.27	ES4	0.60	
		0.80	7.07	D5	0.60	
Stiff locally soft grey brown silty slightly sandy CLAY. (Estuarine Alluvium)				B6	0.60	
				ES7	1.00	
				D8	1.00	
---from 1.00m grey				B9	1.00	
---from 2.00m occasional organic material				D10	2.00	
				B11	2.50	
				D12	3.00	
				B13	4.00	
				D14	4.00	
Trial pit complete at 4.20 m.		4.20	3.67			

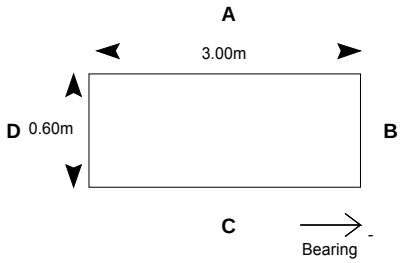
Stability: All faces stable

Shoring: None used

Groundwater: None encountered during excavation

Remarks: 1.Trial pit terminated at 4.20m.

Sketch Plan of Trial Pit



NOTES: All depths in metres, all soil strengths in kPa.
See legend sheet for key to symbols and abbreviations.
All bearings given relate to magnetic North

Form	ARIAL TP LOG
Version	3.06
Revised	17/12/2007

Norwest Holst Soil Engineering Ltd.

HAND VANE AND HAND PENETROMETER TESTS

Hole ID.
STPG02
Data Sheet

Contract No.	F15056	Method	Machine Excavated	Coordinates	333246.74E
Project	New M4 - Second Preliminary Ground Investigation				185332.34 N
		Equipment	JCB 3CX	Ground Level	7.87m AOD
Client	Transport Wales, Welsh Assembly Government			Orientation	Vertical
		Logged by	WA	Date Started	26/11/2007
Consultant	Ove Arup & Partners Ltd			Date Completed	26/11/2007

Hand Vane				Hand Penetrometer		
Depth	Test No	Peak	Remoulded	Depth	Test No	Result
1.00	01	130.0	130.0			
1.00	02	130.0	120.0			
1.00	03	130.0	130.0			
2.00	04	130.0	100.0			
2.00	05	100.0	100.0			
2.00	06	120.0	110.0			
3.00	07	90.0	70.0			
3.00	08	100.0	70.0			
3.00	09	110.0	70.0			
4.00	10	70.0	50.0			
4.00	11	70.0	30.0			
4.00	12	60.0	30.0			

NOTES: All depths in metres, all diameters in millimetres, test results in kPa.

Form	ARIAL HAND VANE/PEN
Version	3.03
Revised	18/01/2007

Geotechnical Engineering Limited

BOREHOLE LOG

BH423

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 1 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
10/03/15 1150hrs	1B	0.20	0.50						Soft dark brownish grey slightly sandy CLAY with frequent roots (up to 20mm diam) and rootlets. (TFD)			
	2D*	0.20	0.50		Vo 0.0							
	3B	0.50	1.00									
	4D*	0.50	1.00		Vo 0.0							
	5B	1.00	1.20									
	6D*	1.00	1.20		Vo 0.0					1.00	6.00	
	UT	1.20	1.65	Nil					Very soft dark grey organic CLAY with rare fragments of fibrous organic material (up to 2mm diam). (TFD)			
	8X	1.20	1.70									
	9D*	1.20	1.40									
	10X	1.70	2.20									
	UT	2.20	2.65	Nil								
	12X	2.20	2.70									
	13D*	2.20	2.40									
10/03/15 1655hrs 0.00m	14X	2.70	3.20	Nil								
	15D*	3.00	3.20									
11/03/15 0930hrs 0.00m	16P	3.20	4.00	3.20		P/S						
	17X	4.00	4.60	3.20								
		4.50		3.20	V 29				4.50m: Low strength.			
	18P	4.60	5.40	4.60		P/S						
	19X	5.40	5.80									
		5.70		4.60	V 1				5.70m: Extremely low strength.			
	20P	5.80	6.60			P/S						
	21X	6.60	7.00									
		6.90		4.60	V 9				6.90m: Extremely low strength.			
	22P	7.00	7.80	7.00		P/S						
	23X	7.80	8.20									
									Continued Next Page	{8.00}		

EQUIPMENT: Geotechnical Pioneer rig.

METHOD: Hand dug inspection pit 0.00-1.20m. Dynamic sampled (128mm) 1.20-3.20m, (113mm) 4.00-15.20m. Waterflush rotary core drilled (116mm) 15.20-60.00m.

CASING: 140mm diam to 18.20m.

BACKFILL: On completion, borehole backfilled with bentonite 60.00-40.00m. A slotted standpipe (50mm) was installed to 40.00m, granular response zone 40.00-25.00m and bentonite seal 25.00-18.00m. A second slotted standpipe (35mm) was installed to 18.00m, granular response zone 18.00-15.00m, bentonite seal 15.00-0.30m and concrete and raised cover 0.30-0.00m.

REMARKS: Downhole magnetometry for UXO risk mitigation undertaken 0.00-15.20m. No anomalies encountered. MMG = Mercia Mudstone Group. Weathering zone after Chandler RJ and Forster CIRIA C570; Engineering in Mercia Mudstone (2001).

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
1.20	Nil	0.54	20	

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 2 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
		8.10		7.00	V 35							
	24P	8.20	9.00	8.20		P/S			8.10m: Low strength. 8.20m: Soft.			
	25X	9.00	10.00									
										9.20	-2.20	
									Soft dark grey organic silty CLAY. (TFD)			
11/03/15 1700hrs 0.00m		9.50		8.20	V 24				9.50m: Low strength.			
12/03/15 0850hrs 0.00m	26P	10.00	10.80	10.00		P/S						
	27X	10.80	11.80									
	28P	11.80	12.60	10.00		P/S						
	29X	12.60	13.60									
										13.20	-6.20	
									Dark grey thickly interlaminated fine SAND and CLAY with frequent fragments of organic material (up to 2mm). (TFD)	13.30	-6.30	
	30P	13.60	14.05	12.60		P/S			Soft dark grey organic silty CLAY with frequent thick laminae of fine sand. (TFD)			
	31D	14.05	14.50	14.05	S 4							
	32X	14.05	15.20									
										15.00	-8.00	
	33D	15.20	15.59	15.20	S*64				Very dense grey thickly laminated silty fine and medium SAND with rare fragments of fibrous organic material (up to 2mm). (TFD)			
	34C	15.20	16.60			100	NA					
										15.60	-8.60	
									Grey thickly bedded silty fine and medium SAND with rare fragments of fibrous organic material (up to 2mm). (TFD)	16.00	-9.00	
12/03/15 1700hrs 0.00m									Grey and reddish brown gravelly fine to coarse SAND with frequent bivalve shells (up to 10mm). Gravel is subangular to rounded fine and medium sandstone and quartz. (TFD)	16.20	-9.20	
	35D	16.60	16.91	15.20	S*94					16.45	-9.45	
13/03/15 0915hrs 0.00m	36C	16.60	16.90	16.60		67				16.60	-9.60	
									Grey fine to coarse SAND with frequent shells (up to 10mm). (TFD)	16.90	-9.90	
	37C	16.90	18.20	16.60		15						
									Grey and reddish brown sandy subangular to rounded fine to coarse sandstone and quartzite GRAVEL with a low subrounded sandstone and quartz cobble content. (RTD)			
									Limited recovery. Grey slightly sandy gravelly subangular to rounded sandstone COBBLES. Gravel is subangular to			
									Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 3 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
		18.20 - 18.48	18.20	S*100				rounded coarse sandstone. Loss of fines. (RTD)	18.20	-11.20	
	38C	18.20 - 18.30			100				18.30	-11.30	
	39C	18.30 - 19.30	18.20		100	NA		Limited recovery. Soft reddish brown slightly sandy silty CLAY. (RTD)			
								Grey subrounded to well rounded sandstone and conglomerate COBBLES. (RTD)			
13/03/15 1600hrs 4.20m	40C	19.30 - 19.60	18.20		100			Hard fissured friable reddish brown gravelly silty CLAY locally tending to extremely weak mudstone frequent greenish grey reduction spots (up to 10mm). Gravel is angular fine and medium mudstone lithorelicts. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)			
		19.60 - 19.85	18.20	C*125							
16/03/15 0955hrs 5.70m	41C	19.60 - 21.10			97			19.40m: Cobble sized lithorelict of weak mudstone.			
	42C	21.10 - 22.60	18.20		97						
						NA			22.30	-15.30	
	43C	22.60 - 24.10	18.20		100			Hard fissured reddish brown silty CLAY with frequent fine sand sized gypsum crystals along fissure surfaces. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)			
						NA			24.00	-17.00	
	44C	24.10 - 25.60	18.20		100			Hard fissured friable reddish brown gravelly silty CLAY frequent greenish grey reduction spots (up to 10mm). Gravel is angular fine and medium mudstone lithorelicts. Locally tending to extremely weak mudstone. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)			
	45C	25.60 - 27.10	18.20		100			25.55m: 50° relict fissure infilled with fine sand sized gypsum crystals.			
	46C	27.10 - 28.60	18.20		100 7 7						
								Continued Next Page	{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 4 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
16/03/15 1700hrs 5.10m								27.95 - 28.05m: Weak mudstone.	28.60	-21.60	
17/03/15 0930hrs 5.60m	47C	28.60 - 30.10	18.20		97 27 9	NI 80 150		Extremely weak reddish brown MUDSTONE locally disintegrated to gravelly clay with frequent greenish grey reduction spots (up to 40mm). Fractures are subhorizontal and 20° very closely and closely spaced undulating rough. (MMG) (Grade II)	29.50	-22.50	
						NA		Hard fissured reddish brown gravelly silty CLAY. Gravel is angular fine and medium mudstone lithorelicts. (MMG) (Grade III)			
	48C	30.10 - 31.60	18.20		93 45 32	NI 60 210		Extremely weak reddish brown MUDSTONE with rare greenish grey reduction spots (up to 20mm). Fractures are subhorizontal very closely to medium closely spaced undulating rough. (MMG) (Grade II)	30.30	-23.30	
	49C	31.60 - 33.10	18.20		97 19 0				32.50	-25.50	
						NA		Hard fissured reddish brown gravelly silty CLAY locally tending to extremely weak mudstone. Gravel is angular fine and medium extremely weak mudstone lithorelicts. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)			
	50C	33.10 - 34.60	18.20		100			34.20 - 34.75m: Frequent fine sand sized gypsum crystals along fissure surfaces.			
	51C	34.60 - 36.10	18.20		100 4 0	NI NI 60		Extremely weak reddish brown MUDSTONE. Fractures are subhorizontal, 20° and 70° extremely closely spaced undulating rough. (MMG) (Grade II)	34.75 35.25	-27.75 -28.25	
						NA		Hard fissured reddish brown gravelly silty CLAY with rare greenish grey reduction spots (up to 30mm). Gravel is angular fine and medium extremely weak mudstone lithorelicts. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)			
	52C	36.10 - 37.60	18.20		87						
17/03/15 1700hrs 6.20m											
18/03/15 0910hrs 5.60m	53C	37.60 - 39.10	18.20		90						
								Continued Next Page	{38.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 5 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
									39.10	-32.10	
	54C	39.10 - 40.60	18.20		100	NI		Extremely weak reddish brown MUDSTONE locally disintegrated to gravelly clay. Recovered non intact. (MMG) (Grade II/III)	39.70	-32.70	
								Hard fissured reddish brown gravelly silty CLAY. Gravel is angular fine and medium extremely weak mudstone lithorelicts. (MMG) (Grade III)	39.90	-32.90	
	55C	40.60 - 42.10	18.20		100 5 0			Extremely weak reddish brown MUDSTONE locally disintegrated to gravelly clay. Non-intact. (MMG) (Grade II/III)	41.10	-34.10	
						NA		Hard fissured reddish brown gravelly silty CLAY. Gravel is angular fine and medium extremely weak mudstone lithorelicts. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)	41.70	-34.70	
						NI		41.20 - 41.30m: Frequent fine and medium sand sized gypsum crystals.			
	56C	42.10 - 43.60	18.20		100 0 0			Extremely weak reddish brown MUDSTONE. Recovered non intact. (MMG) (Grade II)	42.40	-35.40	
						NA		Hard fissured reddish brown gravelly silty CLAY locally tending to extremely weak mudstone. Gravel is angular fine and medium extremely weak mudstone lithorelicts. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)			
	57C	43.60 - 45.10	18.20		87						
18/03/15 1600hrs 6.80m											
19/03/15 0940hrs 6.60m	58C	45.10 - 46.60	18.20		90 14 8				45.80	-38.80	
						NI 80 190		Extremely weak locally weak reddish brown MUDSTONE with frequent gypsum veining along healed fractures (up to 3mm thick). Rare greenish grey reduction spots (up to 20mm). Fractures are subhorizontal, 20° and 60° extremely closely to closely spaced planar smooth. (MMG) (Grade II) 46.10m: Subvertical tending to 70° undulating gypsum vein (17mm thick). 47.05m: Subhorizontal and 70° intersecting planar gypsum veins (5mm thick). 47.50m: 60° planar gypsum vein (5mm thick). 47.80m: 20° undulating gypsum vein (15mm thick).			
	59C	46.60 - 48.10	18.20		93 59 32						
								Continued Next Page	{48.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 6 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
	60C	48.10 - 49.10	18.20		85 39 19						
	61C	49.10 - 50.60	18.20		77 47 21						
19/03/15 1600hrs 7.00m								50.30m: 20° planar gypsum vein (up to 8mm thick).			
24/03/15 1220hrs 8.10m	62C	50.60 - 52.10	18.20		97 90 66				51.00	-44.00	
						160 180 250		Very weak and weak reddish brown MUDSTONE with frequent gypsum infill along healed fractures. Fractures are subhorizontal to 20° and 70° to subvertical, closely and medium spaced planar smooth. (MMG) (Grade I) 51.10 - 52.00m: Subvertical tending to 70° undulating gypsum vein (20mm thick).			
	63C	52.10 - 52.60	18.20		100 80 60						
	64C	52.60 - 54.10	18.20		100 76 61						
						50 100 160		53.25 - 54.60m: Fractures are subhorizontal, 20°, 50° and 70° very closely and closely spaced planar smooth. 53.55 - 53.80m: Frequent greenish grey reduction spots (up to 30mm thick).			
24/03/15 1745hrs 8.50m								53.90 - 54.05m: 70° undulating gypsum vein (15mm thick). 54.10 - 54.25m: 70° planar gypsum vein (12mm thick).			
25/03/15 0945hrs 8.60m	65C	54.10 - 55.60	18.20		97 90 53						
						40 150 300		54.60 - 58.60m: Fractures are subhorizontal, 20° and 30° closely and medium spaced planar smooth.			
	66C	55.60 - 57.10	18.20		93 78 57						
								55.90 - 56.10m: 70° undulating gypsum vein (12mm thick).			
	67C	57.10 - 58.60	18.20		97 79 63						
								57.10 - 57.20m: 70° undulating gypsum vein (30mm thick).			
								Continued Next Page	{58.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

AGS

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 7 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
25/03/15 1530hrs 8.70m												
26/03/15 1020hrs 8.70m	68C	58.60	60.00	18.20		89 89 86	80 110 250		58.75 - 58.80m: 20° planar gypsum vein (4mm thick).			
26/03/15 1430hrs 8.50m									59.55 - 59.57m: 20° planar gypsum vein (7mm thick).	60.00	-53.00	
									Borehole completed at 60.00m.	{68.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

BH424

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 1 of 4

Start Date 9 February 2015 — Easting 332760.1 — Scale 1 : 50

End Date 17 February 2015 — Northing 185474.9 — Ground level 7.90mOD — Depth 34.70 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
09/02/15 0800hrs	1B	0.30	0.60						Black mottled dark grey very sandy subangular fine to coarse slag, brick, concrete and limestone GRAVEL. (MG)			
	2D*	0.30	0.60		Vo 4.6							
	3B	0.70	1.00									
	4D*	0.70	1.00		Vo 7.6							
		1.10	1.14	Nil	C*417					1.10	6.80	
	5B	1.10							Black mottled dark grey sandy subangular fine to coarse slag, brick, concrete and limestone GRAVEL with high subangular limestone cobble content. (MG)			
	6D*	1.10			Vo 6.2							
	7D	1.50	1.95	1.50	S 17					1.50	6.40	
	8B	1.50	2.00						Firm dark grey slightly gravelly silty CLAY. Gravel is subangular fine and medium limestone. (MADE GROUND?)			
	9D*	1.50	1.60		Vo 9.6							
	10D	1.55										
	11UT	2.00	2.45	2.00								
	12D*	2.00	2.10									
	15D	2.45	2.55									
	13D	2.50	2.95	2.40	S 12				2.50 - 3.10m: Firm.			
	14B	2.50	3.00									
	16D*	2.50	2.60		Vo 1.5							
	17UT	3.00	3.45	3.00						3.10	4.80	
09/02/15 1700hrs Dry	18D*	3.00	3.10						Very soft brownish grey organic silty CLAY with rare subangular fine and medium sandstone gravel and rare wood fragments (up to 40mm). (TFD)			
	19D	3.45	3.50									
11/02/15 0800hrs Dry	20D	3.50	3.95	3.50	S<1							
	21B	3.50	4.00									
	22D*	3.50	3.60									
	23UT	4.00	4.45	3.50								
	26D	4.45	4.50									
	24D	4.50	4.95	4.40	S 2							
	25B	4.50	5.00									
	27UT	5.00	5.45	4.90								
	28D	5.50										
	29D*	5.50	5.60									
	30D	6.00										
	31D	6.50	6.95	6.40	S<1							
	32B	6.50	7.20									
	33D	7.50										

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{8.00}

EQUIPMENT: Light cable percussive (shell and auger) rig and Geotechnical Pioneer rig.

METHOD: Hand dug inspection pit 0.00-1.10m. Cable percussion (200mm) 1.10-2.50m and (150mm) 2.50-14.00m. Rotary core drilled (123mm PQ3 Wireline) 14.00-25.80m using a water flush. Waterflush rotary core drilled (116mm) 25.80-34.70m.

CASING: 200mm diam to 2.00m, 150mm diam to 13.40m and 114mm diam to 25.80m (withdrawn to allow conventional coring).

BACKFILL: On completion, hole backfilled with bentonite pellets.

REMARKS: Hole advanced by chiselling 1.10-1.50m (1hr) and 13.70-13.90m (1hr).

Downhole magnetometry for UXO risk mitigation undertaken 0.00-13.50m. No anomalies encountered.

Bentonite seal for aquifer protection installed during drilling 2.50-1.50m, prior to reduction in casing diameter.

MMG = Mercia Mudstone Group. Weathering zone after Chandler RJ and Forster CIRIA C570; Engineering in Mercia Mudstone (2001).

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
1.10	Nil	1.10	20	

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BOREHOLE LOG

BH424

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 2 of 4

Start Date 9 February 2015 — Easting 332760.1 — Scale 1 : 50

End Date 17 February 2015 — Northing 185474.9 — Ground level 7.90mOD — Depth 34.70 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
	34UT	8.00 - 8.45	7.90								
	35D	8.50									
	36D	9.00									
	37D	9.50 - 9.95	9.20	S 3							
	38B	9.50 - 10.00									
	39D	10.50									
	40UT	11.00 - 11.45	10.90								
	41D	11.50									
	42D	12.00									
	44B	12.50 - 13.20									
	43D	12.70 - 13.10	12.40	S 2							
	45D	13.40									
	46D	13.50 - 13.83	13.40	S*83					13.40	-5.50	
	47B	13.50 - 13.90						(Recovered as soft) Greenish grey mottled reddish brown slightly gravelly silty CLAY. Gravel is subangular fine and medium limestone. (TFD)			
11/02/15 1700hrs Dry	48D	13.90 - 14.00	13.40	S*395					14.00	-6.10	
13/02/15 1500hrs 4.10m	49C	14.00 - 14.90	14.90		72 0 0	NI		Very weak and weak thinly laminated greenish grey SILTSTONE. Fractures are subhorizontal to 20° very closely spaced and non intact planar rough. (MMG) (Grade II)			
13/02/15 1615hrs 4.10m											
16/02/15 0845hrs 4.15m	50C	14.90 - 15.30	15.30		100 0 0				15.20	-7.30	
	51C	15.30 - 16.80	16.80		100	NA		Stiff fissured greenish grey gravelly CLAY. Gravel is subangular fine to coarse lithorelicts of extremely weak siltstone. Fissures are subhorizontal to 20° planar rough locally infilled (up to 2mm) with greenish grey clay. (MMG) (Grade III)	15.45	-7.55	
	52C	16.80 - 18.30	18.30		100			Stiff fissured reddish brown mottled greenish grey gravelly CLAY. Gravel is subangular fine to coarse lithorelicts of extremely weak mudstone. Fissures are subhorizontal to 20° and subvertical extremely closely spaced planar rough locally stained light grey locally infilled (up to 2mm) with reddish brown clay. (MMG) (Grade III)			
								17.50 - 17.70m: Tending to greenish grey siltstone.			
								Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 3 of 4

Start Date 9 February 2015 — Easting 332760.1 — Scale 1 : 50

End Date 17 February 2015 — Northing 185474.9 — Ground level 7.90mOD — Depth 34.70 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
									18.30	-10.40	
	53C	18.30 - 19.80	19.80		100 0 0	NI		Extremely weak and very weak thinly laminated and very thinly bedded greenish grey MUDSTONE with rare greenish grey reduction spots (up to 25mm). Fractures are subhorizontal to 20° very closely spaced planar rough. (MMG) (Grade II)			
									19.80	-11.90	
	54C	19.80 - 21.10	21.10		100 0 0	NA		19.75 - 19.80m: Greenish grey.			
								Stiff fissured reddish brown mottled greenish grey gravelly CLAY with rare greenish grey reduction spots (up to 10mm). Gravel is subangular fine to coarse lithorelicts of extremely weak mudstone. Fissures are subhorizontal to 20° and subvertical planar rough locally infilled (up to 2mm) with gypsum crystals (up to 3mm). (MMG) (Grade III)	20.55	-12.65	
						NI					
	55C	21.10 - 22.60	22.60		73 0 0			Extremely weak and very weak thinly laminated and very thinly bedded reddish brown MUDSTONE with frequent greenish grey reduction spots (up to 10mm). Fractures are subhorizontal to 20° very closely spaced planar rough. (MMG) (Grade II)			
									22.00	-14.10	
						NA		Stiff fissured reddish brown mottled greenish grey gravelly CLAY with frequent greenish grey reduction spots (up to 10mm). Gravel is subangular fine to coarse lithorelicts of extremely weak mudstone. Fissures are subhorizontal to 20° and subvertical extremely closely spaced planar rough locally infilled (up to 2mm) with gypsum crystals (up to 3mm). (MMG) (Grade III)	22.65	-14.75	
	56C	22.60 - 23.60	23.60		100 20 14	NI 100 170					
								Extremely weak and very weak thinly laminated and very thinly bedded reddish brown mottled greenish grey MUDSTONE with rare greenish grey reduction spots (up to 10mm). Fractures are subhorizontal to 20° closely spaced planar rough. (MMG) (Grade II)			
	57C	23.60 - 24.30	24.30		100 0 0						
									24.30	-16.40	
	58C	24.30 - 25.80	25.80		100 60 43	NI 200 650		Extremely weak and very weak thinly laminated and very thinly bedded reddish brown mottled greenish grey MUDSTONE with rare greenish grey reduction spots (up to 5mm). Fractures are subhorizontal to 20° medium and widely spaced infilled (up to 2mm) with gypsum planar rough. (MMG) (Grade II)			
16/02/15 1725hrs 2.10m											
									25.80	-17.90	
17/02/15 0840hrs 4.10m	59C	25.80 - 27.30	27.30		100 20 0	NA		Stiff fissured reddish brown mottled greenish grey gravelly CLAY with frequent greenish grey reduction spots (up to 20mm). Gravel is subangular fine to coarse lithorelicts of extremely weak mudstone. Fissures are subhorizontal to 20° and subvertical to 10° extremely closely spaced planar rough locally infilled (up to 2mm) with gypsum crystals (up to 3mm). (MMG) (Grade III)	26.75	-18.85	
						NI 50 95					
						NA		Extremely weak and very weak thinly laminated reddish brown mottled greenish grey MUDSTONE with frequent greenish grey reduction spots (up to 5mm). Fractures are subhorizontal to 20° very closely and closely spaced planar rough stained black infilled (up to 2mm) with gypsum crystals (up to 3mm). (MMG) (Grade II)	27.20	-19.30	
	60C	27.30 - 28.80	28.80		100 0 0						
								Continued Next Page	{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 4 of 4

Start Date 9 February 2015 — Easting 332760.1 — Scale 1 : 50

End Date 17 February 2015 — Northing 185474.9 — Ground level 7.90mOD — Depth 34.70 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
						NI		Stiff fissured reddish brown gravelly CLAY with frequent greenish grey reduction spots (up to 30mm). Gravel is subangular fine to coarse lithorelicts of extremely weak mudstone. Fissures are subhorizontal to 20° and subvertical to 80° extremely closely spaced planar rough locally stained black locally infilled (up to 2mm) with gypsum crystals (up to 3mm). (MMG) (Grade III)	28.40	-20.50	
	61C	28.80 - 30.30	30.30		100 0 0	NA			28.80	-20.90	
								Extremely weak and very weak thinly laminated reddish brown mottled greenish grey MUDSTONE with frequent greenish grey reduction spots (up to 5mm). Fractures are subhorizontal to 20° very closely spaced planar rough stained black infilled (up to 2mm) with gypsum crystals (up to 3mm). (MMG) (Grade II)			
	62C	30.30 - 31.80	31.80		100 20 20	NI NI 40 300		Stiff fissured reddish brown gravelly CLAY with rare greenish grey reduction spots (up to 10mm) and local sand sized gypsum crystals. Gravel is subangular fine to coarse lithorelicts of extremely weak mudstone. Fissures are subhorizontal to 20° and subvertical planar rough locally stained black locally infilled (up to 2mm) with gypsum crystals. (MMG) (Grade III)	30.50	-22.60	
						300					
						NI		Extremely weak and very weak thinly laminated reddish brown mottled greenish grey MUDSTONE with rare greenish grey reduction spots (up to 10mm) and local sand sized gypsum crystals. Fractures are subhorizontal to 20° closely spaced locally medium spaced planar rough stained black infilled (up to 2mm) with gypsum crystals. (MMG) (Grade II) 30.85 - 31.25m: Subvertical to 20° fracture stained black.	31.80	-23.90	
	63C	31.80 - 33.30	33.30		100	NA					
								Stiff fissured reddish brown gravelly CLAY with rare greenish grey reduction spots (up to 10mm) and localised gypsum crystals (up to 2mm). Gravel is subangular fine to coarse lithorelicts of extremely weak mudstone. Fissures are subhorizontal to 20° and subvertical planar rough locally stained black infilled (up to 2mm) with gypsum crystals (up to 3mm). (MMG) (Grade III)			
	64C	33.30 - 34.70	34.70		100						
17/02/15 1400hrs 1.54m									34.70	-26.80	
								Borehole completed at 34.70m.			
									{38.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

BH425

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 1 of 6

Start Date 12 February 2015 — Easting 332927.2 — Scale 1 : 50

End Date 24 February 2015 — Northing 185442.1 — Ground level 7.85mOD — Depth 54.40 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
12/02/15 0800hrs									MADE GROUND comprising CONCRETE. (MG)	0.30	7.55	
	1B	0.40	0.70						Dark grey clayey subangular fine to coarse limestone, slag and brick GRAVEL with medium limestone cobble content. (MG)	0.80	7.05	
	2D*	0.50	0.60		Vo 0.5							
	3B	0.80	1.20									
	4D*	1.00	1.10		Vo 0.4				Medium dense becoming loose with depth grey very clayey very sandy subangular fine to coarse limestone and sandstone GRAVEL with medium cobble content. (MG)			
		1.20	1.65		C 15							
	5B	1.20	1.70	1.20								
	6D*	1.50	1.60		Vo 0.4							
		1.65	2.10	1.60	C 9					2.10	5.75	
	7B	1.70	2.10									
	8D*	2.00	2.10		Vo 0.9				Soft grey mottled brown gravelly silty CLAY. Gravel is subangular fine to coarse limestone and sandstone. (TFD)			
		2.10	2.55	2.10	C 4					2.50	5.35	
	9D	2.30	2.60									
	10D*	2.50	2.60		Vo 0.7				Very soft grey mottled brown silty CLAY. (TFD)			
	11UT	2.60	3.05	2.50								
	14D*	3.00	3.10		Vo 0.7							
		3.10	3.55	2.80	C 11							
	12D	3.10							3.10 - 3.60m: Rare fragments of black organic material.			
	13B	3.10	3.60									
	15D*	3.50	3.60									
	16UT	3.60	4.05	3.50								
	18D*	4.00	4.10									
	17D	4.10	4.55	4.00	S<1				4.10 - 5.10m: Very soft.			
	19D*	4.50	4.60									
	20UT	4.60	5.05	4.50								
	23D*	5.00	5.10							5.10	2.75	
12/02/15 1700hrs Dry	21D	5.10							Very soft grey mottled brown silty CLAY with rare subangular fine to coarse sandstone and slag gravel. (TFD)			
	22B	5.10	5.60							5.50	2.35	
16/02/15 0800hrs 2.30m	24D	5.10	5.55	5.00	S 1				Soft grey mottled brown silty CLAY. (TFD)			
	25D	6.00	6.20						Very soft becoming soft grey mottled brown silty CLAY. (TFD)			
	26UT	6.50	6.95	6.00								
	27D	7.00	7.10									
	28D	7.50	7.60									
	29D	8.00	8.45	8.00	S<1							

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EQUIPMENT: Light cable percussive (shell and auger) rig and Geotechnical Pioneer rig.

METHOD: Hand dug inspection pit 0.00-1.20m. Cable percussion (200mm) 1.20-2.50m and (150mm) 2.50-15.30m. Rotary core drilled (123mm PQ3 Wireline) 15.30-21.90m using a water flush. Waterflush rotary core drilled (116mm) 21.90-54.40m. CASING: 200mm diam to 2.50m, 150mm diam to 14.40m, 140mm diam to 15.30m and 114mm to 21.90m (withdrawn to allow conventional coring). BACKFILL: On completion, hole backfilled with bentonite pellets 54.00-30.00m. A slotted standpipe (50mm) was installed to 30.00m, granular response zone 30.00-20.00m, bentonite seal 20.00-12.30m. A second slotted standpipe (35mm) was installed to 12.30m, granular response zone 12.30-11.80m, bentonite seal 11.80-0.20m, concrete and stopcock cover 0.20-0.00m.

REMARKS: Driller notes reduced flush returns 15.30-34.90m (90% returned). Downhole magnetometry for UXO risk mitigation undertaken 0.00-13.50m. No anomalies encountered. Bentonite seal for aquifer protection installed during drilling 1.50-3.00m, prior to reduction in casing diameter. MMG = Mercia Mudstone Group. Weathering zone after Chandler RJ and Forster CIRIA C570; Engineering in Mercia Mudstone (2001).

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
1.80	1.60	1.70	20	Slow.

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BOREHOLE LOG

BH425

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 2 of 6

Start Date 12 February 2015 — Easting 332927.2 — Scale 1 : 50

End Date 24 February 2015 — Northing 185442.1 — Ground level 7.85mOD — Depth 54.40 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
	30B	8.00 - 8.50									
	31D	9.00 - 9.10									
	32UT	9.50 - 9.95	9.40								
	33D	10.00 - 10.10									
	34D	10.50 - 10.20									
	35D	11.00 - 11.45	10.50	S<1							
	36B	11.00 - 11.60									
									11.70	-3.85	
	37B	11.90 - 12.30						Driller notes 'coarse gravel with wood' and 'chisel jamming'. (RTD)			
	38D	12.40 - 12.50						11.70m: Driller notes 'coarse gravel with wood' and 'chisel jamming'.	12.40	-4.55	
	39D	12.50 - 12.95	12.50	S 23				Stiff reddish brown slightly gravelly silty CLAY. Gravel is subangular fine mudstone. (MMG)			
	40B	12.50 - 13.00							13.00	-5.15	
						NI		Very weak reddish brown MUDSTONE recovered non intact as slightly sandy clayey angular and subangular fine to coarse gravel. (MMG)			
16/02/15 1700hrs 5.60m	41B	13.50 - 14.00	13.90								
17/02/15 0800hrs 5.00m	42D	14.00 - 14.45	13.90	S 35					14.00	-6.15	
	43B	14.00 - 14.50						Very stiff dark reddish brown mottled light grey slightly sandy slightly gravelly silty CLAY. Gravel is angular and subangular fine to coarse mudstone lithorelicts. (MMG. Weathering grade III). (MMG) (Grade III)			
	44D	14.90							14.90	-7.05	
17/02/15 1200hrs 5.00m	45D	15.00 - 15.19	14.40	S*268		NI		Very weak light greenish grey SILTSTONE recovered non intact as subangular fine to coarse gravel. (MMG)			
	46B	15.00 - 15.30							15.30	-7.45	
	47D	15.30 - 15.45	14.40	S*333				15.30 - 15.50m: Tending to greenish grey silty clay.			
18/02/15 1330hrs 5.00m	48C	15.30 - 16.50	15.30		100 45 38	NI 60 60		Medium strong thinly laminated to very thinly bedded greenish grey SILTSTONE. Fractures are subhorizontal to 20° extremely closely and very closely spaced planar rough. (MMG) (Grade I)	15.80	-7.95	
						NI 170 400					
	49C	16.50 - 18.00	16.50		100 38 30			Weak and medium strong thinly laminated purplish brown mottled greenish grey MUDSTONE. Fractures are subhorizontal to 20° and 70° to subvertical closely and medium spaced locally non intact planar rough locally infilled (up to 5mm) with greenish grey clay. (MMG) (Grade II)	17.10	-9.25	
						NI 100 300		Extremely weak and very weak thinly laminated purplish brown MUDSTONE with rare greenish grey reduction spots (up to 20mm). Fractures are subhorizontal to 20° closely and medium spaced planar rough infilled (up to 2mm) with gypsum crystals (up to 3mm). (MMG) (Grade II)			
18/02/15 1645hrs 4.50m											
								Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

BH425

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 3 of 6

Start Date 12 February 2015 — Easting 332927.2 — Scale 1 : 50

End Date 24 February 2015 — Northing 185442.1 — Ground level 7.85mOD — Depth 54.40 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
19/02/15 0840hrs 4.15m	50C	18.00 - 19.50	18.00		100 71 62			17.75 - 18.00m: Recovered non intact. 18.80 - 19.05m: Light greenish grey.			
	51C	19.50 - 21.00	19.50		100 56 33				21.00	-13.15	
	52C	21.00 - 21.90	21.00		100 22 22	NA NI 50 160		Very stiff fissured reddish brown sandy CLAY. Fissures are subhorizontal to 20° very closely spaced planar smooth. (MMG) (Grade III)	21.30	-13.45	
	53C	21.90 - 23.20	15.30		92	NA		Extremely weak and very weak thinly laminated purplish brown MUDSTONE with frequent greenish grey reduction spots (up to 20mm). Fractures are subhorizontal to 20° very closely and closely spaced planar rough infilled (up to 2mm) with gypsum crystals (up to 3mm). (MMG) (Grade II)	21.90	-14.05	
								Stiff fissured reddish brown sandy gravelly CLAY. Gravel is randomly orientated subangular fine to coarse lithorelicts of very stiff clay and extremely weak mudstone. Local relict fissures are randomly orientated extremely closely spaced planar smooth. (MMG) (Grade III)	23.20	-15.35	
	54C	23.20 - 24.70	15.30		100	NA		Very stiff fissured reddish brown sandy gravelly CLAY with greenish grey reduction spots (up to 10mm). Gravel is subangular fine to coarse lithorelicts of extremely weak mudstone. Fissures are subhorizontal to 20° and subvertical closely spaced planar rough locally infilled (up to 2mm) with gypsum crystals (up to 3mm). (MMG) (Grade III)			
	55C	24.70 - 26.20	15.30		100				26.20	-18.35	
	56C	26.20 - 27.40	15.30		100			Stiff fissured reddish brown sandy gravelly CLAY with greenish grey reduction spots (up to 20mm). Gravel is subangular fine to coarse lithorelicts of extremely weak mudstone. Fissures are subhorizontal to 20° and 70° to subvertical closely and medium planar smooth locally rough locally infilled (up to 2mm) with gypsum crystals (up to 2mm). (MMG) (Grade III)			
19/02/15 1645hrs 1.59m											
20/02/15 0830hrs 4.00m	57C	27.40 - 28.90	15.30		100						
								Continued Next Page	{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

BH425

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 4 of 6

Start Date 12 February 2015 — Easting 332927.2 — Scale 1 : 50

End Date 24 February 2015 — Northing 185442.1 — Ground level 7.85mOD — Depth 54.40 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
	58C	28.90	30.40	15.30		100						
	59C	30.40	31.90	15.30		100						
	60C	31.90	33.40	15.30		100						
	61C	33.40	34.90	15.30		100			33.40 - 34.90m: Fissures infilled (up to 3mm) with gypsum and greenish grey clay.			
	62C	34.90	36.40	15.30		100						
20/02/15 1550hrs 2.00m												
23/02/15 0840hrs 5.00m	63C	36.40	37.90	15.30		100						

Continued Next Page

{38.00}

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 5 of 6

Start Date 12 February 2015 — Easting 332927.2 — Scale 1 : 50

End Date 24 February 2015 — Northing 185442.1 — Ground level 7.85mOD — Depth 54.40 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
	64C	37.90 - 39.40	15.30		100			37.90 - 39.90m: Tending to extremely weak and weak reddish brown mudstone. 38.00 - 38.40m: Tending to extremely weak and weak reddish brown mudstone. 38.70 - 38.85m: Tending to extremely weak and weak reddish brown mudstone.			
	65C	39.40 - 40.90	15.30		100	NA		Stiff and very stiff fissured thinly laminated reddish brown locally mottled greenish grey CLAY with frequent greenish grey reduction spots (up to 40mm). Fissures are subhorizontal to 20° and 70° to subvertical very closely and closely spaced planar smooth locally infilled (up to 3mm) with gypsum crystals (up to 2mm). (MMG) (Grade III)	39.90	-32.05	
	66C	40.90 - 42.40	15.30		100						
	67C	42.40 - 43.90	15.30		100						
	68C	43.90 - 45.40	15.30		100	NA		Very stiff fissured reddish brown gravelly CLAY with rare greenish grey reduction spots (up to 30mm). Fissures are subhorizontal to 20° and 70° to subvertical very closely and closely spaced planar smooth locally infilled (up to 5mm) with gypsum crystals (up to 2mm). (MMG) (Grade III) 44.30 - 44.60m: Subvertical fissure infilled (up to 15mm) greenish grey mottled black clay and gypsum crystals (up to 2mm). 45.30 - 45.60m: Subvertical fissure infilled with gypsum (up to 2mm).	43.90	-36.05	
23/02/15 1645hrs 5.00m											
24/02/15 0825hrs 9.20m	69C	45.40 - 46.90	15.30		100						
	70C	46.90 - 48.40	15.30		100						
								Continued Next Page	{48.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

BH425

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 6 of 6

Start Date 12 February 2015 — Easting 332927.2 — Scale 1 : 50

End Date 24 February 2015 — Northing 185442.1 — Ground level 7.85mOD — Depth 54.40 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
	71C	48.40	49.90	15.30		100			48.10 - 48.30m: Subhorizontal and subvertical fissures infilled (up to 5mm) with gypsum crystals (up to 2mm). 48.90 - 49.20m: Tending to extremely weak mudstone. 49.60 - 49.85m: Subvertical fissure infilled (up to 20mm) with gypsum crystals (up to 2mm).			
	72C	49.90	51.40	15.30		100			49.90 - 50.20m: Tending to extremely weak mudstone. 50.65m: gypsum crystals (up to 20mm). 51.00 - 51.10m: Subhorizontal fissure infilled (up to 5mm) with gypsum.	51.40	-43.55	
	73C	51.40	52.90	15.30		100 51 33	NI 70 200		Very weak and weak thinly laminated reddish brown MUDSTONE with rare greenish grey reduction spots (up to 20mm). Fractures are subhorizontal to 20° and 70° to subvertical closely spaced locally non intact planar rough locally infilled (up to 10mm) with greenish grey clay and gypsum crystals (up to 2mm). (MMG) (Grade II)			
24/02/15 1615hrs 1.90m	74C	52.90	54.40	15.30		93 31 9				54.40	-46.55	
									Borehole completed at 54.40m.	{58.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

BH426

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 1 of 6

Start Date 17 February 2015 — Easting 333185.1 — Scale 1 : 50

End Date 4 March 2015 — Northing 185375.4 — Ground level 7.75mOD — Depth 54.50 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
17/02/15 0800hrs									MADE GROUND comprising crushed slag (Driller's description). (MG)	0.40	7.35	
	1B	0.50	0.80						Firm dark brownish grey slightly sandy slightly gravelly CLAY with frequent pockets (up to 150mm) of very soft bluish grey and greyish brown clay. Gravel is angular and subangular fine to coarse slag. Single cobble of black slag. 300mm plastic fragment. (MG)	0.90	6.85	
	2D*	0.50	0.60		Vo 0.1					1.10	6.65	
	3B	0.90	1.20									
	4D*	1.00	1.10		Vo 0.0							
	5D	1.20	1.65	1.20	S 4				Soft grey and brownish grey slightly sandy slightly gravelly CLAY. Gravel is angular and subangular fine to coarse slag and brick. Rare brick cobbles and metal nails (50mm). (MG)			
	6B	1.20	1.70									
	7D*	1.50	1.60		Vo 0.0							
	8D	1.65	2.10	1.50	S 6							
	9B	1.70	2.10									
	10D*	2.00	2.10		Vo 0.0				Soft grey mottled brownish grey and light brown slightly sandy slightly gravelly CLAY. Gravel is subangular fine to coarse sandstone. Frequent fragments of black organic material (up to 10mm). (MG)	2.30	5.45	
	11D	2.10	2.55	2.00	S 7							
	12B	2.10	2.50									
	13D*	2.50	2.60		Vo 0.0							
17/02/15 1700hrs Dry	15B	2.50	3.00						Soft light bluish grey and grey CLAY with rare thin laminae of light grey fine sand and frequent fragments of plant material (up to 80mm x 2mm diam). Slight organic odour. (TFD)			
	14D	2.55	3.00	2.30	S 9							
	16D*	3.00	3.10									
18/02/15 0800hrs 2.80m	17UT	3.00	3.45	3.00								
	18D	3.50										
	19D	3.50	3.95	3.40	S 3							
	20B	3.50	4.00							3.80	3.95	
	21D*	3.50	4.50		Vo 0.0				Very soft bluish grey slightly sandy silty CLAY with frequent fragments of black organic material (up to 10mm). (TFD)			
	22UT	4.00	4.45	3.90								
	23D	4.50										
	24D	4.50	4.95	4.00	S 3							
	25B	4.50	5.00									
	26D*	4.50	5.00									
	27UT	5.00	5.45	4.80								
	28D	5.50							5.50m: Frequent rootlets (up to 1mm diam).			
	29D	6.00							6.00 - 7.00m: Grey and brownish grey.			
	30D	6.50	6.95	6.30	S 2							
	31B	6.50	7.00									
	32D	7.50										
									Continued Next Page	{8.00}		

EQUIPMENT: Light cable percussive (shell and auger) rig and Geotechnical Pioneer rig.

METHOD: Hand dug inspection pit 0.00-1.20m. Cable percussion (200mm) 1.20-3.00m and (150mm) 3.00-14.50m. Waterflush rotary core drilled (116mm) 14.50-54.50m. CASING: 200mm diam to 2.30m and 150mm diam to 14.50m.

BACKFILL: On completion, borehole backfilled on 06/03/2015 with bentonite pellets 54.50-13.00m. A slotted standpipe (50mm) was installed to 13.00m, granular response zone 13.00-4.00m and bentonite seal 4.00-2.00m. A second slotted standpipe (35mm) was installed to 2.00m, granular response zone 2.00-1.00m, bentonite seal 1.00-0.30m, concrete and stopcock cover 0.30-0.00m.

REMARKS: Hole advanced by chiselling 14.50-15.00m (1hr). Downhole magnetometry for UXO risk mitigation undertaken 0.00-14.50m. No anomalies encountered. Bentonite seal for aquifer protection installed during drilling 3.00-2.00m, prior to reduction in casing diameter. MMG = Mercia Mudstone Group. Weathering zone after Chandler RJ and Forster CIRIA C570; Engineering in Mercia Mudstone (2001).

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
0.20	Nil	0.20	20	Slow flow.

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BOREHOLE LOG

BH426

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 2 of 6

Start Date 17 February 2015 — Easting 333185.1 — Scale 1 : 50

End Date 4 March 2015 — Northing 185375.4 — Ground level 7.75mOD — Depth 54.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
	33UT	8.00 - 8.45	7.90								
	34D	8.50						8.50 - 12.00m: Dark bluish grey.			
	35D	9.00									
	36D	9.50 - 9.95	9.30	S<1							
	37B	9.50 - 10.00									
	38D	10.50									
	39UT	11.00 - 11.45	10.90								
	40D	11.50									
	41D	12.00							12.00	-4.25	
18/02/15 1700hrs 7.20m								Very soft bluish grey slightly sandy clayey SILT with frequent fragments of black organic material (up to 10mm). (TFD)			
	42D	12.50 - 12.95	12.50	S<1							
19/02/15 0800hrs 7.10m	43B	12.50 - 13.20									
	44D	13.50									
	45UT	14.00 - 14.45	13.90								
19/02/15 1200hrs 9.00m	47D	14.30							14.30	-6.55	
	46D	14.50						Stiff reddish brown and light greenish grey slightly sandy silty CLAY. (MMG) (Grade III)	14.50	-6.75	
27/02/15 1030hrs 9.22m	48D	14.50 - 14.75	14.40	S*152				Extremely weak reddish brown MUDSTONE with frequent light greenish grey reduction spots (up to 15mm). (MMG) (Grade II)	15.00	-7.25	
	49D	15.00 - 15.16	14.40	S*500	67 12 7	NI NI 50		Extremely weak thinly laminated to very thinly bedded greenish grey SILTSTONE interbedded (up to 70mm) with extremely weak reddish brown mudstone. Fractures are subhorizontal to 20° and 90° extremely and very closely spaced planar smooth. (MMG) (Grade II)			
	50C	15.00 - 16.00									
	51C	16.00 - 17.50	14.50		100 3 0	NI NI 50		15.00 - 16.00m: Limited recovery. 15.10 - 15.15m: Weak grey fine and medium sandstone. 15.80 - 15.90m: Weak grey fine and medium sandstone.			
								17.10 - 17.15m: Weak grey fine and medium sandstone.	17.20	-9.45	
	52C	17.50 - 19.00	14.50		90 7 7	NI NI 100		Extremely weak thinly laminated reddish brown MUDSTONE with rare greenish grey reduction spots (up to 10mm). Fractures are subhorizontal to 20° and 90° extremely closely and very closely spaced planar smooth			
								Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 3 of 6

Start Date 17 February 2015 — Easting 333185.1 — Scale 1 : 50

End Date 4 March 2015 — Northing 185375.4 — Ground level 7.75mOD — Depth 54.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
								infilled (up to 1mm) with clay. (MMG) (Grade II) 18.00 - 18.10m: Weak greenish grey siltstone.			
	53C	19.00 - 20.50	14.50		100 0 0						
	54C	20.50 - 22.00	14.50		87 5 0						
						NA		20.95 - 21.00m: Very weak reddish brown mudstone.	21.00	-13.25	
								Very stiff indistinctly fissured reddish brown and greenish grey slightly sandy gravelly CLAY. Gravel is subangular fine to coarse extremely weak mudstone lithorelicts. Fissures are randomly orientated extremely closely and very closely spaced planar smooth. (MMG) (Grade III)			
	55C	22.00 - 23.50	14.50		83 11 0				22.20	-14.45	
						NI NI 60		Extremely weak and very weak thinly laminated to very thinly bedded reddish brown MUDSTONE with rare greenish grey reduction spots (up to 10mm). Fractures are randomly orientated very closely and closely spaced planar smooth infilled (up to 2mm) with clay. (MMG) (Grade II)			
	56C	23.50 - 25.00	14.50		100 0 0						
	57C	25.00 - 26.50	14.50		85 4 0						
27/02/15 1530hrs 5.05m											
02/03/15 0800hrs 4.39m	58C	26.50 - 28.00	14.50		100 3 0						
						NA			27.80	-20.05	
								Continued Next Page	{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 4 of 6

Start Date 17 February 2015 — Easting 333185.1 — Scale 1 : 50

End Date 4 March 2015 — Northing 185375.4 — Ground level 7.75mOD — Depth 54.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
	59C	28.00 - 29.50	14.50		100			Very stiff indistinctly fissured reddish brown and greenish grey slightly sandy gravelly CLAY. Gravel is subangular fine to coarse extremely weak mudstone lithorelicts and rare gypsum (up to 10mm). Fissures are randomly orientated extremely closely and very closely spaced planar smooth. (MMG) (Grade III)			
	60C	29.50 - 31.00	14.50		100						
	61C	31.00 - 32.50	14.50		100 35 13	NI NI 190			31.25	-23.50	
	62C	32.50 - 34.00	14.50		100 3 0			Very weak thinly laminated to very thinly bedded reddish brown MUDSTONE with rare greenish grey reduction spots (up to 10mm). Fractures are subhorizontal to 20° and 45-65° very closely and closely spaced planar smooth. (MMG) (Grade II)			
	63C	34.00 - 35.50	14.50		100 0 0						
02/03/15 1700hrs 6.03m											
03/03/15 0900hrs 6.45m	64C	35.50 - 37.00	14.50		100 0 0	NA			35.90	-28.15	
	65C	37.00 - 38.50	14.50		100			Very stiff indistinctly fissured reddish brown slightly sandy gravelly CLAY. Gravel is subangular fine to coarse extremely weak mudstone lithorelicts with greenish grey reduction spots (up to 30mm). Fissures are randomly orientated extremely closely and very closely spaced planar smooth locally infilled (up to 5mm) with gypsum. (MMG) (Grade III)			
								Continued Next Page	{38.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 5 of 6

Start Date 17 February 2015 — Easting 333185.1 — Scale 1 : 50

End Date 4 March 2015 — Northing 185375.4 — Ground level 7.75mOD — Depth 54.50 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
	66C	38.50 - 40.00	14.50		100 4 0	NI NI 60					
						NA		Extremely weak and very weak thinly laminated to very thinly bedded reddish brown MUDSTONE with rare greenish grey reduction spots (up to 10mm). Fractures are subhorizontal to 20° and 90° very closely spaced planar smooth infilled (up to 2mm) with clay. (MMG) (Grade II)	39.10	-31.35	
									39.60	-31.85	
	67C	40.00 - 41.50	14.50		100 7 0	NI NI 110		Very stiff indistinctly fissured reddish brown slightly sandy gravelly CLAY. Gravel is subangular fine to coarse extremely weak mudstone lithorelicts with greenish grey reduction spots (up to 30mm). Fissures are randomly orientated extremely closely and very closely spaced planar smooth locally infilled (up to 5mm) with gypsum. (MMG) (Grade III)	40.00	-32.25	
								Extremely weak and very weak thinly laminated to very thinly bedded reddish brown MUDSTONE with rare greenish grey reduction spots (up to 10mm). Fractures are subhorizontal to 20° and 90° very closely and closely spaced planar smooth infilled (up to 2mm) with clay. (MMG) (Grade II)			
	68C	41.50 - 43.00	14.50		100 3 0				42.10	-34.35	
						NA		Very stiff indistinctly fissured reddish brown slightly sandy gravelly CLAY. Gravel is subangular fine to coarse extremely weak mudstone lithorelicts with greenish grey reduction spots (up to 30mm). Fissures are randomly orientated extremely closely and very closely spaced planar smooth. (MMG) (Grade III)			
	69C	43.00 - 44.50	14.50		100						
	70C	44.50 - 46.00	14.50		100						
03/03/15 1700hrs 5.03m									46.00	-38.25	
04/03/15 0800hrs 5.55m	71C	46.00 - 47.50	14.50		56 5 0	NI NI 80		Extremely weak thinly laminated to very thinly bedded reddish brown MUDSTONE with rare greenish grey reduction spots (up to 10mm). Fractures are subhorizontal to 20° and 90° very closely and closely spaced planar smooth infilled (up to 2mm) with clay. (MMG) (Grade II) 46.00 - 47.50m: Limited recovery.			
	72C	47.50 - 49.00	14.50		100 0 0						
								Continued Next Page	{48.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

BH426

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 6 of 6

Start Date 17 February 2015 — Easting 333185.1 — Scale 1 : 50

End Date 4 March 2015 — Northing 185375.4 — Ground level 7.75mOD — Depth 54.50 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
	73C	49.00	50.50	14.50		81 19 0	NI 80 190		Very weak thinly laminated to very thinly bedded reddish brown MUDSTONE with rare greenish grey reduction spots (up to 10mm). Fractures are subhorizontal to 20° and 90° very closely and closely spaced planar smooth infilled (up to 2mm) with clay. (MMG) (Grade II)	49.30	-41.55	
	74C	50.50	52.00	14.50		100 47 16						
	75C	52.00	53.50	14.50		100 32 32						
	76C	53.50	54.50	14.50		100 82 11						
04/03/15 1630hrs 5.89m									Borehole completed at 54.50m.	54.50	-46.75	
										{58.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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TRIAL PIT LOG

TP410

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 1 of 1

Start Date 9 March 2015 — Easting 332693.1 — Scale 1 : 25

End Date 9 March 2015 — Northing 185424.0 — Ground level 7.20mOD — Depth 4.00 m

water record	sample/test no/type	sample/test result	sample/test depth (m)	description	depth (m)	level (m)	legend
	1B	Vo 0.0	0.00- 0.20	Grass over soft dark brown peaty silty CLAY with frequent roots (up to 5mm diam) and rootlets (up to 1mm diam). Frequent plastic bottles, steel cans and cobble sized fragments of wood, timber and plastic. (MG)			
	2D		0.10		0.20	7.00	
				Soft dark brownish grey slightly sandy slightly gravelly silty CLAY. Gravel is angular and subangular medium and coarse red brick, crystalline and sandstone. Low angular and subangular red brick, crystalline and sandstone cobble content. (MG)			
0.90m: Fast inflow.	3B	Vo 1.2	0.90- 1.00				
	4D		1.00				
	5B	Vo 1.1	1.40- 1.50				
	6D		1.50				
					1.80	5.40	
				Soft greenish brown silty CLAY with frequent partings of soft black organic CLAY. (TFD)			
		H 24	2.00				
	7B	Vo 2.6	2.50- 2.60				
	8D	H 22	2.50				
	9B	Vo 0.6	3.70- 3.80				
3.85m	10D		3.80				
					4.00	3.20	

Trial pit completed at 4.00m.

Notes

Trial pit excavated by JCB 3CX mechanical excavator.
Groundwater encountered below 0.90m.
Trial pit sides remained stable and vertical.
Trial pit dimensions 3.50x0.80x4.00m.
On completion, the trial pit was backfilled with materials arising.

Sketch of Foundation - Not to scale. All dimensions in metres.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

AGS

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TRIAL PIT LOG

TP411

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 1 of 1

Start Date 20 February 2015 — Easting 332708.5 — Scale 1 : 25

End Date 20 February 2015 — Northing 185453.8 — Ground level 7.60mOD — Depth 3.80 m

water record	sample/test no/type	sample/test result	sample/test depth (m)	description	depth (m)	level (m)	legend
	1B	Vo 0.4	0.00- 0.30	Dark brown sandy angular and subangular fine to coarse red brick and breeze block gravel with low angular breeze block cobble content. (MADE GROUND) (MG)			
	2D*		0.00- 0.30				
Rapid ingress at 0.70m	3B	Vo 1.3	0.70- 0.90				
	4D*		0.70- 0.90		1.00	6.60	
				Firm locally stiff light brown mottled dark grey slightly sandy CLAY. (TFD)			
	5B	Vo 1.7	1.20- 1.40				
	6D*		1.20- 1.40				
		H 73	1.50				
	7B	Vo 0.8	1.80- 2.00				
	8D*		1.80- 2.00				
	9B	Vo 0.2	2.40- 2.60				
	10D*	H 38	2.40- 2.60				
			2.50		2.60	5.00	
				Firm dark bluish grey slightly sandy CLAY. (TFD)			
	11B	Vo 0	2.80- 3.00				
	12D*		2.80- 3.00				
		H 25	3.50				
	13B	Vo 3.9	3.50- 3.70				
	14D*						
					3.80	3.80	
0.80m.				Trial pit completed at 3.80m.			

Notes

Trial pit excavated by JCB 3CX mechanical excavator.
Groundwater was encountered rapidly ingressing at 0.70m.
Trial pit sides remained stable and vertical.
Trial pit dimensions 1.00x2.60x3.80m.
On completion, the trial pit was backfilled with materials arising.

Sketch of Foundation - Not to scale. All dimensions in metres.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

AGS

CONTRACT	CHECKED
30238	EC

Geotechnical Engineering Ltd, Tel. 01452 527743 30238 YODA.GPJ TRIALJH.GPJ GEOTECH.GLB 16/07/2015 15:49:21 RDL

BOREHOLE LOG

Borehole No. **BHM4CAN024**

Sheet 1 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 13/01/2016 - 25/01/2016		Final Depth:
Project No:	JFR8703	Easting:	332862	Drilling Method:	Pipe Diameter: 50mm	14.90m
Location:	Newport	Northing:	185562	Dando 2000	Casing Diameter (mm) / Casing Depth (m): 150 / 14.20; 200 / 2.00	Scale: 1:50
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.96	Logged By: ERH		

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
					0.00	(0.30)	6.96		(CONCRETE)	
		0.30 - 0.75	B		0.30	(0.20)	6.66		Black slightly clayey sandy GRAVEL. Gravel is subangular to subrounded of brick, charcoal, slag and concrete. (MADE GROUND)	
		0.40	ES		0.50		6.46			
		0.70	ES						Black gravelly SAND of ash with occasional cobbles and slight hydrocarbon odour. Gravels and cobbles are subangular to subrounded of slag. (MADE GROUND)	
		1.00	D			(1.15)			*Below 0.75m sand and groundwater have an oily sheen and hydrocarbon odour has become strong.*	1
		1.10	ES							
		1.20	SPT(C)	N=45 (12,10/18,18,4,5)						
		1.70	ES		1.65	(0.15)	5.30		Black very sandy subrounded to angular GRAVEL of slag and brick with frequent glass fragments. (MADE GROUND)	
		1.80	D		1.80	(0.20)	5.16			
		1.90	ES		2.00		4.96		Firm grey mottled orange CLAY with occasional plant fibres. (TIDAL FLAT DEPOSITS)	2
		2.00	ES			(0.80)			Firm greyish brown CLAY with occasional medium to coarse, angular to subrounded gravels. (TIDAL FLAT DEPOSITS)	
		2.70	D		2.80		4.16		Soft light brown CLAY with occasional fine to medium angular to subrounded gravel. (TIDAL FLAT DEPOSITS)	
		2.80	ES							
		3.00	SPT(S)	N=3 (1,0/1,0,1,1)						3
		3.00 - 3.45	B			(1.20)				
		3.70	D							
		4.00	ES		4.00		2.96		Soft dark grey CLAY. (TIDAL FLAT DEPOSITS)	4
		4.70	D							
		5.00	SPT(S)	0 (0 for 450mm/0 for 0mm)		(2.00)			*Becoming very dark below 5m depth.*	5
		5.00 - 5.45	B							
		5.70	D							
					6.00		0.96		Very soft to soft greyish black CLAY. (TIDAL FLAT DEPOSITS)	6
		6.70	D							
		7.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						7
		7.00 - 7.45	B							
		7.70	D			(3.80)				8
		8.70	D							
		9.00	ES							
		9.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						9
		9.00 - 9.45	B							
		9.80	D		9.80		-2.84		Very soft to soft greyish black slightly sandy CLAY. Sand is	10

Continued on next sheet

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 0.4m on 13/01/16. Cable percussion 1.20m - 14.90m commenced 23/01/16. Borehole terminated within bedrock.
BACKFILL: On completion hole backfilled with bentonite 14.9 - 2.5m and 0.5 - 0.2m, gravel 2.5 - 0.5m and concrete 0.2 - 0.0m. One standpipe (50mm) was installed with slotted section between 0.5 - 1.8m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 11.4m. No anomalies encountered. Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
0.40 12.70	12.20	0.30 10.60	02:00 00:45	1.10 14.60	1.80 14.90

AGS

BOREHOLE LOG

Borehole No. **BHM4CAN024**

Sheet 2 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 13/01/2016 - 25/01/2016		Final Depth:
Project No:	JFR8703	Easting:	332862	Drilling Method:	Pipe Diameter: 50mm	14.90m
Location:	Newport	Northing:	185562	Dando 2000	Casing Diameter (mm) / Casing Depth (m): 150 / 14.20; 200 / 2.00	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.96	Logged By: ERH		1:50

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
									medium to fine and occurs mainly in small pockets (TIDAL FLAT DEPOSITS)	
		10.80	D			(1.60)			*Sand pockets becoming more widespread between 10.6 - 11.4m.*	
		11.00	SPT(S)	N=15 (1,2/2,3,4,6)						11
		11.00 - 11.40	ES							
		11.00 - 11.45	B							
		11.40	D		11.40		-4.44		Soft to firm grey mottled brownish red gravelly CLAY. Gravel is fine to coarse, subrounded to subangular of red mudstone. (Weathering Grade V) (WEATHERED MERCIA MUDSTONE)	
						(0.70)				
		12.10 - 12.55	B		12.10		-5.14		Very stiff reddish brown friable CLAY. At times recovered as coarse angular gravel. (Weathering Grade IVb) (WEATHERED MERCIA MUDSTONE)	12
		13.00	SPT(S)	N=47 (3,8/9,12,13,13)		(1.70)				13
		13.00 - 13.45	B							
					13.80		-6.84		Reddish brown weak friable weathered MUDSTONE with grey staining including clay product which powders easily. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	14
		14.20 - 14.65	B			(1.10)			*At 14m recovered as coarse medium angular gravel.*	
		14.90	D						End of Borehole at 14.90m	15
										16
										17
										18
										19
										20

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 0.4m on 13/01/16. Cable percussion 1.20m - 14.90m commenced 23/01/16. Borehole terminated within bedrock.
BACKFILL: On completion hole backfilled with bentonite 14.9 - 2.5m and 0.5 - 0.2m, gravel 2.5 - 0.5m and concrete 0.2 - 0.0m. One standpipe (50mm) was installed with slotted section between 0.5 - 1.8m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 11.4m. No anomalies encountered. Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
0.40 12.70	12.20	0.30 10.60	02:00 00:45	1.10 14.60	1.80 14.90

AGS

BOREHOLE LOG

Borehole No. **BHM4CAN025**

Sheet 1 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 11/01/2016 - 18/01/2016	Final Depth:
Project No:	JFR8703	Easting:	332650	Drilling Method: Dando 2000 & Comacchio GEO 205	Pipe Diameter: 50mm; Casing Diameter (mm): 130, 150, 200; Casing Depth (m): 19.50, 19.00, 2.00	50.00m
Location:	Newport	Northing:	185503		Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.67	Logged By: ERH	1:50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							0.00		7.67		Brown slightly clayey, very gravelly SAND with occasional cobbles and black staining, Sand is coarse. Gravels are angular to subrounded of brick, concrete and coal. (MADE GROUND)	
	▼	0.40	ES					(1.20)				
		0.80 - 1.40	B									1
							1.20		6.47		Firm brown mottled grey slightly gravelly silty CLAY with occasional plant fibres and slight putrid odour. Gravel is fine to medium subangular to subrounded of brick and natural rock fragments with occasional metal fragments up to 5cm in length. (MADE GROUND)	
		1.30	ES					(0.20)				
		1.40	SPT(S)	N=9 (1,1/2,2,2,3)			1.40		6.27			
		1.40 - 1.85	D									
		1.50	ES									
		2.00	D								Soft to firm brown slightly sandy CLAY with rare angular medium gravel fragments. Sand is fine. (TIDAL FLAT DEPOSITS)	2
		2.00 - 2.50	B					(1.60)				
		3.00 - 3.45	UT				3.00		4.67		Soft dark grey silty CLAY with occasional black pockets. (TIDAL FLAT DEPOSITS)	3
		3.20	ES									
		3.45 - 3.60	D									
								(2.20)				4
												5
							5.20		2.47		Very soft dark greyish black silty CLAY. (TIDAL FLAT DEPOSITS)	
		5.50 - 6.00	B									
		6.00	D									6
		6.00	SPT(S)	0 (1 for 450mm/0 for 0mm)								
		6.01 - 6.45	D									
		6.10	ES									
								(8.50)				8
												9
		9.00	ES									
		9.00	SPT(S)	0 (1 for 450mm/0 for 0mm)								
		9.00 - 9.45	D									
					Core	Fractures					Continued on next sheet	10

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 0.8m due to rapid ingress of water. Cable percussion 0.80m - 19.50m. Air mist rotary coring 19.50 - 50.00m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 45.0m and 21.5 - 0.00m and gravel 21.5 - 45.0m. One standpipe (50mm) was installed with slotted section between 21.5 - 45.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 0.8m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.4 - 15.1m. No anomalies encountered. Installed with raised cover.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	19.50	0.50		0.40	01:00	19.10	19.50
RC	19.50	50.00						

AGS

BOREHOLE LOG

Borehole No. **BHM4CAN025**

Sheet 2 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 11/01/2016 - 18/01/2016	Final Depth:
Project No:	JFR8703	Easting:	332650	Drilling Method: Dando 2000 & Comacchio GEO 205	Pipe Diameter: 50mm; Casing Diameter (mm): 130, 150, 200; Casing Depth (m): 19.50, 19.00, 2.00	50.00m
Location:	Newport	Northing:	185503		Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.67	Logged By: ERH	1:50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
												11
		12.00	SPT(S)	2 (1 for 300mm/2 for 150mm)								12
		12.00 - 12.45	D								*Becoming dark grey after 12.5 m*	
												13
							13.70		-6.03		Very soft grey sandy CLAY with rare gravels. Gravel is subangular to subrounded. (TIDAL FLAT DEPOSITS) *From 13.7m poor returns due to water in hole. Recovered as slurry with rare gravels.*	
		14.50 - 15.00	B					(1.40)				14
		15.00	SPT(S)	N=40 (4,6/8,10,11,11)								15
		15.00 - 15.45	D				15.10		-7.43		Grey coarse SAND and fine to medium subangular to rounded GRAVEL. (GLACIOFLUVIAL DEPOSITS)	
								(1.00)				16
							16.10		-8.43		Medium dense grey coarse SAND with occasional fine to medium subangular to rounded gravel. (GLACIOFLUVIAL DEPOSITS)	
												17
								(3.00)				18
		18.00	SPT(S)	N=20 (3,3/5,5,5,5)								
		18.00 - 18.45	D									19
		19.10 - 19.50	B				19.10		-11.43		Stiff friable red slightly sandy CLAY with rare fine to medium subrounded gravel. (GLACIOFLUVIAL DEPOSITS)	
								(0.40)				
		19.50	SPT(S)	50 (0 for 0mm/50 for 75mm)			19.50		-11.83		Extremely weak reddish brown MUDSTONE with rare white gypsum crystals present on horizontal fracture surfaces. Fractures are closely spaced. Gypsum crystals occur as a small 40mm white patch. (Weathering Grade	20
		19.50 - 19.75	D									
		19.50 - 20.50			Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 0.8m due to rapid ingress of water. Cable percussion 0.80m - 19.50m. Air mist rotary coring 19.50 - 50.00m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 45.0m and 21.5 - 0.00m and gravel 21.5 - 45.0m. One standpipe (50mm) was installed with slotted section between 21.5 - 45.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 0.8m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.4 - 15.1m. No anomalies encountered. Installed with raised cover.

Type: Method	From (m)	To (m)
CP	0.00	19.50
RC	19.50	50.00

Groundwater: Depth Strike (m)	Depth Casing (m)	Level After 20 Mins
0.50		0.40

Chiselling: Duration (hh:mm)	Top Depth (m)	Base Depth (m)
01:00	19.10	19.50

AGS

BOREHOLE LOG

Borehole No. **BHM4CAN025**

Sheet 3 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 11/01/2016 - 18/01/2016		Final Depth:
Project No:	JFR8703	Easting:	332650	Drilling Method:	Pipe Diameter: 50mm	50.00m
Location:	Newport	Northing:	185503	Dando 2000 & Comacchio GEO 205	Casing Diameter (mm) / Casing Depth (m): 130 / 19.50; 150 / 19.00; 200 / 2.00	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.67	Logged By: ERH		1:50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
					TCR: 42 SCR: 35 RQD: 12						II) (MERCIA MUDSTONE)	
		20.50 - 21.50			TCR: 60 SCR: 37 RQD: 22	Min: 40 Avg: 50 Max: 70		(2.00)				21
							21.50		-13.83		Very weak reddish brown MUDSTONE with white gypsum crystals present on horizontal fracture surfaces. and greyish green reduction spots (20mm in diameter) on horizontal fracture surfaces. Core is too highly fractured to assess FI. (Weathering Grade II) (MERCIA MUDSTONE)	
		21.50 - 22.50			TCR: 70 SCR: 50 RQD: 0							22
		22.50	SPT(C)	N=100 (16,9/19,22,29,30)								
		22.50 - 24.00			TCR: 80 SCR: 48 RQD: 0							23
											2nd set of fractures between (24 - 27 m) at 10 - 15 degrees.	24
		24.00 - 25.50			TCR: 85 SCR: 73 RQD: 45			(7.00)				25
		25.50	SPT(C)	95 (12,13/95 for 225mm)								
		25.50 - 27.00			TCR: 56 SCR: 46 RQD: 16	Min: 40 Avg: 70 Max: 120						26
												27
		27.00 - 28.50			TCR: 28 SCR: 21 RQD: 9							28
		28.50	SPT(C)	100 (19,6/100 for 150mm)			28.50		-20.83		Very weak thinly laminated red MUDSTONE with small grey reduction spots (maximum 9mm across). Fractures are horizontal, closely spaced with smooth to rough planar surface. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) *Fractures very closely spaced over 15 mm length (non-intact recovery) at 28.5 m* *Fractures are very closely spaced over 40 mm length (non-intact recovery) at 29.2 m.*	29
		28.50 - 30.00			TCR: 100 SCR: 75 RQD: 63							
					Core	Fractures					Continued on next sheet	30

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 0.8m due to rapid ingress of water. Cable percussion 0.80m - 19.50m. Air mist rotary coring 19.50 - 50.00m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 45.0m and 21.5 - 0.00m and gravel 21.5 - 45.0m. One standpipe (50mm) was installed with slotted section between 21.5 - 45.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 0.8m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.4 - 15.1m. No anomalies encountered. Installed with raised cover.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	19.50	0.50		0.40	01:00	19.10	19.50
RC	19.50	50.00						

AGS

BOREHOLE LOG

Borehole No. **BHM4CAN025**

Sheet 4 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 11/01/2016 - 18/01/2016		Final Depth:
Project No:	JFR8703	Easting:	332650	Drilling Method:	Pipe Diameter: 50mm	50.00m
Location:	Newport	Northing:	185503	Dando 2000 & Comacchio GEO 205	Casing Diameter (mm) / Casing Depth (m): 130 / 19.50; 150 / 19.00; 200 / 2.00	Scale: 1:50
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.67	Logged By: ERH		

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		30.00 - 31.50			TCR: 47 SCR: 37 RQD: 32	Min: 40 Avg: 150 Max: 230						31
		31.50	SPT(C)	100 (14,11/100 for 150mm)								
		31.50 - 32.00			TCR: 100 SCR: 22 RQD: 22						*Becoming weak between 32-33 m.*	32
		32.00 - 33.00			TCR: 89 SCR: 86 RQD: 64							33
		33.00 - 34.50			TCR: 78 SCR: 59 RQD: 10	Min: 40 Avg: 100 Max: 170					*Fractures are very closely spaced over 70 mm length (non-intact recovery) at 34 m.*	34
		34.50	SPT(C)	100 (18,7/100 for 150mm)								
		34.50 - 36.00			TCR: 100 SCR: 86 RQD: 50			(13.50)			*Very crumbly over 120 mm at 35 m.* *Becoming weak at 35.5 m.*	35 36
		36.00 - 37.50			TCR: 73 SCR: 59 RQD: 47	Min: 60 Avg: 200 Max: 340					*Very crumbly over 140 mm at 36.3 m.* *Fracture dipping at approximately 50 degrees with white gypsum crystals along surface. Terminates at horizontal fractures, 90 mm in length, at 36.5 m.*	37
		37.50	SPT(C)	100 (16,9/100 for 150mm)								
		37.50 - 39.00			TCR: 100 SCR: 96 RQD: 79						*Fracture dipping approximately 50 degrees with gypsum crystals. Does not terminate on any bedding planes. 37.9 m.* *Very closely spaced fractures and gypsum crystals over 90 mm (crumbly recovery) at 38.4 m.* *Very closely spaced fractures over 30 mm at 38.6 m.*	38 39
		39.00 - 40.50			TCR: 90 SCR: 69 RQD: 21						*Very crumbly over 60 mm (Very closely spaced fractures) at 39.06 m* *Very crumbly for 55 mm at 39.28 m.* *Very crumbly for 20 mm at 38.9 m.*	
					Core	Fractures					Continued on next sheet	40

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 0.8m due to rapid ingress of water. Cable percussion 0.80m - 19.50m. Air mist rotary coring 19.50 - 50.00m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 45.0m and 21.5 - 0.00m and gravel 21.5 - 45.0m. One standpipe (50mm) was installed with slotted section between 21.5 - 45.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 0.8m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.4 - 15.1m. No anomalies encountered. Installed with raised cover.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	19.50	0.50		0.40	01:00	19.10	19.50
RC	19.50	50.00						

BOREHOLE LOG

Borehole No. **BHM4CAN025**

Sheet 5 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 11/01/2016 - 18/01/2016		Final Depth:
Project No:	JFR8703	Easting:	332650	Drilling Method:	Pipe Diameter: 50mm	50.00m
Location:	Newport	Northing:	185503	Dando 2000 & Comacchio GEO 205	Casing Diameter (mm) / Casing Depth (m): 130 / 19.50; 150 / 19.00; 200 / 2.00	Scale: 1:50
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.67	Logged By: ERH		

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		40.50	SPT(C)	100 (9,16/100 for 150mm)								
		40.50 - 42.00			TCR: 62 SCR: 47 RQD: 22	Min: 30 Avg: 100 Max: 150					*Very crumbly for 70 mm at 41.1 m.*	41
							42.00		-34.33		Weak to medium strong reddish brown thinly laminated MUDSTONE with frequent grey reduction spots. Fractures are horizontal closely to medium spaced with smooth to rough planar surface. (Weathering Grade I) (WEATHERED MERCIA MUDSTONE)	42
		42.00 - 43.50			TCR: 97 SCR: 60 RQD: 27	Min: 40 Avg: 150 Max: 350					*Fracture dipping approximately 45degrees with white gypsum crystals at 42.65 m.*	
								(2.30)			*Horizontal band of white crystals (gypsum or quartz) 10 mm thick at 43.2 m.*	43
		43.50	SPT(C)	100 (21,4/100 for 150mm)								
		43.50 - 44.00			TCR: 100 SCR: 96 RQD: 90							44
							44.30		-36.63		Medium strong reddish brown MUDSTONE with frequent medium to large grey reduction spots (10 - 50 mm in diameter) and occasional white crystal veins. Veins are randomly orientated. Fractures are horizontal closely to medium spaced, smooth to rough and planar. (Weathering Grade I) (WEATHERED MERCIA MUDSTONE)	
		44.00 - 45.50			TCR: 100 SCR: 87 RQD: 67						*Very crumbly over 70 mm at 44.4 m.*	45
		45.50 - 47.00			TCR: 100 SCR: 89 RQD: 76						*Heavily mottled grey between 46-46.4 m.*	46
		47.00	SPT(C)	100 (23,2/100 for 150mm)		Min: 140 Avg: 200 Max: 390		(5.70)			*Very crumbly over 20 mm at 46.8 m.*	47
		47.00 - 48.50			TCR: 100 SCR: 99 RQD: 93						*Becoming medium strong to strong at 48 m.*	48
		48.50 - 50.00			TCR: 100 SCR: 100 RQD: 93						*Higher frequency of randomly orientated crystal veins below 49 m.*	49
		50.00	SPT(C)	100 (25,0/100 for 75mm)							End of Borehole at 50.000m	50
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 0.8m due to rapid ingress of water. Cable percussion 0.80m - 19.50m. Air mist rotary coring 19.50 - 50.00m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 45.0m and 21.5 - 0.00m and gravel 21.5 - 45.0m. One standpipe (50mm) was installed with slotted section between 21.5 - 45.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 0.8m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.4 - 15.1m. No anomalies encountered. Installed with raised cover.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	19.50	0.50		0.40	01:00	19.10	19.50
RC	19.50	50.00						

BOREHOLE LOG

Borehole No. **BHM4CAN026**

Sheet 1 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 13/01/2016 - 27/01/2016	Final Depth:
Project No:	JFR8703	Easting:	332950	Drilling Method:	50.00m
Location:	Newport	Northing:	185494	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.49	Logged By: FB/ ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	19.50
150	16.50
200	2.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							0.00	(0.25)	7.49		(CONCRETE)	
		0.20 - 0.55	B				0.25		7.24		Brown black clayey sandy GRAVEL with frequent cobbles. Sand is coarse. Gravel and cobbles are angular to subangular of brick, concrete, ceramic, hardcore and charcoal. (MADE GROUND)	
		0.40	ES					(0.35)				
	▽						0.60		6.89			
		0.80	ES					(0.30)				
		0.90 - 1.20	B				0.90		6.59		Red sandy GRAVEL. Gravel is angular of hardcore (subbase). (MADE GROUND)	1
		1.20	SPT(C)	N=22 (12,11/8,7,4,3)								
		1.20 - 1.65	B					(1.00)			Medium dense grey slightly sandy GRAVEL. Gravel is of limestone, sandstone, mudstone and reworked material. (MADE GROUND)	
		1.90	D				1.90		5.59			
		1.90	ES					(0.30)			Soft to firm grey slightly gravelly silty CLAY with occasional plant fibres. Gravel is fine subangular to subrounded. (TIDAL FLAT DEPOSITS)	2
							2.20		5.29		Soft to firm grey brown silty CLAY with occasional plant fibres. (TIDAL FLAT DEPOSITS)	
		3.00	ES									
		3.00	SPT(S)	N=3 (1,0/1,0,1,1)								3
		3.00 - 3.45	B					(2.60)				
												4
	▽	4.80	D				4.80		2.69		Very soft dark grey silty CLAY. (TIDAL FLAT DEPOSITS)	
	▽	5.00 - 5.45	UT	Blows=6								5
		6.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								
		6.00 - 6.45	B									6
		6.10	ES									
								(5.80)				7
	▽											8
		9.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								9
		9.00 - 9.45	B									
		10.00	D									10

Core | Fractures

Continued on next sheet

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.70m. Air mist rotary coring 16.7m - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.3m and concrete 0.3 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 1.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.9 - 12.0m. No anomalies encountered. Position not accessible at time of survey due to storage of containers on location. Co-ordinates are approximate.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.70	41.00		5.00	01:00	16.50	16.70
RC	16.70	50.00	0.80		0.70			
			5.20	4.60	4.60			
			12.00	11.80	8.40			

AGS

BOREHOLE LOG

Borehole No. **BHM4CAN026**

Sheet 2 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 13/01/2016 - 27/01/2016	Final Depth:
Project No:	JFR8703	Easting:	332950	Drilling Method:	50.00m
Location:	Newport	Northing:	185494	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.49	Logged By: FB/ ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	19.50
150	16.50
200	2.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		10.70	ES				10.60	(1.40)	-3.11		Very soft dark grey sandy CLAY. Sand is fine and occasionally white. (TIDAL FLAT DEPOSITS)	11
		12.00 12.00 12.10	B SPT(C) ES	N=29 (4,6/6,7,8,8)			12.00	(0.80)	-4.51		Grey sandy clayey subangular to rounded GRAVEL of several lithologies. (GLACIOFLUVIAL DEPOSITS)	12
		12.80	D				12.80	(1.20)	-5.31		Stiff red brown mottled grey sandy CLAY. (Weathering Grade IV) (WEATHERED MERCIA MUDSTONE)	13
		14.00 14.00 - 14.45	ES B				14.00	(2.50)	-6.51		Very weak MUDSTONE with very stiff clay bands. Recovered as angular gravel fragments of mudstone within a reddish brown clay matrix. (Weathering Grade III) (MERCIA MUDSTONE)	14
		15.00	SPT(C)	50 (8,13/50 for 170mm)								15
		16.50 - 16.70 16.70	B SPT(C)	50 (25 for 75mm/50 for 40mm)			16.50 16.70	(0.20)	-9.01 -9.21		Weak reddish brown MUDSTONE (recovered as coarse gravel and cobble fragments.) (Weathering Grade II) (MERCIA MUDSTONE)	16
		16.70 - 18.00			TCR: 35 SCR: 10 RQD: 10						Very weak to weak grey calcareous MUDSTONE. Recovered as angular to subangular gravels of Mudstone. (Weathering Grade II) (MERCIA MUDSTONE)	17
		18.00 - 19.00			TCR: 85 SCR: 12 RQD: 12			(3.30)				18
		19.00 - 20.00			TCR: 0 SCR: 0 RQD: 0							19
		20.00	SPT(C)	100 (10,15/100 for 130mm)	Core	Fractures	20.00		-12.51		Continued on next sheet	20

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.70m. Air mist rotary coring 16.7m - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.3m and concrete 0.3 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 1.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.9 - 12.0m. No anomalies encountered. Position not accessible at time of survey due to storage of containers on location. Co-ordinates are approximate.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.70	41.00		5.00	01:00	16.50	16.70
RC	16.70	50.00	0.80		0.70			
			5.20	4.60	4.60			
			12.00	11.80	8.40			

AGS

BOREHOLE LOG

Borehole No. **BHM4CAN026**

Sheet 3 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 13/01/2016 - 27/01/2016	Final Depth:
Project No:	JFR8703	Easting:	332950	Drilling Method:	50.00m
Location:	Newport	Northing:	185494	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.49	Logged By: FB/ ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	19.50
150	16.50
200	2.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		20.00 - 21.50			TCR: 23 SCR: 0 RQD: 0			(1.50)			Extremely weak reddish brown MUDSTONE with greenish grey reduction spots. Recovered as angular to subangular gravels). (Weathering Grade II) (MERCIA MUDSTONE)	21
							21.50		-14.01		Extremely weak reddish brown thinly laminated MUDSTONE. Recovered as gravel. Coarse gravel of calcareous mudstone present at 200-300mm intervals, possibly a result of weathering along bedding. Bedding up to 10 mm in thickness. Rare greenish grey reduction spots present. (Weathering Grade II) (MERCIA MUDSTONE)	22
		21.50 - 23.00			TCR: 80 SCR: 1 RQD: 0			(2.50)				
		23.00	SPT(C)	100 (25 for 40mm/100 for 75mm)								23
		23.00 - 24.00			TCR: 85 SCR: 0 RQD: 0						*Between 23.7-23.8m weathered to a stiff clay.*	
							24.00		-16.51		Weak reddish brown thinly laminated MUDSTONE fractures are closely spaced horizontal to 20 degrees planar smooth. (MERCIA MUDSTONE)	24
		24.00 - 25.50			TCR: 93 SCR: 22 RQD: 9	Min: 50 Avg: 110 Max: 140	24.80	(0.80)	-17.31		Very stiff reddish brown CLAY locally hardening to extremely weak MUDSTONE. Rare greenish grey reduction spots. Below 25.5m recovered as red brown, very sandy gravelly CLAY. Gravel is mainly calcareous mudstone with a weak strength. (Weathering Grade III) (MERCIA MUDSTONE)	25
		25.50 - 26.00			TCR: 80 SCR: 0 RQD: 0			(2.00)				
		26.00	SPT(C)	N=97 (8,12/21,24,26,26)								26
		26.00 - 27.50			TCR: 47 SCR: 15 RQD: 8	Min: 35 Avg: 120 Max: 180	26.80		-19.31		Weak reddish brown MUDSTONE. Fractures are horizontal , 20 and 70 degrees and are closely spaced planar to undulating smooth. Fracture surfaces polished but no obvious striations possibly induced fractures. Rare small pale greenish grey reduction spots throughout. (Weathering Grade I) (MERCIA MUDSTONE) *Recovered as non-intact sandy clayey gravel from 26.9-27.0m*	27
		27.50 - 29.00			TCR: 100 SCR: 51 RQD: 30			(2.70)				28
		29.00	SPT(C)	100 (25 for 20mm/100 for 75mm)								29
		29.00 - 30.50			TCR: 100 SCR: 17 RQD: 7		29.50	(1.00)	-22.01		*recovered as soft clay from 29.3-29.4m* Very stiff reddish brown silty CLAY locally hardening to extremely weak MUDSTONE with small pale green reduction spots throughout. (Weathering Grade III) (MERCIA MUDSTONE)	
					Core	Fractures					Continued on next sheet	30

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.70m. Air mist rotary coring 16.7m - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.3m and concrete 0.3 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 1.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.9 - 12.0m. No anomalies encountered. Position not accessible at time of survey due to storage of containers on location. Co-ordinates are approximate.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.70	41.00		5.00	01:00	16.50	16.70
RC	16.70	50.00	0.80		0.70			
			5.20	4.60	4.60			
			12.00	11.80	8.40			

AGS

BOREHOLE LOG

Borehole No. **BHM4CAN026**

Sheet 4 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 13/01/2016 - 27/01/2016	Final Depth:
Project No:	JFR8703	Easting:	332950	Drilling Method:	50.00m
Location:	Newport	Northing:	185494	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.49	Logged By: FB/ ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	19.50
150	16.50
200	2.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
						Min: 30	30.50		-23.01		Extremely weak reddish brown MUDSTONE with closely to medium spaced (100-300mm) weathered clay. Fractures are horizontal to 10 degrees closely spaced planar smooth. Rare small greenish grey reduction spots throughout. Interbeds (0-100 mm thick). (Weathering Grade III) (MERCIA MUDSTONE)	31
		30.50 - 32.00			TCR: 100 SCR: 49 RQD: 40							
		32.00	SPT(C)	100 (25 for 60mm/100 for 85mm)								32
		32.00 - 33.50			TCR: 73 SCR: 54 RQD: 44						*At 32.6m some small gypsum growth.*	
								(6.00)				33
		33.50 - 35.00			TCR: 100 SCR: 46 RQD: 37						*Band of weak mudstone from 34.1-34.2m*	34
		35.00	SPT(C)	100 (25 for 50mm/100 for 75mm)							*Rare small gypsum growth at 34.9m*	35
		35.00 - 36.50			TCR: 100 SCR: 66 RQD: 66							
							36.50		-29.01		Very weak reddish brown thinly laminated MUDSTONE with occasional small grey reduction spots (5-7mm across). Fractures are horizontal to 10 degrees closely planar smooth. (Weathering Grade II) (MERCIA MUDSTONE)	36
		36.50 - 38.00			TCR: 86 SCR: 70 RQD: 27						*Thinly laminated and fractured at 37.6-37.7 m*	37
											Band of slightly sandy CLAY at 37.8-38 m	
		38.00	SPT(C)	100 (25 for 30mm/100 for 75mm)							*Recovered as gravels- due to CPT at 38-39 m*	38
								(4.50)				
		38.00 - 39.50			TCR: 44 SCR: 17 RQD: 0							39
		39.50	SPT(C)	100 (25 for 20mm/100 for 75mm)							*Extremely weak recovered as gravels 39.5-39.8 m*	
					Core	Fractures					Continued on next sheet	40

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.70m. Air mist rotary coring 16.7m - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.3m and concrete 0.3 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 1.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.9 - 12.0m. No anomalies encountered. Position not accessible at time of survey due to storage of containers on location. Co-ordinates are approximate.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.70	41.00		5.00	01:00	16.50	16.70
RC	16.70	50.00	0.80		0.70			
			5.20	4.60	4.60			
			12.00	11.80	8.40			

AGS

BOREHOLE LOG

Borehole No. **BHM4CAN026**

Sheet 5 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 13/01/2016 - 27/01/2016	Final Depth:
Project No:	JFR8703	Easting:	332950	Drilling Method:	50.00m
Location:	Newport	Northing:	185494	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.49	Logged By: FB/ ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	19.50
150	16.50
200	2.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		39.50 - 41.00			TCR: 98 SCR: 69 RQD: 48						*Extremely weak recovered as gravels for 100mm at 39.9 m.* *Very closely spaced fractures for 40mm at 40.1 m* *Very closely spaced fractures for 90mm at 40.7 m*	
		41.00	SPT(C)	100 (25 for 25mm/100 for 75mm)			41.00		-33.51		Weak reddish brown MUDSTONE with occasional grey reduction spots ranging from <1mm to 70mm across. fractures are horizontal to 10 degrees smooth but closely-medium spaced. (Weathering Grade I) (MERCIA MUDSTONE) *Band of extremely weak mudstone at 41.4-41.5 m.*	41
		41.00 - 42.50			TCR: 100 SCR: 89 RQD: 69							42
		42.50 - 44.00			TCR: 70 SCR: 56 RQD: 29						*No recovery from 42.5-43.0m* *Recovered as red sandy clay from 43.0-43.25m* *Band of very weak mudstone at 43.5-44 m bGL.*	43
		44.00	SPT(C)	100 (25 for 60mm/100 for 195mm)							*No recovery of drill flush at 44-44.5 m. Possible clay band.*	44
		44.00 - 45.50										45
		45.50	SPT(C)	100 (25 for 40mm/100 for 75mm)				(9.00)			*Recovered as gravels of extremely to very weak mudstone. at 45.5-46.3 m*	
		45.50 - 47.00			TCR: 60 SCR: 23 RQD: 9						*Bands of weak mudstone at 46.3-47.2 m*	46
											Band of very weak mudstone at 47.2-47.6 m.	47
		47.00 - 48.50			TCR: 60 SCR: 31 RQD: 22						*Band of extremely weak mudstone recovered as gravels at 47.6-48.67 m.*	48
		48.50	SPT(C)	100 (25 for 35mm/100 for 85mm)								
		48.50 - 50.00			TCR: 93 SCR: 80 RQD: 49							49
		50.00	SPT(C)	100 (25 for 40mm/100 for 85mm)	Core	Fractures					End of Borehole at 50.000m	50

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.70m. Air mist rotary coring 16.7m - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.3m and concrete 0.3 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 1.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.9 - 12.0m. No anomalies encountered. Position not accessible at time of survey due to storage of containers on location. Co-ordinates are approximate.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.70	41.00		5.00	01:00	16.50	16.70
RC	16.70	50.00	0.80		0.70			
			5.20	4.60	4.60			
			12.00	11.80	8.40			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA023**

Sheet 1 of 4

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 09/02/2016 - 30/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332795	Drilling Method:	38.60m
Location:	Newport	Northing:	185494	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.96	Logged By: JE/HE	1:50

Casing Diameter (mm)	Casing Depth (m)
130	14.40
150	13.70
200	1.80

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							0.00		6.96		Brownish black sandy GRAVEL of ash and clinker. (MADE GROUND)	
		0.20 - 0.65	B									
		0.50	ES									
	▼	0.70 - 1.20	B					(1.20)			*from 0.6-0.8m possible former concrete slab.*	
		1.00	ES									
		1.20	SPT(C)	N=6 (8,4/2,2,1,1)			1.20		5.76		Loose reddish brown slightly gravelly SAND. (MADE GROUND)	1
								(0.40)				
		1.70	ES				1.60	(0.20)	5.36		Soft to firm grey slightly gravelly CLAY. (TIDAL FLAT DEPOSITS)	
							1.80		5.16		Soft to firm grey CLAY. (TIDAL FLAT DEPOSITS)	
		2.00	D									2
		2.30 - 2.75	B									
		2.80 - 3.00	B									
		3.00	D									3
		3.00	ES									
		3.00 - 3.45	UT									
		3.70 - 3.95	B									
		4.00	D								*Becoming soft to very soft slightly silty from 4m.*	4
		4.50	SPT(S)	0 (0 for 450mm/0 for 0mm)								
		4.50 - 4.95	B									
		5.00	D									5
		6.00	D					(9.60)				
		6.00	ES									6
		6.00 - 6.45	UT									
		7.00	D									7
		7.50	SPT(S)	0 (0 for 450mm/0 for 0mm)								
	▼	7.50 - 7.95	B									
		8.00	D									8
		9.00	D									9
		9.00 - 9.45	UT									
		10.00	D								Continued on next sheet	10

Core | Fractures

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 14.30m. Air mist rotary cored 14.3 - 38.6m. Borehole terminated due to time constraints.
BACKFILL: On completion hole backfilled with bentonite 38.6 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 11.4m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	38.60	0.80 11.80	11.70	0.60 7.70	01:00	14.10	14.30

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA023**

Sheet 2 of 4

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 09/02/2016 - 30/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332795	Drilling Method:	38.60m
Location:	Newport	Northing:	185494	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.96	Logged By: JE/HE	1:50

Casing Diameter (mm)	Casing Depth (m)
130	14.40
150	13.70
200	1.80

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		10.50	ES									
		10.50	SPT(S)	0 (0 for 450mm/0 for 0mm)								
		10.50 - 10.95	B									
		11.00	D									11
		11.40 - 11.75	B				11.40		-4.44		Firm to stiff reddish brown occasionally mottled green grey slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium of mudstone. (WEATHERED MERCIA MUDSTONE)	
		12.00	D									
		12.00	SPT(S)	50 (4,7/50 for 285mm)								12
		12.00 - 12.45	B									
								(2.90)				
		13.00	D									13
		13.50	SPT(C)	50 (25 for 115mm/50 for 125mm)								
		14.00	D									
		14.10	SPT(C)	50 (25 for 50mm/50 for 50mm)								14
							14.30		-7.34		Very weak reddish brown weathered MUDSTONE. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	
								(0.95)				
		14.40 - 15.90			TCR: 56 SCR: 26 RQD: 0		15.25		-8.29		*Below 15.1m becoming greenish grey soft sandy fine subangular-subrounded gravelly CLAY.* Assumed zone of core loss. Core loss is presumed to be more weathered material. (WEATHERED MERCIA MUDSTONE)	15
								(0.65)				
		15.90	SPT(C)	33 (92 for 135mm/33 for 10mm)			15.90		-8.94		Very weak greyish green weathered MUDSTONE. Recovered as slightly silty clayey sandy subangular to subrounded coarse gravel. Sand is fine. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	16
								(0.75)				
		15.90 - 17.50			TCR: 50 SCR: 0 RQD: 0		16.65		-9.69		Assumed zone of core loss. Core loss presumed to be more weathered material. (WEATHERED MERCIA MUDSTONE)	
								(0.85)				17
		17.50	SPT(C)	N=28 (5,11/5,5,6,12)			17.50		-10.54		Very weak greyish green weathered MUDSTONE. Recovered as slightly silty clayey sandy subangular to subrounded gravel. Sand is fine. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	
								(0.50)				
		17.50 - 19.00			TCR: 29 SCR: 0 RQD: 0		18.00		-11.04		Assumed zone of core loss. Geology is inferred. Core loss is presumed to be more weathered material. (WEATHERED MERCIA MUDSTONE)	18
								(1.00)				
		19.00	SPT(C)	100 (25 for 80mm/100 for 180mm)			19.00		-12.04		Very weak reddish brown weathered MUDSTONE with frequent greenish grey reduction spots (up to 15mm in diameter). (Weathering Grade II) Recovered as sandy angular to subrounded gravel with occasional cobbles. (MERCIA MUDSTONE) *from 19.0-19.4m recovered as slightly silty sandy angular to subrounded fine to medium gravel.*	19
		19.00 - 20.20			TCR: 100 SCR: 70 RQD: 70			(1.20)				
					Core	Fractures					Continued on next sheet	20

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 14.30m. Air mist rotary cored 14.3 - 38.6m. Borehole terminated due to time constraints.
BACKFILL: On completion hole backfilled with bentonite 38.6 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 11.4m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	38.60	0.80 11.80	11.70	0.60 7.70	01:00	14.10	14.30

BOREHOLE LOG

Borehole No. **BHM4CANA023**

Sheet 3 of 4

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 09/02/2016 - 30/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332795	Drilling Method:	38.60m
Location:	Newport	Northing:	185494	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.96	Logged By: JE/HE	1:50

Casing Diameter (mm)	Casing Depth (m)
130	14.40
150	13.70
200	1.80

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		20.20	SPT(C)	42 (83 for 125mm/42 for 35mm)			20.20		-13.24		Very weak reddish brown weathered MUDSTONE. Recovered as sandy angular to subrounded gravel with occasional cobbles. (Weathering Grade II) (MERCIA MUDSTONE)	
		20.20 - 21.50			TCR: 73 SCR: 33 RQD: 33	Min: 5 Avg: 30 Max: 90						21
		21.50 - 22.00			TCR: 100 SCR: 90 RQD: 90			(3.10)				
		22.00	SPT(C)	35 (90 for 135mm/35 for 70mm)							*from 22.0-22.3m recovered as soft brown slightly gravelly clay. Gravel is subangular to subrounded fine to medium.*	22
		22.00 - 23.30			TCR: 73 SCR: 15 RQD: 0							23
		23.30	SPT(C)	100 (25 for 55mm/100 for 70mm)			23.30		-16.34		Very weak reddish brown weathered MUDSTONE. Recovered as slightly silty clayey sandy subangular to subrounded gravel. Sand is medium. (Weathering Grade III) (MERCIA MUDSTONE)	
		23.30 - 24.80			TCR: 73 SCR: 0 RQD: 0			(2.00)				24
		24.80	SPT(C)	34 (91 for 135mm/34 for 30mm)								25
		24.80 - 26.30			TCR: 95 SCR: 73 RQD: 65		25.30		-18.34		Very weak reddish brown weathered MUDSTONE with occasional greyish green reduction spots. (Weathering Grade II) (MERCIA MUDSTONE)	
		26.30	SPT(C)	15 (103 for 72mm/15 for 0mm)				(2.50)			*from 26.3-26.9m recovered as soft brown slightly gravelly clay with frequent reduction spots (up to 20mm diameter). Gravel is subangular to subrounded fine to medium.*	26
		26.30 - 27.80			TCR: 86 SCR: 33 RQD: 33							27
		27.80	SPT(C)	100 (29 for 86mm/100 for 175mm)			27.80		-20.84		Very weak reddish brown weathered MUDSTONE with frequent greyish green reduction spots. Recovered as subangular to subrounded fine gravel. (Weathering Grade III) (MERCIA MUDSTONE)	28
		27.80 - 29.30			TCR: 90 SCR: 36 RQD: 36	Min: 50 Avg: 120 Max: 270		(1.50)				29
		29.30	SPT(C)	100 (25 for 85mm/100 for 285mm)			29.30		-22.34		*Very weak reddish brown weathered MUDSTONE* Extremely weak reddish brown weathered MUDSTONE. Recovered as soft reddish brown slightly silty slightly sandy CLAY.) (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	
		29.30 - 30.50			TCR: 95 SCR: 25 RQD: 0			(0.60)				
							29.90		-22.94		Continued on next sheet	30
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 14.30m. Air mist rotary cored 14.3 - 38.6m. Borehole terminated due to time constraints.
BACKFILL: On completion hole backfilled with bentonite 38.6 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 11.4m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	38.60	0.80 11.80	11.70	0.60 7.70	01:00	14.10	14.30

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA023**

Sheet 4 of 4

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 09/02/2016 - 30/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332795	Drilling Method:	38.60m
Location:	Newport	Northing:	185494	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.96	Logged By: JE/HE	1:50

Casing Diameter (mm)	Casing Depth (m)
130	14.40
150	13.70
200	1.80

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
								(0.60)			Weak reddish brown weathered MUDSTONE. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	
							30.50		-23.54			
					TCR: 100 SCR: 14 RQD: 0						Weak reddish brown weathered MUDSTONE with medium to widely spaced thin to medium beds of non intact core (recovered as slightly silty sandy angular to subrounded gravel. Sand is fine to medium.) (Weathering Grade III) (MERCIA MUDSTONE)	31
		30.50 - 31.20										
		31.20	SPT(C)	100 (25 for 95mm/100 for 295mm)								
								(2.20)				
					TCR: 93 SCR: 26 RQD: 13							32
		31.20 - 32.70									*32.2 to 32.3 and 32.5 to 32.7 recovered as reddish brown silty and sandy gravels.*	
		32.70	SPT(C)	60 (25,40/60 for 150mm)			32.70		-25.74		Weak reddish brown weathered MUDSTONE with medium to widely spaced thin to medium beds of non intact core (recovered as slightly silty sandy angular to subrounded gravel) (Sand is fine to medium). (MERCIA MUDSTONE)	
					TCR: 93 SCR: 80 RQD: 46	Min: 20 Avg: 140 Max: 340						33
		32.70 - 34.20										
												34
					TCR: 86 SCR: 58 RQD: 49							
		34.20 - 35.60										35
								(4.80)				
		35.60	SPT(C)	54 (25,46/54 for 85mm)								
												36
					TCR: 90 SCR: 17 RQD: 17							
		35.60 - 37.10										
												37
							37.50		-30.54		Weak reddish brown weathered MUDSTONE. Recovered as clayey sandy gravel with occasional cobbles. (Weathering Grade III) (MERCIA MUDSTONE)	
					TCR: 96 SCR: 15 RQD: 6							
		37.10 - 38.60						(1.10)				38
		38.60	SPT(C)	58 (67 for 145mm/58 for 70mm)							End of Borehole at 38.600m	
												39
												40
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 14.30m. Air mist rotary cored 14.3 - 38.6m. Borehole terminated due to time constraints.
BACKFILL: On completion hole backfilled with bentonite 38.6 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 11.4m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	38.60	0.80 11.80	11.70	0.60 7.70	01:00	14.10	14.30

BOREHOLE LOG

Borehole No. **BHM4CANA024**

Sheet 1 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 02/02/2016 - 18/02/2016	Final Depth:
Project No:	JFR8703	Easting:	333211	Drilling Method:	44.10m
Location:	Newport	Northing:	185379	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.97	Logged By: NR/AK	1:50

Casing Diameter (mm)	Casing Depth (m)
130	17.00
150	17.00
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		0.10 - 0.65	B				0.00	(0.65)	7.97		Dark grey silty, sandy angular to subrounded GRAVEL of sandstone, clinker and ash. (MADE GROUND)	
		0.50	ES									
	▼	0.70 - 1.10	B				0.65	(0.45)	7.32		Reddish brown clayey sandy angular to subangular GRAVEL of sandstone with occasional red brick. (MADE GROUND)	
		1.00	D									1
		1.00	ES				1.10		6.87		Soft reddish brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium of sandstone. (TIDAL FLAT DEPOSITS)	
		1.20	SPT(S)	N=4 (1,0/1,1,1,1)								
		1.20 - 1.65	B									
		2.00	D					(1.60)				2
		2.00	ES									
		2.70 - 3.00	B				2.70		5.27		Dark grey clayey slightly sandy SILT with occasional pockets of pseudofibrous peat. Sand is fine. (TIDAL FLAT DEPOSITS)	
		3.00	D									3
		3.00	ES									
		3.00	SPT(S)	N=2 (1,0/1,0,0,1)								
		3.00 - 3.45	B									
		4.00	D									4
		5.00	D								*No peat from 5m*	
		5.00	ES									5
	▼	5.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								
		5.00 - 5.45	B									
	▼	6.00	D					(13.40)				6
	▼	7.00	D									7
		7.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								
	▽	7.00 - 7.45	B									
		8.00	D									8
		8.00 - 8.45	UT									
		9.00	D									9
		9.00	ES									
		10.00	D								Continued on next sheet	10

Core | Fractures

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 17.10m. Air mist rotary cored 17.1 - 44.1m Borehole terminated due to collapse.
BACKFILL: On completion hole backfilled with bentonite 44.1 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 16.1m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	17.10	0.70			00:30	16.50	16.70
RC	17.10	44.10	7.60	7.20	6.90	01:00	17.00	17.10
			16.30	15.50	12.70			
			19.10		5.40			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA024**

Sheet 2 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 02/02/2016 - 18/02/2016	Final Depth:
Project No:	JFR8703	Easting:	333211	Drilling Method:	44.10m
Location:	Newport	Northing:	185379	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.97	Logged By: NR/AK	1:50

Casing Diameter (mm)	Casing Depth (m)
130	17.00
150	17.00
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		10.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								
		10.00 - 10.45	B									
		11.00	D									11
		11.50 - 11.95	B								*Becoming very sandy from 11.5 m. Sand is fine to medium.*	
		12.00	D									12
		13.00	D									
		13.00	ES									13
		13.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								
		13.00 - 13.45	B									
		14.00	D									14
		15.00	D									15
		16.00	D									
		16.00	SPT(S)	50 (1,2/50 for 125mm)			16.10	(0.20)	-8.13		Very weak grey weathered MUDSTONE. Recovered as firm slightly silty gravelly clay. Gravel is angular to subangular. (Weathering Grade IVa) (WEATHERED MERCIA MUDSTONE)	16
		16.00 - 16.45	B				16.30		-8.33			
		16.50 - 17.00	B								Very weak grey mottled red MUDSTONE. Recovered as slightly silty slightly sandy angular to subangular gravel. (Weathering Grade IIII) (WEATHERED MERCIA MUDSTONE)	
		17.00	SPT(C)	80 (25 for 30mm/80 for 30mm)								17
		17.10 - 18.10			TCR: 30 SCR: 0 RQD: 0							
								(5.30)				18
		18.10 - 19.10			TCR: 50 SCR: 8 RQD: 0							
		19.10 - 20.10			TCR: 55 SCR: 10 RQD: 0							19
					Core	Fractures					Continued on next sheet	20

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 17.10m. Air mist rotary cored 17.1 - 44.1m Borehole terminated due to collapse.
BACKFILL: On completion hole backfilled with bentonite 44.1 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 16.1m. No anomalies encountered.

Type: Method	From (m)	To (m)
CP	0.00	17.10
RC	17.10	44.10

Groundwater: Depth Strike (m)	Depth Casing (m)	Level After 20 Mins
0.70		
7.60	7.20	6.90
16.30	15.50	12.70
19.10		5.40

Chiselling: Duration (hh:mm)	Top Depth (m)	Base Depth (m)
00:30	16.50	16.70
01:00	17.00	17.10

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA024**

Sheet 3 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 02/02/2016 - 18/02/2016	Final Depth:
Project No:	JFR8703	Easting:	333211	Drilling Method:	44.10m
Location:	Newport	Northing:	185379	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.97	Logged By: NR/AK	1:50

Casing Diameter (mm)	Casing Depth (m)
130	17.00
150	17.00
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		20.10	SPT(C)	100 (21,4/100 for 105mm)								
		20.10 - 21.60			TCR: 56 SCR: 0 RQD: 0	Min: 10 Avg: 40 Max: 150						
							21.60		-13.63		Weak to medium strong, reddish brown slightly weather MUDSTONE with occasional grey reduction spots. Discontinuities are horizontal to subhorizontal (10 degrees) undulated, rough, open to tight and clean. Open infilled with slightly silty, slightly sandy, fine to medium, angular to sub-angular gravel. (Weathering Grade I - II) (WEATHERED MERCIA MUDSTONE)	21
		21.60 - 23.10			TCR: 100 SCR: 50 RQD: 47			(1.50)			*From 22m heavily fractured.*	22
		23.10	SPT(C)	100 (25,0/100 for 90mm)			23.10		-15.13		Weak to medium strong, reddish brown slightly weathered MUDSTONE with occasional greyish green reduction spots up to 10 mm in diameter. Discontinuities are horizontal (10 degrees) to sub-horizontal (15-25 degrees), undulating with soft slightly sandy slightly gravelly clay infill. Gravel is angular to subangular medium. Fractures are 1-2 mm wide. (WEATHERED MERCIA MUDSTONE)	23
		23.10 - 24.60			TCR: 100 SCR: 29 RQD: 20	Min: 30 Avg: 90 Max: 110						24
		24.60 - 26.10			TCR: 90 SCR: 54 RQD: 46							25
		26.10	SPT(C)	100 (19,6/100 for 90mm)				(6.00)			*from 26.1-26.3m very closely spaced infilled fractures 50mm wide*	26
		26.10 - 27.60			TCR: 93 SCR: 80 RQD: 69	Min: 20 Avg: 150 Max: 230						27
		27.60 - 29.10			TCR: 88 SCR: 83 RQD: 73							28
		29.10	SPT(C)	100 (25,0/100 for 30mm)			29.10		-21.13		Weak reddish brown weathered MUDSTONE with frequent greenish grey reduction spots. Recovered as angular to subangular gravel and cobbles. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	29
		29.10 - 30.60			TCR: 77 SCR: 40 RQD: 25			(1.50)				30
					Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 17.10m. Air mist rotary cored 17.1 - 44.1m Borehole terminated due to collapse.
BACKFILL: On completion hole backfilled with bentonite 44.1 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 16.1m. No anomalies encountered.

Type: Method	From (m)	To (m)
CP	0.00	17.10
RC	17.10	44.10

Groundwater: Depth Strike (m)	Depth Casing (m)	Level After 20 Mins
0.70		
7.60	7.20	6.90
16.30	15.50	12.70
19.10		5.40

Chiselling: Duration (hh:mm)	Top Depth (m)	Base Depth (m)
00:30	16.50	16.70
01:00	17.00	17.10

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA024**

Sheet 4 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 02/02/2016 - 18/02/2016	Final Depth:
Project No:	JFR8703	Easting:	333211	Drilling Method:	44.10m
Location:	Newport	Northing:	185379	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.97	Logged By: NR/AK	1:50

Casing Diameter (mm)	Casing Depth (m)
130	17.00
150	17.00
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							30.60		-22.63		Weak to very weak reddish brown slightly weathered MUDSTONE with occasional greyish green reduction spots up to 10mm in diameter. Discontinuities are horizontal to sub-horizontal undulating, closed occasionally open with spacing of 1-3mm infilled with soft, slightly sandy slightly gravelly clay. Gravel is angular to subangular fine to medium. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	31
		30.60 - 32.10			TCR: 95 SCR: 79 RQD: 73	Min: 15 Avg: 120 Max: 300						
		32.10	SPT(C)	100 (25,0/100 for 90mm)							*from 32.1-32.25m recovered as gravelly cobbles*	32
		32.10 - 33.60			TCR: 97 SCR: 77 RQD: 57							33
											from 33.6-34.0m with closely spaced infilled fractures	
		33.60 - 35.10			TCR: 95 SCR: 80 RQD: 60			(7.50)				34
		35.10	SPT(C)	100 (23,2/100 for 105mm)								35
		35.10 - 36.60			TCR: 97 SCR: 85 RQD: 77							36
		36.60 - 38.10			TCR: 33 SCR: 21 RQD: 15	Min: 10 Avg: 160 Max: 220						37
		38.10	SPT(C)	N=28 (4,7/7,6,6,9)			38.10		-30.13		*from 37.9-38.1m recovered as gravelly cobbles* No recovery, geology inferred. (WEATHERED MERCIA MUDSTONE)	38
		38.10 - 39.60			TCR: 0 SCR: 0 RQD: 0			(1.50)				39
	▽	39.60	SPT(C)	N=96 (7,7/14,29,27,26)			39.60		-31.63		Weak to very weak reddish brown slightly weathered MUDSTONE with occasional greyish green reduction spots up to 10 mm in diameter. Discontinuities are	40
					Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 17.10m. Air mist rotary cored 17.1 - 44.1m Borehole terminated due to collapse.
BACKFILL: On completion hole backfilled with bentonite 44.1 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 16.1m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	17.10	0.70			00:30	16.50	16.70
RC	17.10	44.10	7.60	7.20	6.90	01:00	17.00	17.10
			16.30	15.50	12.70			
			19.10		5.40			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA024**

Sheet 5 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 02/02/2016 - 18/02/2016	Final Depth:
Project No:	JFR8703	Easting:	333211	Drilling Method:	44.10m
Location:	Newport	Northing:	185379	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.97	Logged By: NR/AK	1:50

Casing Diameter (mm)	Casing Depth (m)
130	17.00
150	17.00
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		39.60 - 40.60			TCR: 98 SCR: 41 RQD: 18						horizontal to sub-horizontal, undulating with occasional slightly sandy, slightly gravelly clay infill. Gravel is subangular to angular fine to medium of mudstone. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) *Recovered as slightly silty, slightly sandy gravelly clay. Gravels are fine to coarse, sub-angular to angular of Mudstone at 39.6-40.18 mbGL.*	
		40.60 - 41.60			TCR: 100 SCR: 90 RQD: 75			(2.55)				41
		41.60 - 43.10			TCR: 37 SCR: 25 RQD: 17		42.15		-34.18		*Core recovered as cobbled, gravelled and sandy mudstone at 41.6-41.9 mbGL.* Assumed zone of core loss. Geology is inferred, core loss is presumed to be more weathered material. (WEATHERED MERCIA MUDSTONE) *Cobbles. Assumed zone of core loss. Geology is inferred.*	42
		43.10	SPT(C)	100 (11,14/100 for 180mm)				(1.70)			*Core recovered as cobbled, pebbled and gravelled mudstone at 43.1-43.85 mbGL.*	43
		43.10 - 44.10			TCR: 92 SCR: 45 RQD: 34						*70 mm nodule of white crystalline mineral possible gypsum at 43.4 mbGL.*	
		44.10	SPT(C)	100 (7,18/100 for 85mm)			43.85	(0.25)	-35.88		Weak to very weak, reddish brown, MUDSTONE with rare greyish green reduction spots. Discontinuities are horizontal to sub-horizontal, undulating, occasionally open and infilled with slightly gravelly, slightly sandy, slightly silty clay. Gravel is angular to subangular. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) *43.85 to 44.1m intact.*	44
											End of Borehole at 44.100m	45
												46
												47
												48
												49
					Core	Fractures						50

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 17.10m. Air mist rotary cored 17.1 - 44.1m Borehole terminated due to collapse.
BACKFILL: On completion hole backfilled with bentonite 44.1 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 16.1m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	17.10	0.70			00:30	16.50	16.70
RC	17.10	44.10	7.60	7.20	6.90	01:00	17.00	17.10
			16.30	15.50	12.70			
			19.10		5.40			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA025**

Sheet 1 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 22/01/2016 - 10/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332653	Drilling Method:	50.00m
Location:	Newport	Northing:	185489	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.74	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	18.70
200	1.60

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							0.00	(0.30)	7.74		Brown slightly clayey sandy GRAVEL. Gravel is angular to subrounded of brick, concrete and slag. (MADE GROUND)	
		0.40 - 1.10	ES				0.30		7.44		Brown firm sandy gravelly CLAY with occasional cobbles. Gravel is of brick, concrete, clinker, paper and plastic. (MADE GROUND)	
		0.50 - 1.10	B					(0.80)				
	▽	1.10	D				1.10		6.64		Very loose brown slightly gravelly very clayey SAND. Gravel is of brick, concrete, clinker, paper and plastic. (MADE GROUND)	1
		1.10	SPT(S)	2 (1 for 225mm/2 for 225mm)				(0.50)				
		1.10 - 1.50	B									
		1.10 - 1.50	ES				1.60		6.14		Firm brown grey slightly sandy CLAY with frequent plant fibres and pockets of black organic matter. Sand is fine. (TIDAL FLAT DEPOSITS)	
		1.60 - 2.00	B									
		2.00	ES					(0.80)				2
							2.40		5.34		Soft brown grey CLAY with frequent pockets of black organic matter. (TIDAL FLAT DEPOSITS)	
		2.60	ES					(0.70)				
							3.10		4.64		Very soft grey silty CLAY with pockets of black. (TIDAL FLAT DEPOSITS)	3
		3.50 - 4.00	B									
		4.00	ES									
		4.00	SPT(S)	0 (1 for 450mm/0 for 0mm)								4
		4.00 - 4.45	D									
											From 5 m becoming dark grey.	5
								(10.60)				6
		7.00 - 8.00	P									7
		8.00	ES									8
												9
		10.00	SPT(S)	0 (1 for 450mm/0 for 0mm)								10
					Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.80m. Air mist rotary cored 18.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 18.2m. No anomalies encountered. Methane encountered (9/2/16) at 1% and carbon dioxide at 1.4% at 38m depth within Mercia Mudstone.

Type: Method	From (m)	To (m)
CP	0.00	18.80
RC	18.80	50.00

Groundwater: Depth Strike (m)	Depth Casing (m)	Level After 20 Mins
1.10		0.83

Chiselling: Duration (hh:mm)	Top Depth (m)	Base Depth (m)
01:00	18.70	18.80

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA025**

Sheet 2 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 22/01/2016 - 10/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332653	Drilling Method:	50.00m
Location:	Newport	Northing:	185489	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.74	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	18.70
200	1.60

Well	Water Strike (s)	Samples & In Situ Testing			Rotary Coring		Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		Depth (m)	Type	Results	Core (%)	Fractures (mm)						
		10.00 - 10.50	D									
		13.00	SPT(S)	1 (1 for 300mm/1 for 150mm)								
		13.00 - 13.45	D									
							13.70		-5.96		Dense grey silty SAND of quartz and shell fragments with rare fine to medium subangular to subrounded gravels. (TIDAL FLAT DEPOSITS)	
		14.00 - 14.50	B									
		15.00	ES									
		16.00	SPT(C)	N=43 (3,6/9,10,10,14)				(4.50)				
		18.20 - 18.70	B				18.20		-10.46		Stiff to firm reddish brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is subrounded fine to medium. (Weathering Grade IVa) (WEATHERED MERCIA MUDSTONE)	
		18.20 - 18.70	D					(0.50)				
		18.80	SPT(C)	50 (0 for 0mm/50 for 0mm)			18.70	(0.10)	-10.96		Greenish grey strong SANDSTONE/LIMESTONE (MERCIA MUDSTONE (MARGINAL FACIES))	
							18.80		-11.06		No recovery. Core loss presumed to be weathered material. (MERCIA MUDSTONE)	
					Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.80m. Air mist rotary cored 18.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 18.2m. No anomalies encountered. Methane encountered (9/2/16) at 1% and carbon dioxide at 1.4% at 38m depth within Mercia Mudstone.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.80	1.10		0.83	01:00	18.70	18.80
RC	18.80	50.00						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA025**

Sheet 3 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 22/01/2016 - 10/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332653	Drilling Method:	50.00m
Location:	Newport	Northing:	185489	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.74	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	18.70
200	1.60

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		20.00 - 21.00			TCR: 0 SCR: 0 RQD: 0							
		21.00	SPT(C)	100 (25 for 85mm/100 for 210mm)				(3.20)				21
		21.00 - 22.00			TCR: 0 SCR: 0 RQD: 0							
		22.00	SPT(C)	N=70 (10,12/15,16,16,23)			22.00		-14.26		Medium strong grey green moderately weathered SILTSTONE. Discontinuities are horizontal, very closely to closely spaced, stepped, smooth open and clean or infilled with clayey gravel. (MERCIA MUDSTONE) *Recovered as angular gravel from 22.4 - 22.7m.*	22
		22.00 - 23.50			TCR: 60 SCR: 5 RQD: 0	Min: 20 Avg: 40 Max: 70		(1.60)				23
		23.50	SPT(C)	100 (11,11/100 for 195mm)			23.60		-15.86		Very weak to weak thinly laminated red brown occasionally mottled grey, highly to completely weathered MUDSTONE. Discontinuities are horizontal, very closely to closely spaced, open or partially open, clean or infilled with clayey gravel, undulating smooth. (Weathering Grade II) (MERCIA MUDSTONE) *Recovered as clayey angular to sub angular gravel from 23.6 - 23.9m.* *Assumed some of core loss. Geology is inferred (WMM).*	24
		23.50 - 25.00			TCR: 43 SCR: 4 RQD: 0							
		25.00	SPT(C)	100 (25 for 55mm/100 for 190mm)							*Recovered as clayey angular to sub angular gravel from 25 - 25.3m.*	25
		25.00 - 26.50			TCR: 67 SCR: 6 RQD: 0			(4.40)			*Assumed some of core loss.*	26
		26.50 - 28.00			TCR: 93 SCR: 8 RQD: 0	Min: 20 Avg: 50 Max: 90					*Recovered as clayey angular to sub angular gravel from 26.5 - 27m.*	27
		28.00	SPT(C)	100 (9,12/100 for 125mm)			28.00		-20.26		No recovery. Geology is inferred, core loss presumed to be more weathered material. (WEATHERED MERCIA MUDSTONE) *NO RECOVERY between 28 - 30.5m.*	28
		28.00 - 30.50			TCR: 0 SCR: 0 RQD: 0			(2.50)				29
		29.50	SPT(C)	100 (25 for 50mm/100 for 115mm)								30
					Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.80m. Air mist rotary cored 18.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 18.2m. No anomalies encountered. Methane encountered (9/2/16) at 1% and carbon dioxide at 1.4% at 38m depth within Mercia Mudstone.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.80	1.10		0.83	01:00	18.70	18.80
RC	18.80	50.00						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA025**

Sheet 4 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 22/01/2016 - 10/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332653	Drilling Method:	50.00m
Location:	Newport	Northing:	185489	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.74	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	18.70
200	1.60

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		30.50	SPT(C)	100 (25 for 75mm/100 for 150mm)			30.50		-22.76		Very weak to weak thinly laminated red brown occasionally mottled grey, highly to completely weathered MUDSTONE. Discontinuities are horizontal, very closely to closely spaced, open or partially open, clean or infilled with clayey gravel, undulating smooth. (Weathering Grade II) (MERCIA MUDSTONE)	31
		30.50 - 32.00			TCR: 50 SCR: 5 RQD: 0						*Recovered as clayey angular to sub angular fine to coarse gravel from 30.5 - 30.8m.*	32
		32.00 - 33.50			TCR: 93 SCR: 87 RQD: 63							33
		33.50	SPT(C)	100 (25 for 45mm/100 for 150mm)								
		33.50 - 35.00			TCR: 85 SCR: 61 RQD: 47							34
								(16.50)				35
		35.00 - 36.50			TCR: 97 SCR: 83 RQD: 0							36
		36.50	SPT(C)	100 (25 for 30mm/100 for 75mm)								
		36.50 - 38.00			TCR: 73 SCR: 34 RQD: 0							37
		38.00	SPT(C)	100 (25 for 25mm/100 for 75mm)								38
		38.00 - 39.50			TCR: 97 SCR: 60 RQD: 41							39
					Core	Fractures					Continued on next sheet	40

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.80m. Air mist rotary cored 18.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 18.2m. No anomalies encountered. Methane encountered (9/2/16) at 1% and carbon dioxide at 1.4% at 38m depth within Mercia Mudstone.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.80	1.10		0.83	01:00	18.70	18.80
RC	18.80	50.00						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA025**

Sheet 5 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 22/01/2016 - 10/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332653	Drilling Method:	50.00m
Location:	Newport	Northing:	185489	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.74	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	18.70
200	1.60

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		40.50	SPT(C)	1 (25 for 45mm/1 for 75mm)								41
		43.50	SPT(C)	100 (25 for 20mm/100 for 75mm)								42
		46.00	SPT(C)	100 (25 for 75mm/100 for 105mm)								43
		47.00	SPT(C)	100 (25 for 52mm/100 for 85mm)			47.00		-39.26		Weathered reddish brown MUDSTONE with rare green calcite. (Weathering Grade II) (MERCIA MUDSTONE)	44
		47.00 - 48.50			TCR: 77 SCR: 21 RQD: 20		47.60	(0.60)	-39.86		*Recovered as cobbly gravel between 47.3 - 47.5m with rare firm clay nodules. Cobbles and gravels are angular to sub rounded.*	45
		48.50	SPT()	100 (25 for 20mm/100 for 75mm)							Weathered reddish brown MUDSTONE with occasional calcite veins and pockets and greenish grey reduction spots (3mm). Fractures are approximately 90 degrees with a smooth planar surface and some dip approximately 60 - 70 degrees. (Weathering Grade II) (MERCIA MUDSTONE)	46
		48.50 - 50.00			TCR: 47 SCR: 57 RQD: 36			(2.40)			*Soft reddish brown clay at 48.45m.* *Recovered as angular gravels and firm clay with occasional white clear calcite between 48.5 - 48.75m.* *Band of white calcite dipping at 30 degrees and 40 mm thickness at 49.2m*	47
		50.00	SPT(C)	100 (25 for 35mm/100 for 75mm)							*Band of calcite 200mm thick at 49.8m.*	48
					Core	Fractures					End of Borehole at 50.000m	49
												50

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.80m. Air mist rotary cored 18.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 18.2m. No anomalies encountered. Methane encountered (9/2/16) at 1% and carbon dioxide at 1.4% at 38m depth within Mercia Mudstone.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.80	1.10		0.83	01:00	18.70	18.80
RC	18.80	50.00						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA026**

Sheet 1 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 10/02/2016 - 11/03/2016	Final Depth:
Project No:	JFR8703	Easting:	333136	Drilling Method:	50.00m
Location:	Newport	Northing:	185393	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	8.43	Logged By: ERH/HE	1:50

Casing Diameter (mm)	Casing Depth (m)
130	32.50
150	16.30
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							0.00	(0.20)	8.43		(CONCRETE)	
							0.20		8.23			
		0.40 - 0.60	B					(0.40)			Black brown sandy clayey GRAVEL of slag, ceramics and brick. (MADE GROUND)	
		0.50	ES									
		0.60	ES				0.60		7.83		Soft to firm greyish brown gravelly CLAY. Gravel is subangular to subrounded of brick and slag. (MADE GROUND)	
		0.60 - 1.00	B					(0.40)				
		1.00 - 1.20	B				1.00		7.43		Very soft grey slightly gravelly CLAY with occasional plant fibres. (TIDAL FLAT DEPOSITS)	1
	▼	1.20	SPT(S)	2 (2 for 225mm/2 for 225mm)								
		1.20 - 1.80	ES					(1.00)				
	▽	1.70 - 2.00	B									
		2.00	SPT(S)	N=5 (1,1/1,1,2,1)			2.00		6.43		Soft grey slightly gravelly CLAY. (TIDAL FLAT DEPOSITS)	2
		2.00 - 2.45	D					(0.40)				
		2.00 - 2.50	B				2.40		6.03		Very soft grey CLAY. (TIDAL FLAT DEPOSITS)	
		3.00	D									3
		3.00 - 3.45	UT									
		3.45 - 3.60	D									
		4.00	D									4
		4.00	SPT(S)	1 (1 for 225mm/1 for 225mm)								
		4.01 - 4.45	D									
		5.00	D									5
		5.00 - 5.50	B					(5.60)				
		5.50 - 5.95	UT									
		5.95 - 6.10	D									6
		7.00	D									7
		7.00	SPT(S)	0 (1 for 450mm/0 for 0mm)								
		7.01 - 7.45	D									
		8.00	D				8.00		0.43		Very soft to soft dark bluish grey silty CLAY. (TIDAL FLAT DEPOSITS)	8
		8.50 - 8.95	UT									
		8.95 - 9.10	D									9
		9.00	D									
		10.00	D									10
		10.00	ES									
					Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.80m. Air mist and water flush rotary cored 16.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 15.2m. No anomalies encountered. HPD testing undertaken within the bedrock. Position not accessible at time of survey due to storage of steel rods within port; co-ordinates are approximate.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.80	1.80	1.00	1.30	00:45	15.50	15.80
RC	16.80	50.00	11.00			01:00	16.50	16.80

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA026**

Sheet 2 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 10/02/2016 - 11/03/2016	Final Depth:
Project No:	JFR8703	Easting:	333136	Drilling Method:	50.00m
Location:	Newport	Northing:	185393	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	8.43	Logged By: ERH/HE	1:50

Casing Diameter (mm)	Casing Depth (m)
130	32.50
150	16.30
200	1.50

Well	Water Strike (s)	Depth (m)	Type	Results	Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		10.00	SPT(S)	1 (1 for 300mm/1 for 150mm)								
	▼	11.00	D								*From 11 m sandy.*	11
		11.50 - 11.95	UT					(5.00)				
		11.95 - 12.10	D									
		12.00	D									12
		13.00	D				13.00		-4.57			
		13.00	SPT(S)	N=9 (1,1/2,2,3,2)							Soft to firm brown sandy CLAY. Sand is fine. (TIDAL FLAT DEPOSITS)	13
		13.01 - 13.45	D					(1.00)				
		14.00	D				14.00		-5.57			
		14.00	ES					(0.50)			Very soft to soft brownish grey sandy CLAY. Sand is fine. (TIDAL FLAT DEPOSITS)	14
		14.50	SPT(S)	N=11 (1,2/1,3,4,3)			14.50		-6.07			
		14.50 - 14.95	D					(0.70)			Soft dark grey slightly sandy slightly gravelly CLAY. Gravel is angular, coarse of sandstone. (TIDAL FLAT DEPOSITS)	15
		15.20 - 15.80	B				15.20		-6.77		Clayey silty angular to subangular GRAVEL of sandstone and siltstone with occasional cobbles. (GLACIOFLUVIAL DEPOSITS)	
		15.80	D					(1.30)				
		16.00	SPT(S)	50 (8,16/50 for 165mm)								16
		16.00 - 16.35	D									
		16.40 - 16.80	B				16.50		-8.07			
		16.80	SPT(S)	50 (0 for 0mm/50 for 25mm)							Grey angular to subangular, slightly silty GRAVEL of sandstone, siltstone and mudstone, with occasional cobbles. (WEATHERED MERCIA MUDSTONE)	
		16.50 - 17.80			TCR: 19 SCR: 0 RQD: 0			(1.60)				17
		17.80	SPT(C)	N=72 (5,9/11,11,23,27)								
		17.80 - 19.30			TCR: 93 SCR: 75 RQD: 70		18.10		-9.67		Extremely weak to weak reddish brown mottled grey MUDSTONE with occasional greenish grey reduction spots. Grey staining present on core surface. Discontinuities are closely spaced and horizontal. (Weathering Grade II) (MERCIA MUDSTONE)	18
		19.30	SPT(C)	N=89 (5,7/11,21,24,33)							*Recovered as gravel at 19.3 - 19.5 m.*	19
		19.30 - 20.20			TCR: 93 SCR: 47 RQD: 44							
		20.00	SPT(C)	100 (25 for 50mm/100 for 35mm)							Continued on next sheet	20
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.80m. Air mist and water flush rotary cored 16.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 15.2m. No anomalies encountered. HPD testing undertaken within the bedrock. Position not accessible at time of survey due to storage of steel rods within port; co-ordinates are approximate.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.80	1.80	1.00	1.30	00:45	15.50	15.80
RC	16.80	50.00	11.00			01:00	16.50	16.80

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA026**

Sheet 3 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 10/02/2016 - 11/03/2016	Final Depth:
Project No:	JFR8703	Easting:	333136	Drilling Method:	50.00m
Location:	Newport	Northing:	185393	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	8.43	Logged By: ERH/HE	1:50

Casing Diameter (mm)	Casing Depth (m)
130	32.50
150	16.30
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		20.20 - 20.60 20.40	HPD1		TCR: 100 SCR: 75 RQD: 75						*Recovered as gravel at 20.2 - 20.3 m.*	
		20.60 - 21.30			TCR: 43 SCR: 0 RQD: 0						*Recovered as angular to sub-angular gravel at 20.6 - 21.3 m.*	21
		21.30 - 21.80			TCR: 100 SCR: 90 RQD: 90						*Recovered as gravel at 21.3 - 21.35 m.*	
		21.80 - 22.30			TCR: 84 SCR: 36 RQD: 36						*Recovered as gravel at 21.75 - 21.8 m.* *Recovered as gravel at 21.8 - 21.95 m.*	22
		22.30 - 22.60			TCR: 100						*Recovered as gravel at 22.2 - 22.3 m.* *1 no. thin bed grey SILTSTONE. Recovered as angular to subangular fine to medium gravel at 22.3 - 22.47 m.*	
		22.80 22.60 - 23.30	SPT(C)	100 (25 for 45mm/100 for 29mm)	TCR: 100 SCR: 49 RQD: 46						*Soft black organic matter with rootlets at 22.44 - 22.47 m.* *Recovered as gravel at 22.5 - 22.55 m.* *Recovered as gravel at 22.7 - 22.95 m. Gravel is fine to medium, sub-angular to angular.*	23
		23.30 - 23.90			TCR: 93 SCR: 93 RQD: 77							
		23.90	SPT(C)	100 (25 for 50mm/100 for 36mm)							*Recovered as clay at 23.9 m.*	24
		23.90 - 25.40			TCR: 89 SCR: 80 RQD: 47						*Recovered as clay at 24.25 - 24.4 m.* *Recovered as gravel at 24.27 - 24.45 m.*	
								(11.90)				25
		25.40	SPT(C)	28 (100 for 140mm/28 for 18mm)							*Recovered as gravel at 25.23 - 25.3 m.* *Recovered as gravel at 25.4 - 25.52 m.*	
		25.40 - 26.40 26.00	SPT(C)	100 (25 for 70mm/100 for 73mm)	TCR: 90 SCR: 60 RQD: 53							26
											Recovered as large gravels and cobble at 26.4 m.	
		26.40 - 28.40 27.50	HPD2		TCR: 100 SCR: 80 RQD: 52							27
						Min: 30 Avg: 200 Max: 590					*Recovered as soft laminated clay 27.7 - 28.4 m.*	28
		28.40	SPT(C)	45 (80 for 125mm/45 for 45mm)								
		28.40 - 29.40 29.00	SPT(C)	100 (25 for 50mm/100 for 35mm)	TCR: 59 SCR: 59 RQD: 59							29
		29.40 - 30.00			TCR: 58 SCR: 58 RQD: 42						*White gypsum crystals horizontally along fractures/ bedding plane at 29.4 m.*	
		30.00	SPT(C)	40 (85 for 125mm/40 for 58mm)	Core	Fractures	30.00		-21.57		Continued on next sheet	30

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.80m. Air mist and water flush rotary cored 16.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 15.2m. No anomalies encountered. HPD testing undertaken within the bedrock. Position not accessible at time of survey due to storage of steel rods within port; co-ordinates are approximate.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.80	1.80	1.00	1.30	00:45	15.50	15.80
RC	16.80	50.00	11.00			01:00	16.50	16.80

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA026**

Sheet 4 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 10/02/2016 - 11/03/2016	Final Depth:
Project No:	JFR8703	Easting:	333136	Drilling Method:	50.00m
Location:	Newport	Northing:	185393	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	8.43	Logged By: ERH/HE	1:50

Casing Diameter (mm)	Casing Depth (m)
130	32.50
150	16.30
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		30.00 - 31.00			TCR: 0 SCR: 0 RQD: 0			(1.00)			No recovery. Geology has been inferred, core loss is presumed to be more weathered material. (WEATHERED MERCIA MUDSTONE) *White vein. Possibly calcite or gypsum. At 30 m.*	
		31.00	SPT(C)	45 (80 for 125mm/45 for 40mm)			31.00		-22.57			31
		31.00 - 32.00			TCR: 40 SCR: 40 RQD: 30		31.40	(0.40)	-22.97		Extremely weak reddish brown MUDSTONE. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) No recovery. Geology has been inferred, core loss presumed to be more weathered material. (WEATHERED MERCIA MUDSTONE)	
		32.00 - 33.00			TCR: 0 SCR: 0 RQD: 0			(1.60)				32
		33.00				Min: 50 Avg: 200 Max: 300	33.00		-24.57		Extremely weak to very weak reddish brown thinly laminated MUDSTONE with grey green reduction spots. (Weathering Grade II) (MERCIA MUDSTONE) *Recovered as sandy CLAY at 33.0 - 33.1 m.*	33
		33.85 33.00 - 35.00	HPD3		TCR: 87 SCR: 77 RQD: 47							34
		35.00	SPT(C)	46 (79 for 86mm/46 for 39mm)								35
		35.00 - 35.60			TCR: 100 SCR: 63 RQD: 63						*Recovered as clay at 35.32 - 35.36 m.*	
		35.60 - 36.50			TCR: 76 SCR: 72 RQD: 56						*Recovered as clay at 35.75 - 35.84 m.*	36
		36.50	SPT(C)	73 (52 for 115mm/73 for 88mm)							*Recovered as clay at 36.65 - 36.8 m.*	
		36.50 - 37.50			TCR: 109 SCR: 105 RQD: 100	Min: 60 Avg: 200 Max: 450						37
		37.50	SPT(C)	70 (55 for 115mm/70 for 93mm)							*Recovered as clay at 37.5 - 37.7 m.*	
		37.50 - 38.50			TCR: 98 SCR: 95 RQD: 70							38
		38.50 - 39.00			TCR: 92 SCR: 86 RQD: 82							
		39.00	SPT(C)	32 (93 for 135mm/32 for 27mm)							*Recovered as gravel at 39 - 39.1 m.*	39
		39.00 - 40.00			TCR: 109 SCR: 100 RQD: 83	Min: 40 Avg: 270 Max: 420						
		40.00	SPT(C)	100 (25 for 50mm/100 for 70mm)							Continued on next sheet	40
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.80m. Air mist and water flush rotary cored 16.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 15.2m. No anomalies encountered. HPD testing undertaken within the bedrock. Position not accessible at time of survey due to storage of steel rods within port; co-ordinates are approximate.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.80	1.80	1.00	1.30	00:45	15.50	15.80
RC	16.80	50.00	11.00			01:00	16.50	16.80

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA026**

Sheet 5 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 10/02/2016 - 11/03/2016	Final Depth:
Project No:	JFR8703	Easting:	333136	Drilling Method:	50.00m
Location:	Newport	Northing:	185393	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	8.43	Logged By: ERH/HE	1:50

Casing Diameter (mm)	Casing Depth (m)
130	32.50
150	16.30
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
											Recovered as coarse gravel at 39.95 m.	
		40.00 - 41.40			TCR: 100 SCR: 96 RQD: 69							41
		41.20	HPD4								*Recovered as clay at 41.2 - 41.4 m.*	
		41.40 - 42.00			TCR: 95 SCR: 85 RQD: 80							
		42.00	SPT(C)	42 (83 for 117mm/42 for 39mm)							*Clay is becoming extremely soft at 42.1m.*	42
											Fine gravel band at 42.9, sub rounded to angular.	
		42.00 - 44.80			TCR: 95 SCR: 80 RQD: 78							43
												44
		45.00	SPT(C)	46 (79 for 121mm/46 for 43mm)		Min: 30 Avg: 240 Max: 370		(17.00)			*Becoming soft at 45-48m.*	45
		46.20	HPD5									46
		44.80 - 48.00			TCR: 85 SCR: 80 RQD: 80							
		47.00	SPT(C)	54 (71 for 135mm/54 for 67mm)								47
		48.10	SPT(C)	47 (138 for 135mm/47 for 58mm)							*Small pocket of halite crystals at 48m.*	48
		48.00 - 50.00			TCR: 65 SCR: 57 RQD: 50							49
		50.00	SPT(C)	71 (54 for 145mm/71 for 110mm)							End of Borehole at 50.000m	50
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.80m. Air mist and water flush rotary cored 16.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 15.2m. No anomalies encountered. HPD testing undertaken within the bedrock. Position not accessible at time of survey due to storage of steel rods within port; co-ordinates are approximate.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.80	1.80	1.00	1.30	00:45	15.50	15.80
RC	16.80	50.00	11.00			01:00	16.50	16.80

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA028**

Sheet 1 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 15/01/2016 - 04/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332951	Drilling Method:	50.00m
Location:	Newport	Northing:	185501	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.56	Logged By: FB/HE/ ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	13.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							0.00	(0.30)	7.56		Tarmac (MADE GROUND)	
		0.30 - 0.80	ES				0.30		7.26		Black very gravelly SAND. Gravel is subangular of clinker, glass, limestone and slag. (MADE GROUND)	
		0.50 - 0.80	B					(0.50)				
		0.80 - 1.50	B				0.80		6.76		Loose brown sandy angular limestone GRAVEL with occasional cobbles. (MADE GROUND)	
		1.00	SPT(S)	N=4 (2,2/1,2,1,0)								1
		1.00 - 1.45	D									
		1.00 - 1.50	ES					(0.90)				
		1.70 - 2.00	B				1.70		5.86		Firm blueish grey slightly gravelly CLAY with occasional cobbles with rare fine rootlets. Gravel is angular. (MADE GROUND)	
								(0.30)				
		2.00 - 2.20	ES				2.00		5.56		Stiff grey brown mottled blueish grey CLAY. Becoming firm with depth. (TIDAL FLAT DEPOSITS)	2
		2.00 - 2.50	B									
								(1.00)				
							3.00		4.56		Very soft blueish grey brown CLAY (TIDAL FLAT DEPOSITS)	3
		3.50 - 4.00	B									
		4.00	SPT(S)	1 (1 for 300mm/1 for 150mm)								4
		4.00 - 4.45	D									
												5
												6
								(9.00)				
		7.00 - 7.45	UT									7
												8
												9
		9.50 - 10.00	B									
		10.00	SPT(S)	0 (1 for 450mm/0 for 0mm)							Continued on next sheet	10
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 13.80m. Air mist rotary cored 13.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 1.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.5m. No anomalies encountered. Low levels of methane detected at approximately 17m within bedrock (28/1/16).

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	13.80	0.80		0.60	00:30	13.70	13.80
RC	13.50	50.00						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA028**

Sheet 2 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 15/01/2016 - 04/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332951	Drilling Method:	50.00m
Location:	Newport	Northing:	185501	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.56	Logged By: FB/HE/ ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	13.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		10.00 - 10.45	D								*Dark blueish grey from 10 m.*	11
		12.00 - 12.50	B				12.00	(0.50)	-4.44		Very soft dark blueish grey slightly gravelly CLAY with rare angular to subangular cobbles. Gravel is angular to coarse. (TIDAL FLAT DEPOSITS)	12
		12.50 - 13.00	B				12.50	(1.30)	-4.94		Stiff reddish brown mottled grey brown slightly gravelly CLAY with rare angular to subangular cobbles of sandstone. Gravel is subrounded to rounded of sandstone. (Weathering Grade IVb) (WEATHERED MERCIA MUDSTONE)	13
		13.00 13.00	D SPT(S)	50 (5,10/50 for 225mm)								
		13.70 - 13.80	D				13.80	(2.00)	-6.24		No Recovery. Geology is inferred, core loss assumed to be more weathered material. (WEATHERED MERCIA MUDSTONE)	14
		13.80 - 14.80			TCR: 0 SCR: 0 RQD: 0							
		14.80	SPT(C)	N=95 (6,13/21,22,22,30)								15
		14.80 - 15.80			TCR: 0 SCR: 0 RQD: 0							
		15.80	SPT(C)	N=100 (10,11/13,24,26,37)			15.80	(0.60)	-8.24		Extremely to very weak reddish brown mottled greyish green and black MUDSTONE. Recovered as slightly clayey angular gravel. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	16
		15.80 - 17.00			TCR: 50 SCR: 0 RQD: 0		16.40		-8.84		No Recovery. Geology is inferred, core loss assumed to be more weathered material. (WEATHERED MERCIA MUDSTONE)	
		17.00	SPT(C)	100 (25 for 75mm/100 for 205mm)				(1.60)				17
		17.00 - 18.00			TCR: 0 SCR: 0 RQD: 0							
		18.00	SPT(C)	100 (25 for 60mm/100 for 170mm)			18.00	(0.20)	-10.44			18
		18.00 - 19.00			TCR: 20 SCR: 0 RQD: 0		18.20	(0.80)	-10.64		Extremely to very weak reddish brown mottled greyish green and black MUDSTONE. Recovered as slightly clayey angular gravel. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE) No Recovery. Geology is inferred., core loss assumed to be more weathered material. (WEATHERED MERCIA MUDSTONE)	
		19.00	SPT(C)	100 (25 for 95mm/100 for 255mm)			19.00	(0.30)	-11.44			19
		19.00 - 20.00			TCR: 30 SCR: 0 RQD: 0		19.30	(0.70)	-11.74		Extremely to very weak reddish brown mottled greyish green and black MUDSTONE. Recovered as slightly clayey angular gravel. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) No Recovery. Geology is inferred, core loss presumed to be more weathered material) (WEATHERED MERCIA MUDSTONE)	
		20.00	SPT(C)	100 (25 for 20mm/100 for 75mm)	Core	Fractures	20.00		-12.44		Continued on next sheet	20

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 13.80m. Air mist rotary cored 13.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 1.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.5m. No anomalies encountered. Low levels of methane detected at approximately 17m within bedrock (28/1/16).

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	13.80	0.80		0.60	00:30	13.70	13.80
RC	13.50	50.00						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA028**

Sheet 3 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 15/01/2016 - 04/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332951	Drilling Method:	50.00m
Location:	Newport	Northing:	185501	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.56	Logged By: FB/HE/ ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	13.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		20.00 - 21.00			TCR: 95 SCR: 55 RQD: 37						Extremely to very weak reddish brown mottled greyish green and black MUDSTONE. Recovered as slightly clayey angular gravel. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	
											Non-intact at 20-20.3 m.	
											Soft to firm CLAY at 20.3 - 20.8 m.	
											Grey green sandy discolouration from 20.56-20.6 mbGL	
		21.00	SPT(C)	100 (25 for 75mm/100 for 245mm)								21
		21.00 - 22.50			TCR: 49 SCR: 18 RQD: 0							22
											Fracture dipping at 40 degrees with undulating striated surface at 22.51 m.	
											Soft clay at 22.65 - 22.75 m.	
		22.50 - 24.00			TCR: 40 SCR: 27 RQD: 9	Min: 4 Avg: 6 Max: 19		(6.50)				23
											Non-intact for 40 mm at 23.8 - 24.2 m.	
		24.00	SPT(C)	100 (25 for 60mm/100 for 205mm)								24
		24.00 - 25.50			TCR: 0 SCR: 0 RQD: 0							25
											Recovered as gravel between 25.2-25.8 m.	
		25.50	SPT(C)	100 (25 for 30mm/100 for 115mm)								
		25.50 - 26.50			TCR: 95 SCR: 35 RQD: 19						*Fracture dipping at 40 degrees with undulating striated surface at 25.9 m.*	26
											Clay at 26.2-26.3 m.	
		26.50	SPT(C)	100 (25 for 105mm/100 for 240mm)			26.50		-18.94			
								(0.50)			Extremely to very weak reddish brown MUDSTONE recovered as slightly gravelly sandy clay. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	
							27.00		-19.44			27
		26.50 - 28.00			TCR: 31 SCR: 3 RQD: 0						Assumed zone of core loss. Geology is inferred, core loss presumed to be more weathered material. (WEATHERED MERCIA MUDSTONE)	
								(1.00)				
		28.00	SPT(C)	100 (21,4/100 for 190mm)			28.00		-20.44			28
								(0.40)			Extremely to very weak reddish brown MUDSTONE recovered as slightly gravelly sandy clay. (Weathering Grade III). (WEATHERED MERCIA MUDSTONE)	
							28.40		-20.84			
		28.00 - 29.50			TCR: 27 SCR: 11 RQD: 0						Assumed Zone of Core Loss. Geology is inferred, core loss presumed to be more weathered material. (WEATHERED MERCIA MUDSTONE)	
								(1.10)				29
		29.50	SPT(C)	100 (25 for 105mm/100 for 150mm)			29.50		-21.94			
								(0.70)			Extremely to very weak reddish brown mottled greyish green and black MUDSTONE. Recovered as slightly clayey angular gravel. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	
					Core	Fractures					Continued on next sheet	30

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 13.80m. Air mist rotary cored 13.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 1.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.5m. No anomalies encountered. Low levels of methane detected at approximately 17m within bedrock (28/1/16).

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	13.80	0.80		0.60	00:30	13.70	13.80
RC	13.50	50.00						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA028**

Sheet 4 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 15/01/2016 - 04/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332951	Drilling Method:	50.00m
Location:	Newport	Northing:	185501	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.56	Logged By: FB/HE/ ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	13.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		29.50 - 31.00			TCR: 53 SCR: 40 RQD: 37	Min: 7 Avg: 15 Max: 22	30.20	(0.80)	-22.64		Assumed Zone of Core Loss. Geology is inferred, core loss presumed to be more weathered material. (WEATHERED MERCIA MUDSTONE)	
		31.00	SPT(C)	100 (25 for 50mm/100 for 160mm)			31.00	(0.60)	-23.44		Extremely to very weak reddish brown mottled greyish green and black MUDSTONE. Recovered as slightly clayey angular gravel. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	31
		31.00 - 32.50			TCR: 36 SCR: 22 RQD: 0		31.60	(0.90)	-24.04		Assumed Zone of Core Loss. Geology is inferred, core loss presumed to be more weathered material. (WEATHERED MERCIA MUDSTONE)	32
		32.50	SPT(C)	100 (25 for 85mm/100 for 135mm)			32.50		-24.94		Extremely to very weak reddish brown MUDSTONE recovered as slightly gravelly sandy clay. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	33
		32.50 - 34.00			TCR: 27 SCR: 20 RQD: 0			(1.90)			*White gypsum crystals along fracture surface at 33.3 m.*	
		34.00	SPT(C)	100 (25 for 30mm/100 for 105mm)		Min: 8 Avg: 20 Max: 56						34
		34.00 - 35.50			TCR: 100 SCR: 87 RQD: 85		34.40		-26.84		Extremely to very weak reddish brown MUDSTONE with some grey green reduction spots. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) *Fracture dipping at 5 degrees with white gypsum crystals along fracture surface at 34.45 m.* *Fracture dipping at 35 degrees with undulating rough surface coated in white gypsum crystals at 35 m.*	35
		35.50	SPT(C)	100 (25 for 40mm/100 for 115mm)							*Non-intact at 35.58 m.* *Non-intact at 35.8 - 36.0 m.*	36
		35.50 - 37.00			TCR: 97 SCR: 67 RQD: 40						*Fracture dipping at 35 degrees with undulating striated surface at 36.2 m.*	
		37.00	SPT(C)	100 (10,10/100 for 250mm)				(8.10)				37
		37.00 - 39.50			TCR: 0 SCR: 0 RQD: 0	Min: 3 Avg: 20 Max: 59						38
		38.50	SPT(C)	100 (25 for 30mm/100 for 95mm)								39
		39.50	SPT(C)	100 (25 for 20mm/100 for 75mm)							*Recovered as gravel at 39.5 - 39.7 m.*	
					Core	Fractures					Continued on next sheet	40

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 13.80m. Air mist rotary cored 13.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 1.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.5m. No anomalies encountered. Low levels of methane detected at approximately 17m within bedrock (28/1/16).

Type: Method	From (m)	To (m)
CP	0.00	13.80
RC	13.50	50.00

Groundwater: Depth Strike (m)	Depth Casing (m)	Level After 20 Mins
0.80		0.60

Chiselling: Duration (hh:mm)	Top Depth (m)	Base Depth (m)
00:30	13.70	13.80

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA028**

Sheet 5 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 15/01/2016 - 04/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332951	Drilling Method:	50.00m
Location:	Newport	Northing:	185501	Dando 2000 & Comacchio MC 305	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.56	Logged By: FB/HE/ ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	13.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		39.50 - 41.00			TCR: 100 SCR: 53 RQD: 40						*Soft clay 40.3 - 40.8 m.*	
		41.00	SPT(C)	100 (25 for 25mm/100 for 75mm)							*Fracture dipping at 35 degrees with white gypsum crystals on surface at 40.82 m.* *Recovered as gravel between 41 - 41.2 m.*	41
		41.00 - 42.50			TCR: 100 SCR: 73 RQD: 39	Min: 4 Avg: 10 Max: 14					*Recovered as gravel between 41.56 - 41.62 m.*	42
		42.50	SPT(C)	100 (25 for 75mm/100 for 170mm)			42.50		-34.94		*Near vertical fracture with white gypsum crystals on surface at 42.3 m.* No Recovery. Geology is inferred, core loss presumed to be more weathered material. (MERCIA MUDSTONE)	
		42.50 - 44.00			TCR: 0 SCR: 0 RQD: 0			(2.50)				43
		44.00	SPT(C)	100 (10,13/100 for 225mm)								44
		44.00 - 45.00			TCR: 0 SCR: 0 RQD: 0							
		45.00	SPT(C)	100 (25 for 50mm/100 for 150mm)			45.00	(0.30)	-37.44		Extremely to very weak reddish brown MUDSTONE. Recovered as gravel. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	45
		45.00 - 46.00			TCR: 30 SCR: 0 RQD: 0		45.30		-37.74		No Recovery. Geology is inferred, core loss presumed to be more weathered material. (WEATHERED MERCIA MUDSTONE)	
		46.00	SPT(C)	100 (25 for 60mm/100 for 210mm)				(1.70)				46
		46.00 - 47.00			TCR: 0 SCR: 0 RQD: 0							
		47.00	SPT(C)	100 (25 for 20mm/100 for 95mm)			47.00		-39.44		Very weak to weak reddish brown MUDSTONE with grey green reduction spots (<1 mm to 20 mm diameter) and randomly orientated calcite veins of varying thickness (5 to 0 mm). Fractures are horizontal closely to medium spaced with rough planar texture. (Weathering Grade II) (MERCIA MUDSTONE)	47
		47.00 - 48.50			TCR: 73 SCR: 48 RQD: 22						*Recovered as gravel between 47.4-47.7 m.*	48
		48.50	SPT(C)	100 (25 for 25mm/100 for 75mm)				(3.00)			*Recovered as gravel between 48.5-48.7 m.*	49
		48.50 - 50.00			TCR: 93 SCR: 73 RQD: 33						*Recovered as gravel for 90 mm at 49.5 m.*	
		50.00	SPT(C)	100 (25 for 20mm/100 for 85mm)	Core	Fractures					End of Borehole at 50.000m	50

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 13.80m. Air mist rotary cored 13.8 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.5 - 1.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.5m. No anomalies encountered. Low levels of methane detected at approximately 17m within bedrock (28/1/16).

Type: Method	From (m)	To (m)
CP	0.00	13.80
RC	13.50	50.00

Groundwater: Depth Strike (m)	Depth Casing (m)	Level After 20 Mins
0.80		0.60

Chiselling: Duration (hh:mm)	Top Depth (m)	Base Depth (m)
00:30	13.70	13.80

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA029**

Sheet 1 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 18/01/2016 - 04/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332875	Drilling Method:	50.00m
Location:	Newport	Northing:	185497	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.65	Logged By: ERH/JA	1:50

Casing Diameter (mm)	Casing Depth (m)
130	15.10
150	15.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		0.00 - 1.10	ES				0.00	(0.20)	6.65		(CONCRETE)	
		0.20 - 0.65	B				0.20		6.45		Black slightly gravelly very sandy CLAY. Gravel is coarse angular of limestone. Sand is of ash/slag. (MADE GROUND)	
								(0.90)				
		1.10	D				1.10		5.55		Stiff grey mottled orangish brown CLAY. Rare coarse gravel of limestone. (MADE GROUND)	1
		1.20	SPT(S)	N=6 (1,1/1,1,2,2)								
		1.20 - 1.65	B					(0.60)				
		1.70	D				1.70		4.95		Soft grey and blueish grey CLAY. (TIDAL FLAT DEPOSITS)	
		1.70	ES									
		2.00	ES									2
		2.00 - 2.45	B									
		2.90	D								*From 2.9 m very soft.*	
		3.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								3
		3.00 - 3.45	B									
		4.00 - 4.45	B									4
		5.00 - 5.45	B									5
								(7.00)				
		6.00	SPT()	0 (0 for 450mm/0 for 0mm)								6
		6.00 - 6.45	B									
		7.00 - 7.45	B									7
		8.00 - 8.45	B									8
		8.70	D				8.70		-2.05		Very soft blueish grey CLAY with very closely spaced thin laminations of grey fine sand. (TIDAL FLAT DEPOSITS)	
		9.00 - 9.45	UT									9
								(1.70)				
		10.00 - 10.45	B								Continued on next sheet	10

Core | Fractures

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.20m. Air mist rotary cored 15.2 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 10.4m. No anomalies encountered. 19//16: Drillers reported initial steam-like reject from borehole followed by bubbling sound. Obvious veil distortion at top of casing. Slight hydrogen sulphide odour reported. Methane recorded at 50% at head of casing at approximately 10.6m within peat band and again (20/1/16) at 14m depth within mudstone. On both occasions drilling stopped until methane recorded at concentrations below 5%. 27/1/16: Water strike at approximately 17m within mudstone coincided with methane pocket (<5%) resulting in large volumes of water rapidly releasing from hole.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.20	0.60		0.40	01:00	15.00	15.20
RC	15.20	50.00	17.00					

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA029**

Sheet 2 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 18/01/2016 - 04/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332875	Drilling Method:	50.00m
Location:	Newport	Northing:	185497	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.65	Logged By: ERH/JA	1:50

Casing Diameter (mm)	Casing Depth (m)
130	15.10
150	15.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							10.40	(1.00)	-3.75		Grey slightly clayey slightly sandy subangular to rounded GRAVEL with occasional subrounded to rounded cobbles. (GLACIOFLUVIAL DEPOSITS) *Ground gas emission at 10.6 m.*	
		11.00	ES									11
		11.00 - 11.45	B									
		11.40	D				11.40	(2.10)	-4.75		Firm to stiff reddish brown slightly sandy CLAY. (Weathering Grade IVa) (WEATHERED MERCIA MUDSTONE)	
		12.00	SPT(S)	N=30 (2,3/4,6,9,11)								12
		12.00 - 12.45	B									
		13.00	D									13
		13.50	D				13.50	(1.70)	-6.85		Stiff reddish brown CLAY interbedded with weak mudstone lithorelics. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	
		14.00 - 14.45	B									14
		14.70	D									
		15.00	SPT(C)	50 (25 for 75mm/50 for 30mm)	TCR: 0 SCR: 0 RQD: 0							15
		15.00 - 15.20	D				15.20	(0.80)	-8.55		Extremely weak thinly laminated reddish brown MUDSTONE with occasional grey reduction spots. Fractures are approximately horizontal closely spaced with smooth planar surface. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) *Non intact between 15.4-15.5 m.* *Recovered as gravels between 15.56-16 mbG.*	
		13.20 - 17.20										
		15.20	SPT(C)	50 (25 for 85mm/50 for 95mm)	TCR: 80 SCR: 30 RQD: 15							
		15.20 - 16.20										
							16.00	(0.20)	-9.35			16
							16.20		-9.55		Weak to medium strong greyish green MUDSTONE. (Weathering Grade I) (WEATHERED MERCIA MUDSTONE)	
		16.20 - 17.20			TCR: 0 SCR: 0 RQD: 0			(0.80)			No recovery. Core loss presumed to be more weathered material. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	
							17.00	(0.15)	-10.35			17
							17.15		-10.50		Weak to medium strong reddish brown and green grey MUDSTONE. With quartz veins and vugs. Recovered as gravel. (WEATHERED MERCIA MUDSTONE)	
		17.20 - 18.20			TCR: 15 SCR: 0 RQD: 0			(0.85)			No assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	
		18.00	SPT(C)	100 (6,19/100 for 150mm)			18.00	(1.00)	-11.35		Very weak thinly laminated reddish brown MUDSTONE with grey reduction spots. Recovered as gravel. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) *Recovered as gravels between 18-19 mbGL.* *Soft clay at 18.3 mbGL.* *Think lamina of very thin bed of medium strong green grey mudstone at 18.5 m.*	18
		18.20 - 19.00			TCR: 56 SCR: 12 RQD: 0							
							19.00		-12.35		Weak to very weak thinly laminated reddish brown MUDSTONE with frequent grey reduction spots (<1 mm to 15 mm in diameter). Fractures dip horizontal to 10 degrees with planar smooth surface and are very closely to closely spaced. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) *Recovered as gravel between 19-19.1 m.*	19
		19.00 - 20.00			TCR: 95 SCR: 80 RQD: 10	Min: 30 Avg: 50 Max: 100						
					Core	Fractures					Continued on next sheet	20

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.20m. Air mist rotary cored 15.2 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 10.4m. No anomalies encountered. 19//16: Drillers reported initial steam-like reject from borehole followed by bubbling sound. Obvious veil distortion at top of casing. Slight hydrogen sulphide odour reported. Methane recorded at 50% at head of casing at approximately 10.6m within peat band and again (20/1/16) at 14m depth within mudstone. On both occasions drilling stopped until methane recorded at concentrations below 5%. 27/1/16: Water strike at approximately 17m within mudstone coincided with methane pocket (<5%) resulting in large volumes of water rapidly releasing from hole.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.20	0.60		0.40	01:00	15.00	15.20
RC	15.20	50.00	17.00					

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA029**

Sheet 3 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 18/01/2016 - 04/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332875	Drilling Method:	50.00m
Location:	Newport	Northing:	185497	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.65	Logged By: ERH/JA	1:50

Casing Diameter (mm)	Casing Depth (m)
130	15.10
150	15.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		20.00 - 21.00			TCR: 65 SCR: 48 RQD: 0						*Recovered as gravel between 19.14-19.2 m.* *Recovered as non-intact gravels between 19.3-19.36 m.*	
		21.00	SPT(C)	100 (17,8/100 for 225mm)								21
		21.00 - 22.00			TCR: 0 SCR: 0 RQD: 0							
						Min: 30 Avg: 70 Max: 200					*Recovered as gravels between 22.0 - 22.49 m.*	22
		22.00 - 23.50			TCR: 76 SCR: 57 RQD: 29							
								(7.50)				23
		23.50	SPT(C)	100 (19,6/100 for 150mm)							*Very thin bed of soft red clay 40 mm at 23.4 m.*	
											Very thin bed of non-intact at 23.67 m.	
		23.50 - 25.00			TCR: 95 SCR: 80 RQD: 35							24
											Thin bed of extremely weak mudstone at 24.3 m.	
											Very thin bed of non-intact at 24.57 m. *Thin bed of non-intact recovery at 24.7 m.*	
		25.00 - 26.50			TCR: 97 SCR: 90 RQD: 51							25
											Recovered as gravel at 25.43 m.	
											Recovered as gravel at 26.1 m.	26
		26.50	SPT(C)	100 (23,2/100 for 150mm)			26.50		-19.85			
								(0.65)			Very weak highly weathered, red brown locally mottled grey MUDSTONE with occasional grey reduction patches. Discontinuities are horizontal, very closely to closely spaced undulating, rough open and infilled with clayey gravel or open and clean. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	27
		26.50 - 28.00			TCR: 43 SCR: 5 RQD: 0		27.15		-20.50		No recovery. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	
						Min: 250 Avg: 500 Max: 1100						28
		28.00 - 29.50			TCR: 0 SCR: 0 RQD: 0			(5.35)				
		29.50	SPT(C)	N=100 (9,11/21,27,48,4)								29
					Core	Fractures					Continued on next sheet	30

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.20m. Air mist rotary cored 15.2 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 10.4m. No anomalies encountered. 19//16: Drillers reported initial steam-like reject from borehole followed by bubbling sound. Obvious veil distortion at top of casing. Slight hydrogen sulphide odour reported. Methane recorded at 50% at head of casing at approximately 10.6m within peat band and again (20/1/16) at 14m depth within mudstone. On both occasions drilling stopped until methane recorded at concentrations below 5%. 27/1/16: Water strike at approximately 17m within mudstone coincided with methane pocket (<5%) resulting in large volumes of water rapidly releasing from hole.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.20	0.60		0.40	01:00	15.00	15.20
RC	15.20	50.00	17.00					

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA029**

Sheet 4 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 18/01/2016 - 04/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332875	Drilling Method:	50.00m
Location:	Newport	Northing:	185497	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.65	Logged By: ERH/JA	1:50

Casing Diameter (mm)	Casing Depth (m)
130	15.10
150	15.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		29.50 - 31.00			TCR: 73 SCR: 13 RQD: 0							31
		31.00 - 32.50			TCR: 77 SCR: 16 RQD: 0							32
		32.50	SPT(C)	100 (24,1/100 for 150mm)			32.50		-25.85		Very weak to weak thinly laminated reddish brown MUDSTONE with frequent grey reduction spots (<1 mm to 15 mm in diameter). Fractures dip horizontal to 10 degrees with planar smooth surface and are very closely to closely spaced. (WEATHERED MERCIA MUDSTONE)	33
		32.50 - 34.00			TCR: 99 SCR: 82 RQD: 35							34
		34.00 - 35.00			TCR: 75 SCR: 45 RQD: 34	Min: 40 Avg: 150 Max: 330						35
		35.50	SPT(C)	100 (19,6/100 for 150mm)								
		35.00 - 36.50			TCR: 114 SCR: 70 RQD: 41			(9.30)				36
		36.50 - 38.00			TCR: 83 SCR: 67 RQD: 32							37
		38.00	SPT(C)	100 (23,2/100 for 150mm)		Min: 40 Avg: 100 Max: 270						38
		38.00 - 39.50			TCR: 93 SCR: 67 RQD: 34							39
											Continued on next sheet	40
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.20m. Air mist rotary cored 15.2 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 10.4m. No anomalies encountered. 19//16: Drillers reported initial steam-like reject from borehole followed by bubbling sound. Obvious veil distortion at top of casing. Slight hydrogen sulphide odour reported. Methane recorded at 50% at head of casing at approximately 10.6m within peat band and again (20/1/16) at 14m depth within mudstone. On both occasions drilling stopped until methane recorded at concentrations below 5%. 27/1/16: Water strike at approximately 17m within mudstone coincided with methane pocket (<5%) resulting in large volumes of water rapidly releasing from hole.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.20	0.60		0.40	01:00	15.00	15.20
RC	15.20	50.00	17.00					

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA029**

Sheet 5 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 18/01/2016 - 04/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332875	Drilling Method:	50.00m
Location:	Newport	Northing:	185497	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.65	Logged By: ERH/JA	1:50

Casing Diameter (mm)	Casing Depth (m)
130	15.10
150	15.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		39.50 - 41.00			TCR: 98 SCR: 73 RQD: 36	Min: 50 Avg: 100 Max: 250						
		41.00	SPT(C)	100 (25 for 75mm/100 for 150mm)								41
		41.00 - 42.50			TCR: 77 SCR: 63 RQD: 39		41.80		-35.15		Weak reddish brown MUDSTONE with grey reduction spots 3-20 mm in diameter and frequent randomly orientated white quartz veins of varying thickness. Fractures are dipping at approximately 10 degrees with planar smooth or striated surface and are closely to medium spaced. (Weathering Grade I) (WEATHERED MERCIA MUDSTONE)	42
											Gravel along fracture zone at 42 m.	
											Quartz vein 60 mm thick at 43 m.	43
		42.50 - 44.00			TCR: 99 SCR: 77 RQD: 23	Min: 30 Avg: 120 Max: 340					*Very thin bed of gravel at 43.2 m.*	
		44.00	SPT(C)	100 (25 for 75mm/100 for 150mm)							*Very thin bed of gravel 44.2 m.*	44
		44.00 - 45.50			TCR: 99 SCR: 84 RQD: 39						*Thick laminae of gravel at 44.5 m.*	
											Thin bed of soft red clay at 44.5-45.7 m.	45
								(8.20)				
		45.50 - 47.00			TCR: 93 SCR: 45 RQD: 23						*Thick laminae of gravel at 46.1 m.* *Recovered as gravel between 46.22-46.4 m.*	46
		47.00	SPT(C)	100 (25 for 75mm/100 for 150mm)		Min: 50 Avg: 250 Max: 580					*Quartz vein dipping approximately 80 degrees between 46.8-47.5 m.*	47
		47.00 - 48.50			TCR: 100 SCR: 97 RQD: 89							48
											Thick laminae of soft red clay between 48.5-48.6 m.	
											Becoming medium strong from 48.85 mbGL.	49
		48.50 - 50.00			TCR: 100 SCR: 97 RQD: 67	Min: 50 Avg: 150 Max: 240						
					Core	Fractures					End of Borehole at 50.000m	50

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.20m. Air mist rotary cored 15.2 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 10.4m. No anomalies encountered. 19//16: Drillers reported initial steam-like reject from borehole followed by bubbling sound. Obvious veil distortion at top of casing. Slight hydrogen sulphide odour reported. Methane recorded at 50% at head of casing at approximately 10.6m within peat band and again (20/1/16) at 14m depth within mudstone. On both occasions drilling stopped until methane recorded at concentrations below 5%. 27/1/16: Water strike at approximately 17m within mudstone coincided with methane pocket (<5%) resulting in large volumes of water rapidly releasing from hole.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.20	0.60		0.40	01:00	15.00	15.20
RC	15.20	50.00	17.00					

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA030**

Sheet 1 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 26/01/2016 - 10/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332804	Drilling Method:	48.50m
Location:	Newport	Northing:	185513	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.08	Logged By: JA	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	15.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							0.00	(0.10)	7.08		Brick paving	
		0.20	ES				0.10	(0.10)	6.98		(MADE GROUND)	
		0.30	ES				0.20		6.88		Dark grey concrete.	
		0.30 - 0.75	B								(MADE GROUND)	
											Loose dark grey slightly clayey sandy angular to subrounded GRAVEL. of concrete, brick and mudstone. (MADE GROUND)	
	▼							(1.30)				
		1.00	D									1
		1.00 - 1.20	ES									
		1.20	SPT(C)	N=8 (13,10/2,2,2,2)								
		1.20 - 1.65	B									
							1.50		5.58		Firm dark brown, mottled grey brown silty CLAY. (TIDAL FLAT DEPOSITS)	
		1.70	ES									
		2.00	D									2
		2.40 - 2.75	B									
											Becoming very soft blue grey mottled brown below 2.5 m.	
		3.00	SPT(S)	N=2 (1,0/1,0,1,0)								3
		3.00 - 3.45	B									
		3.00 - 3.45	D									
											Becoming blue grey below 3.3 m.	
		4.00	D									4
											Becoming dark blue grey below 4 m.	
		4.30 - 4.75	B									
		4.50	ES									
		5.00	D									5
		5.00 - 6.00	P									
								(10.80)				
		6.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								6
		6.00 - 6.45	B									
		6.00 - 6.45	D									
		7.00	D									7
		8.00	D									8
		8.00	ES									
		9.00	D									9
		9.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								
		9.00 - 9.45	B									
		9.01 - 9.45	D									
		10.00	D									10
		10.00 - 11.00	P									
					Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.30m. Rotary open hole drilling 15.3 - 17.5 m. Air mist rotary coring 17.5 - 50.0 m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.3m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.30	0.90		0.80	02:45	0.60	1.00
RC	15.30	50.00	14.00	13.70	11.50	01:00	15.00	15.30

BOREHOLE LOG

Borehole No. **BHM4CANA030**

Sheet 2 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 26/01/2016 - 10/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332804	Drilling Method:	48.50m
Location:	Newport	Northing:	185513	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.08	Logged By: JA	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	15.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		11.00	D									11
		12.00	D									12
		12.00	ES									
		12.00	SPT(S)	N=14 (1,0/1,3,5,5)			12.30		-5.22		Firm to stiff red brown slightly gravelly silty CLAY. Gravel is angular to subangular of mudstone. (Weathering Grade IVa) (WEATHERED MERCIA MUDSTONE)	
		12.01 - 12.45	D									
		13.00	B									13
								(3.00)				
		14.00	D								*Becoming grey gravelly CLAY below 14 m.*	14
		15.00	D									15
		15.00	SPT(S)	50 (25 for 50mm/50 for 60mm)								
		15.00 - 15.30	B				15.30		-8.22		No Recovery. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	
		15.30	SPT(C)	50 (25 for 60mm/50 for 60mm)								
		15.00 - 17.50			TCR: 0 SCR: 0 RQD: 0							16
								(4.70)				17
		17.50 - 18.50			TCR: 0 SCR: 0 RQD: 0							18
		18.50	SPT(C)	N=59 (4,7/7,19,17,16)								
		18.50 - 20.00			TCR: 0 SCR: 0 RQD: 0							19
		20.00	SPT(C)	100 (11,14/100 for 160mm)	Core	Fractures	20.00		-12.92		Continued on next sheet	20

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.30m. Rotary open hole drilling 15.3 - 17.5 m. Air mist rotary coring 17.5 - 50.0 m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.3m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.30	0.90		0.80	02:45	0.60	1.00
RC	15.30	50.00	14.00	13.70	11.50	01:00	15.00	15.30

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA030**

Sheet 3 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 26/01/2016 - 10/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332804	Drilling Method:	48.50m
Location:	Newport	Northing:	185513	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.08	Logged By: JA	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	15.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
								(0.45)			Strong greyish green crystalline MUDSTONE with vugs. Recovered as coarse gravel. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	
							20.45		-13.37		Assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	
		20.00 - 21.50			TCR: 30 SCR: 0 RQD: 0			(1.05)				21
		21.50	SPT(C)	N=71 (10,9/17,16,17,21)			21.50		-14.42		Strong greyish green crystalline MUDSTONE with vugs. Recovered as coarse gravel. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	
		21.50 - 23.00			TCR: 92 SCR: 60 RQD: 36			(1.50)			*Very thin bed of fine gravel at 22.15 m.*	22
		23.00	SPT(C)	100 (19,6/100 for 170mm)		Min: 50 Avg: 100 Max: 190	23.00		-15.92		*Very thin bed of fine gravel at 22.85 m.*	
								(0.50)			Very weak thinly laminated reddish brown MUDSTONE. Recovered as soft slightly gravelly sandy clay. (Weathering Grade IVa) (WEATHERED MERCIA MUDSTONE)	23
		23.00 - 24.50			TCR: 33 SCR: 13 RQD: 0		23.50		-16.42		Assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	
								(1.00)				24
		24.50	SPT(C)	100 (25 for 75mm/100 for 80mm)			24.50		-17.42		Extremely weak reddish brown MUDSTONE. Recovered as soft sandy clay. (Weathering Grade IVa) (WEATHERED MERCIA MUDSTONE)	
		24.50 - 26.00			TCR: 53 SCR: 43 RQD: 22			(0.80)				25
							25.30		-18.22		Assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	
								(0.70)				
		26.00	SPT(C)	100 (23,2/100 for 85mm)			26.00		-18.92		Extremely weak reddish brown MUDSTONE. Recovered as soft sandy clay. (Weathering Grade IVa) (WEATHERED MERCIA MUDSTONE)	26
								(0.60)				
		26.00 - 27.50			TCR: 88 SCR: 56 RQD: 29		26.60		-19.52		Very weak thinly laminated reddish brown MUDSTONE. with frequent greyish green reduction spots. Fractures are very closely to closely spaced 0 - 10 degrees rough planar. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	
						Min: 30 Avg: 120 Max: 160					*Very thin bed of gravel at 27 m. From 27.5-27.66 m recovered as gravel.*	27
		27.50	SPT(C)	100 (25 for 75mm/100 for 30mm)							*Extremely weak at 27.3 - 27.5 m.*	
											Recovered as gravel 27.79 - 27.82 m.	
								(2.90)			*Recovered as gravel at 27.5 - 27.66 m.*	28
		27.50 - 29.00			TCR: 73 SCR: 59 RQD: 25						*Recovered as gravel.*	
											Medium strong.	
		29.00	SPT(C)	100 (25 for 75mm/100 for 20mm)								29
					TCR: 35 SCR: 20 RQD: 8		29.50		-22.42		Assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	
		29.00 - 30.50						(1.00)				
					Core	Fractures					Continued on next sheet	30

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.30m. Rotary open hole drilling 15.3 - 17.5 m. Air mist rotary coring 17.5 - 50.0 m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.3m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.30	0.90		0.80	02:45	0.60	1.00
RC	15.30	50.00	14.00	13.70	11.50	01:00	15.00	15.30

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA030**

Sheet 4 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 26/01/2016 - 10/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332804	Drilling Method:	48.50m
Location:	Newport	Northing:	185513	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.08	Logged By: JA	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	15.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		30.50	SPT(C)	100 (25 for 75mm/100 for 105mm)			30.50		-23.42		Very weak reddish brown MUDSTONE. Recovered as gravel. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	
								(0.50)				
							31.00		-23.92		Assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	31
		30.50 - 32.00			TCR: 35 SCR: 20 RQD: 13							
								(1.00)				
		32.00	SPT(C)	100 (13,7/100 for 170mm)			32.00		-24.92		Very weak thinly laminated reddish brown MUDSTONE. with frequent greyish green reduction spots. Fractures are very closely to closely spaced 0 - 10 degrees rough planar. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	32
		32.00 - 33.50			TCR: 87 SCR: 73 RQD: 42	Min: 20 Avg: 100 Max: 190					*Very thin bed of gravel at 32.2 m.* *From 32.45 - 34.05 m with closely to medium spaced very thin beds of gravel.*	33
		33.50	SPT(C)	100 (25 for 75mm/100 for 30mm)								
		33.50 - 35.00			TCR: 99 SCR: 73 RQD: 28							34
											At 34.5 - 34.8 near vertical fracture with a rough planar surface.	
		35.00	SPT(C)	100 (25 for 75mm/100 for 10mm)				(6.00)			*From 35.0 m becoming weak to medium strong. Fractures becoming closely to medium spaced.*	35
		35.00 - 36.50			TCR: 83 SCR: 63 RQD: 31	Min: 50 Avg: 150 Max: 240					*At 35.4 - 35.5 m vertical to 80 degrees dipping fracture.*	
												36
		36.50	SPT(C)	100 (25 for 75mm/100 for 85mm)							*At 36.35 m white gypsum crystals on fracture surface.* *From 36.56 - 36.67 m. Recovered as gravel.*	
		36.50 - 38.00			TCR: 65 SCR: 57 RQD: 19							37
							38.00		-30.92		*From 37.9 - 37.95 m. Recovered as gravel.*	38
						Min: 30 Avg: 100 Max: 140					Very weak reddish brown MUDSTONE. Recovered as sandy clayey gravel. Sand is fine. (WEATHERED MERCIA MUDSTONE)	
		38.00 - 39.50			TCR: 62 SCR: 31 RQD: 13			(1.50)			*38 - 39.1 m. Recovered as sandy clayey GRAVELS. Sand is fine. Core is wet.*	39
		39.50	SPT(C)	100 (25 for 75mm/100 for 105mm)			39.50		-32.42		Extremely weak reddish brown MUDSTONE. Recovered as sandy clay. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	
								(0.65)				
					Core	Fractures					Continued on next sheet	40

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.30m. Rotary open hole drilling 15.3 - 17.5 m. Air mist rotary coring 17.5 - 50.0 m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.3m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.30	0.90		0.80	02:45	0.60	1.00
RC	15.30	50.00	14.00	13.70	11.50	01:00	15.00	15.30

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA030**

Sheet 5 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 26/01/2016 - 10/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332804	Drilling Method:	48.50m
Location:	Newport	Northing:	185513	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.08	Logged By: JA	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.00
150	15.00
200	2.00

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		39.50 - 41.00			TCR: 43 SCR: 38 RQD: 15		40.15	(0.85)	-33.07		*From 39.5 - 40.5 m. Recovered as sandy CLAY.* Assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	
		41.00 - 42.50			TCR: 63 SCR: 43 RQD: 22		41.00	(2.10)	-33.92		Very weak thinly laminated reddish brown MUDSTONE. with frequent greyish green reduction spots. Fractures are very closely to closely spaced 0 - 10 degrees rough planar. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) *From 41.7 - 42.3 m with medium spaced very thin beds of gravel.*	41
		42.50	SPT(C)	100 (25 for 75mm/100 for 30mm)							*From 42.5 - 42.75 m recovered as sandy, clayey, angular fine gravel.*	42
		42.50 - 44.00			TCR: 38 SCR: 13 RQD: 7		43.10	(0.90)	-36.02		Assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	43
		44.00 - 45.50			TCR: 34 SCR: 19 RQD: 19		44.00	(0.50)	-36.92		Very weak thinly laminated reddish brown MUDSTONE. with frequent greyish green reduction spots. Fractures are very closely to closely spaced 0 - 10 degrees rough planar. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	44
		45.50	SPT(C)	100 (25 for 75mm/100 for 10mm)			44.50	(1.00)	-37.42		Assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	45
		45.50 - 47.00			TCR: 36 SCR: 0 RQD: 0		45.50	(0.60)	-38.42		Extremely weak reddish brown MUDSTONE with calcite crystals (30 mm). Recovered as soft sandy clay. Becoming gravelly with depth. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	46
							46.10	(0.90)	-39.02		Assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	
		47.00 - 48.50			TCR: 29 SCR: 0 RQD: 0		47.00	(0.50)	-39.92		Weak reddish brown MUDSTONE with rare greyish green reduction spots. Recovered as angular to subangular cobbles. (Weathering Grade I) (WEATHERED MERCIA MUDSTONE)	47
							47.50	(1.00)	-40.42		Very weak thinly laminated reddish brown MUDSTONE with frequent greyish green reduction spots and widely spaced calcite bands. Fractures are closely spaced horizontal rough planar. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	48
		48.50	SPT(C)	100 (25 for 75mm/100 for 20mm)							End of Borehole at 48.500m	
		48.50 - 50.00			TCR: 66 SCR: 54 RQD: 50							49
					Core	Fractures						50

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.30m. Rotary open hole drilling 15.3 - 17.5 m. Air mist rotary coring 17.5 - 50.0 m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.3m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.30	0.90		0.80	02:45	0.60	1.00
RC	15.30	50.00	14.00	13.70	11.50	01:00	15.00	15.30

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA031**

Sheet 1 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 27/01/2016 - 01/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332713	Drilling Method:	50.00m
Location:	Newport	Northing:	185487	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.72	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	21.00
150	15.20
200	1.60

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							0.00		7.72		Reddish brown slightly clayey gravelly SAND. Gravel is angular to subrounded of brick, clinker and concrete. (MADE GROUND)	
		0.40	ES					(0.60)				
		0.50 - 1.00	B				0.60		7.12		Medium dense brown sandy GRAVEL of brick, coal, clinker and concrete. Sand is angular to subrounded. (MADE GROUND)	
		1.10	ES					(0.80)				1
		1.20	SPT(C)	N=12 (2,3/3,3,3,3)								
		1.20 - 1.60	B				1.40		6.32		Firm brown mottled grey CLAY with frequent plant fibres and rootlets. (TIDAL FLAT DEPOSITS)	
		1.60 - 2.00	B					(0.30)				
	▼	1.70	ES				1.70		6.02		Firm grey silty CLAY with occasional plant fibres. (TIDAL FLAT DEPOSITS)	
		2.00	ES									2
		2.50 - 3.00	B								*Becoming soft at 2.5 m.*	
		3.00	ES					(2.80)				3
	▽											
		4.00	SPT(C)	1 (1 for 225mm/1 for 225mm)								4
		4.00 - 4.45	D									
							4.50		3.22		Very soft dark grey silty CLAY. (TIDAL FLAT DEPOSITS)	
												5
												6
		6.50 - 7.00	B									
		7.00	ES									7
		7.00	SPT(C)	0 (1 for 450mm/0 for 0mm)				(9.00)				
		7.00 - 7.45	D									
												8
												9
		10.00	SPT(C)	0 (1 for 450mm/0 for 0mm)							Continued on next sheet	10

Core | Fractures

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.50m. Air mist rotary cored 15.5 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 14.4m. No anomalies encountered.

Type: Method	From (m)	To (m)
CP	0.00	15.50
RC	15.50	50.00

Groundwater: Depth Strike (m)	Depth Casing (m)	Level After 20 Mins
3.50	2.50	1.75

Chiselling: Duration (hh:mm)	Top Depth (m)	Base Depth (m)
01:30	0.70	1.10
01:00	15.20	15.50

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA031**

Sheet 2 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 27/01/2016 - 01/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332713	Drilling Method:	50.00m
Location:	Newport	Northing:	185487	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.72	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	21.00
150	15.20
200	1.60

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		10.00 - 10.45	D									
		11.00	ES									11
		12.30 - 12.75	UT									12
		12.75 - 12.90	D									
		13.50 - 14.00	B				13.50		-5.78		Soft dark grey gravelly CLAY. Gravel is subangular to subrounded and coarse. (TIDAL FLAT DEPOSITS)	13
								(0.90)				
		14.50 - 15.00	B				14.40		-6.68		Firm to stiff reddish brown mottled grey CLAY. (Weathering Grade IVb) (WEATHERED MERCIA MUDSTONE)	14
								(0.80)				
											From 15 - 17.Recovered as gravels	15
		15.30 - 15.50	B		TCR: 40 SCR: 0 RQD: 0		15.20	(0.30)	-7.48		Stiff reddish brown CLAY with weak mudstone lithroelics. (Weathering Grade IVa) (WEATHERED MERCIA MUDSTONE)	
		15.00 - 16.00					15.50		-7.78		Extremely weak reddish brown thinly laminated MUDSTONE with green grey reduction spots. Recovered as gravel. (WEATHERED MERCIA MUDSTONE)	
		15.50	SPT(C)	32 (18 for 75mm/32 for 65mm)				(0.50)				
		15.50 - 15.64	D									
		16.00	SPT(C)	100 (25 for 95mm/100 for 170mm)			16.00		-8.28		No recovery. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	16
		16.00 - 17.00			TCR: 0 SCR: 0 RQD: 0			(1.00)				
		17.00	SPT(C)	100 (25 for 75mm/100 for 115mm)			17.00		-9.28		Extremely weak reddish brown thinly laminated MUDSTONE with green grey reduction spots. Recovered as gravel. (WEATHERED MERCIA MUDSTONE)	17
		17.00 - 18.50			TCR: 93 SCR: 51 RQD: 0			(1.00)				
							18.00		-10.28		Very weak reddish brown thinly laminated MUDSTONE with green grey reduction spots of various sizes. Fractures are very closely to closely spaced from horizontal to 5 degrees dipping with rough stepped or planar surfaces, with calcite infill locally. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE)	18
		18.50	SPT(C)	100 (25 for 85mm/100 for 105mm)		Min: 30 Avg: 100 Max: 190					*From 18.1 - 18.17 m Recovered as gravels* *At 18.8 m thin bed of weak greyish green mudstone.*	19
		18.50 - 20.00			TCR: 65 SCR: 41 RQD: 21						*At 19.1 - 19.3 m thin bed of red gravelly clay.*	
		20.00	SPT(C)	100 (25 for 20mm/100 for 75mm)							Continued on next sheet	20
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.50m. Air mist rotary cored 15.5 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 14.4m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.50	3.50	2.50	1.75	01:30	0.70	1.10
RC	15.50	50.00				01:00	15.20	15.50

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA031**

Sheet 3 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 27/01/2016 - 01/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332713	Drilling Method:	50.00m
Location:	Newport	Northing:	185487	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.72	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	21.00
150	15.20
200	1.60

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		20.00 - 21.50			TCR: 100 SCR: 80 RQD: 49						*From 20.0 - 20.1 m recovered as gravel.*	
		21.50	SPT(C)	100 (25 for 40mm/100 for 85mm)								21
		21.50 - 23.00			TCR: 69 SCR: 43 RQD: 18						*From 22.9 - 24.0 m with closely to medium spaced thin to medium beds of gravel.*	22
		23.00	SPT(C)	100 (25 for 20mm/100 for 95mm)							*From 22.6 - 23.0 m medium bed of soft reddish brown sandy gravelly clay.*	23
		23.00 - 24.50			TCR: 100 SCR: 73 RQD: 42	Min: 50 Avg: 120 Max: 140		(9.50)			*25.3 - 25.8 m gypsum crystals present on surface of fracture.* *From 24.05 - 24.15 m recovered as gravel.*	24
		24.50	SPT(C)	100 (25 for 105mm/100 for 150mm)								25
		24.50 - 26.00			TCR: 57 SCR: 14 RQD: 6						*From 25.3 - 25.8 m recovered as gravel.*	
		26.00	SPT(C)	100 (25 for 15mm/100 for 30mm)							*At 26.3 m closely to medium spaced fractures.*	26
		26.00 - 27.50			TCR: 100 SCR: 85 RQD: 46	Min: 50 Avg: 150 Max: 230					*At 26.7 m black discoloration and gypsum crystals present on fracture surface.* *From 27.1 - 27.3 m recovered as gravel.*	27
		27.50	SPT(C)	100 (25 for 10mm/100 for 40mm)			27.50		-19.78		Very weak brown MUDSTONE with closely spaced thin beds of angular gravel. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) *From 27.5 - 27.65 m recovered as clayey angular to subrounded clayey gravel.*	28
		27.50 - 29.00			TCR: 63 SCR: 45 RQD: 29	Min: 10 Avg: 60 Max: 170		(1.50)				
		29.00	SPT(C)	100 (25 for 40mm/100 for 125mm)			29.00		-21.28		Very weak reddish brown MUDSTONE with rare greyish green reduction spots (up to 5mm in size). Fractures are closely spaced horizontal with a clayey, angular to subangular fine gravel infill. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE) *From 29.0 - 29.7 m very closely spaced very thin beds of angular to subangular fine to medium gravel.*	29
		29.00 - 30.50			TCR: 73 SCR: 30 RQD: 0							
					Core	Fractures					Continued on next sheet	30

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.50m. Air mist rotary cored 15.5 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 14.4m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.50	3.50	2.50	1.75	01:30	0.70	1.10
RC	15.50	50.00				01:00	15.20	15.50

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA031**

Sheet 4 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 27/01/2016 - 01/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332713	Drilling Method:	50.00m
Location:	Newport	Northing:	185487	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.72	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	21.00
150	15.20
200	1.60

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		30.50	SPT(C)	100 (25 for 50mm/100 for 150mm)				(2.40)			*From 30.6 - 31.4 m recovered as clayey angular gravel and cobbles.*	31
		30.50 - 32.00			TCR: 57 SCR: 17 RQD: 6		31.40		-23.68		Assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	
		32.00	SPT(C)	100 (25 for 85mm/100 for 170mm)			32.00	(0.60)	-24.28		Extremely weak reddish brown MUDSTONE. Recovered as clayey angular gravel with some cobbles. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	32
		32.00 - 33.50			TCR: 57 SCR: 6 RQD: 0		32.90	(0.90)	-25.18		No recovery. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	33
		33.50	SPT(C)	100 (25 for 50mm/100 for 170mm)								34
		33.50 - 36.00			TCR: 0 SCR: 0 RQD: 0			(3.10)				
		35.00	SPT(C)	100 (25 for 75mm/100 for 190mm)								35
		36.00	SPT(C)	100 (25 for 15mm/100 for 30mm)			36.00		-28.28		Very weak reddish brown MUDSTONE with closely to medium spaced thin beds of clayey angular to subrounded gravel. Fractures are horizontal medium spaced. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	36
		36.00 - 37.50			TCR: 98 SCR: 46 RQD: 13	Min: 10 Avg: 50 Max: 80						
		37.50	SPT(C)	100 (25 for 25mm/100 for 50mm)								37
		37.50 - 39.00			TCR: 72 SCR: 56 RQD: 40	Min: 20 Avg: 60 Max: 170						38
		39.00	SPT(C)	100 (25 for 30mm/100 for 50mm)								39
		39.00 - 40.50			TCR: 95 SCR: 53 RQD: 17							
					Core	Fractures					Continued on next sheet	40

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.50m. Air mist rotary cored 15.5 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 14.4m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.50	3.50	2.50	1.75	01:30	0.70	1.10
RC	15.50	50.00				01:00	15.20	15.50

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA031**

Sheet 5 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 27/01/2016 - 01/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332713	Drilling Method:	50.00m
Location:	Newport	Northing:	185487	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.72	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	21.00
150	15.20
200	1.60

Depth (m)	Type	Results	Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Stratum Description
40.50	SPT(C)	100 (25 for 45mm/100 for 115mm)						
40.50 - 42.00			TCR: 85 SCR: 43 RQD: 40	Min: 30 Avg: 100 Max: 220				
42.00	SPT(C)	100 (25 for 35mm/100 for 120mm)						*From 42.0 m with occasional green reduction spots. From 42.1 - 42.4 recovered as slightly sandy clay.*
42.00 - 43.50			TCR: 99 SCR: 63 RQD: 47			(9.00)		
43.50	SPT(C)	100 (25 for 20mm/100 for 75mm)						
43.50 - 45.00			TCR: 73 SCR: 27 RQD: 22					
45.00	SPT(C)	100 (25 for 10mm/100 for 45mm)			45.00		-37.28	No recovery. Geology is inferred. (MERCIA MUDSTONE)
45.00 - 46.00			TCR: 0 SCR: 0 RQD: 0	Min: 20 Avg: 90 Max: 170		(1.00)		
46.00	SPT(C)	100 (25 for 35mm/100 for 150mm)			46.00		-38.28	Reddish brown MUDSTONE Recovered as slightly silty, slightly clayey, sandy gravel. (Weathering Grade III (MERCIA MUDSTONE)
						(0.60)		
46.00 - 47.50			TCR: 100 SCR: 33 RQD: 21		46.60		-38.88	Very weak reddish brown MUDSTONE with occasional green reduction spots, with closely to medium spaced thin beds of sandy gravel with occasional green reduction spots. (Weathering Grade II) (MERCIA MUDSTONE)
						(0.90)		
47.50	SPT(C)	100 (25 for 50mm/100 for 130mm)			47.50		-39.78	Reddish brown MUDSTONE Recovered as slightly silty sandy gravel. (Weathering Grade III) (MERCIA MUDSTONE)
47.50 - 48.50			TCR: 80 SCR: 0 RQD: 0			(1.00)		
48.50	SPT(C)	100 (25 for 10mm/100 for 25mm)			48.50		-40.78	Very weak to weak reddish brown MUDSTONE with occasional reduction spots. Fractures are horizontal, closely spaced with a slightly clayey, gravel and calcite infill. (Weathering Grade II) (MERCIA MUDSTONE)
48.50 - 50.00			TCR: 93 SCR: 64 RQD: 59	Min: 30 Avg: 150 Max: 210		(1.50)		*From 48.5 - 48.7 m Core recovered as gravel.*
50.00	SPT(C)	100 (25 for 20mm/100 for 30mm)						

Continued on next sheet

Core | Fractures

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.50m. Air mist rotary cored 15.5 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 14.4m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.50	3.50	2.50	1.75	01:30	0.70	1.10
RC	15.50	50.00				01:00	15.20	15.50

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA031**

Sheet 6 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 27/01/2016 - 01/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332713	Drilling Method:	50.00m
Location:	Newport	Northing:	185487	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.72	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	21.00
150	15.20
200	1.60

Well	Water Strike (s)	Samples & In Situ Testing			Rotary Coring		Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		Depth (m)	Type	Results	Core (%)	Fractures (mm)					
											From 49.9 - 50.0 m Recovered as gravel.	
											End of Borehole at 50.000m	
												51
												52
												53
												54
												55
												56
												57
												58
												59
					Core	Fractures						60

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 15.50m. Air mist rotary cored 15.5 - 50.0m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 14.4m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	15.50	3.50	2.50	1.75	01:30	0.70	1.10
RC	15.50	50.00				01:00	15.20	15.50

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA032**

Sheet 1 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 04/02/2016 - 24/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332721	Drilling Method:	49.70m
Location:	Newport	Northing:	185513	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.83	Logged By: NR	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.80
150	16.00
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		0.00	ES				0.00	(0.10) (0.05)	6.83		Red brick paving stones.	
							0.10	(0.15)	6.73		(MADE GROUND)	
		0.30 - 0.55	B				0.15		6.68		Asphalt.	
		0.50	ES				0.30	(0.30)	6.53		(MADE GROUND)	
	▼	0.60 - 1.00	B				0.60		6.23		Weathered red and yellow brick.	
								(0.50)			(MADE GROUND)	
		1.00	ES								Dark grey silty, sandy angular to sub-angular, GRAVEL of concrete and red brick with occasional plastic.	
	▽	1.10 - 1.20	B				1.10		5.73		(MADE GROUND)	1
		1.20	SPT(S)	N=8 (1,1/2,2,2,2)							Grey slightly silty, sandy, angular to subangular GRAVEL of white grey crystalline materials with rare brick and glass.	
		1.20 - 1.65	B								(MADE GROUND)	
											Firm brown mottled grey, silty CLAY.	
								(1.20)			(TIDAL FLAT DEPOSITS)	
		2.00	D									2
		2.00	ES									
		2.00 - 2.45	UT				2.30		4.53			
											Very soft grey silty CLAY with occasional pockets of pseudo-fibrous peat.	
								(1.30)			(TIDAL FLAT DEPOSITS)	
		3.00	D									3
		3.00	ES									
		3.60 - 3.95	B				3.60		3.23			
											Very soft grey and dark grey slightly sandy silt CLAY. Sand is fine.	
		4.00	D								(TIDAL FLAT DEPOSITS)	
		4.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								4
		4.00 - 4.45	B									
		5.00	D									5
		6.00	D									
		6.00	ES									6
		6.70 - 6.95	B					(8.90)			*From 6.7 m sandy. Sand is fine to medium.*	
		7.00	D									
		7.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								7
		7.00 - 7.45	B									
		8.00	D									8
		9.00	D									9
		10.00	D									
		10.00	ES									10
					Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.20m. Air mist and water flush rotary cored 16.2 - 49.7m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.5m. No anomalies encountered. HDP testing undertaken within bedrock.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.20	1.10		0.70	01:00	16.00	16.20
RC	16.20	49.70	12.70	12.20	12.20			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA032**

Sheet 2 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 04/02/2016 - 24/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332721	Drilling Method:	49.70m
Location:	Newport	Northing:	185513	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.83	Logged By: NR	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.80
150	16.00
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		10.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								
		10.00 - 10.45	B									
		11.00	D									11
		12.00	D									12
	▼	12.50 - 12.95	B				12.50		-5.67		Very soft dark grey slightly gravelly, silt sandy CLAY. Gravel is angular to subangular mudstone. (Weathering Grade V) (WEATHERED MERCIA MUDSTONE)	
		13.00	D					(0.80)				13
		13.00	SPT(S)	N=35 (1,2/4,8,10,13)								
		13.00 - 13.45	B				13.30		-6.47		Red mottled MUDSTONE. Recovered as slightly silty, slightly sandy, angular to subangular gravel. (Weathering Grade IVa) (WEATHERED MERCIA MUDSTONE)	
		13.50 - 13.95	B									
		14.00	D									14
								(2.90)				15
		15.50 - 15.95	B									
		16.00	SPT(C)	50 (25 for 85mm/50 for 75mm)								16
		16.00 - 16.20	B				16.20		-9.37		Weak greenish grey moderately to highly weathered SILTSTONE. Discontinuities are horizontal, very closely to closely spaced, undulating, smooth, open, clean. (WEATHERED MERCIA MUDSTONE)	
		16.20	SPT(C)	50 (25 for 50mm/50 for 40mm)								
		16.20 - 17.20			TCR: 100 SCR: 16 RQD: 0	Min: 20 Avg: 50 Max: 130						
		17.20	SPT(C)	80 (25,37/80 for 168mm)				(1.75)			*From 17.0 - 17.25 m recovered as clayey, angular, fine to coarse gravel.*	17
		17.20 - 17.90			TCR: 93 SCR: 26 RQD: 17							
							17.95		-11.12		Very weak completely weathered MUDSTONE. Recovered as angular to subangular gravel. (Weathering Grade IVa) (WEATHERED MERCIA MUDSTONE)	18
								(0.55)				
		17.90 - 19.30			TCR: 100 SCR: 33 RQD: 29	Min: 50 Avg: 90 Max: 320	18.50		-11.67		Very weak reddish brown grey occasionally mottled, moderately weathered MUDSTONE. Discontinuities are subhorizontal (20 degrees), very closely to medium spaced, undulating, smooth, typically open and infilled with clayey gravel. (Weathering Grade III) (MERCIA MUDSTONE)	19
								(0.80)				
		19.30 - 19.80			TCR: 50 SCR: 0 RQD: 0		19.30		-12.47		Red brown occasionally mottled grey completely weathered MUDSTONE. Recovered as clayey, angular gravel. (Weathering Grade IVa) (WEATHERED MERCIA MUDSTONE)	
					Core	Fractures					Continued on next sheet	20

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.20m. Air mist and water flush rotary cored 16.2 - 49.7m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.5m. No anomalies encountered. HDP testing undertaken within bedrock.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.20	1.10		0.70	01:00	16.00	16.20
RC	16.20	49.70	12.70	12.20	12.20			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA032**

Sheet 3 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 04/02/2016 - 24/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332721	Drilling Method:	49.70m
Location:	Newport	Northing:	185513	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.83	Logged By: NR	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.80
150	16.00
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		19.80 - 20.80			TCR: 100 SCR: 2 RQD: 0			(1.45)				
		20.80	SPT(C)	100 (17,25/100 for 128mm)			20.75		-13.92		Weak reddish brown occasionally mottled grey slightly to moderately weathered MUDSTONE. Discontinuities are horizontal, very closely to medium spaced, undulating, smooth, open and clean or infilled with clayey gravel. (Weathering Grade II) (MERCIA MUDSTONE)	21
		20.80 - 21.80			TCR: 75 SCR: 57 RQD: 48							
		21.80	HPD1								*Grey from 21.85 - 22.1 m.*	22
		21.80 - 22.80			TCR: 100 SCR: 64 RQD: 52							
		22.80 - 23.80			TCR: 100 SCR: 71 RQD: 47							23
		23.80	SPT(C)	100 (25,37/100 for 190mm)		Min: 50 Avg: 70 Max: 230		(5.95)				24
		23.80 - 25.30			TCR: 100 SCR: 60 RQD: 49							
		25.30	SPT(C)	100 (25,34/100 for 161mm)								25
		25.30 - 26.80			TCR: 100 SCR: 52 RQD: 41							26
		26.80	SPT(C)	100 (25,34/100 for 158mm)			26.70		-19.87		Very weak highly to completely weathered, reddish brown with occasionally mottled grey MUDSTONE. Residual discontinuities horizontal, closely to widely spaced, undulating, smooth, tight or open, clean. (Weathering Grade III) (MERCIA MUDSTONE)	27
		26.80 - 27.90			TCR: 100 SCR: 62 RQD: 55							
		27.90	SPT(C)	108 (25,35/108 for 160mm)								28
		27.90 - 28.90			TCR: 100 SCR: 89 RQD: 84	Min: 50 Avg: 300 Max: 800		(6.30)				
		29.10	HPD2									29
		28.90 - 29.90			TCR: 100 SCR: 87 RQD: 80							
		29.90	SPT(C)	35 (25,40/35 for 47mm)								
					Core	Fractures					Continued on next sheet	30

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.20m. Air mist and water flush rotary cored 16.2 - 49.7m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.5m. No anomalies encountered. HDP testing undertaken within bedrock.

Type: Method	From (m)	To (m)
CP	0.00	16.20
RC	16.20	49.70

Groundwater: Depth Strike (m)	Depth Casing (m)	Level After 20 Mins
1.10	12.20	0.70
12.70		12.20

Chiselling: Duration (hh:mm)	Top Depth (m)	Base Depth (m)
01:00	16.00	16.20

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA032**

Sheet 4 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 04/02/2016 - 24/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332721	Drilling Method:	49.70m
Location:	Newport	Northing:	185513	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.83	Logged By: NR	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.80
150	16.00
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		29.90 - 31.40			TCR: 100 SCR: 60 RQD: 43							31
		31.40 - 32.40			TCR: 90 SCR: 52 RQD: 37	Min: 20 Avg: 300 Max: 800						32
		32.40 - 33.90			TCR: 40 SCR: 14 RQD: 9		33.00	(0.90)	-26.17		Assumed zone of core loss. Geology is inferred. (MERCIA MUDSTONE)	33
		33.90	SPT(C)	95 (17,22/95 for 158mm)			33.90		-27.07		Very weak highly to completely weathered reddish brown, occasionally mottled grey MUDSTONE. Residual discontinuities horizontal, closely to widely spaced, undulating, smooth, tight or open, clean.. (Weathering Grade III) (MERCIA MUDSTONE)	34
		33.90 - 34.50			TCR: 50 SCR: 0 RQD: 0							
		34.50 - 34.90			TCR: 100 SCR: 80 RQD: 80							
		34.90	SPT(C)	125 (17,8/125 for 246mm)								35
		34.90 - 35.40			TCR: 60 SCR: 0 RQD: 0			(3.40)				
		36.00	HPD3									36
		35.40 - 36.90			TCR: 83 SCR: 50 RQD: 41	Min: 50 Avg: 300 Max: 500						
		36.90	SPT(C)	100 (17,25/100 for 140mm)								37
		36.90 - 38.40			TCR: 87 SCR: 53 RQD: 46		37.30		-30.47		Weak reddish brown mottled grey moderately to highly weathered MUDSTONE. Discontinuities are horizontal and vertical. Closely to widely spaced undulating smooth tight or open clean. (MERCIA MUDSTONE)	38
		38.40 - 39.40			TCR: 100 SCR: 29 RQD: 0			(4.90)				39
		39.40	SPT(C)	100 (5,23/100 for 158mm)								
					Core	Fractures					Continued on next sheet	40

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.20m. Air mist and water flush rotary cored 16.2 - 49.7m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.5m. No anomalies encountered. HDP testing undertaken within bedrock.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.20	1.10		0.70	01:00	16.00	16.20
RC	16.20	49.70	12.70	12.20	12.20			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA032**

Sheet 5 of 5

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 04/02/2016 - 24/02/2016	Final Depth:
Project No:	JFR8703	Easting:	332721	Drilling Method:	49.70m
Location:	Newport	Northing:	185513	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.83	Logged By: NR	1:50

Casing Diameter (mm)	Casing Depth (m)
130	20.80
150	16.00
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		39.40 - 40.90			TCR: 100 SCR: 50 RQD: 21							
		40.90	SPT(C)	91 (22,38/91 for 158mm)							*Weak moderately weathered.*	41
		42.20	SPT(C)	102 (17,23/102 for 228mm)			42.20		-35.37		Extremely to very weak reddish brown weathered MUDSTONE with rare greenish grey reduction spots. (Weathering Grade II) (MERCIA MUDSTONE)	42
		42.20 - 43.30			TCR: 81 SCR: 15 RQD: 10			(1.10)			*from 42.2 - 42.41 recovered as soft sandy clay.* *Mudstone is gravelly and clayey at 42.5 m.*	43
		43.30	SPT(C)	64 (13,20/64 for 154mm)		Min: 30 Avg: 130 Max: 250					Weak reddish brown MUDSTONE with occasional greenish grey reduction spots, and closely spaced calcite veins 1mm to 60mm wide. (Weathering Grade I) (MERCIA MUDSTONE)	
		43.30 - 44.30			TCR: 72 SCR: 49 RQD: 49							44
		44.30 - 44.90			TCR: 100 SCR: 50 RQD: 50							
		44.60	HPD4									45
		44.90 - 45.50			TCR: 90 SCR: 63 RQD: 40							
		45.50	SPT(C)	100 (11,24/100 for 125mm)								46
		45.50 - 47.50			TCR: 91 SCR: 82 RQD: 65	Min: 10 Avg: 100 Max: 210						
		46.80	HPD5									47
		47.50	SPT(C)	100 (25 for 12mm/100 for 68mm)			47.50		-40.67		*Recovered as gravel at 47.5 - 47.7 m.*	
											Recovered as gravel at 47.9 m.	48
		47.50 - 49.70			TCR: 95 SCR: 55 RQD: 36	Min: 10 Avg: 140 Max: 300		(2.20)				49
											Recovered as clayey cobbles at 49.6 m.	
											End of Borehole at 49.700m	50
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.20m. Air mist and water flush rotary cored 16.2 - 49.7m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 50.0 - 0.5m and concrete 0.5 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.5m. No anomalies encountered. HDP testing undertaken within bedrock.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	16.20	1.10		0.70	01:00	16.00	16.20
RC	16.20	49.70	12.70	12.20	12.20			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA033**

Sheet 1 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/02/2016 - 22/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332594	Drilling Method:	50.00m
Location:	Newport	Northing:	185495	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.31	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	22.00
150	21.80
200	1.50

Well	Water Strike (s)	Depth (m)	Type	Results	Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		0.05 - 0.50	B				0.00		7.31		Red, grey mottled brown gravelly SAND with occasional cobbles. Gravels and cobbles are angular to sub-rounded of brick, concrete and paving slabs. (MADE GROUND)	
		0.30	ES					(0.80)				
		0.80 - 1.15	B				0.80		6.51		Very soft to firm orangish brown CLAY with frequent large plant fibres and roots. (TIDAL FLAT DEPOSITS)	
		1.00	ES									1
		1.20	SPT(S)	N=3 (1,0/1,0,1,1)								
		1.20 - 1.65	B									
		1.20 - 1.65	D					(1.60)				
		2.00	D									2
		2.40 - 2.85	B				2.40		4.91		Soft to very soft dark grey silty CLAY. Occasional pockets of black organic matter. (TIDAL FLAT DEPOSITS)	
		2.60	ES									
		3.00	D									3
		4.00	D									
		4.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								4
		4.00 - 4.45	B									
		4.01 - 4.45	D									
		5.00	D									5
		5.80	ES									
		6.00	D					(11.70)				6
		7.00	D									
		7.00 - 7.45	UT									7
		7.50	D									
		8.00	D									8
		9.00	D									
		9.00	ES									9
		10.00	SPT(S)	0 (0 for 450mm/0 for 0mm)							Continued on next sheet	10

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 22.0m. Air mist rotary cored 22.0 - 50.5m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite50.5 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 14.1m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	22.00	0.40		0.20	01:00	21.80	22.00
RC	22.00	50.50	14.10	13.60	10.70			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA033**

Sheet 2 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/02/2016 - 22/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332594	Drilling Method:	50.00m
Location:	Newport	Northing:	185495	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.31	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	22.00
150	21.80
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		10.00 - 10.45	B									
		10.00 - 10.45	D									
		11.00	D									11
		12.00	D									12
		13.00	D									
		13.00	SPT(S)	0 (0 for 450mm/0 for 0mm)								13
		13.00 - 13.45	B									
		13.01 - 13.45	D									
		14.00	D									14
		14.10 - 14.55	B				14.10		-6.79		Medium dense grey sandy subangular to rounded GRAVEL of various lithologies. (GLACIOFLUVIAL DEPOSITS)	
		15.00	D									15
		16.00	D									
		16.00	SPT(C)	N=19 (3,4/4,5,5,5)								16
		16.00 - 16.45	B									
		17.00	D					(6.70)				17
		18.00	D									18
		19.00	D									
		19.00	SPT(C)	N=26 (4,7/6,6,7,7)								19
		19.00 - 19.45	B									
		20.00	D									20

Core | Fractures

Continued on next sheet

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 22.0m. Air mist rotary cored 22.0 - 50.5m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite50.5 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 14.1m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	22.00	0.40		0.20	01:00	21.80	22.00
RC	22.00	50.50	14.10	13.60	10.70			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA033**

Sheet 3 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/02/2016 - 22/03/2016		Final Depth:
Project No:	JFR8703	Easting:	332594	Drilling Method:		50.00m
Location:	Newport	Northing:	185495	Dando 2000 & Comacchio GEO 205	Casing Diameter (mm) / Casing Depth (m): 130 / 22.00; 150 / 21.80; 200 / 1.50	Scale: 1:50
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.31	Logged By: ERH		

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							20.80		-13.49		Stiff reddish brown CLAY with occasional mudstone lithorelics. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	21
								(1.40)				
		22.00	SPT(C)	50 (25 for 60mm/50 for 30mm)			22.20		-14.89		Very weak thinly laminated reddish brown MUDSTONE With frequent greenish grey reduction spots. Fractures are 0-5 degrees planar rough very closely to closely spaced. (Weathering Grade II) (MERCIA MUDSTONE)	22
		22.20 - 23.70			TCR: 87 SCR: 73 RQD: 8			(1.50)			*Recovered as gravel between 22.2-22.5 m.* *Greenish grey between 22.75-22.9 m.*	23
		23.70	SPT(C)	80 (25 for 95mm/80 for 225mm)		Min: 2 Avg: 5 Max: 20	23.70		-16.39		*At 23.5 m fracture dipping at 35 degrees with white crystals along plane (Gypsum/calcite).* Very weak thinly laminated reddish brown MUDSTONE. Recovered as clayey sandy gravel. (Weathering Grade II) (MERCIA MUDSTONE)	24
								(0.70)				
		23.70 - 25.20			TCR: 80 SCR: 60 RQD: 32		24.40		-17.09		Very weak thinly laminated reddish brown MUDSTONE. With frequent greenish grey reduction spots. Fractures are 0-5 degrees planar rough very closely to closely spaced. (Weathering Grade II) (MERCIA MUDSTONE) *Recovered as gravels between 24.53-24.6 m.* *From 25.95 - 26.05 m recovered as stiff clay.*	25
		25.20	SPT(C)	100 (25 for 80mm/100 for 150mm)								
		25.20 - 26.70			TCR: 99 SCR: 99 RQD: 45						*Recovered as gravels from 25.95 - 26.05 m.*	26
		26.70	SPT(C)	100 (25 for 105mm/100 for 60mm)		Min: 6 Avg: 10 Max: 34					*Recovered as sandy gravelly clay between 26.7-27.95 m.*	27
		26.70 - 28.20			TCR: 73 SCR: 8 RQD: 8						*Weak between 27.95 - 28.1 m.*	28
		28.20	SPT(C)	64 (71 for 140mm/64 for 70mm)							*Sandy gravelly clay between 28.1-28.2 m.* *Recovered as gravel between 28.4-28.6 m.*	
		28.20 - 29.70			TCR: 67 SCR: 50 RQD: 12							29
		29.70	SPT(C)	100 (25 for 90mm/100 for 210mm)							*Stiff clay between 29.7-30.2 m.*	
					Core	Fractures					Continued on next sheet	30

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 22.0m. Air mist rotary cored 22.0 - 50.5m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite50.5 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 14.1m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	22.00	0.40		0.20	01:00	21.80	22.00
RC	22.00	50.50	14.10	13.60	10.70			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA033**

Sheet 4 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/02/2016 - 22/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332594	Drilling Method:	50.00m
Location:	Newport	Northing:	185495	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.31	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	22.00
150	21.80
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		29.70 - 31.20			TCR: 93 SCR: 67 RQD: 45						*Becoming weak from 30.2 mbGL.* *Very thin bed of gravel at 30.6 m.*	31
		31.20	SPT(C)	100 (25 for 120mm/100 for 155mm)							*Soft sandy clay between 31.2-31.7 m.*	
		31.20 - 32.70			TCR: 93 SCR: 50 RQD: 23	Min: 4 Avg: 15 Max: 20					*Soft sandy clay between 31.95-32 m.* *Recovered as gravel between 32-32.15 m.*	32
		32.70	SPT(C)	100 (25 for 105mm/100 for 165mm)							*Soft sandy clay between 32.5-32.6 m.* *Soft sandy clay between 32.7-33.1 m.*	
		32.70 - 34.20			TCR: 93 SCR: 67 RQD: 25							33
		34.20	SPT(C)	100 (25 for 10mm/100 for 75mm)							*Recovered as gravel between 34.15-34.2 m.* *Extremely weak 34.2-35.5 m.*	34
		34.20 - 35.70			TCR: 100 SCR: 77 RQD: 43			(17.30)				35
		35.70	SPT(C)	100 (25 for 78mm/100 for 160mm)							*Recovered as reddish brown sandy clay between .35.7-36.6 m.*	
		35.70 - 37.20			TCR: 93 SCR: 40 RQD: 11	Min: 4 Avg: 10 Max: 22					*Extremely weak mudstone between 36.6-37.1 m.*	36
		37.20	SPT(C)	100 (25 for 100mm/100 for 205mm)							*Recovered as soft sandy clay between 37.2-37.5 m.* *Extremely weak between 37.5-38 m.*	37
		37.20 - 38.70			TCR: 97 SCR: 67 RQD: 42						*Thin bed of gravel at 38.18 m.*	38
		38.70	SPT(C)	100 (25 for 83mm/100 for 145mm)							*Recovered as gravel between 38.5-38.6 m.* *Recovered as fine gravel between 38.7-38.82 m.*	39
		38.70 - 40.20			TCR: 100 SCR: 93 RQD: 57	Min: 6 Avg: 10 Max: 22						
					Core	Fractures					Continued on next sheet	40

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 22.0m. Air mist rotary cored 22.0 - 50.5m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite50.5 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 14.1m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	22.00	0.40		0.20	01:00	21.80	22.00
RC	22.00	50.50	14.10	13.60	10.70			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA033**

Sheet 5 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/02/2016 - 22/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332594	Drilling Method:	50.00m
Location:	Newport	Northing:	185495	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.31	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	22.00
150	21.80
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		40.20	SPT(C)	20 (105 for 115mm/20 for 15mm)							*Soft clay band between 40.3-41 m.*	
		40.20 - 41.70			TCR: 90 SCR: 67 RQD: 27						*Very thin bed of gravel at 41.08 m.* *Thin bed of gravel for 110 mm at 41.33 m.*	41
		41.70	SPT(C)	62 (25,38/62 for 80mm)			41.70		-34.39		Extremely weak thinly laminated reddish to brown MUDSTONE. Recovered as gravel. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	
								(0.70)				42
		41.70 - 43.30			TCR: 47 SCR: 25 RQD: 9		42.40		-35.09		Assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	
								(0.90)				43
							43.30		-35.99		Extremely weak thinly laminated reddish to brown MUDSTONE. Recovered as gravel. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) *Recovered as gravels between 43.3-44.3 mbGL.*	
								(0.70)				
		43.30 - 44.70			TCR: 46 SCR: 29 RQD: 20		44.00		-36.69		Assumed zone of core loss. Geology is inferred. (WEATHERED MERCIA MUDSTONE)	44
						Min: 6 Avg: 10 Max: 18		(0.70)				
		44.70	SPT(C)	100 (25 for 80mm/100 for 135mm)			44.70		-37.39		Extremely weak reddish brown MUDSTONE. Recovered as soft sandy clay. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	45
		44.70 - 46.00			TCR: 88 SCR: 48 RQD: 14			(0.90)				
							45.60		-38.29		Extremely to very weak thinly laminated reddish brown MUDSTONE with frequent green grey reduction spots. Fractures are o - 5 degrees planar rough closely to medium spaced. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) *Recovered as gravel between 46-46.14 m.*	46
		46.00 - 47.50			TCR: 97 SCR: 87 RQD: 73			(1.90)				47
		47.50	SPT(C)	100 (25 for 105mm/100 for 200mm)			47.50		-40.19		Extremely weak reddish brown MUDSTONE. Recovered as soft sandy clay. (Weathering Grade III) (WEATHERED MERCIA MUDSTONE)	
		47.50 - 49.00			TCR: 70 SCR: 7 RQD: 7	Min: 7 Avg: 17 Max: 25		(1.50)				48
							49.00		-41.69		Extremely to very weak thinly laminated reddish brown MUDSTONE with frequent green grey reduction spots. Fractures are 0 - 5 degrees planar rough closely to medium spaced. (Weathering Grade II) (WEATHERED MERCIA MUDSTONE) *Recovered as gravel between 49-49.2 m.* *Recovered as soft sandy gravelly clay between*	49
		49.00 - 50.50			TCR: 73 SCR: 0 RQD: 0			(1.00)				
					Core	Fractures					Continued on next sheet	50

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 22.0m. Air mist rotary cored 22.0 - 50.5m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite50.5 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 14.1m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	22.00	0.40		0.20	01:00	21.80	22.00
RC	22.00	50.50	14.10	13.60	10.70			

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA033**

Sheet 6 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/02/2016 - 22/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332594	Drilling Method:	50.00m
Location:	Newport	Northing:	185495	Dando 2000 & Comacchio GEO 205	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.31	Logged By: ERH	1:50

Casing Diameter (mm)	Casing Depth (m)
130	22.00
150	21.80
200	1.50

Well	Water Strike (s)	Samples & In Situ Testing			Rotary Coring		Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		Depth (m)	Type	Results	Core (%)	Fractures (mm)						
		50.50	SPT(C)	100 (25 for 95mm/100 for 77mm)							*Recovered as soft sandy gravelly clay between 49.2-49.7 m.* *Recovered as gravel of quartz between 49.7-50 m.* End of Borehole at 50.000m	51 52 53 54 55 56 57 58 59 60
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 22.0m. Air mist rotary cored 22.0 - 50.5m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite50.5 - 0.2m and concrete 0.2 - 0.0m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 14.1m. No anomalies encountered.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	22.00	0.40		0.20	01:00	21.80	22.00
RC	22.00	50.50	14.10	13.60	10.70			

AGS

WINDOW SAMPLE LOG

Borehole No. **WSM4CANA014**

Sheet 1 of 1

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 22/02/2016		Final Depth:
Project No:	JFR8703	Easting:	332744	Drilling Method:		0.45m
Location:	Newport	Northing:	185598	Dando Terrier	Casing Diameter (mm) / Casing Depth (m)	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.20	Logged By: JA		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
					0.00	(0.08)	7.20		Block paving (MADE GROUND)	
					0.08	(0.10)	7.12		Concrete slab. (CONCRETE)	
		0.30	ES		0.18	(0.27)	7.02		Dark brownish grey sandy angular to subrounded GRAVEL of siltstone, mudstone and brick. (MADE GROUND)	
									End of Borehole at 0.45m	

DRAFT

Remarks:
Unable to progress hand dug pit below 0.45m due to dense fill materials. No groundwater encountered.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)

AGS

SUPPLEMENTARY HOLE INFORMATION

BHM4CAN024

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
13/01/2016 07:30:00	0.00	0.00	
13/01/2016 18:00:00	0.30	0.00	
22/01/2016 07:30:00	0.30	0.00	
22/01/2016 18:00:00	2.00	2.00	1.6
25/01/2016 07:30:00	2.00	2.00	
25/01/2016 18:00:00	14.90	14.20	7.7

Sample Information

Type/Ref	Depth (m)	Date
W2		17-05-2016
W3		01-06-2016
W1		04-05-2016
B	0.30 - 0.75	
ES	0.40	13-01-2016
ES	0.70	22-01-2016
D	1.00	
ES	1.10	
ES	1.70	
D	1.80	
ES	1.90	
ES	2.00	
D	2.70	
ES	2.80	
B	3.00 - 3.45	
D	3.70	
ES	4.00	
D	4.70	
B	5.00 - 5.45	
D	5.70	
D	6.70	
B	7.00 - 7.45	
D	7.70	
D	8.70	
B	9.00 - 9.45	
ES	9.00	
D	9.80	
D	10.80	
B	11.00 - 11.45	
ES	11.00 - 11.40	
D	11.40	
B	12.10 - 12.55	
B	13.00 - 13.45	
B	14.20 - 14.65	
D	14.90	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	C	N=45 (12,10/18,18,4,5)
3.00	S	N=3 (1,0/1,0,1,1)
5.00	S	0 (0 for 450mm/0 for 0mm)
7.00	S	0 (0 for 450mm/0 for 0mm)
9.00	S	0 (0 for 450mm/0 for 0mm)
11.00	S	N=15 (1,2/2,3,4,6)
13.00	S	N=47 (3,8/9,12,13,13)

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)
04/05/2016 11:40:00	1	0.54
18/05/2016 15:45:00	2	0.36
01/06/2016 14:00:00	3	0.52

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

DRAFT

SUPPLEMENTARY HOLE INFORMATION

BHM4CAN025

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
11/01/2016 07:30:00	0.00	0.00	
11/01/2016 18:00:00	1.40	1.30	1
12/01/2016 07:30:00	1.40	1.30	0.6
12/01/2016 18:00:00	12.50	12.00	3.4
13/01/2016 07:30:00	12.00	12.00	0.5
13/01/2016 18:00:00	19.50	19.00	4
18/01/2016 07:30:00	19.50	19.00	
18/01/2016 18:00:00	28.50	19.50	
19/01/2016 07:30:00	28.50	19.50	
19/01/2016 18:00:00	37.50	19.50	
20/01/2016 07:30:00	37.50	19.50	
20/01/2016 18:00:00	44.00	19.50	
21/01/2016 07:30:00	44.00	19.50	
21/01/2016 18:00:00	50.00	19.50	

Sample Information

Type/Ref	Depth (m)	Date
W1		04-05-2016
W2		17-05-2016
W3		01-06-2016
ES	0.40	11-01-2016
B	0.80 - 1.40	
ES	1.30	
D	1.40 - 1.85	
ES	1.50	
B	2.00 - 2.50	
D	2.00	
UT	3.00 - 3.45	
ES	3.20	
D	3.45 - 3.60	
B	5.50 - 6.00	
D	6.00	
D	6.01 - 6.45	
ES	6.10	
ES	9.00	
D	9.00 - 9.45	
D	12.00 - 12.45	
B	14.50 - 15.00	
D	15.00 - 15.45	
D	18.00 - 18.45	
B	19.10 - 19.50	
D	19.50 - 19.75	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.40	S	N=9 (1,1/2,2,2,3)
6.00	S	0 (1 for 450mm/0 for 0mm)
9.00	S	0 (1 for 450mm/0 for 0mm)
12.00	S	2 (1 for 300mm/2 for 150mm)
15.00	S	N=40 (4,6/8,10,11,11)
18.00	S	N=20 (3,3/5,5,5,5)
19.50	S	50 (0 for 0mm/50 for 75mm)
22.50	C	N=100 (16,9/19,22,29,30)
25.50	C	95 (12,13/95 for 225mm)
28.50	C	100 (19,6/100 for 150mm)
31.50	C	100 (14,11/100 for 150mm)
34.50	C	100 (18,7/100 for 150mm)
37.50	C	100 (16,9/100 for 150mm)
40.50	C	100 (9,16/100 for 150mm)
43.50	C	100 (21,4/100 for 150mm)
47.00	C	100 (23,2/100 for 150mm)
50.00	C	100 (25,0/100 for 75mm)

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)
04/05/2016 12:30:00	1	6.90
18/05/2016 13:45:00	2	6.93
01/06/2016 12:30:00	3	7.10

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CAN026

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
13/01/2016 07:30:00	0.00	0.00	
13/01/2016 18:00:00	1.20	1.20	0.9
14/01/2016 07:30:00	1.20	1.20	0.9
14/01/2016 18:00:00	14.00	13.70	10.2
15/01/2016 07:30:00	14.00	13.70	5.6
15/01/2016 18:00:00	16.70	16.50	9.7
19/01/2016 07:30:00	16.50	16.50	
19/01/2016 18:00:00	21.50	19.50	
21/01/2016 07:30:00	21.50	19.50	
21/01/2016 18:00:00	27.50	19.50	16.3
22/01/2016 07:30:00	26.00	19.50	5.3
22/01/2016 18:00:00	36.50	19.50	
25/01/2016 07:30:00	36.50	19.50	5.3
25/01/2016 18:00:00	45.50	19.50	
26/01/2016 07:30:00	45.50	19.50	5
26/01/2016 15:00:00	50.00	19.50	

Sample Information

Type/Ref	Depth (m)	Date
B	0.20 - 0.55	
ES	0.40	
ES	0.80	13-01-2016
B	0.90 - 1.20	
B	1.20 - 1.65	
D	1.90	
ES	1.90	
ES	3.00	
B	3.00 - 3.45	
D	4.80	
UT	5.00 - 5.45	
B	6.00 - 6.45	
ES	6.10	
B	9.00 - 9.45	
D	10.00	
ES	10.70	
B	12.00	
ES	12.10	
D	12.80	
B	14.00 - 14.45	
ES	14.00	
B	16.50 - 16.70	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	C	N=22 (12,11/8,7,4,3)
3.00	S	N=3 (1,0/1,0,1,1)
6.00	S	0 (0 for 450mm/0 for 0mm)
9.00	S	0 (0 for 450mm/0 for 0mm)
12.00	C	N=29 (4,6/6,7,8,8)
15.00	C	50 (8,13/50 for 170mm)
16.70	C	50 (25 for 75mm/50 for 40mm)
20.00	C	100 (10,15/100 for 130mm)
23.00	C	100 (25 for 40mm/100 for 75mm)
26.00	C	N=97 (8,12/21,24,26,26)
29.00	C	100 (25 for 20mm/100 for 75mm)
32.00	C	100 (25 for 60mm/100 for 85mm)
35.00	C	100 (25 for 50mm/100 for 75mm)
38.00	C	100 (25 for 30mm/100 for 75mm)
39.50	C	100 (25 for 20mm/100 for 75mm)
41.00	C	100 (25 for 25mm/100 for 75mm)
44.00	C	100 (25 for 60mm/100 for 195mm)
45.50	C	100 (25 for 40mm/100 for 75mm)
48.50	C	100 (25 for 35mm/100 for 85mm)
50.00	C	100 (25 for 40mm/100 for 85mm)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CANA023

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
09/02/2016 07:30:00	0.00	0.00	
09/02/2016 18:00:00	11.00	11.00	
10/02/2016 07:30:00	11.00	11.00	
10/02/2016 18:00:00	14.30	13.70	11.5
23/03/2016 07:30:00	14.30	14.30	2.4
23/03/2016 18:00:00	22.00	14.40	4.6
24/03/2016 07:30:00	22.00	14.40	5.1
24/03/2016 18:00:00	30.50	14.40	6.53
29/03/2016 07:30:00	30.50	14.40	5.6
29/03/2016 18:00:00	38.60	14.40	

Sample Information

Type/Ref	Depth (m)	Date
B	0.20 - 0.65	
ES	0.50	09-02-2016
B	0.70 - 1.20	
ES	1.00	09-02-2016
ES	1.70	09-02-2016
D	2.00	
B	2.30 - 2.75	
B	2.80 - 3.00	
D	3.00	
UT	3.00 - 3.45	
ES	3.00	09-02-2016
B	3.70 - 3.95	
D	4.00	
B	4.50 - 4.95	
D	5.00	
D	6.00	
UT	6.00 - 6.45	
ES	6.00	09-02-2016
D	7.00	
B	7.50 - 7.95	
D	8.00	
D	9.00	
UT	9.00 - 9.45	
D	10.00	
B	10.50 - 10.95	
ES	10.50	09-02-2016
D	11.00	
B	11.40 - 11.75	
D	12.00	
B	12.00 - 12.45	
D	13.00	
D	14.00	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	C	N=6 (8,4/2,2,1,1)
4.50	S	0 (0 for 450mm/0 for 0mm)
7.50	S	0 (0 for 450mm/0 for 0mm)
10.50	S	0 (0 for 450mm/0 for 0mm)
12.00	S	50 (4,7/50 for 285mm)
13.50	C	50 (25 for 115mm/50 for 125mm)
14.10	C	50 (25 for 50mm/50 for 50mm)
15.90	C	33 (92 for 135mm/33 for 10mm)
17.50	C	N=28 (5,11/5,5,6,12)
19.00	C	100 (25 for 80mm/100 for 180mm)
20.20	C	42 (83 for 125mm/42 for 35mm)
22.00	C	35 (90 for 135mm/35 for 70mm)
23.30	C	100 (25 for 55mm/100 for 70mm)
24.80	C	34 (91 for 135mm/34 for 30mm)
26.30	C	15 (103 for 72mm/15 for 0mm)
27.80	C	100 (29 for 86mm/100 for 175mm)
29.30	C	100 (25 for 85mm/100 for 285mm)
31.20	C	100 (25 for 95mm/100 for 295mm)
32.70	C	60 (25,40/60 for 150mm)
35.60	C	54 (25,46/54 for 85mm)
38.60	C	58 (67 for 145mm/58 for 70mm)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CANA024

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
02/02/2016 07:30:00	0.00	0.00	
02/02/2016 18:00:00	16.50	16.50	13
03/02/2016 07:30:00	16.60	16.50	6.9
03/02/2016 18:00:00	17.10	17.00	6.7
15/02/2016 07:30:00	17.10	17.00	
15/02/2016 18:00:00	23.10	17.00	
16/02/2016 07:30:00	23.10	17.00	
16/02/2016 18:00:00	35.10	17.00	
17/02/2016 07:30:00	35.10	17.00	
17/02/2016 18:00:00	44.10	17.00	

Sample Information

Type/Ref	Depth (m)	Date
B	0.10 - 0.65	
ES	0.50	
B	0.70 - 1.10	
D	1.00	
ES	1.00	
B	1.20 - 1.65	
D	2.00	
ES	2.00	
B	2.70 - 3.00	
D	3.00	
B	3.00 - 3.45	
ES	3.00	
D	4.00	
D	5.00	
B	5.00 - 5.45	
ES	5.00	
D	6.00	
D	7.00	
B	7.00 - 7.45	
D	8.00	
UT	8.00 - 8.45	
D	9.00	
ES	9.00	
D	10.00	
B	10.00 - 10.45	
D	11.00	
B	11.50 - 11.95	
D	12.00	
D	13.00	
B	13.00 - 13.45	
ES	13.00	
D	14.00	
D	15.00	
D	16.00	
B	16.00 - 16.45	
B	16.50 - 17.00	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	S	N=4 (1,0/1,1,1,1)
3.00	S	N=2 (1,0/1,0,0,1)
5.00	S	0 (0 for 450mm/0 for 0mm)
7.00	S	0 (0 for 450mm/0 for 0mm)
10.00	S	0 (0 for 450mm/0 for 0mm)
13.00	S	0 (0 for 450mm/0 for 0mm)
16.00	S	50 (1,2/50 for 125mm)
17.00	C	80 (25 for 30mm/80 for 30mm)
20.10	C	100 (21,4/100 for 105mm)
23.10	C	100 (25,0/100 for 90mm)
26.10	C	100 (19,6/100 for 90mm)
29.10	C	100 (25,0/100 for 30mm)
32.10	C	100 (25,0/100 for 90mm)
35.10	C	100 (23,2/100 for 105mm)
38.10	C	N=28 (4,7/7,6,6,9)
39.60	C	N=96 (7,7/14,29,27,26)
43.10	C	100 (11,14/100 for 180mm)
44.10	C	100 (7,18/100 for 85mm)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CANA025

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
22/01/2016 07:30:00	0.00	0.00	
22/01/2016 18:00:00	1.60	1.60	
25/01/2016 07:30:00	1.60	1.60	
25/01/2016 18:00:00	17.00	17.00	7
26/01/2016 07:30:00	15.80	17.00	0.5
26/01/2016 18:00:00	18.80	18.70	
05/02/2016 07:30:00	18.80	18.70	
05/02/2016 18:00:00	26.50	20.00	
08/02/2016 07:30:00	26.50	20.00	
08/02/2016 18:00:00	33.50	20.00	
09/02/2016 07:30:00	33.50	20.00	
09/02/2016 18:00:00	42.00	20.00	
10/02/2016 07:30:00	42.00	20.00	
10/02/2016 18:00:00	50.00	20.00	

Sample Information

Type/Ref	Depth (m)	Date
ES	0.40 - 1.10	22-01-2016
B	0.50 - 1.10	
ES	1.10 - 1.50	
B	1.10 - 1.50	
D	1.10	
B	1.60 - 2.00	
ES	2.00	
ES	2.60	
B	3.50 - 4.00	
D	4.00 - 4.45	
ES	4.00	
P	7.00 - 8.00	
ES	8.00	
D	10.00 - 10.50	
D	13.00 - 13.45	
B	14.00 - 14.50	
ES	15.00	
B	18.20 - 18.70	
D	18.20 - 18.70	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.10	S	2 (1 for 225mm/2 for 225mm)
4.00	S	0 (1 for 450mm/0 for 0mm)
10.00	S	0 (1 for 450mm/0 for 0mm)
13.00	S	1 (1 for 300mm/1 for 150mm)
16.00	C	N=43 (3,6/9,10,10,14)
18.80	C	50 (0 for 0mm/50 for 0mm)
21.00	C	100 (25 for 85mm/100 for 210mm)
22.00	C	N=70 (10,12/15,16,16,23)
23.50	C	100 (11,11/100 for 195mm)
25.00	C	100 (25 for 55mm/100 for 190mm)
28.00	C	100 (9,12/100 for 125mm)
29.50	C	100 (25 for 50mm/100 for 115mm)
30.50	C	100 (25 for 75mm/100 for 150mm)
33.50	C	100 (25 for 45mm/100 for 150mm)
36.50	C	100 (25 for 30mm/100 for 75mm)
38.00	C	100 (25 for 25mm/100 for 75mm)
40.50	C	1 (25 for 45mm/1 for 75mm)
43.50	C	100 (25 for 20mm/100 for 75mm)
46.00	C	100 (25 for 75mm/100 for 105mm)
47.00	C	100 (25 for 52mm/100 for 85mm)
48.50		100 (25 for 20mm/100 for 75mm)
50.00	C	100 (25 for 35mm/100 for 75mm)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CANA026

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
10/02/2016 07:30:00	0.00	0.00	
10/02/2016 18:00:00	8.00	8.00	6.4
11/02/2016 07:30:00	8.00	8.00	
11/02/2016 18:00:00	16.40	15.80	
12/02/2016 07:30:00	16.00	15.80	6
12/02/2016 18:00:00	16.80	16.30	
26/02/2016 07:30:00	16.30	16.30	0.0
26/02/2016 18:00:00	20.60	18.00	3.3
29/02/2016 07:30:00	20.60	18.00	
29/02/2016 18:00:00	23.90	21.00	
01/03/2016 07:30:00	23.90	21.00	5.1
01/03/2016 18:00:00	28.40	22.05	3.5
02/03/2016 07:30:00	28.40	22.05	5.5
02/03/2016 18:00:00	28.40	22.05	5.5
03/03/2016 07:30:00	28.40	22.05	5.7
03/03/2016 18:00:00	30.00	30.00	
04/03/2016 07:30:00	30.00	30.00	5.7
04/03/2016 18:00:00	31.00	30.00	
07/03/2016 07:30:00	30.00	30.00	5.4
07/03/2016 18:00:00	31.50	31.50	5.7
08/03/2016 07:30:00	31.50	31.50	5.4
08/03/2016 18:00:00	39.00	32.50	5.9
09/03/2016 07:30:00	39.00	32.50	5.4
09/03/2016 18:00:00	45.00	32.50	5.7
10/03/2016 07:30:00	45.00	32.50	7.2
10/03/2016 18:00:00	50.00	32.50	

Sample Information

Type/Ref	Depth (m)	Date
B	0.40 - 0.60	
ES	0.50	
ES	0.60	
B	0.60 - 1.00	
B	1.00 - 1.20	
ES	1.20 - 1.80	
B	1.70 - 2.00	
D	2.00 - 2.45	
B	2.00 - 2.50	
D	3.00	
UT	3.00 - 3.45	
D	3.45 - 3.60	
D	4.00	
D	4.01 - 4.45	
D	5.00	
B	5.00 - 5.50	
UT	5.50 - 5.95	
D	5.95 - 6.10	
D	7.00	
D	7.01 - 7.45	
D	8.00	
UT	8.50 - 8.95	
D	8.95 - 9.10	
D	9.00	
D	10.00	
ES	10.00	
D	11.00	
UT	11.50 - 11.95	
D	11.95 - 12.10	
D	12.00	
D	13.00	
D	13.01 - 13.45	
D	14.00	
ES	14.00	
D	14.50 - 14.95	
B	15.20 - 15.80	
D	15.80	
D	16.00 - 16.35	
B	16.40 - 16.80	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	S	2 (2 for 225mm/2 for 225mm)
2.00	S	N=5 (1,1/1,1,2,1)
4.00	S	1 (1 for 225mm/1 for 225mm)
7.00	S	0 (1 for 450mm/0 for 0mm)
10.00	S	1 (1 for 300mm/1 for 150mm)
13.00	S	N=9 (1,1/2,2,3,2)
14.50	S	N=11 (1,2/1,3,4,3)
16.00	S	50 (8,16/50 for 165mm)
16.80	S	50 (0 for 0mm/50 for 25mm)
17.80	C	N=72 (5,9/11,11,23,27)
19.30	C	N=89 (5,7/11,21,24,33)
20.00	C	100 (25 for 50mm/100 for 35mm)
22.80	C	100 (25 for 45mm/100 for 29mm)
23.90	C	100 (25 for 50mm/100 for 36mm)
25.40	C	28 (100 for 140mm/28 for 18mm)
26.00	C	100 (25 for 70mm/100 for 73mm)
28.40	C	45 (80 for 125mm/45 for 45mm)
29.00	C	100 (25 for 50mm/100 for 35mm)
30.00	C	40 (85 for 125mm/40 for 58mm)
31.00	C	45 (80 for 125mm/45 for 40mm)
35.00	C	46 (79 for 86mm/46 for 39mm)
36.50	C	73 (52 for 115mm/73 for 88mm)
37.50	C	70 (55 for 115mm/70 for 93mm)
39.00	C	32 (93 for 135mm/32 for 27mm)
40.00	C	100 (25 for 50mm/100 for 70mm)
42.00	C	42 (83 for 117mm/42 for 39mm)
45.00	C	46 (79 for 121mm/46 for 43mm)
47.00	C	54 (71 for 135mm/54 for 67mm)
48.10	C	47 (138 for 135mm/47 for 58mm)
50.00	C	71 (54 for 145mm/71 for 110mm)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CANA028

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
15/01/2016 07:30:00	0.00	0.00	
15/01/2016 18:00:00	8.00	8.00	7.5
18/01/2016 07:30:00	8.00	8.00	7.5
18/01/2016 18:00:00	13.80	13.00	2.5
28/01/2016 07:30:00	13.80	13.00	
28/01/2016 18:00:00	19.00	14.00	
29/01/2016 07:30:00	19.00	14.00	
29/01/2016 18:00:00	26.50	20.00	
01/02/2016 07:30:00	26.50	20.00	
01/02/2016 18:00:00	35.50	20.00	
02/02/2016 07:30:00	35.50	20.00	
02/02/2016 18:00:00	45.00	20.00	
04/02/2016 07:30:00	45.00	20.00	
04/02/2016 18:00:00	50.00	20.00	

Sample Information

Type/Ref	Depth (m)	Date
ES	0.30 - 0.80	
B	0.50 - 0.80	
B	0.80 - 1.50	
ES	1.00 - 1.50	
D	1.00 - 1.45	
B	1.70 - 2.00	
ES	2.00 - 2.20	
B	2.00 - 2.50	
B	3.50 - 4.00	
D	4.00 - 4.45	
UT	7.00 - 7.45	
B	9.50 - 10.00	
D	10.00 - 10.45	
B	12.00 - 12.50	
B	12.50 - 13.00	
D	13.00	
D	13.70 - 13.80	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.00	S	N=4 (2,2/1,2,1,0)
4.00	S	1 (1 for 300mm/1 for 150mm)
10.00	S	0 (1 for 450mm/0 for 0mm)
13.00	S	50 (5,10/50 for 225mm)
14.80	C	N=95 (6,13/21,22,22,30)
15.80	C	N=100 (10,11/13,24,26,37)
17.00	C	100 (25 for 75mm/100 for 205mm)
18.00	C	100 (25 for 60mm/100 for 170mm)
19.00	C	100 (25 for 95mm/100 for 255mm)
20.00	C	100 (25 for 20mm/100 for 75mm)
21.00	C	100 (25 for 75mm/100 for 245mm)
24.00	C	100 (25 for 60mm/100 for 205mm)
25.50	C	100 (25 for 30mm/100 for 115mm)
26.50	C	100 (25 for 105mm/100 for 240mm)
28.00	C	100 (21,4/100 for 190mm)
29.50	C	100 (25 for 105mm/100 for 150mm)
31.00	C	100 (25 for 50mm/100 for 160mm)
32.50	C	100 (25 for 85mm/100 for 135mm)
34.00	C	100 (25 for 30mm/100 for 105mm)
35.50	C	100 (25 for 40mm/100 for 115mm)
37.00	C	100 (10,10/100 for 250mm)
38.50	C	100 (25 for 30mm/100 for 95mm)
39.50	C	100 (25 for 20mm/100 for 75mm)
41.00	C	100 (25 for 25mm/100 for 75mm)
42.50	C	100 (25 for 75mm/100 for 170mm)
44.00	C	100 (10,13/100 for 225mm)
45.00	C	100 (25 for 50mm/100 for 150mm)
46.00	C	100 (25 for 60mm/100 for 210mm)
47.00	C	100 (25 for 20mm/100 for 95mm)
48.50	C	100 (25 for 25mm/100 for 75mm)
50.00	C	100 (25 for 20mm/100 for 85mm)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CANA029

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
15/01/2016 07:30:00	0.00	0.00	
15/01/2016 18:00:00	1.20	0.00	
18/01/2016 07:30:00	1.20	0.00	
18/01/2016 18:00:00	2.00	2.00	
19/01/2016 07:30:00	2.00	2.00	
19/01/2016 18:00:00	10.60	9.70	
20/01/2016 07:30:00	10.60	9.70	5.2
20/01/2016 18:00:00	15.20	15.00	6.4
27/01/2016 07:30:00	15.20	15.00	
27/01/2016 18:00:00	17.00	15.00	
28/01/2016 07:30:00	17.00	15.00	
28/01/2016 18:00:00	23.50	15.00	
01/02/2016 07:30:00	23.50	15.00	
01/02/2016 18:00:00	26.50	15.00	
02/02/2016 07:30:00	26.50	15.00	
02/02/2016 18:00:00	34.00	15.00	
03/02/2016 07:30:00	34.00	15.00	
03/02/2016 18:00:00	41.00	15.10	
04/02/2016 07:30:00	41.00	15.10	
04/02/2016 18:00:00	50.00	15.10	

Sample Information

Type/Ref	Depth (m)	Date
ES	0.00 - 1.10	18-01-2016
B	0.20 - 0.65	
D	1.10	
B	1.20 - 1.65	
D	1.70	
ES	1.70	
ES	2.00	
B	2.00 - 2.45	
D	2.90	
B	3.00 - 3.45	
B	4.00 - 4.45	
B	5.00 - 5.45	
B	6.00 - 6.45	
B	7.00 - 7.45	
B	8.00 - 8.45	
D	8.70	
UT	9.00 - 9.45	
B	10.00 - 10.45	
B	11.00 - 11.45	
ES	11.00	
D	11.40	
B	12.00 - 12.45	
D	13.00	
D	13.50	
B	14.00 - 14.45	
D	14.70	
D	15.00 - 15.20	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	S	N=6 (1,1/1,1,2,2)
3.00	S	0 (0 for 450mm/0 for 0mm)
6.00		0 (0 for 450mm/0 for 0mm)
12.00	S	N=30 (2,3/4,6,9,11)
15.00	C	50 (25 for 75mm/50 for 30mm)
15.20	C	50 (25 for 85mm/50 for 95mm)
18.00	C	100 (6,19/100 for 150mm)
21.00	C	100 (17,8/100 for 225mm)
23.50	C	100 (19,6/100 for 150mm)
26.50	C	100 (23,2/100 for 150mm)
29.50	C	N=100 (9,11/21,27,48,4)
32.50	C	100 (24,1/100 for 150mm)
35.50	C	100 (19,6/100 for 150mm)
38.00	C	100 (23,2/100 for 150mm)
41.00	C	100 (25 for 75mm/100 for 150mm)
44.00	C	100 (25 for 75mm/100 for 150mm)
47.00	C	100 (25 for 75mm/100 for 150mm)

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CANA030

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
14/01/2016 00:00:00	0.00	0.00	
14/01/2016 18:00:00	0.70	0.00	
26/01/2016 00:00:00	0.30	0.00	
26/01/2016 18:00:00	1.20	1.20	
27/01/2016 07:30:00	1.20	1.20	
27/01/2016 18:00:00	14.00	13.70	
03/03/2016 07:30:00	14.00	13.70	
03/03/2016 18:00:00	21.50	14.00	
07/03/2016 07:30:00	21.50	14.00	
07/03/2016 18:00:00	30.50	20.00	
08/03/2016 07:30:00	30.50	20.00	
08/03/2016 18:00:00	35.00	20.00	
09/03/2016 07:30:00	35.00	20.00	
09/03/2016 18:00:00	45.50	20.00	
10/03/2016 07:30:00	45.50	20.00	
10/03/2016 18:00:00	50.00	20.00	

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

Sample Information

Type/Ref	Depth (m)	Date
ES	0.20	
ES	0.30	
B	0.30 - 0.75	
D	1.00	
ES	1.00 - 1.20	
B	1.20 - 1.65	
ES	1.70	
D	2.00	
B	2.40 - 2.75	
D	3.00 - 3.45	
B	3.00 - 3.45	
D	4.00	
B	4.30 - 4.75	
ES	4.50	
D	5.00	
P	5.00 - 6.00	
D	6.00 - 6.45	
B	6.00 - 6.45	
D	7.00	
D	8.00	
ES	8.00	
B	9.00 - 9.45	
D	9.00	
D	9.01 - 9.45	
D	10.00	
P	10.00 - 11.00	
D	11.00	
D	12.00	
ES	12.00	
D	12.01 - 12.45	
B	13.00	
D	14.00	
D	15.00	
B	15.00 - 15.30	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	C	N=8 (13,10/2,2,2,2)
3.00	S	N=2 (1,0/1,0,1,0)
6.00	S	0 (0 for 450mm/0 for 0mm)
9.00	S	0 (0 for 450mm/0 for 0mm)
12.00	S	N=14 (1,0/1,3,5,5)
15.00	S	50 (25 for 50mm/50 for 60mm)
15.30	C	50 (25 for 60mm/50 for 60mm)
18.50	C	N=59 (4,7/7,19,17,16)
20.00	C	100 (11,14/100 for 160mm)
21.50	C	N=71 (10,9/17,16,17,21)
23.00	C	100 (19,6/100 for 170mm)
24.50	C	100 (25 for 75mm/100 for 80mm)
26.00	C	100 (23,2/100 for 85mm)
27.50	C	100 (25 for 75mm/100 for 30mm)
29.00	C	100 (25 for 75mm/100 for 20mm)
30.50	C	100 (25 for 75mm/100 for 105mm)
32.00	C	100 (13,7/100 for 170mm)
33.50	C	100 (25 for 75mm/100 for 30mm)
35.00	C	100 (25 for 75mm/100 for 10mm)
36.50	C	100 (25 for 75mm/100 for 85mm)
39.50	C	100 (25 for 75mm/100 for 105mm)
42.50	C	100 (25 for 75mm/100 for 30mm)
45.50	C	100 (25 for 75mm/100 for 10mm)
48.50	C	100 (25 for 75mm/100 for 20mm)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

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SUPPLEMENTARY HOLE INFORMATION

BHM4CANA031

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
27/01/2016 07:30:00	0.00	0.00	
27/01/2016 18:00:00	6.50	6.50	5
28/01/2016 07:30:00	6.60	6.50	5
28/01/2016 18:00:00	15.50	15.20	
24/02/2016 07:30:00	15.00	15.00	0.3
24/02/2016 18:00:00	27.50	21.00	
25/02/2016 07:30:00	27.50	21.00	3.3
25/02/2016 18:00:00	37.50	21.00	
26/02/2016 07:30:00	37.50	21.00	1.1
26/02/2016 18:00:00	43.50	21.00	
29/02/2016 07:30:00	43.50	21.00	2.3
29/02/2016 18:00:00	50.00	21.00	

Sample Information

Type/Ref	Depth (m)	Date
ES	0.40	
B	0.50 - 1.00	
ES	1.10	27-01-2016
B	1.20 - 1.60	
B	1.60 - 2.00	
ES	1.70	
ES	2.00	
B	2.50 - 3.00	
ES	3.00	
D	4.00 - 4.45	
B	6.50 - 7.00	
D	7.00 - 7.45	
ES	7.00	
D	10.00 - 10.45	
ES	11.00	
UT	12.30 - 12.75	
D	12.75 - 12.90	
B	13.50 - 14.00	
B	14.50 - 15.00	
B	15.30 - 15.50	
D	15.50 - 15.64	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	C	N=12 (2,3/3,3,3,3)
4.00	C	1 (1 for 225mm/1 for 225mm)
7.00	C	0 (1 for 450mm/0 for 0mm)
10.00	C	0 (1 for 450mm/0 for 0mm)
15.50	C	32 (18 for 75mm/32 for 65mm)
16.00	C	100 (25 for 95mm/100 for 170mm)
17.00	C	100 (25 for 75mm/100 for 115mm)
18.50	C	100 (25 for 85mm/100 for 105mm)
20.00	C	100 (25 for 20mm/100 for 75mm)
21.50	C	100 (25 for 40mm/100 for 85mm)
23.00	C	100 (25 for 20mm/100 for 95mm)
24.50	C	100 (25 for 105mm/100 for 150mm)
26.00	C	100 (25 for 15mm/100 for 30mm)
27.50	C	100 (25 for 10mm/100 for 40mm)
29.00	C	100 (25 for 40mm/100 for 125mm)
30.50	C	100 (25 for 50mm/100 for 150mm)
32.00	C	100 (25 for 85mm/100 for 170mm)
33.50	C	100 (25 for 50mm/100 for 170mm)
35.00	C	100 (25 for 75mm/100 for 190mm)
36.00	C	100 (25 for 15mm/100 for 30mm)
37.50	C	100 (25 for 25mm/100 for 50mm)
39.00	C	100 (25 for 30mm/100 for 50mm)
40.50	C	100 (25 for 45mm/100 for 115mm)
42.00	C	100 (25 for 35mm/100 for 120mm)
43.50	C	100 (25 for 20mm/100 for 75mm)
45.00	C	100 (25 for 10mm/100 for 45mm)
46.00	C	100 (25 for 35mm/100 for 150mm)
47.50	C	100 (25 for 50mm/100 for 130mm)
48.50	C	100 (25 for 10mm/100 for 25mm)
50.00	C	100 (25 for 20mm/100 for 30mm)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CANA032

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
04/02/2016 07:30:00	0.00	0.00	
04/02/2016 18:00:00	1.50	1.50	
05/02/2016 07:30:00	1.50	1.50	
05/02/2016 18:00:00	15.00	15.00	13.9
08/02/2016 07:30:00	15.00	15.00	7.3
08/02/2016 18:00:00	16.20	16.00	10.9
11/02/2016 07:30:00	16.20	16.00	
11/02/2016 18:00:00	19.30	19.00	
12/02/2016 07:30:00	19.30	19.00	
12/02/2016 18:00:00	22.80	20.80	
15/02/2016 07:30:00	22.80	20.80	4.8
15/02/2016 18:00:00	27.90	20.80	6.2
16/02/2016 07:30:00	27.90	20.80	0.2
16/02/2016 18:00:00	31.40	20.80	4.3
17/02/2016 07:30:00	31.40	20.80	2.9
17/02/2016 18:00:00	34.90	20.80	4.6
18/02/2016 07:30:00	34.90	20.80	2.9
18/02/2016 18:00:00	38.40	20.00	4.6
19/02/2016 07:30:00	38.40	20.00	
19/02/2016 18:00:00	42.80	20.80	
22/02/2016 07:30:00	42.80	20.80	
22/02/2016 18:00:00	45.50	20.80	
23/02/2016 07:30:00	45.50	20.80	5.2
23/02/2016 18:00:00	47.50	20.80	0
24/02/2016 07:30:00	47.50	20.80	5.2
24/02/2016 18:00:00	49.70	20.80	0

Sample Information

Type/Ref	Depth (m)	Date
ES	0.00	
B	0.30 - 0.55	
ES	0.50	04-02-2016
B	0.60 - 1.00	
ES	1.00	
B	1.10 - 1.20	
B	1.20 - 1.65	
D	2.00	
UT	2.00 - 2.45	
ES	2.00	
ES	3.00	
D	3.00	
B	3.60 - 3.95	
D	4.00	
B	4.00 - 4.45	
D	5.00	
D	6.00	
ES	6.00	
B	6.70 - 6.95	
D	7.00	
B	7.00 - 7.45	
D	8.00	
D	9.00	
D	10.00	
B	10.00 - 10.45	
ES	10.00	
D	11.00	
D	12.00	
B	12.50 - 12.95	
D	13.00	
B	13.00 - 13.45	
B	13.50 - 13.95	
D	14.00	
B	15.50 - 15.95	
B	16.00 - 16.20	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	S	N=8 (1,1/2,2,2,2)
4.00	S	0 (0 for 450mm/0 for 0mm)
7.00	S	0 (0 for 450mm/0 for 0mm)
10.00	S	0 (0 for 450mm/0 for 0mm)
13.00	S	N=35 (1,2/4,8,10,13)
16.00	C	50 (25 for 85mm/50 for 75mm)
16.20	C	50 (25 for 50mm/50 for 40mm)
17.20	C	80 (25,37/80 for 168mm)
20.80	C	100 (17,25/100 for 128mm)
23.80	C	100 (25,37/100 for 190mm)
25.30	C	100 (25,34/100 for 161mm)
26.80	C	100 (25,34/100 for 158mm)
27.90	C	108 (25,35/108 for 160mm)
29.90	C	35 (25,40/35 for 47mm)
33.90	C	95 (17,22/95 for 158mm)
34.90	C	125 (17,8/125 for 246mm)
36.90	C	100 (17,25/100 for 140mm)
39.40	C	100 (5,23/100 for 158mm)
40.90	C	91 (22,38/91 for 158mm)
42.20	C	102 (17,23/102 for 228mm)
43.30	C	64 (13,20/64 for 154mm)
45.50	C	100 (11,24/100 for 125mm)
47.50	C	100 (25 for 12mm/100 for 68mm)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CANA033

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
12/02/2016 07:30:00	0.00	0.00	
12/02/2016 18:00:00	20.00	20.00	12.2
15/02/2016 07:30:00	20.00	20.00	3.4
15/02/2016 18:00:00	22.00	21.80	7.6
01/03/2016 07:30:00	43.30	22.00	6.06
01/03/2016 18:00:00	50.50	22.00	6.66
16/03/2016 07:30:00	22.00	22.00	6.54
16/03/2016 18:00:00	28.20	22.00	6.74
17/03/2016 07:30:00	28.20	22.00	7.06
17/03/2016 18:00:00	35.70	22.00	6.35
18/03/2016 07:30:00	35.70	22.00	6.85
18/03/2016 18:00:00	43.30	22.00	6.1

Sample Information

Type/Ref	Depth (m)	Date
B	0.05 - 0.50	
ES	0.30	12-02-2016
B	0.80 - 1.15	
ES	1.00	12-02-2016
D	1.20 - 1.65	
B	1.20 - 1.65	
D	2.00	
B	2.40 - 2.85	
ES	2.60	12-02-2016
D	3.00	
D	4.00	
B	4.00 - 4.45	
D	4.01 - 4.45	
D	5.00	
ES	5.80	12-02-2016
D	6.00	
D	7.00	
UT	7.00 - 7.45	
D	7.50	
D	8.00	
D	9.00	
ES	9.00	12-02-2016
D	10.00 - 10.45	
B	10.00 - 10.45	
D	11.00	
D	12.00	
D	13.00	
B	13.00 - 13.45	
D	13.01 - 13.45	
D	14.00	
B	14.10 - 14.55	
D	15.00	
D	16.00	
B	16.00 - 16.45	
D	17.00	
D	18.00	
D	19.00	
B	19.00 - 19.45	
D	20.00	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	S	N=3 (1,0/1,0,1,1)
4.00	S	0 (0 for 450mm/0 for 0mm)
10.00	S	0 (0 for 450mm/0 for 0mm)
13.00	S	0 (0 for 450mm/0 for 0mm)
16.00	C	N=19 (3,4/4,5,5,5)
19.00	C	N=26 (4,7/6,6,7,7)
22.00	C	50 (25 for 60mm/50 for 30mm)
23.70	C	80 (25 for 95mm/80 for 225mm)
25.20	C	100 (25 for 80mm/100 for 150mm)
26.70	C	100 (25 for 105mm/100 for 60mm)
28.20	C	64 (71 for 140mm/64 for 70mm)
29.70	C	100 (25 for 90mm/100 for 210mm)
31.20	C	100 (25 for 120mm/100 for 155mm)
32.70	C	100 (25 for 105mm/100 for 165mm)
34.20	C	100 (25 for 10mm/100 for 75mm)
35.70	C	100 (25 for 78mm/100 for 160mm)
37.20	C	100 (25 for 100mm/100 for 205mm)
38.70	C	100 (25 for 83mm/100 for 145mm)
40.20	C	20 (105 for 115mm/20 for 15mm)
41.70	C	62 (25,38/62 for 80mm)
44.70	C	100 (25 for 80mm/100 for 135mm)
47.50	C	100 (25 for 105mm/100 for 200mm)
50.50	C	100 (25 for 95mm/100 for 77mm)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

DRAFT

SUPPLEMENTARY HOLE INFORMATION

WSM4CANA014

Start & End of Shift Observations			
Date & Time	Depth (m)	Casing (m)	Water (m)

Sample Information		
Type/Ref	Depth (m)	Date
ES	0.30	22-02-2016

Standard Penetration Tests		
Depth (m)	Type	Reported Result

Groundwater Monitoring		
Date & Time	Reference	Depth (mbGL)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

DRAFT

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

Appendix 2

Tabulated Gas and Groundwater Monitoring Data

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH423	28/04/15 11:00:00	1016	0								0.0	10		53 litres purged, base depth 18.00m.
BH423	28/04/15 11:01:00										0.0			
BH423	28/04/15 11:02:00										0.0			
BH423	28/04/15 11:03:00										0.0			
BH423	28/04/15 11:04:00										0.0			
BH423	28/04/15 11:05:00			0.2	0.4	19.8	11.1	0	0	0.6				
BH423	28/04/15 11:06:00			0.3	0.4	19.9	9.3	0	0	0.6				
BH423	28/04/15 11:07:00			0.3	0.6	19.9	16.7	0	0	0.5				
BH423	28/04/15 11:08:00			0.2	0.9	19.8	23.0	0	0	0.5				
BH423	28/04/15 11:09:00			0.2	1.0	19.8	23.4	0	0	0.4				
BH423	28/04/15 11:10:00			0.2	1.0	19.8	23.4	0	0	0.4				
BH423	28/04/15 11:11:00			0.1	1.0	19.9	24.0	0	0	0.3				
BH423	28/04/15 11:12:00			0.1	1.0	19.9	24.2	0	0	0.3				
BH423	28/04/15 11:13:00			0.1	1.0	19.9	23.6	0	0	0.1				
BH423	28/04/15 11:14:00			0.1	1.0	19.9	23.6	0	0	0.1			6.21	
BH423	06/05/15 11:00:00	1004	-1.16								0.0	13		57 litres purged, base depth 18.00m.
BH423	06/05/15 11:01:00										0.0			
BH423	06/05/15 11:02:00										0.0			

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

CONTRACT	CHECKED
30238	**EC**

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GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH423	06/05/15 11:03:00										0.0			
BH423	06/05/15 11:04:00										0.0			
BH423	06/05/15 11:05:00			0.0	0.1	20.4	1.0	0	0	3.3				
BH423	06/05/15 11:06:00			0.0	0.1	20.5	1.0	0	0	3.0				
BH423	06/05/15 11:07:00			0.0	0.1	20.5	1.0	0	0	2.8				
BH423	06/05/15 11:08:00			0.0	0.1	20.6	1.0	0	0	2.7				
BH423	06/05/15 11:09:00			0.0	0.0	20.6	0.0	0	0	2.6				
BH423	06/05/15 11:10:00			0.0	0.0	20.6	0.0	0	0	2.6				
BH423	06/05/15 11:11:00			0.0	0.0	20.7	0.0	0	0	2.5				
BH423	06/05/15 11:12:00			0.0	0.0	20.7	0.0	0	0	2.4				
BH423	06/05/15 11:13:00			0.0	0.0	20.7	0.0	0	0	2.3				
BH423	06/05/15 11:14:00			0.0	0.0	20.7	0.0	0	0	2.3			5.18	
BH423	11/05/15 09:00:00	1015	0								0.0	15		52 litres purged, base depth 18.00m.
BH423	11/05/15 09:31:00										0.0			
BH423	11/05/15 10:02:00										0.0			
BH423	11/05/15 10:33:00										0.0			
BH423	11/05/15 11:04:00										0.0			
BH423	11/05/15 11:35:00			0.0	0.0	20.5	0.0	0	0	1.4				

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

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GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH423	11/05/15 12:06:00			0.0	0.0	20.4	0.0	0	0	1.1				
BH423	11/05/15 12:37:00			0.0	0.0	20.4	0.0	0	0	1.0				
BH423	11/05/15 13:08:00			0.0	0.0	20.4	0.0	0	0	1.0				
BH423	11/05/15 13:39:00			0.0	0.0	20.4	0.0	0	0	0.9				
BH423	11/05/15 14:10:00			0.1	0.0	20.4	0.0	0	0	0.9				
BH423	11/05/15 14:41:00			0.0	0.0	20.3	0.0	0	0	0.8				
BH423	11/05/15 15:12:00			0.0	0.0	20.3	0.0	0	0	0.8				
BH423	11/05/15 15:43:00			0.0	0.0	20.3	0.0	0	0	0.8				
BH423	11/05/15 16:14:00			0.0	0.0	20.3	0.0	0	0	0.8			6.37	
BH423	19/05/15 09:38:00	1004	0								-3.4	12		
BH423	19/05/15 09:39:00										0.0			
BH423	19/05/15 09:40:00										-0.4			
BH423	19/05/15 09:41:00										0.0			
BH423	19/05/15 09:42:00										-1.6			
BH423	19/05/15 09:43:00			0.0	0.0	20.3	0.0	0	0	0.1				
BH423	19/05/15 09:44:00			0.0	0.0	20.3	0.0	0	0	0.1				
BH423	19/05/15 09:45:00			0.0	0.0	20.3	0.0	0	0	0.1				
BH423	19/05/15 09:46:00			0.0	0.0	20.3	0.0	0	0	0.1				

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

CONTRACT	CHECKED
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GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH423	19/05/15 09:47:00			0.0	0.0	20.3	0.0	0	0	0.0				
BH423	19/05/15 09:48:00			0.0	0.0	20.3	0.0	0	0	0.0				
BH423	19/05/15 09:49:00			0.0	0.0	20.3	0.0	0	0	0.0				
BH423	19/05/15 09:50:00			0.0	0.0	20.3	0.0	0	0	0.0				
BH423	19/05/15 09:51:00			0.0	0.0	20.3	0.0	0	0	0.0				
BH423	19/05/15 09:52:00			0.0	0.0	20.3	0.0	0	0	0.0				
BH423	19/05/15 09:53:00												7.40	

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

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GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH423	28/04/15 11:14:00												6.02	203 litres purged, base depth 40.00m.
BH423	06/05/15 11:14:00												5.27	208 litres purged, base depth 40.00m.
BH423	11/05/15 16:14:00												6.20	202 litres purged, base depth 40.00m.
BH423	19/05/15 09:54:00												6.90	

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Deep install.

CONTRACT	CHECKED
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GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH425	28/04/15 12:30:00	1022	-0.8								0.0	12		Only 15 litres purged. Thick sediment in water making purging difficult. Base depth 12.30m.
BH425	28/04/15 12:31:00										0.0			
BH425	28/04/15 12:32:00										0.0			
BH425	28/04/15 12:33:00										0.0			
BH425	28/04/15 12:34:00										0.0			
BH425	28/04/15 12:35:00			0.1	0.1	20.5	2.0	0	22	2.3				
BH425	28/04/15 12:36:00			0.0	0.1	20.6	1.0	0	3	1.4				
BH425	28/04/15 12:37:00			0.0	0.1	20.6	1.0	0	1	1.2				
BH425	28/04/15 12:38:00			0.0	0.1	20.6	1.0	0	0	0.9				
BH425	28/04/15 12:39:00			0.0	0.1	20.6	1.0	0	0	0.9				
BH425	28/04/15 12:40:00			0.0	0.1	20.6	1.0	0	0	0.8				
BH425	28/04/15 12:41:00			0.0	0.1	20.5	1.0	0	0	0.8				
BH425	28/04/15 12:42:00			0.0	0.1	20.5	1.0	0	0	0.7				
BH425	28/04/15 12:43:00			0.0	0.1	20.5	0.0	0	0	0.8				
BH425	28/04/15 12:44:00			0.0	0.1	20.5	1.0	0	0	0.7			2.10	
BH425	06/05/15 12:30:00	1004	-0.43								0.0	14		15 litres purged, base depth 12.30m.
BH425	06/05/15 12:31:00										0.0			

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

CONTRACT	CHECKED
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GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH425	06/05/15 12:32:00										0.0			
BH425	06/05/15 12:33:00										0.0			
BH425	06/05/15 12:34:00										0.0			
BH425	06/05/15 12:35:00			3.3	67.5	5.3	#	0	7	0.0				
BH425	06/05/15 12:36:00			3.3	65.3	5.7	#	0	5	0.0				
BH425	06/05/15 12:37:00			3.1	60.2	6.7	#	0	3	0.0				
BH425	06/05/15 12:38:00			3.0	55.9	7.3	#	0	0	1.4				
BH425	06/05/15 12:39:00			0.5	29.1	8.4	#	0	0	0.9				
BH425	06/05/15 12:40:00			1.0	14.5	17.2	#	0	0	0.0				
BH425	06/05/15 12:41:00			1.2	19.9	16.3	#	0	0	0.0				
BH425	06/05/15 12:42:00			1.3	22.3	15.6	#	0	0	0.0				
BH425	06/05/15 12:43:00			1.5	25.1	14.7	#	0	0	0.0				
BH425	06/05/15 12:44:00			1.6	26.9	14.3	#	0	0	0.0			4.45	
BH425	12/05/15 10:30:00	1017	0								0.0	14		10 litres purged, base depth 12.30m.
BH425	12/05/15 10:31:00										0.0			
BH425	12/05/15 10:32:00										0.0			
BH425	12/05/15 10:33:00										0.0			
BH425	12/05/15 10:34:00										0.0			

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

CONTRACT	CHECKED
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GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH425	12/05/15 10:35:00			2.0	45.1	10.8	#	0	1	0.0				
BH425	12/05/15 10:36:00			1.4	31.2	13.4	#	0	0	0.0				
BH425	12/05/15 10:37:00			1.0	24.1	15.0	#	0	0	0.0				
BH425	12/05/15 10:38:00			0.9	19.4	16.1	#	0	0	0.0				
BH425	12/05/15 10:39:00			0.8	17.8	16.4	#	0	0	0.0				
BH425	12/05/15 10:40:00			0.8	17.9	16.3	#	0	0	0.0				
BH425	12/05/15 10:41:00			0.7	16.5	16.8	#	0	0	0.0				
BH425	12/05/15 10:42:00			0.8	16.5	16.7	#	0	0	0.0				
BH425	12/05/15 10:43:00			0.7	13.8	17.4	#	0	0	0.0				
BH425	12/05/15 10:44:00			0.6	12.2	17.5	#	0	0	0.0			5.27	
BH425	19/05/15 10:40:00	1003	0								0.0	12		
BH425	19/05/15 10:41:00										0.0			
BH425	19/05/15 10:42:00										0.0			
BH425	19/05/15 10:43:00										0.0			
BH425	19/05/15 10:44:00										0.0			
BH425	19/05/15 10:45:00			2.3	50.5	9.5	#	0	0	0.0				
BH425	19/05/15 10:46:00			1.8	38.2	12.2	#	0	0	0.0				
BH425	19/05/15 10:47:00			1.3	28.1	14.2	#	0	0	0.0				

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

CONTRACT	CHECKED
30238	**EC**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH425	19/05/15 10:48:00			1.0	21.3	15.6	#	0	0	0.0				
BH425	19/05/15 10:49:00			0.8	17.9	16.4	#	0	0	0.0				
BH425	19/05/15 10:50:00			0.6	14.4	17.3	#	0	0	0.0				
BH425	19/05/15 10:51:00			0.5	11.6	17.9	#	0	0	0.0				
BH425	19/05/15 10:52:00			0.5	12.5	17.8	#	0	0	0.0				
BH425	19/05/15 10:53:00			0.4	10.7	18.1	#	0	0	0.0				
BH425	19/05/15 10:54:00			0.4	9.9	18.3	#	0	0	0.0				
BH425	19/05/15 10:55:00												7.24	

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

CONTRACT	CHECKED
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GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH425	28/04/15 12:44:00												5.46	Only 40 litres purged. Thick sediment in water making purging difficult. Base depth 30.00m.
BH425	06/05/15 12:44:00												5.30	40 litres purged, base depth 30.00m.
BH425	12/05/15 10:44:00												5.41	40 litres purged, base depth 30.00m.
BH425	19/05/15 10:56:00												6.73	

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Deep install.

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Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH426	28/04/15 14:00:00											14	0.10	Unable to obtain gas readings due to water level. Base depth 2.00m.
BH426	06/05/15 13:30:00											14	0.50	Unable to obtain gas readings due to water level. Base depth 2.00m.
BH426	12/05/15 09:00:00	1017	0								0.0	12		Upsurge at 2m 10s. Not enough water in shallow install to obtain sample. Base depth 2.00m.
BH426	12/05/15 09:01:00										0.0			
BH426	12/05/15 09:02:00										0.0			Only 25ltrs purged from deep install - running dry with slow recharge.
BH426	12/05/15 09:03:00										0.0			
BH426	12/05/15 09:04:00										0.0			
BH426	12/05/15 09:05:00			0.2	39.9	7.6	#	0	0	0.0				
BH426	12/05/15 09:06:00			0.3	74.1	0.2	#	0	0	0.0				
BH426	12/05/15 09:07:00													
BH426	12/05/15 09:08:00													
BH426	12/05/15 09:09:00													
BH426	12/05/15 09:10:00													
BH426	12/05/15 09:11:00													
BH426	12/05/15 09:12:00													
BH426	12/05/15 09:13:00													

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

CONTRACT	CHECKED
30238	**EC**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH426	12/05/15 09:14:00												0.43	

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

CONTRACT	CHECKED
30238	**EC**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH426	28/04/15 14:14:00												1.69	Only 20 litres purged due to thick sediment making purging difficult. Base depth 13.00m.
BH426	06/05/15 13:44:00												0.70	Only 20 litres purged due to thick sediment. Base depth 13.00m.
BH426	12/05/15 09:14:00												1.77	Only 25 litres purged from deep install - running dry with slow recharge. Base depth 13.00m.

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Deep install.

CONTRACT **30238**

CHECKED **EC**

M4CAN
Gas Monitoring
CL-15

Loc. Ref.	Install Ref. *1	Reading Ref. *2	Location Notes	Gas Monitoring																	Additional Notes / Comments
				Date	Time	Min	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak LEL	Flow Rate (l/hr)	Differential Pressure (pa)	Air Pressure (mb)	Air Temperature (°C)	
						Oxygen (O_2) %		Carbon Dioxide (CO_2) %		Carbon Monoxide (CO) ppm		Hydrogen Sulphide (H_2S) ppm		Methane (CH_4) %							
BHM4CAN024	1	1		04/05/16	11:30 AM	3.10	19.20	0.40	0.00	9.00	0.00	0.00	0.00	20.20	1.60	>>	0.00		1026.00		
BHM4CAN024	1	2		18/05/16	03:45 PM	15.10	19.20	0.10	0.10	1.00	0.00	0.00	0.00	17.30	3.90						
BHM4CAN024	1	3		01/06/16	02:00 PM	14.80	17.90	0.20	0.10	2.00	1.00	0.00	0.00	8.30	3.40		0.50	15.80			
BHM4CAN025	1	1		04/05/16	12:20 PM	20.40	20.40	0.00	0.00	1.00	1.00	0.00	0.00	0.10	0.10	1.00	-0.10	0.04	1026.00		
BHM4CAN025	1	2		18/05/16	01:45 PM	20.80	20.90	0.10	0.10	0.00	0.00	0.00	0.00	0.30	0.30	0.00					
BHM4CAN025	1	3		01/06/16	12:30 PM	17.20	17.90	0.20	0.20	2.00	2.00	0.00	0.00	3.20	2.80		0.50	1.01			

M4CAN
Groundwater Monitoring
CL-15

Legend

DO	Dissolved Oxygen	ORP	Oxidation Reduction Potential	mAOD	meters Above Ordnance Datum
RWL	Resting Water Level	mbGL	meters below Ground Level		

Loc. Ref.	Install Ref. *1	Monitoring Round *2	Location Notes	Groundwater & Product Levels							Water Quality									Additional Notes / Comments
				Date	Time	Depth to Product (mbGL)	Groundwater Level (mbGL)	Depth to Base (mbGL)	Ground Level (mAOD)	RWL (mAOD)	Measurement Approach *3	Temperature (°C)	pH	Electrical Conductivity (µS/cm)	DO (%)	ORP (mV)	Stabilised Water Level (mbGL)	Time (min)	Logged Data Available (Y/N)	
BHM4CAN024	1	1		04/05/16	11:40 AM		0.54	1.48	6.96	6.42	GS	15.38	7.6	1833	8	-111	0.62			Slightly milky. Very heavy sediment load at start of purge. Salinity 1.2 psu. Recovery rate slow but possible to match. Very silty base.
BHM4CAN024	1	2		18/05/16	03:45 PM		0.36	1.48	6.96	6.60	GS	17.28	7.8	1739	21.80	114.00	0.45			3 well volumes (6.86 l) purged prior to sampling.
BHM4CAN024	1	3		01/06/16	02:00 PM		0.52	1.49	6.96	6.44	GS	19.28	8.0	1781	22.30	-91.20	0.52			Salinity 1 psu. 3 well volumes (5.7 l) purged prior to sampling.
BHM4CAN025	1	1		04/05/16	12:30 PM		6.90	44.85	7.67	0.77	GS	13.69	7.8	16459	16	40	7.28			No odour. Slightly murky appearance. Recovery rate good.
BHM4CAN025	1	2		18/05/16	01:45 PM		6.93	44.85	7.67	0.74	GS	12.97	7.7	16113	16.60	31.10	7.00			3 well volumes purged prior to sampling (222 l)
BHM4CAN025	1	3		01/06/16	12:30 PM		7.10	44.85	7.67	0.57	GS	13.61	7.8	16271	33.30	69.90	7.10			Salinity 12.4 psu. 3 well volumes (238 l) purged prior to sample.

Appendix 3

Tabulated Soil Laboratory Data

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-15
20/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criterion for lead is C4SL in the absence of a S4UL
Conservative 1% SOM has been used

Sample Reference / Specimen Depth / Level / Sample Type / Geology Code / Cluster Code	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
Metals								
Antimony	mg/kg	2	2	92	2	STPG01 @ 0.3mbGL		
Arsenic	mg/kg	33	33	170	4	BH426 @ 0.5 - 0.6mbGL	170	0
Barium	mg/kg	2	2	460	67	STPG01 @ 0.3mbGL		
Boron	mg/kg	23	22	35.3	0.5	BHG3 @ 0.2mbGL	46000	0
Boron Water Soluble	mg/kg	2	1	23	23	STPG01 @ 0.3mbGL		
Cadmium	mg/kg	33	30	10.6	0.094	BHG3 @ 0.2mbGL	190	0
Chromium	mg/kg	33	33	2410	4.96	BHM4CANA023 @ 1mbGL	33	15
Copper	mg/kg	33	33	536	5.32	CH31 @ 0mbGL	44000	0
Lead	mg/kg	33	33	449.9	8.86	BHG3 @ 0.2mbGL	1300	0
Mercury	mg/kg	33	22	16.9	0.09	CH32 @ 0.5mbGL	30	0
Molybdenum	mg/kg	2	2	36	0.8	STPG01 @ 0.3mbGL		
Nickel	mg/kg	33	33	620	4.67	BH426 @ 0.5 - 0.6mbGL	980	0
Selenium	mg/kg	33	23	2.52	0	CH31 @ 0mbGL	1800	0
Tin	mg/kg	2	1	8.5	8.5	BH426 @ 0.5 - 0.6mbGL		
Vanadium	mg/kg	10	10	213	7.44	BHM4CANA023 @ 1mbGL	5000	0
Zinc	mg/kg	33	33	1368.1	25.3	BHG3 @ 0.2mbGL	170000	0
Iron	mg/kg	5	5	36500	10000	BHM4CANA025 @ 0.4-1.1mbGL		
Hexavalent Chromium	mg/kg	7	1	0.4	0.4	STPG01 @ 0.3mbGL		
Non-Metal Inorganics								
Cyanide (total)	mg/kg	25	2	0.7	0.3	BH425 @ 1.5 - 1.6mbGL		
Cyanide (free)	mg/kg	31	1	1	1	CH29 @ 0.4mbGL		
Thiocyanate	mg/kg	1	0	None > LOD	None > LOD			
Ferro/ferricyanide	mg/kg	2	0	None > LOD	None > LOD			
Acid Soluble Sulphate	mg/kg	11	10	2440	626	CH25 @ 0mbGL		
Sulphate (soluble)	g/l	2	2	0.058	0.025	STPG01 @ 0.3mbGL		
Sulphate (total)	mg/kg	4	4	3456	777	BHG3 @ 0.2mbGL		
Sulphide	mg/kg	14	11	40	10.8	CH24 @ 0mbGL		
Sulphur	%	2	2	0.22	0.13	BH426 @ 0.5 - 0.6mbGL		
Other								
Ammoniacal Nitrogen as N	mg/kg	2	2	56	19	BH426 @ 1.5 - 1.6mbGL		
Nitrate as N	mg/kg	2	0	None > LOD	None > LOD			
Nitrate as NO2	mg/kg	2	1	0.14	0.14	BH426 @ 0.5 - 0.6mbGL		
Asbestos Presence Screen	None	15	9	0	0	BH424 @ 0.3 - 0.6mbGL		
Asbestos Identification	%	9	9	0	0	BH424 @ 0.3 - 0.6mbGL		
Asbestos by Gravimetry	%	2	2	0	0	BH426 @ 0.5 - 0.6mbGL		
Asbestos (Total)	%	2	2	0	0	BH426 @ 0.5 - 0.6mbGL		
Total Organic Carbon	%	4	4	0.85	0.5	BH425 @ 0.5 - 0.6mbGL		
Organic Matter	%	2	2	4.5	1.3	BH426 @ 1.5 - 1.6mbGL		
Calorific Value	MJ/kg	1	0	None > LOD	None > LOD			
pH Value	pH units	33	33	12.2	7.9	BHM4CANA033 @ 0.3mbGL	6-9	24
Organics								
PAH (Screening)	mg/kg	13	12	191	9.3	CH25 @ 0mbGL	1.1	12
Mineral Oil	mg/kg	13	1	53	53	BHG3 @ 0.2mbGL		
TPH FTIR (AR)	mg/kg	10	7	1190	66	CH32 @ 0mbGL	2000	0
OIL FTIR	mg/kg	13	11	1130	131	CH25 @ 0mbGL		
PCBs								
PCB - ARO	mg/kg	3	3	0.5	0.2	CH32 @ 0.5mbGL	0.24	1
PCBs (vs Aroclor 1254)	mg/kg	2	2	0.61	0.062	STPG01 @ 0.3mbGL	0.24	1
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg	10	0	None > LOD	None > LOD		0.24	0
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg	10	0	None > LOD	None > LOD		0.24	0
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg	10	0	None > LOD	None > LOD		0.24	0
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg	10	0	None > LOD	None > LOD		0.24	0
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg	10	0	None > LOD	None > LOD		0.24	0
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg	10	0	None > LOD	None > LOD		0.24	0
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg	10	0	None > LOD	None > LOD		0.24	0
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg	10	0	None > LOD	None > LOD		0.24	0
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg	10	0	None > LOD	None > LOD		0.24	0
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg	10	0	None > LOD	None > LOD		0.24	0
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg	10	0	None > LOD	None > LOD		0.24	0
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphen	mg/kg	10	0	None > LOD	None > LOD		0.24	0
Sum of detected WHO 12 PCBs	mg/kg	4	0	None > LOD	None > LOD		0.24	0
Phenols								
Phenol Index	mg/kg	19	1	0.5	0.5	CH29 @ 0.4mbGL	440	0
Phenols Monohydric	mg/kg	10	0	None > LOD	None > LOD		440	0
Phenols (total)	mg/kg	11	0	None > LOD	None > LOD		440	0
Cresols	mg/kg	8	0	None > LOD	None > LOD			
BTEX								
GRO (C4-C12)	mg/kg	10	5	0.243	0.0706	BHM4CANA029 @ 0-1.1mbGL		
MTBE	mg/kg	11	0	None > LOD	None > LOD			
Benzene	mg/kg	15	0	None > LOD	None > LOD		27	0
Toluene	mg/kg	15	4	0.00896	0.00203	BHM4CANA032 @ 0.5mbGL	56000	0
Ethyl benzene	mg/kg	15	0	None > LOD	None > LOD		5700	0
m & p Xylene	mg/kg	15	1	0.00896	0.00896	BHM4CANA032 @ 0.5mbGL	5900	0
o Xylene	mg/kg	15	2	0.00512	0.00357	BHM4CANA032 @ 0.5mbGL	6600	0
Sum of Detected BTEX	mg/kg	8	0	None > LOD	None > LOD			
Sum of Detected Xylenes	mg/kg	8	1	0.0141	0.0141	BHM4CANA032 @ 0.5mbGL		
TPH								
TPH >C6-C8	mg/kg	2	0	None > LOD	None > LOD		7800	0
TPH >C8-C10	mg/kg	2	0	None > LOD	None > LOD		2000	0
TPH >C10-C12	mg/kg	2	0	None > LOD	None > LOD		9200	0
TPH >C12-C16	mg/kg	2	0	None > LOD	None > LOD		10000	0
TPH >C16-C21	mg/kg	2	0	None > LOD	None > LOD		7600	0
TPH >C21-C35	mg/kg	2	0	None > LOD	None > LOD		7800	0
Aliphatics C5-C6	mg/kg	15	2	0.0345	0.0154	BHM4CANA029 @ 0-1.1mbGL	3200	0
Aliphatics >C6-C8	mg/kg	15	5	0.0702	0.0112	BHM4CANA029 @ 0-1.1mbGL	7800	0
Aliphatics >C8-C10	mg/kg	15	4	0.0333	0.0142	BHM4CANA029 @ 0-1.1mbGL	2000	0
Aliphatics >C10-C12	mg/kg	15	5	0.0369	0.0128	BHM4CANA029 @ 0-1.1mbGL	9700	0
Aliphatics >C12-C16	mg/kg	15	6	214	1.26	BHM4CANA032 @ 0.5mbGL	25000	0
Aliphatics >C16-C21	mg/kg	15	8	237	0.315	BHM4CANA032 @ 0.5mbGL	450000	0

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-15
20/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criterion for lead is C4SL in the absence of a S4UL
Conservative 1% SOM has been used

Sample Reference Specimen Depth Level Sample Type Geology Code Cluster Code	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
Aliphatics >C21-C35	mg/kg	15	9	130	4.45	STPG01 @ 0.3mbGL	450000	0
Total Aliphatics >C12-C44	mg/kg	8	7	533	5.45	BHM4CANA032 @ 0.5mbGL	25000	0
Total Aliphatics C5-C35	mg/kg	2	2	160	110	STPG01 @ 0.3mbGL	2000	0
Aliphatics >C35-C44	mg/kg	13	5	18.6	2.6	BHM4CANA025 @ 0.4-1.1mbGL	450000	0
Aromatics >C5-C7	mg/kg	13	0	None > LOD	None > LOD		26000	0
Aromatics C6-C7	mg/kg	2	0	None > LOD	None > LOD		7800	0
Aromatics >C7-C8	mg/kg	15	0	None > LOD	None > LOD		56000	0
Aromatics >EC8-EC10	mg/kg	15	6	0.0346	0.0104	BHM4CANA032 @ 0.5mbGL	3500	0
Aromatics >EC10-EC12	mg/kg	15	4	0.025	0.0112	BHM4CANA029 @ 0-1.1mbGL	9200	0
Aromatics >EC12-EC16	mg/kg	15	3	91.4	0.339	BHM4CANA032 @ 0.5mbGL	10000	0
Aromatics >EC16-EC21	mg/kg	15	11	126	0.22	BHM4CANA032 @ 0.5mbGL	7600	0
Aromatics >EC21-EC35	mg/kg	15	11	68.1	2.47	BHM4CANA032 @ 0.5mbGL	7800	0
Total Aromatics C6-C35	mg/kg	2	2	24	3.9	STPG02 @ 0.3mbGL	3500	0
Aromatics >C35-C44	mg/kg	13	6	9.13	1.32	BHM4CANA025 @ 0.4-1.1mbGL	7800	0
Aromatics >EC40-EC44	mg/kg	8	5	3.94	0.851	BHM4CAN025 @ 0.4mbGL	7800	0
Total Aromatics >EC12-EC44	mg/kg	8	8	292	3.09	BHM4CANA032 @ 0.5mbGL	7600	0
Total Aliphatic hydrocarbons	mg/kg	5	0	None > LOD	None > LOD		2000	0
Total Aromatic hydrocarbons	mg/kg	5	2	14	10	BH426 @ 0.5 - 0.6mbGL	3500	0
TPH (Aliphatics and Aromatics C5-C35)	mg/kg	2	2	160	130	STPG01 @ 0.3mbGL	2000	0
TPH (Aliphatics and Aromatics C5-C44)	mg/kg	8	8	825	8.63	BHM4CANA032 @ 0.5mbGL	2000	0
Total petroleum hydrocarbons	mg/kg	5	2	14	10	BH426 @ 0.5 - 0.6mbGL	2000	0
PAH								
Acenaphthene	mg/kg	20	7	1.1	0.015	TP410 @ 0 - 0.1mbGL	29000	0
Acenaphthylene	mg/kg	20	5	0.5	0.008	TP410 @ 0 - 0.1mbGL	29000	0
Anthracene	mg/kg	20	8	1.6	0.019	BH426 @ 0.5 - 0.6mbGL	150000	0
Benzo(a)anthracene	mg/kg	20	12	4.9	0.0261	BH426 @ 0.5 - 0.6mbGL	49	0
Benzo(a)pyrene	mg/kg	20	9	5.7	0.0436	BH426 @ 0.5 - 0.6mbGL	11	0
Benzo(b)fluoranthene	mg/kg	20	10	7.5	0.0208	BH426 @ 0.5 - 0.6mbGL	13	0
Benzo(ghi)perylene	mg/kg	20	10	3.7	0.0395	BH426 @ 0.5 - 0.6mbGL	1400	0
Benzo(k)fluoranthene	mg/kg	20	9	2.4	0.0283	BH426 @ 0.5 - 0.6mbGL	370	0
Chrysene	mg/kg	20	11	3.7	0.0455	BH426 @ 0.5 - 0.6mbGL	93	0
Dibenzo(ah)anthracene	mg/kg	20	7	0.61	0.018	TP410 @ 0 - 0.1mbGL	1.1	0
Fluoranthene	mg/kg	20	15	9.7	0.0727	BH426 @ 0.5 - 0.6mbGL	6300	0
Fluorene	mg/kg	20	7	0.68	0.015	BH426 @ 0.5 - 0.6mbGL	20000	0
Indeno(123cd)pyrene	mg/kg	20	9	4	0.0319	BH426 @ 0.5 - 0.6mbGL	150	0
Naphthalene	mg/kg	20	10	0.66	0.022	BH424 @ 0.7 - 1mbGL	190	0
Phenanthrene	mg/kg	20	16	7.4	0.0175	BH426 @ 0.5 - 0.6mbGL	6200	0
Pyrene	mg/kg	20	16	7.7	0.0183	BH426 @ 0.5 - 0.6mbGL	15000	0
Coronene	mg/kg	2	0	None > LOD	None > LOD			
PAH 16 Total	mg/kg	20	11	64	0.531	BH426 @ 0.5 - 0.6mbGL		
SVOCs								
Phenols								
2,3,4,5-tetrachlorophenol.	mg/kg	2	0	None > LOD	None > LOD			
2,3,4,6-Tetrachlorophenol	mg/kg	2	0	None > LOD	None > LOD			
2,3,4-trichlorophenol.	mg/kg	2	0	None > LOD	None > LOD			
2,3,5,6-Tetrachlorophenol	mg/kg	2	0	None > LOD	None > LOD			
2,3,5-Trichlorophenol	mg/kg	2	0	None > LOD	None > LOD			
2,3,6-Trichlorophenol	mg/kg	2	0	None > LOD	None > LOD			
2,6-Dichlorophenol	mg/kg	2	0	None > LOD	None > LOD			
2-sec-Butyl-4,6-dinitrophenol	mg/kg	2	0	None > LOD	None > LOD			
3,4,5-Trichlorophenol	mg/kg	2	0	None > LOD	None > LOD			
3-methylphenol	mg/kg	2	0	None > LOD	None > LOD			
2-Chlorophenol	mg/kg	8	0	None > LOD	None > LOD			
2-Methylphenol	mg/kg	8	0	None > LOD	None > LOD			
2-Nitrophenol	mg/kg	8	0	None > LOD	None > LOD			
2-Methyl-4,6 Dinitrophenol	mg/kg	2	0	None > LOD	None > LOD			
2,4-Dichlorophenol	mg/kg	8	0	None > LOD	None > LOD			
2,4-Dimethylphenol	mg/kg	8	0	None > LOD	None > LOD			
2,4,5-Trichlorophenol	mg/kg	8	0	None > LOD	None > LOD			
2,4,6-Trichlorophenol	mg/kg	8	0	None > LOD	None > LOD			
4-Chloro-3-methylphenol	mg/kg	8	0	None > LOD	None > LOD			
4-Methylphenol	mg/kg	8	0	None > LOD	None > LOD			
4-Nitrophenol	mg/kg	8	0	None > LOD	None > LOD			
Pentachlorophenol	mg/kg	8	0	None > LOD	None > LOD			
1-naphthol	mg/kg	2	0	None > LOD	None > LOD			
Methylphenols	mg/kg	2	0	None > LOD	None > LOD			
Resorcinol	mg/kg	2	0	None > LOD	None > LOD			
Trimethylphenol	mg/kg	2	0	None > LOD	None > LOD			
Xylenols	mg/kg	10	0	None > LOD	None > LOD			
Phenol	mg/kg	8	0	None > LOD	None > LOD		440	0
Phenols	mg/kg	7	0	None > LOD	None > LOD		440	0
PAHs								
2-Chloronaphthalene	mg/kg	7	0	None > LOD	None > LOD			
2-Methylnaphthalene	mg/kg	7	1	0.122	0.122	BHM4CANA029 @ 0-1.1mbGL		
Acenaphthene	mg/kg	5	0	None > LOD	None > LOD		29000	0
Acenaphthylene	mg/kg	5	0	None > LOD	None > LOD		29000	0
Anthracene	mg/kg	5	0	None > LOD	None > LOD		150000	0
Benzo(a)anthracene	mg/kg	5	2	0.404	0.14	BHM4CANA029 @ 0-1.1mbGL	49	0
Benzo(a)pyrene	mg/kg	5	2	0.508	0.11	BHM4CANA029 @ 0-1.1mbGL	11	0
Benzo(b)fluoranthene	mg/kg	5	2	0.594	0.12	BHM4CANA029 @ 0-1.1mbGL	13	0
Benzo(ghi)perylene	mg/kg	5	2	0.586	0.11	BHM4CANA029 @ 0-1.1mbGL	1400	0
Benzo(k)fluoranthene	mg/kg	5	1	0.412	0.412	BHM4CANA029 @ 0-1.1mbGL	370	0
Chrysene	mg/kg	5	2	0.545	0.16	BHM4CANA029 @ 0-1.1mbGL	93	0
Dibenzo(a,h)anthracene	mg/kg	5	1	0.134	0.134	BHM4CANA029 @ 0-1.1mbGL		
Fluoranthene	mg/kg	5	2	0.501	0.29	BHM4CANA029 @ 0-1.1mbGL	6300	0
Fluorene	mg/kg	5	0	None > LOD	None > LOD		20000	0
Indeno(1,2,3-cd)pyrene	mg/kg	5	2	0.524	0.15	BHM4CANA029 @ 0-1.1mbGL		
Naphthalene	mg/kg	5	1	0.161	0.161	BHM4CANA029 @ 0-1.1mbGL	190	0
Phenanthrene	mg/kg	5	2	0.289	0.25	BHM4CANA029 @ 0-1.1mbGL	6200	0
Pyrene	mg/kg	5	2	0.49	0.23	BHM4CANA029 @ 0-1.1mbGL	15000	0

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	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criterion for lead is C4SL in the absence of a S4UL
Conservative 1% SOM has been used

Sample Reference / Specimen Depth / Level / Sample Type / Geology Code / Cluster Code	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
Pthalates								
Bis(2-ethylhexyl) phthalate	mg/kg	7	2	8.6	2.9	STPG02 @ 0.3mbGL		
Butylbenzyl phthalate	mg/kg	7	0	None > LOD	None > LOD			
Di-n-butyl phthalate	mg/kg	7	0	None > LOD	None > LOD			
Di-n-Octyl phthalate	mg/kg	7	0	None > LOD	None > LOD			
Diethyl phthalate	mg/kg	7	0	None > LOD	None > LOD			
Dimethyl phthalate	mg/kg	7	0	None > LOD	None > LOD			
Other Semi-Volatiles								
1,2-Dichlorobenzene	mg/kg	6	0	None > LOD	None > LOD			
1,2,4-Trichlorobenzene	mg/kg	6	0	None > LOD	None > LOD		220	0
1,3-Dichlorobenzene	mg/kg	6	0	None > LOD	None > LOD			
1,4-Dichlorobenzene	mg/kg	6	0	None > LOD	None > LOD			
2-Nitroaniline	mg/kg	7	0	None > LOD	None > LOD			
2,4-Dinitrotoluene	mg/kg	7	0	None > LOD	None > LOD			
2,6-Dinitrotoluene	mg/kg	7	0	None > LOD	None > LOD			
3-Nitroaniline	mg/kg	7	0	None > LOD	None > LOD			
4-Bromophenylphenylether	mg/kg	7	0	None > LOD	None > LOD			
4-Chloroaniline	mg/kg	7	0	None > LOD	None > LOD			
4-Chlorophenylphenylether	mg/kg	7	0	None > LOD	None > LOD			
4-Nitroaniline	mg/kg	7	0	None > LOD	None > LOD			
Azobenzene	mg/kg	7	0	None > LOD	None > LOD			
Bis(2-chloroethoxy)methane	mg/kg	7	0	None > LOD	None > LOD			
Bis(2-chloroethyl)ether	mg/kg	7	0	None > LOD	None > LOD			
Bis(2-chloroisopropyl)ether	mg/kg	1	0	None > LOD	None > LOD			
Carbazole	mg/kg	7	0	None > LOD	None > LOD			
Dibenzofuran	mg/kg	7	0	None > LOD	None > LOD			
Hexachlorobenzene	mg/kg	7	0	None > LOD	None > LOD		30	0
Hexachlorobutadiene	mg/kg	7	0	None > LOD	None > LOD		31	0
Hexachlorocyclopentadiene	mg/kg	7	0	None > LOD	None > LOD			
Hexachloroethane	mg/kg	7	0	None > LOD	None > LOD			
Isophorone	mg/kg	7	0	None > LOD	None > LOD			
N-nitrosodimethylamine	mg/kg	1	0	None > LOD	None > LOD			
N-nitrosodi-n-propylamine	mg/kg	7	0	None > LOD	None > LOD			
Nitrobenzene	mg/kg	7	0	None > LOD	None > LOD			
VOCs								
Methyl Tertiary Butyl Ether	ug/kg	7	0	None > LOD	None > LOD			
Benzene	ug/kg	7	0	None > LOD	None > LOD		27000	0
Toluene	ug/kg	7	0	None > LOD	None > LOD		56000000	0
Ethylbenzene	ug/kg	7	0	None > LOD	None > LOD		5700000	0
p/m-Xylene	ug/kg	7	0	None > LOD	None > LOD			
o-Xylene	ug/kg	7	0	None > LOD	None > LOD		6600000	0
Naphthalene	ug/kg	6	0	None > LOD	None > LOD		190000	0
Hexachlorobutadiene	ug/kg	7	0	None > LOD	None > LOD		31000	0
1.2.4-Trichlorobenzene	ug/kg	3	0	None > LOD	None > LOD		220000	0
1.2-Dichlorobenzene	ug/kg	7	0	None > LOD	None > LOD			
1.3-Dichlorobenzene	ug/kg	7	0	None > LOD	None > LOD			
1.4-Dichlorobenzene	ug/kg	7	0	None > LOD	None > LOD			
1.1.1.2-Tetrachloroethane	ug/kg	7	0	None > LOD	None > LOD			
1.1.1-Trichloroethane	ug/kg	7	0	None > LOD	None > LOD			
1.1.2.2-Tetrachloroethane	ug/kg	6	0	None > LOD	None > LOD			
1.1.2-Trichloroethane	ug/kg	7	0	None > LOD	None > LOD			
1.1-Dichloropropene	ug/kg	7	0	None > LOD	None > LOD			
1.1-Dichloroethane	ug/kg	7	0	None > LOD	None > LOD			
1.1-Dichloroethene	ug/kg	7	0	None > LOD	None > LOD			
1.2.3-Trichlorobenzene	ug/kg	7	0	None > LOD	None > LOD		102000	0
1.2.3-Trichloropropane	ug/kg	7	0	None > LOD	None > LOD			
1.2.4-Trimethylbenzene	ug/kg	7	0	None > LOD	None > LOD			
1.2-Dibromo-3-chloropropane	ug/kg	7	0	None > LOD	None > LOD			
1.2-Dichloroethane	ug/kg	7	0	None > LOD	None > LOD			
cis-1-2-Dichloroethene	ug/kg	7	0	None > LOD	None > LOD			
1.2-Dibromoethane	ug/kg	7	0	None > LOD	None > LOD			
1.2-Dichloropropane	ug/kg	7	0	None > LOD	None > LOD			
1.3.5-Trimethylbenzene	ug/kg	7	0	None > LOD	None > LOD			
cis-1-3-Dichloropropene	ug/kg	7	0	None > LOD	None > LOD			
1.3-Dichloropropane	ug/kg	7	0	None > LOD	None > LOD			
2.2-Dichloropropane	ug/kg	6	0	None > LOD	None > LOD			
2-Chlorotoluene	ug/kg	7	0	None > LOD	None > LOD			
4-Chlorotoluene	ug/kg	7	0	None > LOD	None > LOD			
4-Isopropyltoluene	ug/kg	7	0	None > LOD	None > LOD			
Bromobenzene	ug/kg	7	0	None > LOD	None > LOD			
Bromochloromethane	ug/kg	7	0	None > LOD	None > LOD			
Bromoform	ug/kg	6	0	None > LOD	None > LOD			
Bromomethane	ug/kg	7	0	None > LOD	None > LOD			
Bromodichloromethane	ug/kg	7	0	None > LOD	None > LOD			
Chlorobenzene	ug/kg	7	0	None > LOD	None > LOD		56000	0
Carbon Disulphide	ug/kg	6	0	None > LOD	None > LOD		11000	0
Chloroethane	ug/kg	7	0	None > LOD	None > LOD			
Chloroethene	ug/kg	1	0	None > LOD	None > LOD		59	0
Chloroform	ug/kg	7	0	None > LOD	None > LOD		99000	0
Chloromethane	ug/kg	7	0	None > LOD	None > LOD			
Carbontetrachloride	ug/kg	7	0	None > LOD	None > LOD			
Dibromomethane	ug/kg	7	0	None > LOD	None > LOD			
Dichlorodifluoromethane	ug/kg	7	0	None > LOD	None > LOD			
Dibromochloromethane	ug/kg	7	0	None > LOD	None > LOD			
Dichloromethane	ug/kg	6	0	None > LOD	None > LOD			
Isopropylbenzene	ug/kg	7	0	None > LOD	None > LOD			
n-Butylbenzene	ug/kg	7	0	None > LOD	None > LOD			
Propylbenzene	ug/kg	7	0	None > LOD	None > LOD			
sec-Butylbenzene	ug/kg	7	0	None > LOD	None > LOD			
Styrene	ug/kg	7	0	None > LOD	None > LOD			

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Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criterion for lead is C4SL in the absence of a S4UL
Conservative 1% SOM has been used

Sample Reference / Specimen Depth / Level / Sample Type / Geology Code / Cluster Code	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
Tert-amyl methyl ether	ug/kg	4	0	None > LOD	None > LOD			
trans-1-2-Dichloroethene	ug/kg	7	0	None > LOD	None > LOD			
trans-1-3-Dichloropropene	ug/kg	7	0	None > LOD	None > LOD			
Trichlorofluoromethane	ug/kg	7	0	None > LOD	None > LOD			
tert-Butylbenzene	ug/kg	7	0	None > LOD	None > LOD			
Tetrachloroethene	ug/kg	7	1	6.84	6.84	BHM4CAN026 @ 0.8mbGL	19000	0
Tribromomethane	ug/kg	1	0	None > LOD	None > LOD			
Trichloroethene	ug/kg	7	0	None > LOD	None > LOD		1200	0
Vinyl Chloride	ug/kg	6	0	None > LOD	None > LOD		59	0

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Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	X

Sample Reference	Units	BHG2	BHG3	CH24	CH25	CH26	CH27	CH28	CH29	CH30	CH30	CH31	CH32	CH32
Specimen Depth		1	0.2	0	0	0.3	0.55	0.22	0.4	0	1	0	0	0.5
Level		7	7.8	7.41	7.61	6.89	6.23	7.67	7.64	8.23	7.23	7.96	8.13	7.63
Sample Type		B	D	D	D	D	D	D	D	D	D	D	D	D
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Cluster Code		1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI
Metals														
Antimony	mg/kg													
Arsenic	mg/kg	20.9	13.3	9.3	4.6	6.43	14.4	16.7	8.18	8.85	12	21.3	12.8	29.5
Barium	mg/kg													
Boron	mg/kg	2.9	35.3	<0.5	0.5	1	1.8	0.6	0.7	1.5	3.2	23	2.1	1.3
Boron Water Soluble	mg/kg													
Cadmium	mg/kg	<0.2	10.6	0.87	0.51	0.1	0.35	0.22	0.18	0.36	0.68	1.09	0.57	0.29
Chromium	mg/kg	67.5	1137.9	99	16	13	120	16	33	32	45	2170	1790	41
Copper	mg/kg	26	228.4	141	16	19	147	43	52	60	77	536	221	172
Lead	mg/kg	59.5	449.9	154	56	45	157	62	60	125	111	182	166	417
Mercury	mg/kg	<0.1	0.5	<0.14	<0.14	0.09	0.14	2.91	0.8	0.38	1.21	0.38	3.21	16.9
Molybdenum	mg/kg													
Nickel	mg/kg	39.3	81.5	51	9	10	53	13	29	23	29	141	49	32
Selenium	mg/kg	0.3	1.2	0.6	0.64	0.94	0.6	0.99	0.67	0.83	0.97	2.52	1.79	0.97
Tin	mg/kg													
Vanadium	mg/kg													
Zinc	mg/kg	136.7	1368.1	280	69	53	188	89	63	139	168	475	390	389
Iron	mg/kg													
Hexavalent Chromium	mg/kg													
Non-Metal Inorganics														
Cyanide (total)	mg/kg	<0.1	0.3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cyanide (free)	mg/kg	<0.1	<0.1	<1	<1	<1	<1	<1	1	<1	<1	<1	<1	<1
Thiocyanate	mg/kg	<1												
Ferro/ferricyanide	mg/kg	<10	<10											
Acid Soluble Sulphate	mg/kg			<836	2440	1110	626	2240	674	760	1190	2440	1150	1420
Sulphate (soluble)	g/l													
Sulphate (total)	mg/kg	777	3456											
Sulphide	mg/kg	10.8		40	12	16	<11	<1	19	19	20	14	38	<1
Sulphur	%													
Other														
Ammoniacal Nitrogen as N	mg/kg													
Nitrate as N	mg/kg													
Nitrate as NO2	mg/kg													
Asbestos Presence Screen	None													
Asbestos Identification	%													
Asbestos by Gravimetry	%													
Asbestos (Total)	%													
Total Organic Carbon	%													
Organic Matter	%													
Calorific Value	MJ/kg													
pH Value	pH units	8.3	11.5	9.5	10.6	10.3	8.5	11.2	10	9.2	10.4	11.7	11.2	8.8
Organics														
PAH (Screening)	mg/kg	<0.1	9.3	17	191	40	56	58	21	10	66	10	26	44
Mineral Oil	mg/kg	<1	53											
TPH FTIR (AR)	mg/kg				302	<20	<346	66	88	<20	132	105	1190	94
OIL FTIR	mg/kg			200	1130	137	485	175	443	152	477	160	514	131
PCBs														
PCB - ARO	mg/kg											0.2	0.2	0.5
PCBs (vs Aroclor 1254)	mg/kg													
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg													
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg													
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg													
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg													
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg													
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg													
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg													
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg													
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg													
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg													
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg													
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobipheny	mg/kg													
Sum of detected WHO 12 PCBs	mg/kg													
Phenols														
Phenol Index	mg/kg			<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenols Monohydric	mg/kg	<1	<1											
Phenols (total)	mg/kg	<1	<1											
Cresols	mg/kg													
BTEX														

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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	X

Sample Reference	Units	STPG01	STPG02	BH424	BH424	BH424	BH425	BH425	BH425	BH426	BH426	TP410	TP410
Specimen Depth		0.3	0.3	0.3 - 0.6	0.7 - 1	1 - 1.1	0.5 - 0.6	1.5 - 1.6	2 - 2.1	0.5 - 0.6	1.5 - 1.6	0 - 0.1	0.9 - 1
Level		7.54	7.57	7.6	7.2	6.9	7.35	6.35	5.85	7.25	6.25	7.2	6.3
Sample Type		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Cluster Code		2007 GI	2007 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI
Metals													
Antimony	mg/kg	92	2										
Arsenic	mg/kg	4	5	23	27	27	16	22	21	170	16	8.9	31
Barium	mg/kg	460	67										
Boron	mg/kg			0.75	0.81	0.8	1.4	0.91	1.1	4.7	2.4	4.4	3.3
Boron Water Soluble	mg/kg	23	<3.5										
Cadmium	mg/kg	4.1	0.5	0.34	1.2	0.51	<0.1	0.37	<0.1	0.66	0.66	0.41	0.14
Chromium	mg/kg	1900	26	21	26	41	32	13	16	190	51	16	20
Copper	mg/kg	350	20	66	60	19	21	42	22	160	36	17	18
Lead	mg/kg	340	47	36	160	48	52	73	200	71	96	120	53
Mercury	mg/kg	<0.6	<0.6	0.22	0.39	0.2	0.19	0.88	0.54	0.73	0.81	1.3	0.21
Molybdenum	mg/kg	36	0.8										
Nickel	mg/kg	140	10	34	32	27	29	13	12	620	35	16	22
Selenium	mg/kg	<3	<3	0.59	0.26	0	0	0	0	0.58	0.38	0.68	0
Tin	mg/kg									8.5	<5		
Vanadium	mg/kg									81	44		
Zinc	mg/kg	980	87	70	140	72	140	290	210	330	160	150	86
Iron	mg/kg									13000	17000		
Hexavalent Chromium	mg/kg	0.4	<0.3							<0.5	<0.5		
Non-Metal Inorganics													
Cyanide (total)	mg/kg	<1	<1	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5
Cyanide (free)	mg/kg			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Thiocyanate	mg/kg												
Ferro/ferricyanide	mg/kg												
Acid Soluble Sulphate	mg/kg												
Sulphate (soluble)	g/l	0.058	0.025										
Sulphate (total)	mg/kg									1400	1400		
Sulphide	mg/kg									16	15		
Sulphur	%									0.22	0.13		
Other													
Ammoniacal Nitrogen as N	mg/kg									19	56		
Nitrate as N	mg/kg									<1	<1		
Nitrate as NO2	mg/kg									0.14	<0.1		
Asbestos Presence Screen	None	NFD	NFD	0	0	0	0	0		0	0	0	0
Asbestos Identification	%			0	0	0	0	0		0	0	0	0
Asbestos by Gravimetry	%									0	0		
Asbestos (Total)	%									0	0		
Total Organic Carbon	%	0.5	0.5				0.85			0.78			
Organic Matter	%									1.3	4.5		
Calorific Value	MJ/kg									<0.1			
pH Value	pH units	10.83	8.85	11.3	10.8	12	8.7	10.1	9.1	9.2	8.5	7.9	8.4
Organics													
PAH (Screening)	mg/kg												
Mineral Oil	mg/kg												
TPH FTIR (AR)	mg/kg												
OIL FTIR	mg/kg												
PCBs													
PCB - ARO	mg/kg												
PCBs (vs Aroclor 1254)	mg/kg	0.61	0.062										
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg						<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg						<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg						<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg						<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg						<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg						<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg						<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg						<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg						<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg						<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg						<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobipheny	mg/kg						<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Sum of detected WHO 12 PCBs	mg/kg												
Phenols													
Phenol Index	mg/kg												
Phenols Monohydric	mg/kg												
Phenols (total)	mg/kg	<0.15	<0.15				<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Cresols	mg/kg												
BTEX													

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
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20/06/2016

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	X

Sample Reference	Units	BHM4CAN025	BHM4CAN026	BHM4CANA023	BHM4CANA025	BHM4CANA029	BHM4CANA031	BHM4CANA032
Specimen Depth		0.4	0.8	1	0.4-1.1	0-1.1	1.1	0.5
Level		7.27		5.96	7.34-6.64	6.65-5.55	6.62	6.33
Sample Type		ES	ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	MG	MG	MG	MG	MG
Cluster Code		2016 GI	2016 GI	2016 GI	2016 GI	2016 G1	2016 MG	2016 GI
Metals								
Antimony	mg/kg							
Arsenic	mg/kg	13.6	7.78	10.5	17.1	11.9	8.02	4.74
Barium	mg/kg							
Boron	mg/kg							
Boron Water Soluble	mg/kg							
Cadmium	mg/kg	0.757	2.59	1.92	0.723	0.634	0.271	0.094
Chromium	mg/kg	4.96	7.19	2410	40.2	96.7	13.7	22.3
Copper	mg/kg	5.32	12.3	214	76.2	207	5.63	16.9
Lead	mg/kg	18	143	39.3	91.4	80.8	11.4	8.86
Mercury	mg/kg	<0.14	0.244	<1.4	7.21	<0.14	<0.14	<0.14
Molybdenum	mg/kg							
Nickel	mg/kg	6.5	4.67	29.4	41.5	62.6	5.77	12.7
Selenium	mg/kg	<1	<1	<10	<1	<1	<1	<1
Tin	mg/kg							
Vanadium	mg/kg	12.9	7.44	213	43.3	28.6	14.7	19
Zinc	mg/kg	58.9	208	324	223	222	72	25.3
Iron	mg/kg	10000			36500	34800		
Hexavalent Chromium	mg/kg	<0.6			<0.6	<0.6		
Non-Metal Inorganics								
Cyanide (total)	mg/kg							
Cyanide (free)	mg/kg	<1	<1	<1	<1	<1	<1	<1
Thiocyanate	mg/kg							
Ferro/ferricyanide	mg/kg							
Acid Soluble Sulphate	mg/kg							
Sulphate (soluble)	g/l							
Sulphate (total)	mg/kg							
Sulphide	mg/kg							
Sulphur	%							
Other								
Ammoniacal Nitrogen as N	mg/kg							
Nitrate as N	mg/kg							
Nitrate as NO2	mg/kg							
Asbestos Presence Screen	None			NFD			NFD	NFD
Asbestos Identification	%							
Asbestos by Gravimetry	%							
Asbestos (Total)	%							
Total Organic Carbon	%							
Organic Matter	%							
Calorific Value	MJ/kg							
pH Value	pH units	10.3	9.37	12.1	8.49	10.6	11.7	10.8
Organics								
PAH (Screening)	mg/kg							
Mineral Oil	mg/kg							
TPH FTIR (AR)	mg/kg							
OIL FTIR	mg/kg							
PCBs								
PCB - ARO	mg/kg							
PCBs (vs Aroclor 1254)	mg/kg							
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg			<0.003		<0.003		<0.003
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg			<0.003		<0.003		<0.003
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg			<0.003		<0.003		<0.003
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg			<0.003		<0.003		<0.003
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg			<0.003		<0.003		<0.003
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg			<0.003		<0.003		<0.003
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg			<0.003		<0.003		<0.003
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg			<0.003		<0.003		<0.003
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg			<0.003		<0.003		<0.003
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg			<0.003		<0.003		<0.003
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg			<0.003		<0.003		<0.003
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobipheny	mg/kg			<0.003		<0.003		<0.003
Sum of detected WHO 12 PCBs	mg/kg			<0.036		<0.036		<0.036
Phenols								
Phenol Index	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenols Monohydric	mg/kg	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035	<0.035
Phenols (total)	mg/kg							
Cresols	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BTEX								

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	X

Sample Reference	Units	BHM4CANA033
Specimen Depth		0.3
Level		7.01
Sample Type		ES
Geology Code		MG
Cluster Code		2016 GI
Metals		
Antimony	mg/kg	
Arsenic	mg/kg	10.7
Barium	mg/kg	
Boron	mg/kg	
Boron Water Soluble	mg/kg	
Cadmium	mg/kg	0.23
Chromium	mg/kg	21.2
Copper	mg/kg	7.88
Lead	mg/kg	8.92
Mercury	mg/kg	<0.14
Molybdenum	mg/kg	
Nickel	mg/kg	6.46
Selenium	mg/kg	<1
Tin	mg/kg	
Vanadium	mg/kg	18
Zinc	mg/kg	44.5
Iron	mg/kg	
Hexavalent Chromium	mg/kg	
Non-Metal Inorganics		
Cyanide (total)	mg/kg	
Cyanide (free)	mg/kg	<1
Thiocyanate	mg/kg	
Ferro/ferricyanide	mg/kg	
Acid Soluble Sulphate	mg/kg	
Sulphate (soluble)	g/l	
Sulphate (total)	mg/kg	
Sulphide	mg/kg	
Sulphur	%	
Other		
Ammoniacal Nitrogen as N	mg/kg	
Nitrate as N	mg/kg	
Nitrate as NO2	mg/kg	
Asbestos Presence Screen	None	NFD
Asbestos Identification	%	
Asbestos by Gravimetry	%	
Asbestos (Total)	%	
Total Organic Carbon	%	
Organic Matter	%	
Calorific Value	MJ/kg	
pH Value	pH units	12.2
Organics		
PAH (Screening)	mg/kg	
Mineral Oil	mg/kg	
TPH FTIR (AR)	mg/kg	
OIL FTIR	mg/kg	
PCBs		
PCB - ARO	mg/kg	
PCBs (vs Aroclor 1254)	mg/kg	
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg	<0.003
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg	<0.003
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg	<0.003
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg	<0.003
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg	<0.003
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg	<0.003
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg	<0.003
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg	<0.003
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg	<0.003
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg	<0.003
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg	<0.003
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobipheny	mg/kg	<0.003
Sum of detected WHO 12 PCBs	mg/kg	<0.036
Phenols		
Phenol Index	mg/kg	<0.01
Phenols Monohydric	mg/kg	<0.035
Phenols (total)	mg/kg	
Cresols	mg/kg	<0.01
BTEX		

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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	X

Sample Reference	Units	BHG2	BHG3	CH24	CH25	CH26	CH27	CH28	CH29	CH30	CH30	CH31	CH32	CH32
Specimen Depth		1	0.2	0	0	0.3	0.55	0.22	0.4	0	1	0	0	0.5
Level		7	7.8	7.41	7.61	6.89	6.23	7.67	7.64	8.23	7.23	7.96	8.13	7.63
Sample Type		B	D	D	D	D	D	D	D	D	D	D	D	D
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Cluster Code		1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI
GRO (C4-C12)	mg/kg													
MTBE	mg/kg													
Benzene	mg/kg													
Toluene	mg/kg													
Ethyl benzene	mg/kg													
m & p Xylene	mg/kg													
o Xylene	mg/kg													
Sum of Detected BTEX	mg/kg													
Sum of Detected Xylenes	mg/kg													
TPH														
TPH >C6-C8	mg/kg													
TPH >C8-C10	mg/kg													
TPH >C10-C12	mg/kg													
TPH >C12-C16	mg/kg													
TPH >C16-C21	mg/kg													
TPH >C21-C35	mg/kg													
Aliphatics C5-C6	mg/kg													
Aliphatics >C6-C8	mg/kg													
Aliphatics >C8-C10	mg/kg													
Aliphatics >C10-C12	mg/kg													
Aliphatics >C12-C16	mg/kg													
Aliphatics >C16-C21	mg/kg													
Aliphatics >C21-C35	mg/kg													
Total Aliphatics >C12-C44	mg/kg													
Total Aliphatics C5-C35	mg/kg													
Aliphatics >C35-C44	mg/kg													
Aromatics >C5-C7	mg/kg													
Aromatics C6-C7	mg/kg													
Aromatics >C7-C8	mg/kg													
Aromatics >EC8-EC10	mg/kg													
Aromatics >EC10-EC12	mg/kg													
Aromatics >EC12-EC16	mg/kg													
Aromatics >EC16-EC21	mg/kg													
Aromatics >EC21-EC35	mg/kg													
Total Aromatics C6-C35	mg/kg													
Aromatics >C35-C44	mg/kg													
Aromatics >EC40-EC44	mg/kg													
Total Aromatics >EC12-EC44	mg/kg													
Total Aliphatic hydrocarbons	mg/kg													
Total Aromatic hydrocarbons	mg/kg													
TPH (Aliphatics and Aromatics C5-C35)	mg/kg													
TPH (Aliphatics and Aromatics C5-C44)	mg/kg													
Total petroleum hydrocarbons	mg/kg													
PAH														
Acenaphthene	mg/kg													
Acenaphthylene	mg/kg													
Anthracene	mg/kg													
Benzo(a)anthracene	mg/kg													
Benzo(a)pyrene	mg/kg													
Benzo(b)fluoranthene	mg/kg													
Benzo(ghi)perylene	mg/kg													
Benzo(k)fluoranthene	mg/kg													
Chrysene	mg/kg													
Dibenzo(ah)anthracene	mg/kg													
Fluoranthene	mg/kg													
Fluorene	mg/kg													
Indeno(123cd)pyrene	mg/kg													
Naphthalene	mg/kg													
Phenanthrene	mg/kg													
Pyrene	mg/kg													
Coronene	mg/kg													
PAH 16 Total	mg/kg													
SVOCs														
Phenols														
2,3,4,5-tetrachlorophenol.	mg/kg													
2,3,4,6-Tetrachlorophenol	mg/kg													
2,3,4-trichlorophenol.	mg/kg													
2,3,5,6-Tetrachlorophenol	mg/kg													

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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	X

Sample Reference	Units	STPG01	STPG02	BH424	BH424	BH424	BH425	BH425	BH425	BH426	BH426	TP410	TP410
Specimen Depth		0.3	0.3	0.3 - 0.6	0.7 - 1	1 - 1.1	0.5 - 0.6	1.5 - 1.6	2 - 2.1	0.5 - 0.6	1.5 - 1.6	0 - 0.1	0.9 - 1
Level		7.54	7.57	7.6	7.2	6.9	7.35	6.35	5.85	7.25	6.25	7.2	6.3
Sample Type		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Cluster Code		2007 GI	2007 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI
GRO (C4-C12)	mg/kg	<0.01	<0.01										
MTBE	mg/kg	<0.01	<0.01				<0.001						
Benzene	mg/kg	<0.01	<0.01				<0.001	<0.001	<0.001	<0.001	<0.001		
Toluene	mg/kg	<0.01	<0.01				<0.001	<0.001	<0.001	<0.001	<0.001		
Ethyl benzene	mg/kg	<0.01	<0.01				<0.001	<0.001	<0.001	<0.001	<0.001		
m & p Xylene	mg/kg	<0.01	<0.01				<0.001	<0.001	<0.001	<0.001	<0.001		
o Xylene	mg/kg	<0.01	<0.01				<0.001	<0.001	<0.001	<0.001	<0.001		
Sum of Detected BTEX	mg/kg												
Sum of Detected Xylenes	mg/kg												
TPH													
TPH >C6-C8	mg/kg											<1	<1
TPH >C8-C10	mg/kg											<1	<1
TPH >C10-C12	mg/kg											<1	<1
TPH >C12-C16	mg/kg											<1	<1
TPH >C16-C21	mg/kg											<1	<1
TPH >C21-C35	mg/kg											<1	<1
Aliphatics C5-C6	mg/kg	<0.01	<0.01				<0.1	<0.1	<0.1	<0.1	<0.1		
Aliphatics >C6-C8	mg/kg	<0.01	<0.01				<0.1	<0.1	<0.1	<0.1	<0.1		
Aliphatics >C8-C10	mg/kg	<0.01	<0.01				<0.1	<0.1	<0.1	<0.1	<0.1		
Aliphatics >C10-C12	mg/kg	<0.01	<0.01				<1	<1	<1	<1	<1		
Aliphatics >C12-C16	mg/kg	3.9	2.8				<1	<1	<1	<1	<1		
Aliphatics >C16-C21	mg/kg	25	13				<1	<1	<1	<1	<1		
Aliphatics >C21-C35	mg/kg	130	93				<1	<1	<1	<1	<1		
Total Aliphatics >C12-C44	mg/kg												
Total Aliphatics C5-C35	mg/kg	160	110										
Aliphatics >C35-C44	mg/kg						<0.1	<0.1	<0.1	<0.1	<0.1		
Aromatics >C5-C7	mg/kg						<1	<1	<1	<1	<1		
Aromatics C6-C7	mg/kg	<0.01	<0.01										
Aromatics >C7-C8	mg/kg	<0.01	<0.01				<0.1	<0.1	<0.1	<0.1	<0.1		
Aromatics >EC8-EC10	mg/kg	<0.01	<0.01				<0.1	<0.1	<0.1	<0.1	<0.1		
Aromatics >EC10-EC12	mg/kg	<0.01	<0.01				<0.1	<0.1	<0.1	<0.1	<0.1		
Aromatics >EC12-EC16	mg/kg	<0.1	<0.1				<1	<1	<1	3.2	<1		
Aromatics >EC16-EC21	mg/kg	0.99	0.22				<1	3.5	<1	3.3	<1		
Aromatics >EC21-EC35	mg/kg	2.9	23				<1	6.5	<1	7.4	<1		
Total Aromatics C6-C35	mg/kg	3.9	24										
Aromatics >C35-C44	mg/kg						<1	<1	<1	<1	<1		
Aromatics >EC40-EC44	mg/kg												
Total Aromatics >EC12-EC44	mg/kg												
Total Aliphatic hydrocarbons	mg/kg						<5	<5	<5	<5	<5		
Total Aromatic hydrocarbons	mg/kg						<5	10	<5	14	<5		
TPH (Aliphatics and Aromatics C5-C35)	mg/kg	160	130										
TPH (Aliphatics and Aromatics C5-C44)	mg/kg												
Total petroleum hydrocarbons	mg/kg						<10	10	<10	14	<10		
PAH													
Acenaphthene	mg/kg	<0.014	0.015	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	1	0.27	1.1	0.23
Acenaphthylene	mg/kg	0.013	0.008	<0.1	0.45	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	0.5	<0.1
Anthracene	mg/kg	0.032	0.019	<0.1	0.22	<0.1	<0.1	<0.1	<0.1	1.6	0.12	0.64	0.11
Benzo(a)anthracene	mg/kg	0.14	0.098	<0.1	0.84	0.42	<0.1	<0.1	0.13	4.9	0.6	1.1	<0.1
Benzo(a)pyrene	mg/kg	0.13	0.11	<0.1	1.1	<0.1	<0.1	<0.1	<0.1	5.7	0.7	1.3	<0.1
Benzo(b)fluoranthene	mg/kg	0.27	0.23	<0.1	1.9	<0.1	<0.1	<0.1	<0.1	7.5	1.2	2.1	<0.1
Benzo(ghi)perylene	mg/kg	0.099	0.09	<0.1	2	<0.1	<0.1	<0.1	<0.1	3.7	0.67	0.5	<0.1
Benzo(k)fluoranthene	mg/kg	0.11	0.08	<0.1	0.33	<0.1	<0.1	<0.1	<0.1	2.4	0.34	0.5	<0.1
Chrysene	mg/kg	0.22	0.17	<0.1	1.4	0.3	<0.1	<0.1	0.16	3.7	0.61	0.57	<0.1
Dibenzo(ah)anthracene	mg/kg	0.022	0.018	<0.1	0.39	<0.1	<0.1	<0.1	<0.1	0.24	0.11	0.61	<0.1
Fluoranthene	mg/kg	0.28	0.21	0.34	0.34	1.2	0.28	0.52	0.37	9.7	1.4	3.1	0.67
Fluorene	mg/kg	0.015	0.019	<0.1	0.4	<0.1	<0.1	<0.1	<0.1	0.68	<0.1	0.52	0.27
Indeno(123cd)pyrene	mg/kg	0.081	0.074	<0.1	1.2	<0.1	<0.1	<0.1	<0.1	4	0.76	0.67	<0.1
Naphthalene	mg/kg	0.027	0.041	<0.1	0.66	<0.1	<0.1	<0.1	<0.1	0.23	0.24	0.58	0.3
Phenanthrene	mg/kg	0.17	0.17	<0.1	1.9	0.84	0.22	0.35	0.3	7.4	0.74	2.7	0.94
Pyrene	mg/kg	0.25	0.17	0.27	0.27	0.91	0.24	0.48	0.36	7.7	1	2.6	0.48
Coronene	mg/kg									<0.1	<0.1		
PAH 16 Total	mg/kg	1.8	1.5	<2	14	3.7	<2	<2	<2	64	7.5	19	3
SVOCs													
Phenols													
2,3,4,5-tetrachlorophenol.	mg/kg						<0.2	<0.2					
2,3,4,6-Tetrachlorophenol	mg/kg						<0.2	<0.2					
2,3,4-trichlorophenol.	mg/kg						<0.2	<0.2					
2,3,5,6-Tetrachlorophenol	mg/kg						<0.2	<0.2					

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-15
20/06/2016

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	x

Sample Reference	Units	BHM4CAN025	BHM4CAN026	BHM4CANA023	BHM4CANA025	BHM4CANA029	BHM4CANA031	BHM4CANA032
Specimen Depth		0.4	0.8	1	0.4-1.1	0-1.1	1.1	0.5
Level		7.27		5.96	7.34-6.64	6.65-5.55	6.62	6.33
Sample Type		ES	ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	MG	MG	MG	MG	MG
Cluster Code		2016 GI	2016 GI	2016 GI	2016 GI	2016 G1	2016 MG	2016 GI
GRO (C4-C12)	mg/kg	<0.044	0.073	0.0706	<0.044	0.243	<0.044	0.142
MTBE	mg/kg	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Benzene	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Toluene	mg/kg	<0.002	0.00203	0.00336	<0.002	0.00476	<0.002	0.00896
Ethyl benzene	mg/kg	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
m & p Xylene	mg/kg	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.00896
o Xylene	mg/kg	<0.003	<0.003	<0.003	<0.003	0.00357	<0.003	0.00512
Sum of Detected BTEX	mg/kg	<0.024	<0.024	<0.024	<0.024	<0.024	<0.024	<0.024
Sum of Detected Xylenes	mg/kg	<0.009	<0.009	<0.009	<0.009	<0.009	<0.009	0.0141
TPH								
TPH >C6-C8	mg/kg							
TPH >C8-C10	mg/kg							
TPH >C10-C12	mg/kg							
TPH >C12-C16	mg/kg							
TPH >C16-C21	mg/kg							
TPH >C21-C35	mg/kg							
Aliphatics C5-C6	mg/kg	<0.01	<0.01	<0.01	<0.01	0.0345	<0.01	0.0154
Aliphatics >C6-C8	mg/kg	<0.01	0.0132	0.0112	<0.01	0.0702	<0.01	0.0307
Aliphatics >C8-C10	mg/kg	<0.01	0.0142	<0.01	<0.01	0.0333	<0.01	0.0282
Aliphatics >C10-C12	mg/kg	<0.01	0.0162	0.0202	<0.01	0.0369	<0.01	0.0128
Aliphatics >C12-C16	mg/kg	<0.1	<0.1	2.12	2.13	<0.1	1.26	214
Aliphatics >C16-C21	mg/kg	0.315	1.91	14.1	20	<0.1	8.32	237
Aliphatics >C21-C35	mg/kg	4.45	6.66	18.3	115	<0.1	44.3	78.3
Total Aliphatics >C12-C44	mg/kg	7.65	8.56	37.2	155	<0.1	61.5	533
Total Aliphatics C5-C35	mg/kg							
Aliphatics >C35-C44	mg/kg	2.89	<0.1	2.6	18.6	<0.1	7.62	3.65
Aromatics >C5-C7	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics C6-C7	mg/kg							
Aromatics >C7-C8	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >EC8-EC10	mg/kg	<0.01	0.0112	0.0112	0.0104	0.0333	<0.01	0.0346
Aromatics >EC10-EC12	mg/kg	<0.01	0.0112	0.0134	<0.01	0.025	<0.01	<0.01
Aromatics >EC12-EC16	mg/kg	<0.1	<0.1	<0.1	0.339	<0.1	<0.1	91.4
Aromatics >EC16-EC21	mg/kg	<0.1	0.734	3.39	4.8	1.31	0.49	126
Aromatics >EC21-EC35	mg/kg	<0.1	3.03	4.73	31.5	9.61	12.8	68.1
Total Aromatics C6-C35	mg/kg							
Aromatics >C35-C44	mg/kg	3.44	1.82	<0.1	9.13	1.32	7.82	6.89
Aromatics >EC40-EC44	mg/kg	3.94	0.851	<0.1	3.1	<0.1	3.33	2.42
Total Aromatics >EC12-EC44	mg/kg	3.44	5.59	8.12	45.7	12.2	21.1	292
Total Aliphatic hydrocarbons	mg/kg							
Total Aromatic hydrocarbons	mg/kg							
TPH (Aliphatics and Aromatics C5-C35)	mg/kg							
TPH (Aliphatics and Aromatics C5-C44)	mg/kg	11.1	14.2	45.3	201	12.5	82.6	825
Total petroleum hydrocarbons	mg/kg							
PAH								
Acenaphthene	mg/kg	<0.008	<0.008	<0.008	<0.008	0.0784	<0.008	<0.008
Acenaphthylene	mg/kg	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Anthracene	mg/kg	<0.016	<0.016	<0.016	<0.016	0.518	<0.016	<0.016
Benzo(a)anthracene	mg/kg	<0.014	<0.014	0.0261	0.0537	0.834	<0.014	0.0775
Benzo(a)pyrene	mg/kg	<0.015	<0.015	<0.015	0.0436	1.03	<0.015	0.0563
Benzo(b)fluoranthene	mg/kg	0.0208	<0.015	<0.015	0.0692	2.49	<0.015	0.1
Benzo(ghi)perylene	mg/kg	<0.24	<0.24	<0.24	0.0395	0.962	0.045	0.0532
Benzo(k)fluoranthene	mg/kg	<0.014	<0.014	<0.014	0.0283	2.18	<0.014	0.0349
Chrysene	mg/kg	<0.01	<0.01	<0.01	0.0455	1.04	<0.01	0.0798
Dibenzo(ah)anthracene	mg/kg	<0.023	<0.023	<0.023	<0.023	0.219	<0.023	<0.023
Fluoranthene	mg/kg	<0.017	<0.017	<0.017	0.0727	0.898	<0.017	0.088
Fluorene	mg/kg	<0.01	<0.01	<0.01	<0.01	0.0815	<0.01	<0.01
Indeno(123cd)pyrene	mg/kg	<0.018	<0.018	<0.018	0.0319	0.654	<0.018	0.035
Naphthalene	mg/kg	<0.009	<0.009	<0.009	0.022	0.243	<0.009	0.0367
Phenanthrene	mg/kg	0.023	<0.015	0.0175	0.0608	0.5	<0.015	0.08
Pyrene	mg/kg	0.0183	<0.015	<0.015	0.0638	0.946	<0.015	0.0764
Coronene	mg/kg							
PAH 16 Total	mg/kg	<0.118	<0.118	<0.118	0.531	12.7	<0.118	0.718
SVOCs								
Phenols								
2,3,4,5-tetrachlorophenol.	mg/kg							
2,3,4,6-Tetrachlorophenol	mg/kg							
2,3,4-trichlorophenol.	mg/kg							
2,3,5,6-Tetrachlorophenol	mg/kg							

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-15
20/06/2016

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	X

Sample Reference	Units	BHM4CANA033
Specimen Depth		0.3
Level		7.01
Sample Type		ES
Geology Code		MG
Cluster Code		2016 GI
GRO (C4-C12)	mg/kg	0.0855
MTBE	mg/kg	<0.005
Benzene	mg/kg	<0.01
Toluene	mg/kg	<0.002
Ethyl benzene	mg/kg	<0.003
m & p Xylene	mg/kg	<0.006
o Xylene	mg/kg	<0.003
Sum of Detected BTEX	mg/kg	<0.024
Sum of Detected Xylenes	mg/kg	<0.009
TPH		
TPH >C6-C8	mg/kg	
TPH >C8-C10	mg/kg	
TPH >C10-C12	mg/kg	
TPH >C12-C16	mg/kg	
TPH >C16-C21	mg/kg	
TPH >C21-C35	mg/kg	
Aliphatics C5-C6	mg/kg	<0.01
Aliphatics >C6-C8	mg/kg	0.0162
Aliphatics >C8-C10	mg/kg	0.0151
Aliphatics >C10-C12	mg/kg	0.0209
Aliphatics >C12-C16	mg/kg	<0.1
Aliphatics >C16-C21	mg/kg	<0.1
Aliphatics >C21-C35	mg/kg	5.45
Total Aliphatics >C12-C44	mg/kg	5.45
Total Aliphatics C5-C35	mg/kg	
Aliphatics >C35-C44	mg/kg	<0.1
Aromatics >C5-C7	mg/kg	<0.01
Aromatics C6-C7	mg/kg	
Aromatics >C7-C8	mg/kg	<0.01
Aromatics >EC8-EC10	mg/kg	0.0116
Aromatics >EC10-EC12	mg/kg	0.0139
Aromatics >EC12-EC16	mg/kg	<0.1
Aromatics >EC16-EC21	mg/kg	0.626
Aromatics >EC21-EC35	mg/kg	2.47
Total Aromatics C6-C35	mg/kg	
Aromatics >C35-C44	mg/kg	<0.1
Aromatics >EC40-EC44	mg/kg	<0.1
Total Aromatics >EC12-EC44	mg/kg	3.09
Total Aliphatic hydrocarbons	mg/kg	
Total Aromatic hydrocarbons	mg/kg	
TPH (Aliphatics and Aromatics C5-C35)	mg/kg	
TPH (Aliphatics and Aromatics C5-C44)	mg/kg	8.63
Total petroleum hydrocarbons	mg/kg	
PAH		
Acenaphthene	mg/kg	<0.008
Acenaphthylene	mg/kg	<0.012
Anthracene	mg/kg	<0.016
Benzo(a)anthracene	mg/kg	<0.014
Benzo(a)pyrene	mg/kg	<0.015
Benzo(b)fluoranthene	mg/kg	<0.015
Benzo(ghi)perylene	mg/kg	<0.24
Benzo(k)fluoranthene	mg/kg	<0.014
Chrysene	mg/kg	<0.01
Dibenzo(ah)anthracene	mg/kg	<0.023
Fluoranthene	mg/kg	<0.017
Fluorene	mg/kg	<0.01
Indeno(123cd)pyrene	mg/kg	<0.018
Naphthalene	mg/kg	<0.009
Phenanthrene	mg/kg	<0.015
Pyrene	mg/kg	<0.015
Coronene	mg/kg	
PAH 16 Total	mg/kg	<0.118
SVOCs		
Phenols		
2,3,4,5-tetrachlorophenol.	mg/kg	
2,3,4,6-Tetrachlorophenol	mg/kg	
2,3,4-trichlorophenol.	mg/kg	
2,3,5,6-Tetrachlorophenol	mg/kg	

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
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20/06/2016

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	x

Sample Reference	Units	BHG2	BHG3	CH24	CH25	CH26	CH27	CH28	CH29	CH30	CH30	CH31	CH32	CH32
Specimen Depth		1	0.2	0	0	0.3	0.55	0.22	0.4	0	1	0	0	0.5
Level		7	7.8	7.41	7.61	6.89	6.23	7.67	7.64	8.23	7.23	7.96	8.13	7.63
Sample Type		B	D	D	D	D	D	D	D	D	D	D	D	D
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Cluster Code		1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI
2,3,5-Trichlorophenol	mg/kg													
2,3,6-Trichlorophenol	mg/kg													
2,6-Dichlorophenol	mg/kg													
2-sec-Butyl-4,6-dinitrophenol	mg/kg													
3,4,5-Trichlorophenol	mg/kg													
3-methylphenol	mg/kg													
2-Chlorophenol	mg/kg													
2-Methylphenol	mg/kg													
2-Nitrophenol	mg/kg													
2-Methyl-4,6 Dinitrophenol	mg/kg													
2,4-Dichlorophenol	mg/kg													
2,4-Dimethylphenol	mg/kg													
2,4,5-Trichlorophenol	mg/kg													
2,4,6-Trichlorophenol	mg/kg													
4-Chloro-3-methylphenol	mg/kg													
4-Methylphenol	mg/kg													
4-Nitrophenol	mg/kg													
Pentachlorophenol	mg/kg													
1-naphthol	mg/kg													
Methylphenols	mg/kg													
Resorcinol	mg/kg													
Trimethylphenol	mg/kg													
Xylenols	mg/kg													
Phenol	mg/kg													
Phenols	mg/kg													
PAHs														
2-Chloronaphthalene	mg/kg													
2-Methylnaphthalene	mg/kg													
Acenaphthene	mg/kg													
Acenaphthylene	mg/kg													
Anthracene	mg/kg													
Benzo(a)anthracene	mg/kg													
Benzo(a)pyrene	mg/kg													
Benzo(b)fluoranthene	mg/kg													
Benzo(ghi)perylene	mg/kg													
Benzo(k)fluoranthene	mg/kg													
Chrysene	mg/kg													
Dibenzo(a,h)anthracene	mg/kg													
Fluoranthene	mg/kg													
Fluorene	mg/kg													
Indeno(1,2,3-cd)pyrene	mg/kg													
Naphthalene	mg/kg													
Phenanthrene	mg/kg													
Pyrene	mg/kg													
Pthalates														
Bis(2-ethylhexyl) phthalate	mg/kg													
Butylbenzyl phthalate	mg/kg													
Di-n-butyl phthalate	mg/kg													
Di-n-Octyl phthalate	mg/kg													
Diethyl phthalate	mg/kg													
Dimethyl phthalate	mg/kg													
Other Semi-Volatiles														
1,2-Dichlorobenzene	mg/kg													
1,2,4-Trichlorobenzene	mg/kg													
1,3-Dichlorobenzene	mg/kg													
1,4-Dichlorobenzene	mg/kg													
2-Nitroaniline	mg/kg													
2,4-Dinitrotoluene	mg/kg													
2,6-Dinitrotoluene	mg/kg													
3-Nitroaniline	mg/kg													
4-Bromophenylphenylether	mg/kg													
4-Chloroaniline	mg/kg													
4-Chlorophenylphenylether	mg/kg													
4-Nitroaniline	mg/kg													
Azobenzene	mg/kg													
Bis(2-chloroethoxy)methane	mg/kg													
Bis(2-chloroethyl)ether	mg/kg													
Bis(2-chloroisopropyl)ether	mg/kg													

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-15
20/06/2016

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	x

Sample Reference	Units	STPG01	STPG02	BH424	BH424	BH424	BH425	BH425	BH425	BH426	BH426	TP410	TP410
Specimen Depth		0.3	0.3	0.3 - 0.6	0.7 - 1	1 - 1.1	0.5 - 0.6	1.5 - 1.6	2 - 2.1	0.5 - 0.6	1.5 - 1.6	0 - 0.1	0.9 - 1
Level		7.54	7.57	7.6	7.2	6.9	7.35	6.35	5.85	7.25	6.25	7.2	6.3
Sample Type		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Cluster Code		2007 GI	2007 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI
2,3,5-Trichlorophenol	mg/kg						<0.2	<0.2					
2,3,6-Trichlorophenol	mg/kg						<0.2	<0.2					
2,6-Dichlorophenol	mg/kg						<0.2	<0.2					
2-sec-Butyl-4,6-dinitrophenol	mg/kg						<0.2	<0.2					
3,4,5-Trichlorophenol	mg/kg						<0.2	<0.2					
3-methylphenol	mg/kg						<0.2	<0.2					
2-Chlorophenol	mg/kg	<0.1	<0.1				<0.2	<0.2					
2-Methylphenol	mg/kg	<0.1	<0.1				<0.2	<0.2					
2-Nitrophenol	mg/kg	<0.1	<0.1				<0.2	<0.2					
2-Methyl-4,6 Dinitrophenol	mg/kg						<0.2	<0.2					
2,4-Dichlorophenol	mg/kg	<0.1	<0.1				<0.2	<0.2					
2,4-Dimethylphenol	mg/kg	<0.1	<0.1				<0.2	<0.2					
2,4,5-Trichlorophenol	mg/kg	<0.1	<0.1				<0.2	<0.2					
2,4,6-Trichlorophenol	mg/kg	<0.1	<0.1				<0.2	<0.2					
4-Chloro-3-methylphenol	mg/kg	<0.1	<0.1				<0.2	<0.2					
4-Methylphenol	mg/kg	<0.1	<0.1				<0.2	<0.2					
4-Nitrophenol	mg/kg	<0.1	<0.1				<0.2	<0.2					
Pentachlorophenol	mg/kg	<0.1	<0.1				<0.2	<0.2					
1-naphthol	mg/kg						<0.05	<0.05					
Methylphenols	mg/kg						<0.05	<0.05					
Resorcinol	mg/kg						<0.05	<0.05					
Trimethylphenol	mg/kg						<0.05	<0.05					
Xylenols	mg/kg						<0.05	<0.05					
Phenol	mg/kg	<0.1	<0.1				<0.05	<0.05					
Phenols	mg/kg						<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
PAHs													
2-Chloronaphthalene	mg/kg	<0.1	<0.1				<0.5						
2-Methylnaphthalene	mg/kg	<0.1	<0.1				<0.5						
Acenaphthene	mg/kg		<0.1										
Acenaphthylene	mg/kg		<0.1										
Anthracene	mg/kg		<0.1										
Benzo(a)anthracene	mg/kg		0.14										
Benzo(a)pyrene	mg/kg		0.11										
Benzo(b)fluoranthene	mg/kg		0.12										
Benzo(ghi)perylene	mg/kg		0.11										
Benzo(k)fluoranthene	mg/kg		<0.1										
Chrysene	mg/kg		0.16										
Dibenzo(a,h)anthracene	mg/kg		<0.1										
Fluoranthene	mg/kg		0.29										
Fluorene	mg/kg		<0.1										
Indeno(1,2,3-cd)pyrene	mg/kg		0.15										
Naphthalene	mg/kg		<0.1										
Phenanthrene	mg/kg		0.25										
Pyrene	mg/kg		0.23										
Pthalates													
Bis(2-ethylhexyl) phthalate	mg/kg	2.9	8.6				<0.5						
Butylbenzyl phthalate	mg/kg	<0.1	<0.1				<0.5						
Di-n-butyl phthalate	mg/kg	<0.1	<0.1				<0.5						
Di-n-Octyl phthalate	mg/kg	<0.1	<0.1				<0.5						
Diethyl phthalate	mg/kg	<0.1	<0.1				<0.5						
Dimethyl phthalate	mg/kg	<0.1	<0.1				<0.5						
Other Semi-Volatiles													
1,2-Dichlorobenzene	mg/kg	<0.1	<0.1										
1,2,4-Trichlorobenzene	mg/kg	<0.1	<0.1										
1,3-Dichlorobenzene	mg/kg	<0.1	<0.1										
1,4-Dichlorobenzene	mg/kg	<0.1	<0.1										
2-Nitroaniline	mg/kg	<0.1	<0.1				<0.5						
2,4-Dinitrotoluene	mg/kg	<0.1	<0.1				<0.5						
2,6-Dinitrotoluene	mg/kg	<0.1	<0.1				<0.5						
3-Nitroaniline	mg/kg	<0.1	<0.1				<0.5						
4-Bromophenylphenylether	mg/kg	<0.1	<0.1				<0.5						
4-Chloroaniline	mg/kg	<0.1	<0.1				<0.5						
4-Chlorophenylphenylether	mg/kg	<0.1	<0.1				<0.5						
4-Nitroaniline	mg/kg	<0.1	<0.1				<0.5						
Azobenzene	mg/kg	<0.1	<0.1				<0.5						
Bis(2-chloroethoxy)methane	mg/kg	<0.1	<0.1				<0.5						
Bis(2-chloroethyl)ether	mg/kg	<0.1	<0.1				<0.5						
Bis(2-chloroisopropyl)ether	mg/kg						<0.5						

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-15
20/06/2016

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	X

Sample Reference	Units	BHM4CAN025	BHM4CAN026	BHM4CANA023	BHM4CANA025	BHM4CANA029	BHM4CANA031	BHM4CANA032
Specimen Depth		0.4	0.8	1	0.4-1.1	0-1.1	1.1	0.5
Level		7.27		5.96	7.34-6.64	6.65-5.55	6.62	6.33
Sample Type		ES	ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	MG	MG	MG	MG	MG
Cluster Code		2016 GI	2016 GI	2016 GI	2016 GI	2016 G1	2016 MG	2016 GI
2,3,5-Trichlorophenol	mg/kg							
2,3,6-Trichlorophenol	mg/kg							
2,6-Dichlorophenol	mg/kg							
2-sec-Butyl-4,6-dinitrophenol	mg/kg							
3,4,5-Trichlorophenol	mg/kg							
3-methylphenol	mg/kg							
2-Chlorophenol	mg/kg		<0.1	<0.1		<0.1	<0.1	
2-Methylphenol	mg/kg		<0.1	<0.1		<0.1	<0.1	
2-Nitrophenol	mg/kg		<0.1	<0.1		<0.1	<0.1	
2-Methyl-4,6 Dinitrophenol	mg/kg							
2,4-Dichlorophenol	mg/kg		<0.1	<0.1		<0.1	<0.1	
2,4-Dimethylphenol	mg/kg		<0.1	<0.1		<0.1	<0.1	
2,4,5-Trichlorophenol	mg/kg		<0.1	<0.1		<0.1	<0.1	
2,4,6-Trichlorophenol	mg/kg		<0.1	<0.1		<0.1	<0.1	
4-Chloro-3-methylphenol	mg/kg		<0.1	<0.1		<0.1	<0.1	
4-Methylphenol	mg/kg		<0.1	<0.1		<0.1	<0.1	
4-Nitrophenol	mg/kg		<0.1	<0.1		<0.1	<0.1	
Pentachlorophenol	mg/kg		<0.1	<0.1		<0.1	<0.1	
1-naphthol	mg/kg							
Methylphenols	mg/kg							
Resorcinol	mg/kg							
Trimethylphenol	mg/kg							
Xylenols	mg/kg	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Phenol	mg/kg		<0.1	<0.1		<0.1	<0.1	
Phenols	mg/kg							
PAHs								
2-Chloronaphthalene	mg/kg		<0.1	<0.1		<0.1	<0.1	
2-Methylnaphthalene	mg/kg		<0.1	<0.1		0.122	<0.1	
Acenaphthene	mg/kg		<0.1	<0.1		<0.1	<0.1	
Acenaphthylene	mg/kg		<0.1	<0.1		<0.1	<0.1	
Anthracene	mg/kg		<0.1	<0.1		<0.1	<0.1	
Benzo(a)anthracene	mg/kg		<0.1	<0.1		0.404	<0.1	
Benzo(a)pyrene	mg/kg		<0.1	<0.1		0.508	<0.1	
Benzo(b)fluoranthene	mg/kg		<0.1	<0.1		0.594	<0.1	
Benzo(ghi)perylene	mg/kg		<0.1	<0.1		0.586	<0.1	
Benzo(k)fluoranthene	mg/kg		<0.1	<0.1		0.412	<0.1	
Chrysene	mg/kg		<0.1	<0.1		0.545	<0.1	
Dibenzo(a,h)anthracene	mg/kg		<0.1	<0.1		0.134	<0.1	
Fluoranthene	mg/kg		<0.1	<0.1		0.501	<0.1	
Fluorene	mg/kg		<0.1	<0.1		<0.1	<0.1	
Indeno(1,2,3-cd)pyrene	mg/kg		<0.1	<0.1		0.524	<0.1	
Naphthalene	mg/kg		<0.1	<0.1		0.161	<0.1	
Phenanthrene	mg/kg		<0.1	<0.1		0.289	<0.1	
Pyrene	mg/kg		<0.1	<0.1		0.49	<0.1	
Pthalates								
Bis(2-ethylhexyl) phthalate	mg/kg		<0.1	<0.1		<0.1	<0.1	
Butylbenzyl phthalate	mg/kg		<0.1	<0.1		<0.1	<0.1	
Di-n-butyl phthalate	mg/kg		<0.1	<0.1		<0.1	<0.1	
Di-n-Octyl phthalate	mg/kg		<0.1	<0.1		<0.1	<0.1	
Diethyl phthalate	mg/kg		<0.1	<0.1		<0.1	<0.1	
Dimethyl phthalate	mg/kg		<0.1	<0.1		<0.1	<0.1	
Other Semi-Volatiles								
1,2-Dichlorobenzene	mg/kg		<0.1	<0.1		<0.1	<0.1	
1,2,4-Trichlorobenzene	mg/kg		<0.1	<0.1		<0.1	<0.1	
1,3-Dichlorobenzene	mg/kg		<0.1	<0.1		<0.1	<0.1	
1,4-Dichlorobenzene	mg/kg		<0.1	<0.1		<0.1	<0.1	
2-Nitroaniline	mg/kg		<0.1	<0.1		<0.1	<0.1	
2,4-Dinitrotoluene	mg/kg		<0.1	<0.1		<0.1	<0.1	
2,6-Dinitrotoluene	mg/kg		<0.1	<0.1		<0.1	<0.1	
3-Nitroaniline	mg/kg		<0.1	<0.1		<0.1	<0.1	
4-Bromophenylphenylether	mg/kg		<0.1	<0.1		<0.1	<0.1	
4-Chloroaniline	mg/kg		<0.1	<0.1		<0.1	<0.1	
4-Chlorophenylphenylether	mg/kg		<0.1	<0.1		<0.1	<0.1	
4-Nitroaniline	mg/kg		<0.1	<0.1		<0.1	<0.1	
Azobenzene	mg/kg		<0.1	<0.1		<0.1	<0.1	
Bis(2-chloroethoxy)methane	mg/kg		<0.1	<0.1		<0.1	<0.1	
Bis(2-chloroethyl)ether	mg/kg		<0.1	<0.1		<0.1	<0.1	
Bis(2-chloroisopropyl)ether	mg/kg							

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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	x

Sample Reference	Units	BHM4CANA033
Specimen Depth		0.3
Level		7.01
Sample Type		ES
Geology Code		MG
Cluster Code		2016 GI
2,3,5-Trichlorophenol	mg/kg	
2,3,6-Trichlorophenol	mg/kg	
2,6-Dichlorophenol	mg/kg	
2-sec-Butyl-4,6-dinitrophenol	mg/kg	
3,4,5-Trichlorophenol	mg/kg	
3-methylphenol	mg/kg	
2-Chlorophenol	mg/kg	
2-Methylphenol	mg/kg	
2-Nitrophenol	mg/kg	
2-Methyl-4,6 Dinitrophenol	mg/kg	
2,4-Dichlorophenol	mg/kg	
2,4-Dimethylphenol	mg/kg	
2,4,5-Trichlorophenol	mg/kg	
2,4,6-Trichlorophenol	mg/kg	
4-Chloro-3-methylphenol	mg/kg	
4-Methylphenol	mg/kg	
4-Nitrophenol	mg/kg	
Pentachlorophenol	mg/kg	
1-naphthol	mg/kg	
Methylphenols	mg/kg	
Resorcinol	mg/kg	
Trimethylphenol	mg/kg	
Xylenols	mg/kg	<0.015
Phenol	mg/kg	
Phenols	mg/kg	
PAHs		
2-Chloronaphthalene	mg/kg	
2-Methylnaphthalene	mg/kg	
Acenaphthene	mg/kg	
Acenaphthylene	mg/kg	
Anthracene	mg/kg	
Benzo(a)anthracene	mg/kg	
Benzo(a)pyrene	mg/kg	
Benzo(b)fluoranthene	mg/kg	
Benzo(ghi)perylene	mg/kg	
Benzo(k)fluoranthene	mg/kg	
Chrysene	mg/kg	
Dibenzo(a,h)anthracene	mg/kg	
Fluoranthene	mg/kg	
Fluorene	mg/kg	
Indeno(1,2,3-cd)pyrene	mg/kg	
Naphthalene	mg/kg	
Phenanthrene	mg/kg	
Pyrene	mg/kg	
Pthalates		
Bis(2-ethylhexyl) phthalate	mg/kg	
Butylbenzyl phthalate	mg/kg	
Di-n-butyl phthalate	mg/kg	
Di-n-Octyl phthalate	mg/kg	
Diethyl phthalate	mg/kg	
Dimethyl phthalate	mg/kg	
Other Semi-Volatiles		
1,2-Dichlorobenzene	mg/kg	
1,2,4-Trichlorobenzene	mg/kg	
1,3-Dichlorobenzene	mg/kg	
1,4-Dichlorobenzene	mg/kg	
2-Nitroaniline	mg/kg	
2,4-Dinitrotoluene	mg/kg	
2,6-Dinitrotoluene	mg/kg	
3-Nitroaniline	mg/kg	
4-Bromophenylphenylether	mg/kg	
4-Chloroaniline	mg/kg	
4-Chlorophenylphenylether	mg/kg	
4-Nitroaniline	mg/kg	
Azobenzene	mg/kg	
Bis(2-chloroethoxy)methane	mg/kg	
Bis(2-chloroethyl)ether	mg/kg	
Bis(2-chloroisopropyl)ether	mg/kg	

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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	x

Sample Reference	Units	BHG2	BHG3	CH24	CH25	CH26	CH27	CH28	CH29	CH30	CH30	CH31	CH32	CH32
Specimen Depth		1	0.2	0	0	0.3	0.55	0.22	0.4	0	1	0	0	0.5
Level		7	7.8	7.41	7.61	6.89	6.23	7.67	7.64	8.23	7.23	7.96	8.13	7.63
Sample Type		B	D	D	D	D	D	D	D	D	D	D	D	D
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Cluster Code		1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI
Carbazole	mg/kg													
Dibenzofuran	mg/kg													
Hexachlorobenzene	mg/kg													
Hexachlorobutadiene	mg/kg													
Hexachlorocyclopentadiene	mg/kg													
Hexachloroethane	mg/kg													
Isophorone	mg/kg													
N-nitrosodimethylamine	mg/kg													
N-nitrosodi-n-propylamine	mg/kg													
Nitrobenzene	mg/kg													
VOCs														
Methyl Tertiary Butyl Ether	ug/kg													
Benzene	ug/kg													
Toluene	ug/kg													
Ethylbenzene	ug/kg													
p/m-Xylene	ug/kg													
o-Xylene	ug/kg													
Naphthalene	ug/kg													
Hexachlorobutadiene	ug/kg													
1.2.4-Trichlorobenzene	ug/kg													
1.2-Dichlorobenzene	ug/kg													
1.3-Dichlorobenzene	ug/kg													
1.4-Dichlorobenzene	ug/kg													
1.1.1.2-Tetrachloroethane	ug/kg													
1.1.1-Trichloroethane	ug/kg													
1.1.2.2-Tetrachloroethane	ug/kg													
1.1.2-Trichloroethane	ug/kg													
1.1-Dichloropropene	ug/kg													
1.1-Dichloroethane	ug/kg													
1.1-Dichloroethene	ug/kg													
1.2.3-Trichlorobenzene	ug/kg													
1.2.3-Trichloropropane	ug/kg													
1.2.4-Trimethylbenzene	ug/kg													
1.2-Dibromo-3-chloropropane	ug/kg													
1.2-Dichloroethane	ug/kg													
cis-1-2-Dichloroethene	ug/kg													
1.2-Dibromoethane	ug/kg													
1.2-Dichloropropane	ug/kg													
1.3.5-Trimethylbenzene	ug/kg													
cis-1-3-Dichloropropene	ug/kg													
1.3-Dichloropropane	ug/kg													
2.2-Dichloropropane	ug/kg													
2-Chlorotoluene	ug/kg													
4-Chlorotoluene	ug/kg													
4-Isopropyltoluene	ug/kg													
Bromobenzene	ug/kg													
Bromochloromethane	ug/kg													
Bromoform	ug/kg													
Bromomethane	ug/kg													
Bromodichloromethane	ug/kg													
Chlorobenzene	ug/kg													
Carbon Disulphide	ug/kg													
Chloroethane	ug/kg													
Chloroethene	ug/kg													
Chloroform	ug/kg													
Chloromethane	ug/kg													
Carbontetrachloride	ug/kg													
Dibromomethane	ug/kg													
Dichlorodifluoromethane	ug/kg													
Dibromochloromethane	ug/kg													
Dichloromethane	ug/kg													
Isopropylbenzene	ug/kg													
n-Butylbenzene	ug/kg													
Propylbenzene	ug/kg													
sec-Butylbenzene	ug/kg													
Styrene	ug/kg													
Tert-amyl methyl ether	ug/kg													
trans-1-2-Dichloroethene	ug/kg													

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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	x

Sample Reference	Units	STPG01	STPG02	BH424	BH424	BH424	BH425	BH425	BH425	BH426	BH426	TP410	TP410
Specimen Depth		0.3	0.3	0.3 - 0.6	0.7 - 1	1 - 1.1	0.5 - 0.6	1.5 - 1.6	2 - 2.1	0.5 - 0.6	1.5 - 1.6	0 - 0.1	0.9 - 1
Level		7.54	7.57	7.6	7.2	6.9	7.35	6.35	5.85	7.25	6.25	7.2	6.3
Sample Type		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Cluster Code		2007 GI	2007 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI
Carbazole	mg/kg	<0.1	<0.1				<0.5						
Dibenzofuran	mg/kg	<0.1	<0.1				<0.5						
Hexachlorobenzene	mg/kg	<0.1	<0.1				<0.5						
Hexachlorobutadiene	mg/kg	<0.1	<0.1				<0.001						
Hexachlorocyclopentadiene	mg/kg	<0.1	<0.1				<0.5						
Hexachloroethane	mg/kg	<0.1	<0.1				<0.5						
Isophorone	mg/kg	<0.1	<0.1				<0.5						
N-nitrosodimethylamine	mg/kg						<0.5						
N-nitrosodi-n-propylamine	mg/kg	<0.1	<0.1				<0.5						
Nitrobenzene	mg/kg	<0.1	<0.1				<0.5						
VOCs													
Methyl Tertiary Butyl Ether	ug/kg	<11	<11				<1						
Benzene	ug/kg	<9	<9				<1						
Toluene	ug/kg	<5	<5				<1						
Ethylbenzene	ug/kg	<4	<4				<1						
p/m-Xylene	ug/kg	<14	<14				<1						
o-Xylene	ug/kg	<10	<10				<1						
Naphthalene	ug/kg	<13	<13										
Hexachlorobutadiene	ug/kg	<12	<12				<1						
1.2.4-Trichlorobenzene	ug/kg	<6	<6				<1						
1.2-Dichlorobenzene	ug/kg	<12	<12				<1						
1.3-Dichlorobenzene	ug/kg	<6	<6				<1						
1.4-Dichlorobenzene	ug/kg	<5	<5				<1						
1.1.1.2-Tetrachloroethane	ug/kg	<10	<10				<2						
1.1.1-Trichloroethane	ug/kg	<7	<7				<1						
1.1.2.2-Tetrachloroethane	ug/kg	<10	<10										
1.1.2-Trichloroethane	ug/kg	<10	<10				<10						
1.1-Dichloropropene	ug/kg	<11	<11				<1						
1.1-Dichloroethane	ug/kg	<8	<8				<1						
1.1-Dichloroethene	ug/kg	<10	<10				<1						
1.2.3-Trichlorobenzene	ug/kg	<11	<11				<2						
1.2.3-Trichloropropane	ug/kg	<17	<17				<50						
1.2.4-Trimethylbenzene	ug/kg	<9	<9				<1						
1.2-Dibromo-3-chloropropane	ug/kg	<14	<14				<50						
1.2-Dichloroethane	ug/kg	<5	<5				<2						
cis-1-2-Dichloroethene	ug/kg	<5	<5				<1						
1.2-Dibromoethane	ug/kg	<12	<12				<5						
1.2-Dichloropropane	ug/kg	<12	<12				<1						
1.3.5-Trimethylbenzene	ug/kg	<8	<8				<1						
cis-1-3-Dichloropropene	ug/kg	<14	<14				<10						
1.3-Dichloropropane	ug/kg	<7	<7				<1						
2.2-Dichloropropane	ug/kg	<12	<12										
2-Chlorotoluene	ug/kg	<9	<9				<1						
4-Chlorotoluene	ug/kg	<12	<12				<1						
4-Isopropyltoluene	ug/kg	<11	<11				<1						
Bromobenzene	ug/kg	<10	<10				<1						
Bromochloromethane	ug/kg	<14	<14				<5						
Bromoform	ug/kg	<10	<10										
Bromomethane	ug/kg	<13	<13				<20						
Bromodichloromethane	ug/kg	<7	<7				<5						
Chlorobenzene	ug/kg	<5	<5				<1						
Carbon Disulphide	ug/kg	<7	<7										
Chloroethane	ug/kg	<14	<14				<2						
Chloroethene	ug/kg						<1						
Chloroform	ug/kg	<8	<8				<1						
Chloromethane	ug/kg	<7	<7				<1						
Carbontetrachloride	ug/kg	<14	<14				<1						
Dibromomethane	ug/kg	<9	<9				<1						
Dichlorodifluoromethane	ug/kg	<4	<4				<1						
Dibromochloromethane	ug/kg	<13	<13				<10						
Dichloromethane	ug/kg	<10	<10										
Isopropylbenzene	ug/kg	<5	<5				<1						
n-Butylbenzene	ug/kg	<10	<10				<1						
Propylbenzene	ug/kg	<11	<11				<1						
sec-Butylbenzene	ug/kg	<10	<10				<1						
Styrene	ug/kg	<10	<10				<1						
Tert-amyl methyl ether	ug/kg												
trans-1-2-Dichloroethene	ug/kg	<11	<11				<1						

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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	x

Sample Reference	Units	BHM4CAN025	BHM4CAN026	BHM4CANA023	BHM4CANA025	BHM4CANA029	BHM4CANA031	BHM4CANA032
Specimen Depth		0.4	0.8	1	0.4-1.1	0-1.1	1.1	0.5
Level		7.27		5.96	7.34-6.64	6.65-5.55	6.62	6.33
Sample Type		ES	ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	MG	MG	MG	MG	MG
Cluster Code		2016 GI	2016 GI	2016 GI	2016 GI	2016 G1	2016 MG	2016 GI
Carbazole	mg/kg		<0.1	<0.1		<0.1	<0.1	
Dibenzofuran	mg/kg		<0.1	<0.1		<0.1	<0.1	
Hexachlorobenzene	mg/kg		<0.1	<0.1		<0.1	<0.1	
Hexachlorobutadiene	mg/kg		<0.1	<0.1		<0.1	<0.1	
Hexachlorocyclopentadiene	mg/kg		<0.1	<0.1		<0.1	<0.1	
Hexachloroethane	mg/kg		<0.1	<0.1		<0.1	<0.1	
Isophorone	mg/kg		<0.1	<0.1		<0.1	<0.1	
N-nitrosodimethylamine	mg/kg							
N-nitrosodi-n-propylamine	mg/kg		<0.1	<0.1		<0.1	<0.1	
Nitrobenzene	mg/kg		<0.1	<0.1		<0.1	<0.1	
VOCs								
Methyl Tertiary Butyl Ether	ug/kg		<10	<100		<100	<10	
Benzene	ug/kg		<9	<90		<90	<9	
Toluene	ug/kg		<7	<70		<70	<7	
Ethylbenzene	ug/kg		<4	<40		<40	<4	
p/m-Xylene	ug/kg		<10	<100		<100	<10	
o-Xylene	ug/kg		<10	<100		<100	<10	
Naphthalene	ug/kg		<13	<130		<130	<13	
Hexachlorobutadiene	ug/kg		<20	<200		<20	<200	
1.2.4-Trichlorobenzene	ug/kg							
1.2-Dichlorobenzene	ug/kg		<10	<100		<100	<10	
1.3-Dichlorobenzene	ug/kg		<8	<80		<80	<8	
1.4-Dichlorobenzene	ug/kg		<5	<50		<50	<5	
1.1.1.2-Tetrachloroethane	ug/kg		<10	<100		<100	<10	
1.1.1-Trichloroethane	ug/kg		<7	<70		<70	<7	
1.1.2.2-Tetrachloroethane	ug/kg		<10	<100		<100	<10	
1.1.2-Trichloroethane	ug/kg		<10	<100		<100	<10	
1.1-Dichloropropene	ug/kg		<10	<100		<100	<10	
1.1-Dichloroethane	ug/kg		<8	<80		<80	<8	
1.1-Dichloroethene	ug/kg		<10	<100		<100	<10	
1.2.3-Trichlorobenzene	ug/kg		<20	<200		<20	<200	
1.2.3-Trichloropropane	ug/kg		<16	<160		<160	<16	
1.2.4-Trimethylbenzene	ug/kg		<9	<90		<90	<9	
1.2-Dibromo-3-chloropropane	ug/kg		<14	<140		<140	<14	
1.2-Dichloroethane	ug/kg		<5	<50		<50	<5	
cis-1-2-Dichloroethene	ug/kg		<6	<60		<60	<6	
1.2-Dibromoethane	ug/kg		<10	<100		<100	<10	
1.2-Dichloropropane	ug/kg		<10	<100		<100	<10	
1.3.5-Trimethylbenzene	ug/kg		<8	<80		<80	<8	
cis-1-3-Dichloropropene	ug/kg		<10	<100		<100	<10	
1.3-Dichloropropane	ug/kg		<7	<70		<70	<7	
2.2-Dichloropropane	ug/kg		<10	<100		<100	<10	
2-Chlorotoluene	ug/kg		<9	<90		<90	<9	
4-Chlorotoluene	ug/kg		<10	<100		<100	<10	
4-Isopropyltoluene	ug/kg		<10	<100		<100	<10	
Bromobenzene	ug/kg		<10	<100		<100	<10	
Bromochloromethane	ug/kg		<10	<100		<100	<10	
Bromoform	ug/kg		<10	<100		<100	<10	
Bromomethane	ug/kg		<10	<100		<100	<10	
Bromodichloromethane	ug/kg		<7	<70		<70	<7	
Chlorobenzene	ug/kg		<5	<50		<50	<5	
Carbon Disulphide	ug/kg		<7	<70		<70	<7	
Chloroethane	ug/kg		<10	<100		<100	<10	
Chloroethene	ug/kg							
Chloroform	ug/kg		<8	<80		<80	<8	
Chloromethane	ug/kg		<7	<70		<70	<7	
Carbontetrachloride	ug/kg		<10	<100		<100	<10	
Dibromomethane	ug/kg		<9	<90		<90	<9	
Dichlorodifluoromethane	ug/kg		<6	<60		<60	<6	
Dibromochloromethane	ug/kg		<10	<100		<100	<10	
Dichloromethane	ug/kg		<10	<100		<100	<10	
Isopropylbenzene	ug/kg		<5	<50		<50	<5	
n-Butylbenzene	ug/kg		<11	<110		<110	<11	
Propylbenzene	ug/kg		<10	<100		<100	<10	
sec-Butylbenzene	ug/kg		<10	<100		<100	<10	
Styrene	ug/kg		<10	<100		<100	<10	
Tert-amyl methyl ether	ug/kg		<10	<100		<100	<10	
trans-1-2-Dichloroethene	ug/kg		<10	<100		<100	<10	

M4CAN
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CL-15
20/06/2016

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	x

Sample Reference	Units	BHM4CANA033
Specimen Depth		0.3
Level		7.01
Sample Type		ES
Geology Code		MG
Cluster Code		2016 GI
Carbazole	mg/kg	
Dibenzofuran	mg/kg	
Hexachlorobenzene	mg/kg	
Hexachlorobutadiene	mg/kg	
Hexachlorocyclopentadiene	mg/kg	
Hexachloroethane	mg/kg	
Isophorone	mg/kg	
N-nitrosodimethylamine	mg/kg	
N-nitrosodi-n-propylamine	mg/kg	
Nitrobenzene	mg/kg	
VOCs		
Methyl Tertiary Butyl Ether	ug/kg	
Benzene	ug/kg	
Toluene	ug/kg	
Ethylbenzene	ug/kg	
p/m-Xylene	ug/kg	
o-Xylene	ug/kg	
Naphthalene	ug/kg	
Hexachlorobutadiene	ug/kg	
1.2.4-Trichlorobenzene	ug/kg	
1.2-Dichlorobenzene	ug/kg	
1.3-Dichlorobenzene	ug/kg	
1.4-Dichlorobenzene	ug/kg	
1.1.1.2-Tetrachloroethane	ug/kg	
1.1.1-Trichloroethane	ug/kg	
1.1.2.2-Tetrachloroethane	ug/kg	
1.1.2-Trichloroethane	ug/kg	
1.1-Dichloropropene	ug/kg	
1.1-Dichloroethane	ug/kg	
1.1-Dichloroethene	ug/kg	
1.2.3-Trichlorobenzene	ug/kg	
1.2.3-Trichloropropane	ug/kg	
1.2.4-Trimethylbenzene	ug/kg	
1.2-Dibromo-3-chloropropane	ug/kg	
1.2-Dichloroethane	ug/kg	
cis-1-2-Dichloroethene	ug/kg	
1.2-Dibromoethane	ug/kg	
1.2-Dichloropropane	ug/kg	
1.3.5-Trimethylbenzene	ug/kg	
cis-1-3-Dichloropropene	ug/kg	
1.3-Dichloropropane	ug/kg	
2.2-Dichloropropane	ug/kg	
2-Chlorotoluene	ug/kg	
4-Chlorotoluene	ug/kg	
4-Isopropyltoluene	ug/kg	
Bromobenzene	ug/kg	
Bromochloromethane	ug/kg	
Bromoform	ug/kg	
Bromomethane	ug/kg	
Bromodichloromethane	ug/kg	
Chlorobenzene	ug/kg	
Carbon Disulphide	ug/kg	
Chloroethane	ug/kg	
Chloroethene	ug/kg	
Chloroform	ug/kg	
Chloromethane	ug/kg	
Carbontetrachloride	ug/kg	
Dibromomethane	ug/kg	
Dichlorodifluoromethane	ug/kg	
Dibromochloromethane	ug/kg	
Dichloromethane	ug/kg	
Isopropylbenzene	ug/kg	
n-Butylbenzene	ug/kg	
Propylbenzene	ug/kg	
sec-Butylbenzene	ug/kg	
Styrene	ug/kg	
Tert-amyl methyl ether	ug/kg	
trans-1-2-Dichloroethene	ug/kg	

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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	x

Sample Reference	Units	BHG2	BHG3	CH24	CH25	CH26	CH27	CH28	CH29	CH30	CH30	CH31	CH32	CH32
Specimen Depth		1	0.2	0	0	0.3	0.55	0.22	0.4	0	1	0	0	0.5
Level		7	7.8	7.41	7.61	6.89	6.23	7.67	7.64	8.23	7.23	7.96	8.13	7.63
Sample Type		B	D	D	D	D	D	D	D	D	D	D	D	D
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Cluster Code		1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI
trans-1-3-Dichloropropene	ug/kg													
Trichlorofluoromethane	ug/kg													
tert-Butylbenzene	ug/kg													
Tetrachloroethene	ug/kg													
Tribromomethane	ug/kg													
Trichloroethene	ug/kg													
Vinyl Chloride	ug/kg													

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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	X

Sample Reference	Units	STPG01	STPG02	BH424	BH424	BH424	BH425	BH425	BH425	BH426	BH426	TP410	TP410
Specimen Depth		0.3	0.3	0.3 - 0.6	0.7 - 1	1 - 1.1	0.5 - 0.6	1.5 - 1.6	2 - 2.1	0.5 - 0.6	1.5 - 1.6	0 - 0.1	0.9 - 1
Level		7.54	7.57	7.6	7.2	6.9	7.35	6.35	5.85	7.25	6.25	7.2	6.3
Sample Type		ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Cluster Code		2007 GI	2007 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI	2015 GI
trans-1-3-Dichloropropene	ug/kg	<14	<14				<10						
Trichlorofluoromethane	ug/kg	<6	<6				<1						
tert-Butylbenzene	ug/kg	<12	<12				<1						
Tetrachloroethene	ug/kg	<5	<5				<1						
Tribromomethane	ug/kg						<1						
Trichloroethene	ug/kg	<9	<9				<1						
Vinyl Chloride	ug/kg	<10	<10										

M4CAN
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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	x

Sample Reference	Units	BHM4CAN025	BHM4CAN026	BHM4CANA023	BHM4CANA025	BHM4CANA029	BHM4CANA031	BHM4CANA032
Specimen Depth		0.4	0.8	1	0.4-1.1	0-1.1	1.1	0.5
Level		7.27		5.96	7.34-6.64	6.65-5.55	6.62	6.33
Sample Type		ES	ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	MG	MG	MG	MG	MG
Cluster Code		2016 GI	2016 GI	2016 GI	2016 GI	2016 G1	2016 MG	2016 GI
trans-1-3-Dichloropropene	ug/kg		<10	<100		<100	<10	
Trichlorofluoromethane	ug/kg		<6	<60		<60	<6	
tert-Butylbenzene	ug/kg		<14	<140		<140	<14	
Tetrachloroethene	ug/kg		6.84	<50		<50	<5	
Tribromomethane	ug/kg							
Trichloroethene	ug/kg		<9	<90		<90	<9	
Vinyl Chloride	ug/kg		<6	<60		<60	<6	

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-15
20/06/2016

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criteria	x

Sample Reference	**Units**	**BHM4CANA033**
Specimen Depth		0.3
Level		7.01
Sample Type		ES
Geology Code		MG
Cluster Code		2016 GI
trans-1-3-Dichloropropene	ug/kg	
Trichlorofluoromethane	ug/kg	
tert-Butylbenzene	ug/kg	
Tetrachloroethene	ug/kg	
Tribromomethane	ug/kg	
Trichloroethene	ug/kg	
Vinyl Chloride	ug/kg	

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Soil (Nat) Sample Analysis & Screening Assessment
CL-15
14/07/2015

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
Specimen Depth								
Level								
Sample Type								
Geology Code								
Cluster Code								
Metals								
Antimony	mg/kg	2	2	4	3.3	STPG01 @ 1.2mbGL		
Arsenic	mg/kg	9	9	26	5.52	BH423 @ 0.2 - 0.5mbGL	170	0
Barium	mg/kg	2	2	82	70	STPG02 @ 1mbGL		
Boron	mg/kg	7	6	7.6	0.6	BH423 @ 0.2 - 0.5mbGL	46000	0
Cadmium	mg/kg	9	9	1.2	0.12	STPG01 @ 1.2 / BH423 @ 0.2-0.5mbGL	190	0
Chromium	mg/kg	9	9	84	14	STPG01 @ 1.2mbGL	33	7
Copper	mg/kg	9	9	49	10	STPG02 @ 1mbGL	44000	0
Lead	mg/kg	9	9	99	26	BH423 @ 0.2 - 0.5mbGL	1300	0
Mercury	mg/kg	9	6	0.84	0.04	BH423 @ 0.2 - 0.5mbGL	30	0
Molybdenum	mg/kg	2	2	2.5	2	STPG01 @ 1.2mbGL		
Nickel	mg/kg	9	9	39	10	CH24 @ 0.75 / STPG02 @ 1mbG	980	0
Selenium	mg/kg	8	5	1.01	0	CH28 @ 1.9mbGL	1800	0
Zinc	mg/kg	9	9	260	44	BH423 @ 0.2 - 0.5mbGL	170000	0
Hexavalent Chromium	mg/kg	2	0	None > LOD	None > LOD			
Non-Metal Inorganics								
Cyanide (total)	mg/kg	9	0	None > LOD	None > LOD			
Cyanide (free)	mg/kg	6	0	None > LOD	None > LOD			
Acid Soluble Sulphate	mg/kg	4	4	1370	533	CH28 @ 1.9mbGL		
Sulphate (soluble)	g/l	2	2	0.096	0.041	STPG02 @ 1mbGL		
Sulphide	mg/kg	3	3	6	1	CH24 @ 0.75mbGL		
Other								
Asbestos Presence Screen	None	2	0	None > LOD	None > LOD			
Total Organic Carbon	%	2	2	1	0.7	STPG02 @ 1mbGL		
Organic Matter	%	1	1	1.1	1.1	STPG02 @ 3mbGL		
pH Value	pH Units	9	9	11.1	7.3	CH28 @ 1.9mbGL	6-9	2
Organics								
PAH (Screening)	mg/kg	4	2	71	20	CH25 @ 0.8mbGL	1.1	2
TPH FTIR (AR)	mg/kg	3	1	53	53	CH28 @ 1.9mbGL	2000	0
OIL FTIR	mg/kg	3	3	149	105	CH24 @ 0.75mbGL		
PCBs								
PCBs (vs Aroclor 1254)	mg/kg	2	1	0.025	0.025	STPG01 @ 1.2mbGL	0.24	0
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg	1	0	None > LOD	None > LOD		0.24	0
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg	1	0	None > LOD	None > LOD		0.24	0
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg	1	0	None > LOD	None > LOD		0.24	0
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg	1	0	None > LOD	None > LOD		0.24	0
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg	1	0	None > LOD	None > LOD		0.24	0
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg	1	0	None > LOD	None > LOD		0.24	0
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg	1	0	None > LOD	None > LOD		0.24	0
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg	1	0	None > LOD	None > LOD		0.24	0
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg	1	0	None > LOD	None > LOD		0.24	0
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg	1	0	None > LOD	None > LOD		0.24	0
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg	1	0	None > LOD	None > LOD		0.24	0
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	mg/kg	1	0	None > LOD	None > LOD		0.24	0
Phenols								
Phenol Index	mg/kg	4	0	None > LOD	None > LOD		440	0
Phenols (total)	mg/kg	2	0	None > LOD	None > LOD		440	0
BTEX								
GRO (C4-C12)	mg/kg	2	0	None > LOD	None > LOD			
MTBE	mg/kg	2	0	None > LOD	None > LOD			
Benzene	mg/kg	2	0	None > LOD	None > LOD		27	0
Toluene	mg/kg	2	0	None > LOD	None > LOD		56000	0
Ethyl benzene	mg/kg	2	0	None > LOD	None > LOD		5700	0
m & p Xylene	mg/kg	2	0	None > LOD	None > LOD		5900	0
o Xylene	mg/kg	2	0	None > LOD	None > LOD		6600	0
TPH								
TPH >C6-C8	mg/kg	3	0	None > LOD	None > LOD		7800	0
TPH >C8-C10	mg/kg	3	0	None > LOD	None > LOD		2000	0
TPH >C10-C12	mg/kg	3	0	None > LOD	None > LOD		9200	0
TPH >C12-C16	mg/kg	3	0	None > LOD	None > LOD		10000	0
TPH >C16-C21	mg/kg	3	0	None > LOD	None > LOD		7600	0
TPH >C21-C35	mg/kg	3	0	None > LOD	None > LOD		7800	0
Aliphatics C5-C6	mg/kg	2	0	None > LOD	None > LOD		3200	0
Aliphatics >C6-C8	mg/kg	2	0	None > LOD	None > LOD		7800	0
Aliphatics >C8-C10	mg/kg	2	0	None > LOD	None > LOD		2000	0
Aliphatics >C10-C12	mg/kg	2	0	None > LOD	None > LOD		9700	0
Aliphatics >C12-C16	mg/kg	2	2	30	0.62	STPG02 @ 1mbGL	25000	0
Aliphatics >C16-C21	mg/kg	2	2	64	2.2	STPG02 @ 1mbGL	450000	0
Aliphatics >C21-C35	mg/kg	2	2	200	7.4	STPG02 @ 1mbGL	450000	0
Total Aliphatics C5-C35	mg/kg	2	2	290	10	STPG02 @ 1mbGL	2000	0
Aromatics C6-C7	mg/kg	2	0	None > LOD	None > LOD		7800	0
Aromatics >C7-C8	mg/kg	2	0	None > LOD	None > LOD		56000	0
Aromatics >EC8-EC10	mg/kg	2	0	None > LOD	None > LOD		3500	0
Aromatics >EC10-EC12	mg/kg	2	0	None > LOD	None > LOD		9200	0
Aromatics >EC12-EC16	mg/kg	2	1	1.7	1.7	STPG02 @ 1mbGL	10000	0
Aromatics >EC16-EC21	mg/kg	2	2	5.3	0.33	STPG02 @ 1mbGL	7600	0
Aromatics >EC21-EC35	mg/kg	2	2	48	0.31	STPG02 @ 1mbGL	7800	0
Total Aromatics C6-C35	mg/kg	2	2	55	0.64	STPG02 @ 1mbGL	3500	0
TPH (Aliphatics and Aromatics C5-C35)	mg/kg	2	2	350	11	STPG02 @ 1mbGL	2000	0
PAH								
Acenaphthene	mg/kg	5	3	0.36	0.056	BH423 @ 0.2 - 0.5mbGL	29000	0
Acenaphthylene	mg/kg	5	3	0.34	0.044	BH423 @ 0.2 - 0.5mbGL	29000	0
Anthracene	mg/kg	5	3	0.16	0.077	BH423 @ 0.2 - 0.5mbGL	150000	0
Benzo(a)anthracene	mg/kg	5	4	0.57	0.025	BH423 @ 0.2 - 0.5mbGL	49	0
Benzo(a)pyrene	mg/kg	5	3	0.58	0.1	BH423 @ 0.2 - 0.5mbGL	11	0
Benzo(b)fluoranthene	mg/kg	5	4	0.69	0.017	BH423 @ 0.5 - 1mbGL	13	0
Benzo(ghi)perylene	mg/kg	5	3	0.33	0.01	BH423 @ 0.2 - 0.5mbGL	1400	0
Benzo(k)fluoranthene	mg/kg	5	3	0.14	0.052	BH423 0.2-0.5 / 0.5-1 mbGL	370	0
Chrysene	mg/kg	5	4	0.85	0.017	BH423 @ 0.2 - 0.5mbGL	93	0
Dibenzo(ah)anthracene	mg/kg	5	1	0.015	0.015	STPG02 @ 1mbGL	1.1	0
Fluoranthene	mg/kg	5	4	1.3	0.29	BH423 @ 0.2 - 0.5mbGL	6300	0
Fluorene	mg/kg	5	3	0.36	0.096	BH423 @ 0.2 - 0.5mbGL	20000	0
Indeno(123cd)pyrene	mg/kg	5	2	0.24	0.069	BH423 @ 0.2 - 0.5mbGL	150	0
Naphthalene	mg/kg	5	3	0.61	0.069	BH423 @ 0.2 - 0.5mbGL	190	0
Phenanthrene	mg/kg	5	4	1.2	0.18	BH423 @ 0.2 - 0.5mbGL	6200	0
Pyrene	mg/kg	5	4	0.97	0.28	BH423 @ 0.2 - 0.5mbGL	15000	0
PAH 16 Total	mg/kg	5	4	8.6	0.069	BH423 @ 0.2 - 0.5mbGL		
SVOCs								
Phenols								
2-Chlorophenol	mg/kg	2	0	None > LOD	None > LOD			
2-Methylphenol	mg/kg	2	0	None > LOD	None > LOD			
2-Nitrophenol	mg/kg	2	0	None > LOD	None > LOD			
2,4-Dichlorophenol	mg/kg	2	0	None > LOD	None > LOD			
2,4-Dimethylphenol	mg/kg	2	0	None > LOD	None > LOD			
2,4,5-Trichlorophenol	mg/kg	2	0	None > LOD	None > LOD			
2,4,6-Trichlorophenol	mg/kg	2	0	None > LOD	None > LOD			
4-Chloro-3-methylphenol	mg/kg	2	0	None > LOD	None > LOD			
4-Methylphenol	mg/kg	2	0	None > LOD	None > LOD			
4-Nitrophenol	mg/kg	2	0	None > LOD	None > LOD			

M4CAN
Soil (Nat) Sample Analysis & Screening Assessment
CL-15
14/07/2015

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference / Specimen Depth / Level / Sample Type / Geology Code / Cluster Code	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
Pentachlorophenol	mg/kg	2	0	None > LOD	None > LOD			
Phenol	mg/kg	2	0	None > LOD	None > LOD		440	0
PAHs								
2-Chloronaphthalene	mg/kg	2	0	None > LOD	None > LOD			
2-Methylnaphthalene	mg/kg	2	0	None > LOD	None > LOD			
Acenaphthene	mg/kg	1	0	None > LOD	None > LOD		29000	0
Acenaphthylene	mg/kg	1	0	None > LOD	None > LOD		29000	0
Anthracene	mg/kg	1	0	None > LOD	None > LOD		150000	0
Benzo(a)anthracene	mg/kg	1	0	None > LOD	None > LOD		49	0
Benzo(a)pyrene	mg/kg	1	0	None > LOD	None > LOD		11	0
Benzo(b)fluoranthene	mg/kg	1	0	None > LOD	None > LOD		13	0
Benzo(ghi)perylene	mg/kg	1	0	None > LOD	None > LOD		1400	0
Benzo(k)fluoranthene	mg/kg	1	0	None > LOD	None > LOD		370	0
Chrysene	mg/kg	1	0	None > LOD	None > LOD		93	0
Dibenzo(ah)anthracene	mg/kg	1	0	None > LOD	None > LOD		1.1	0
Fluoranthene	mg/kg	1	0	None > LOD	None > LOD		6300	0
Fluorene	mg/kg	1	0	None > LOD	None > LOD		20000	0
Indeno(123cd)pyrene	mg/kg	1	0	None > LOD	None > LOD		150	0
Naphthalene	mg/kg	1	0	None > LOD	None > LOD		190	0
Phenanthrene	mg/kg	1	0	None > LOD	None > LOD		6200	0
Pyrene	mg/kg	1	0	None > LOD	None > LOD		15000	0
Pthalates								
Bis(2-ethylhexyl) phthalate	mg/kg	2	0	None > LOD	None > LOD			
Butylbenzyl phthalate	mg/kg	2	0	None > LOD	None > LOD			
Di-n-butyl phthalate	mg/kg	2	0	None > LOD	None > LOD			
Di-n-Octyl phthalate	mg/kg	2	0	None > LOD	None > LOD			
Diethyl phthalate	mg/kg	2	0	None > LOD	None > LOD			
Dimethyl phthalate	mg/kg	2	0	None > LOD	None > LOD			
Other Semi-Volatiles								
1,2-Dichlorobenzene	mg/kg	2	0	None > LOD	None > LOD			
1,2,4-Trichlorobenzene	mg/kg	2	0	None > LOD	None > LOD		220	0
1,3-Dichlorobenzene	mg/kg	2	0	None > LOD	None > LOD			
1,4-Dichlorobenzene	mg/kg	2	0	None > LOD	None > LOD			
2-Nitroaniline	mg/kg	2	0	None > LOD	None > LOD			
2,4-Dinitrotoluene	mg/kg	2	0	None > LOD	None > LOD			
2,6-Dinitrotoluene	mg/kg	2	0	None > LOD	None > LOD			
3-Nitroaniline	mg/kg	2	0	None > LOD	None > LOD			
4-Bromophenylphenylether	mg/kg	2	0	None > LOD	None > LOD			
4-Chloroaniline	mg/kg	2	0	None > LOD	None > LOD			
4-Chlorophenylphenylether	mg/kg	2	0	None > LOD	None > LOD			
4-Nitroaniline	mg/kg	2	0	None > LOD	None > LOD			
Azobenzene	mg/kg	2	0	None > LOD	None > LOD			
Bis(2-chloroethoxy)methane	mg/kg	2	0	None > LOD	None > LOD			
Bis(2-chloroethyl)ether	mg/kg	2	0	None > LOD	None > LOD			
Carbazole	mg/kg	2	0	None > LOD	None > LOD			
Dibenzofuran	mg/kg	2	0	None > LOD	None > LOD			
Hexachlorobenzene	mg/kg	2	0	None > LOD	None > LOD		30	0
Hexachlorobutadiene	mg/kg	2	0	None > LOD	None > LOD		31	0
Hexachlorocyclopentadiene	mg/kg	2	0	None > LOD	None > LOD			
Hexachloroethane	mg/kg	2	0	None > LOD	None > LOD			
Isophorone	mg/kg	2	0	None > LOD	None > LOD			
N-nitrosodi-n-propylamine	mg/kg	2	0	None > LOD	None > LOD			
Nitrobenzene	mg/kg	2	0	None > LOD	None > LOD			
VOCs								
Methyl Tertiary Butyl Ether	ug/kg	2	0	None > LOD	None > LOD			
Benzene	ug/kg	2	0	None > LOD	None > LOD		27000	0
Toluene	ug/kg	2	0	None > LOD	None > LOD		56000000	0
Ethylbenzene	ug/kg	2	0	None > LOD	None > LOD		5700000	0
p/m-Xylene	ug/kg	2	0	None > LOD	None > LOD			
o-Xylene	ug/kg	2	0	None > LOD	None > LOD		6600000	0
Naphthalene	ug/kg	2	0	None > LOD	None > LOD		190000	0
Hexachlorobutadiene	ug/kg	2	0	None > LOD	None > LOD		31000	0
1.2.4-Trichlorobenzene	ug/kg	2	0	None > LOD	None > LOD		220000	0
1.2-Dichlorobenzene	ug/kg	2	0	None > LOD	None > LOD			
1.3-Dichlorobenzene	ug/kg	2	0	None > LOD	None > LOD			
1.4-Dichlorobenzene	ug/kg	2	0	None > LOD	None > LOD			
1.1.1.2-Tetrachloroethane	ug/kg	2	0	None > LOD	None > LOD			
1.1.1-Trichloroethane	ug/kg	2	0	None > LOD	None > LOD			
1.1.2.2-Tetrachloroethane	ug/kg	2	0	None > LOD	None > LOD			
1.1.2-Trichloroethane	ug/kg	2	0	None > LOD	None > LOD			
1.1-Dichloropropene	ug/kg	2	0	None > LOD	None > LOD			
1.1-Dichloroethane	ug/kg	2	0	None > LOD	None > LOD			
1.1-Dichloroethene	ug/kg	2	0	None > LOD	None > LOD			
1.2.3-Trichlorobenzene	ug/kg	2	0	None > LOD	None > LOD		102000	0
1.2.3-Trichloropropane	ug/kg	2	0	None > LOD	None > LOD			
1.2.4-Trimethylbenzene	ug/kg	2	0	None > LOD	None > LOD			
1.2-Dibromo-3-chloropropane	ug/kg	2	0	None > LOD	None > LOD			
1.2-Dichloroethane	ug/kg	2	0	None > LOD	None > LOD			
cis-1-2-Dichloroethene	ug/kg	2	0	None > LOD	None > LOD			
1.2-Dibromoethane	ug/kg	2	0	None > LOD	None > LOD			
1.2-Dichloropropane	ug/kg	2	0	None > LOD	None > LOD			
1.3.5-Trimethylbenzene	ug/kg	2	0	None > LOD	None > LOD			
cis-1-3-Dichloropropene	ug/kg	2	0	None > LOD	None > LOD			
1.3-Dichloropropane	ug/kg	2	0	None > LOD	None > LOD			
2.2-Dichloropropane	ug/kg	2	0	None > LOD	None > LOD			
2-Chlorotoluene	ug/kg	2	0	None > LOD	None > LOD			
4-Chlorotoluene	ug/kg	2	0	None > LOD	None > LOD			
4-Isopropyltoluene	ug/kg	2	0	None > LOD	None > LOD			
Bromobenzene	ug/kg	2	0	None > LOD	None > LOD			
Bromochloromethane	ug/kg	2	0	None > LOD	None > LOD			
Bromoform	ug/kg	2	0	None > LOD	None > LOD			
Bromomethane	ug/kg	2	0	None > LOD	None > LOD			
Bromodichloromethane	ug/kg	2	0	None > LOD	None > LOD			
Chlorobenzene	ug/kg	2	0	None > LOD	None > LOD		56000	0
Carbon Disulphide	ug/kg	2	0	None > LOD	None > LOD		11000	0
Chloroethane	ug/kg	2	0	None > LOD	None > LOD			
Chloroform	ug/kg	2	0	None > LOD	None > LOD		99000	0
Chloromethane	ug/kg	2	0	None > LOD	None > LOD			
Carbontetrachloride	ug/kg	2	0	None > LOD	None > LOD			
Dibromomethane	ug/kg	2	0	None > LOD	None > LOD			
Dichlorodifluoromethane	ug/kg	2	0	None > LOD	None > LOD			
Dibromochloromethane	ug/kg	2	0	None > LOD	None > LOD			
Dichloromethane	ug/kg	2	0	None > LOD	None > LOD			
Isopropylbenzene	ug/kg	2	0	None > LOD	None > LOD			
n-Butylbenzene	ug/kg	2	0	None > LOD	None > LOD			
Propylbenzene	ug/kg	2	0	None > LOD	None > LOD			
sec-Butylbenzene	ug/kg	2	0	None > LOD	None > LOD			
Styrene	ug/kg	2	0	None > LOD	None > LOD			
trans-1-2-Dichloroethene	ug/kg	2	0	None > LOD	None > LOD			
trans-1-3-Dichloropropene	ug/kg	2	0	None > LOD	None > LOD			

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Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	**Units**	**No. Analyses**	**No. Analyses Above LOD**	**Maximum**	**Minimum**	**Location & Depth of Maximum concentration**	**Selected S4ULs Criteria**	**No. Data Exceeding S4ULs Criteria**
Specimen Depth								
Level								
Sample Type								
Geology Code								
Cluster Code								
Trichlorofluoromethane	ug/kg	2	0	None > LOD	None > LOD			
tert-Butylbenzene	ug/kg	2	0	None > LOD	None > LOD			
Tetrachloroethene	ug/kg	2	0	None > LOD	None > LOD		19000	0
Trichloroethene	ug/kg	2	0	None > LOD	None > LOD		1200	0
Vinyl Chloride	ug/kg	2	0	None > LOD	None > LOD		59	0

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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criterion	X

Sample Reference	Units	CH24	CH25	CH27	CH28	STPG01	STPG02	STPG02	BH423	BH423	BH426
Specimen Depth		0.75	0.8	1.1	1.9	1.2	1	3	0.2 - 0.5	0.5 - 1	2.5 - 2.6
Level		6.66	6.81	5.68	5.99	6.64	6.87	4.87	6.8	6.5	5.25
Sample Type		D	D	D	D	ES	B	D	ES	ES	ES
Geology Code		TFD	TFD	TFD	TFD	TFD	TFD	TFD	CLAY	CLAY	CLAY
Cluster Code		2000 GI	2000 GI	2000 GI	2000 GI	2007 GI	2007 GI	2007 GI	2015 GI	2015 GI	2015 GI
Metals											
Antimony	mg/kg					4	3.3				
Arsenic	mg/kg	17	15	11.3	5.52	8	13		26	17	12
Barium	mg/kg					70	82				
Boron	mg/kg	<5	1.6	2.6	0.6				7.6	6.8	1.8
Cadmium	mg/kg	0.2	0.21	0.12	0.17	1.2	0.4		1.2	0.2	0.19
Chromium	mg/kg	44	35	42	14	84	38		36	19	43
Copper	mg/kg	25	23	15	10	20	49		42	25	19
Lead	mg/kg	69	68	49	26	34	41		99	46	61
Mercury	mg/kg	<0.14	0.14	0.04	0.13	<0.6	<0.6		0.84	0.38	0.28
Molybdenum	mg/kg					2.5	2				
Nickel	mg/kg	39	32	33	10	32	39		33	19	34
Selenium	mg/kg	0.42		<0.5	1.01	<3	<3		0.39	0	0
Zinc	mg/kg	122	129	92	44	130	160		260	130	100
Hexavalent Chromium	mg/kg					<0.3	<0.3				
Non-Metal Inorganics											
Cyanide (total)	mg/kg	<1	<1	<1	<1	<1	<1		<0.5	<0.5	<0.5
Cyanide (free)	mg/kg	<1		<1	<1				<0.5	<0.5	<0.5
Acid Soluble Sulphate	mg/kg	760	843	533	1370						
Sulphate (soluble)	g/l					0.041	0.096				
Sulphide	mg/kg	6		4	1						
Other											
Asbestos Presence Screen	None					NFD	NFD				
Total Organic Carbon	%					0.7	1				
Organic Matter	%							1.1			
pH Value	pH Units	7.3	7.6	8.6	11.1	8.33	8		8.3	8.7	9.1
Organics											
PAH (Screening)	mg/kg	<19	71	<10	20						
TPH FTIR (AR)	mg/kg	<20		<20	53						
OIL FTIR	mg/kg	149		105	137						
PCBs											
PCBs (vs Aroclor 1254)	mg/kg					0.025	<0.1				
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg										<0.01
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg										<0.01
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg										<0.01
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg										<0.01
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg										<0.01
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg										<0.01
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg										<0.01
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg										<0.01
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg										<0.01
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg										<0.01
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg										<0.01
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	mg/kg										<0.01
Phenols											
Phenol Index	mg/kg	<0.5	<0.5	<0.5	<0.5						
Phenols (total)	mg/kg					<0.15	<0.15				
BTEX											
GRO (C4-C12)	mg/kg					<0.01	<0.01				
MTBE	mg/kg					<0.01	<0.01				
Benzene	mg/kg					<0.01	<0.01				
Toluene	mg/kg					<0.01	<0.01				
Ethyl benzene	mg/kg					<0.01	<0.01				
m & p Xylene	mg/kg					<0.01	<0.01				
o Xylene	mg/kg					<0.01	<0.01				
TPH											
TPH >C6-C8	mg/kg								<1	<1	<1
TPH >C8-C10	mg/kg								<1	<1	<1
TPH >C10-C12	mg/kg								<1	<1	<1
TPH >C12-C16	mg/kg								<1	<1	<1
TPH >C16-C21	mg/kg								<1	<1	<1
TPH >C21-C35	mg/kg								<1	<1	<1
Aliphatics C5-C6	mg/kg					<0.01	<0.01				
Aliphatics >C6-C8	mg/kg					<0.01	<0.01				
Aliphatics >C8-C10	mg/kg					<0.01	<0.01				
Aliphatics >C10-C12	mg/kg					<0.01	<0.01				
Aliphatics >C12-C16	mg/kg					0.62	30				
Aliphatics >C16-C21	mg/kg					2.2	64				
Aliphatics >C21-C35	mg/kg					7.4	200				
Total Aliphatics C5-C35	mg/kg					10	290				
Aromatics C6-C7	mg/kg					<0.01	<0.01				
Aromatics >C7-C8	mg/kg					<0.01	<0.01				
Aromatics >EC8-EC10	mg/kg					<0.01	<0.01				
Aromatics >EC10-EC12	mg/kg					<0.01	<0.01				
Aromatics >EC12-EC16	mg/kg					<0.1	1.7				
Aromatics >EC16-EC21	mg/kg					0.33	5.3				
Aromatics >EC21-EC35	mg/kg					0.31	48				
Total Aromatics C6-C35	mg/kg					0.64	55				
TPH (Aliphatics and Aromatics C5-C35)	mg/kg					11	350				
PAH											
Acenaphthene	mg/kg					<0.014	0.056		0.36	0.11	<0.1
Acenaphthylene	mg/kg					<0.005	0.044		0.34	0.22	<0.1
Anthracene	mg/kg					<0.009	0.077		0.16	0.12	<0.1
Benzo(a)anthracene	mg/kg					0.025	0.18		0.57	0.36	<0.1
Benzo(a)pyrene	mg/kg					<0.012	0.12		0.58	0.1	<0.1
Benzo(b)fluoranthene	mg/kg					0.017	0.13		0.6	0.69	<0.1
Benzo(ghi)perylene	mg/kg					0.01	0.089		0.33	<0.1	<0.1
Benzo(k)fluoranthene	mg/kg					<0.025	0.052		0.14	0.14	<0.1
Chrysene	mg/kg					0.017	0.17		0.85	0.24	<0.1
Dibenzo(ah)anthracene	mg/kg					<0.008	0.015		<0.1	<0.1	<0.1
Fluoranthene	mg/kg					<0.025	0.29		1.3	0.93	0.47
Fluorene	mg/kg					<0.012	0.096		0.36	0.19	<0.1
Indeno(123cd)pyrene	mg/kg					<0.011	0.069		0.24	<0.1	<0.1
Naphthalene	mg/kg					<0.01	0.069		0.61	0.3	<0.1
Phenanthrene	mg/kg					<0.021	0.25		1.2	0.77	0.18

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Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criterion	X

Sample Reference	Units	CH24	CH25	CH27	CH28	STPG01	STPG02	STPG02	BH423	BH423	BH426
Specimen Depth		0.75	0.8	1.1	1.9	1.2	1	3	0.2 - 0.5	0.5 - 1	2.5 - 2.6
Level		6.66	6.81	5.68	5.99	6.64	6.87	4.87	6.8	6.5	5.25
Sample Type		D	D	D	D	ES	B	D	ES	ES	ES
Geology Code		TFD	TFD	TFD	TFD	TFD	TFD	TFD	CLAY	CLAY	CLAY
Cluster Code		2000 GI	2000 GI	2000 GI	2000 GI	2007 GI	2007 GI	2007 GI	2015 GI	2015 GI	2015 GI
Pyrene	mg/kg					<0.022	0.28		0.97	0.82	0.28
PAH 16 Total	mg/kg					0.069	2		8.6	5	<2
SVOCs											
Phenols											
2-Chlorophenol	mg/kg					<0.1	<0.1				
2-Methylphenol	mg/kg					<0.1	<0.1				
2-Nitrophenol	mg/kg					<0.1	<0.1				
2,4-Dichlorophenol	mg/kg					<0.1	<0.1				
2,4-Dimethylphenol	mg/kg					<0.1	<0.1				
2,4,5-Trichlorophenol	mg/kg					<0.1	<0.1				
2,4,6-Trichlorophenol	mg/kg					<0.1	<0.1				
4-Chloro-3-methylphenol	mg/kg					<0.1	<0.1				
4-Methylphenol	mg/kg					<0.1	<0.1				
4-Nitrophenol	mg/kg					<0.1	<0.1				
Pentachlorophenol	mg/kg					<0.1	<0.1				
Phenol	mg/kg					<0.1	<0.1				
PAHs											
2-Chloronaphthalene	mg/kg					<0.1	<0.1				
2-Methylnaphthalene	mg/kg					<0.1	<0.1				
Acenaphthene	mg/kg						<0.1				
Acenaphthylene	mg/kg						<0.1				
Anthracene	mg/kg						<0.1				
Benzo(a)anthracene	mg/kg						<0.1				
Benzo(a)pyrene	mg/kg						<0.1				
Benzo(b)fluoranthene	mg/kg						<0.1				
Benzo(ghi)perylene	mg/kg						<0.1				
Benzo(k)fluoranthene	mg/kg						<0.1				
Chrysene	mg/kg						<0.1				
Dibenzo(ah)anthracene	mg/kg						<0.1				
Fluoranthene	mg/kg						<0.1				
Fluorene	mg/kg						<0.1				
Indeno(123cd)pyrene	mg/kg						<0.1				
Naphthalene	mg/kg						<0.1				
Phenanthrene	mg/kg						<0.1				
Pyrene	mg/kg						<0.1				
Pthalates											
Bis(2-ethylhexyl) phthalate	mg/kg					<0.1	<0.1				
Butylbenzyl phthalate	mg/kg					<0.1	<0.1				
Di-n-butyl phthalate	mg/kg					<0.1	<0.1				
Di-n-Octyl phthalate	mg/kg					<0.1	<0.1				
Diethyl phthalate	mg/kg					<0.1	<0.1				
Dimethyl phthalate	mg/kg					<0.1	<0.1				
Other Semi-Volatiles											
1,2-Dichlorobenzene	mg/kg					<0.1	<0.1				
1,2,4-Trichlorobenzene	mg/kg					<0.1	<0.1				
1,3-Dichlorobenzene	mg/kg					<0.1	<0.1				
1,4-Dichlorobenzene	mg/kg					<0.1	<0.1				
2-Nitroaniline	mg/kg					<0.1	<0.1				
2,4-Dinitrotoluene	mg/kg					<0.1	<0.1				
2,6-Dinitrotoluene	mg/kg					<0.1	<0.1				
3-Nitroaniline	mg/kg					<0.1	<0.1				
4-Bromophenylphenylether	mg/kg					<0.1	<0.1				
4-Chloroaniline	mg/kg					<0.1	<0.1				
4-Chlorophenylphenylether	mg/kg					<0.1	<0.1				
4-Nitroaniline	mg/kg					<0.1	<0.1				
Azobenzene	mg/kg					<0.1	<0.1				
Bis(2-chloroethoxy)methane	mg/kg					<0.1	<0.1				
Bis(2-chloroethyl)ether	mg/kg					<0.1	<0.1				
Carbazole	mg/kg					<0.1	<0.1				
Dibenzofuran	mg/kg					<0.1	<0.1				
Hexachlorobenzene	mg/kg					<0.1	<0.1				
Hexachlorobutadiene	mg/kg					<0.1	<0.1				
Hexachlorocyclopentadiene	mg/kg					<0.1	<0.1				
Hexachloroethane	mg/kg					<0.1	<0.1				
Isophorone	mg/kg					<0.1	<0.1				
N-nitrosodi-n-propylamine	mg/kg					<0.1	<0.1				
Nitrobenzene	mg/kg					<0.1	<0.1				
VOCs											
Methyl Tertiary Butyl Ether	ug/kg					<11	<11				
Benzene	ug/kg					<9	<9				
Toluene	ug/kg					<5	<5				
Ethylbenzene	ug/kg					<4	<4				
p/m-Xylene	ug/kg					<14	<14				
o-Xylene	ug/kg					<10	<10				
Naphthalene	ug/kg					<13	<13				
Hexachlorobutadiene	ug/kg					<12	<12				
1.2.4-Trichlorobenzene	ug/kg					<6	<6				
1.2-Dichlorobenzene	ug/kg					<12	<12				
1.3-Dichlorobenzene	ug/kg					<6	<6				
1.4-Dichlorobenzene	ug/kg					<5	<5				
1.1.1.2-Tetrachloroethane	ug/kg					<10	<10				
1.1.1-Trichloroethane	ug/kg					<7	<7				
1.1.2.2-Tetrachloroethane	ug/kg					<10	<10				
1.1.2-Trichloroethane	ug/kg					<10	<10				
1.1-Dichloropropene	ug/kg					<11	<11				
1.1-Dichloroethane	ug/kg					<8	<8				
1.1-Dichloroethene	ug/kg					<10	<10				
1.2.3-Trichlorobenzene	ug/kg					<11	<11				
1.2.3-Trichloropropane	ug/kg					<17	<17				
1.2.4-Trimethylbenzene	ug/kg					<9	<9				
1.2-Dibromo-3-chloropropane	ug/kg					<14	<14				
1.2-Dichloroethane	ug/kg					<5	<5				
cis-1-2-Dichloroethene	ug/kg					<5	<5				
1.2-Dibromoethane	ug/kg					<12	<12				
1.2-Dichloropropane	ug/kg					<12	<12				
1.3.5-Trimethylbenzene	ug/kg					<8	<8				

M4CAN
Soil (Nat) Sample Analysis & Screening Assessment
CL-15
14/07/2015

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criterion	X

Sample Reference	Units	CH24	CH25	CH27	CH28	STPG01	STPG02	STPG02	BH423	BH423	BH426
Specimen Depth		0.75	0.8	1.1	1.9	1.2	1	3	0.2 - 0.5	0.5 - 1	2.5 - 2.6
Level		6.66	6.81	5.68	5.99	6.64	6.87	4.87	6.8	6.5	5.25
Sample Type		D	D	D	D	ES	B	D	ES	ES	ES
Geology Code		TFD	TFD	TFD	TFD	TFD	TFD	TFD	CLAY	CLAY	CLAY
Cluster Code		2000 GI	2000 GI	2000 GI	2000 GI	2007 GI	2007 GI	2007 GI	2015 GI	2015 GI	2015 GI
cis-1-3-Dichloropropene	ug/kg					<14	<14				
1.3-Dichloropropane	ug/kg					<7	<7				
2.2-Dichloropropane	ug/kg					<12	<12				
2-Chlorotoluene	ug/kg					<9	<9				
4-Chlorotoluene	ug/kg					<12	<12				
4-Isopropyltoluene	ug/kg					<11	<11				
Bromobenzene	ug/kg					<10	<10				
Bromochloromethane	ug/kg					<14	<14				
Bromoform	ug/kg					<10	<10				
Bromomethane	ug/kg					<13	<13				
Bromodichloromethane	ug/kg					<7	<7				
Chlorobenzene	ug/kg					<5	<5				
Carbon Disulphide	ug/kg					<7	<7				
Chloroethane	ug/kg					<14	<14				
Chloroform	ug/kg					<8	<8				
Chloromethane	ug/kg					<7	<7				
Carbontetrachloride	ug/kg					<14	<14				
Dibromomethane	ug/kg					<9	<9				
Dichlorodifluoromethane	ug/kg					<4	<4				
Dibromochloromethane	ug/kg					<13	<13				
Dichloromethane	ug/kg					<10	<10				
Isopropylbenzene	ug/kg					<5	<5				
n-Butylbenzene	ug/kg					<10	<10				
Propylbenzene	ug/kg					<11	<11				
sec-Butylbenzene	ug/kg					<10	<10				
Styrene	ug/kg					<10	<10				
trans-1-2-Dichloroethene	ug/kg					<11	<11				
trans-1-3-Dichloropropene	ug/kg					<14	<14				
Trichlorofluoromethane	ug/kg					<6	<6				
tert-Butylbenzene	ug/kg					<12	<12				
Tetrachloroethene	ug/kg					<5	<5				
Trichloroethene	ug/kg					<9	<9				
Vinyl Chloride	ug/kg					<10	<10				

Appendix 4

Tabulated Groundwater Laboratory Data

M4CAN
Groundwater Sample Analysis & Screening Assessment
CL-15
14/07/2015

Screening Values & Assessment

	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion
N/A	Not Available

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: chromium, copper, lead, nickel and zinc

X Inferred from fieldwork records (standpipe depths)

Monitoring Round	Units	Screening Criteria	
Location			
Location Type			
Depth (m)			
Installation Details			
Response Zone			
Date Sampled		EQS	DWS
Metals			
Arsenic Dissolved	ug/l	50	10
Boron	ug/l	2000	1000
Chromium Dissolved	ug/l		50
Copper Dissolved	ug/l	10	2000
Lead Dissolved	ug/l	1.2	10
Nickel Dissolved	ug/l	4	20
Selenium Dissolved	ug/l		10
Cadmium Dissolved	ug/l	0.15	5
Zinc Dissolved	ug/l	75	
Vanadium Dissolved	ug/l		
Mercury Dissolved	ug/l	0.07	1
Non-Metal Inorganics			
Total Alkalinity as CaCO3	mg/l		
Total Diss Sulphur	mg/l		
Chloride	mg/l	250	250
Ammoniacal Nitrogen as N	mg/l	0.6	
Nitrate as NO3	mg/l		
Nitrite as NO2	mg/l		
Total Cyanide	mg/l	0.001	0.05
Free Cyanide	mg/l		
pH Value	pH units	6-9	6.5-10
Conductivity uS/cm @25C	mS/cm		
Phenols			
Phenol	ug/l	7.7	
Phenol Index	mg/l		
Phenols	mg/l	0.0077	
BTEX			
MTBE	ug/l		
Benzene	ug/l	10	1
Toluene	ug/l	50	
Ethyl benzene	ug/l	20	
m & p Xylene	ug/l	30	
o Xylene	ug/l	30	
TPH			
TPH FTIR	ug/l		
TPH GC	ug/l		
GRO >C5-C12	ug/l		
Aliphatics C5-C6	ug/l		
Aliphatics >C6-C8	ug/l		
Aliphatics >C8-C10	ug/l		
Aliphatics >C10-C12	ug/l		
Aliphatics >C12-C16 Aqueous	ug/l		
Aliphatics >C16-C21 Aqueous	ug/l		
Aliphatics >C21-C35 Aqueous	ug/l		
Aliphatics >C35-44	ug/l		
Aromatics >C5-C7	ug/l		
Aromatics >C7-C8	ug/l		
Aromatics >EC8-EC10	ug/l		
Aromatics >EC10-EC12	ug/l		
Aromatics >EC12-EC16 Aqueous	ug/l		
Aromatics >EC16-EC21 Aqueous	ug/l		
Aromatics >EC21-EC35 Aqueous	ug/l		
Aromatics >C35-44	ug/l		
Total Aliphatic TPH	ug/l		
Total Aromatic TPH	ug/l		
Total petroleum hydrocarbons	ug/l		
Speciated PAHs			
Acenaphthene	ug/l		
Acenaphthylene	ug/l		
Anthracene	ug/l	0.1	
Benzo(a)anthracene	ug/l		
Benzo(a)pyrene	ug/l	0.00017	0.01
Benzo(b)fluoranthene	ug/l	0.017	0.1
Benzo(k)fluoranthene	ug/l	0.017	0.1
Benzo(ghi)perylene	ug/l	0.0082	0.1
Indeno(1,2,3-cd)pyrene	ug/l		0.1
Chrysene	ug/l		
Dibenzo(a,h)anthracene	ug/l		
Fluoranthene	ug/l	0.0063	
Fluorene	ug/l		
Naphthalene	ug/l	2	
Phenanthrene	ug/l		
Pyrene	ug/l		
Total PAHs (USEPA 16)	ug/l		
PCBs			
PCB- ARO	ug/l	0	0
Pcb-28 2,4,4' - Trichlororbiphenyl	ug/l	0	0
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	ug/l	0	0
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	ug/l	0	0
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	ug/l	0	0
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	ug/l	0	0
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	ug/l	0	0
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	ug/l	0	0
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	ug/l	0	0
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	ug/l	0	0
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	ug/l	0	0
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	ug/l	0	0
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	ug/l	0	0
Pcb-156 2,3,3',4,4',5-Hexachlorobiphenyl	ug/l	0	0
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	ug/l	0	0
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	ug/l	0	0
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	ug/l	0	0
SVOCs			
PAHs			
Acenaphthene	ug/l		
Acenaphthylene	ug/l		
Anthracene	ug/l	0.1	
Benzo(a)anthracene	ug/l		
Benzo(a)pyrene	ug/l	0.00017	0.01
Benzo(b)fluoranthene	ug/l	0.017	0.1
Benzo(ghi)perylene	ug/l	0.0082	0.1
Benzo(k)fluoranthene	ug/l	0.017	0.1
Chrysene	ug/l		
Dibenzo(ah)anthracene	ug/l		
Fluoranthene	ug/l	0.0063	
Fluorene	ug/l		
Indeno(123cd)pyrene	ug/l	N/A	0.1
Naphthalene	ug/l	2	
Phenanthrene	ug/l		
Pyrene	ug/l		
Other SVOCs			
1,3-Dichlorobenzene	ug/l	20	
1,2,4-Trichlorobenzene	ug/l		
1,2-Dichlorobenzene	ug/l		
2,4,5-Trichlorophenol	ug/l		
2,4,6-Trichlorophenol	ug/l		
2,4-Dichlorophenol	ug/l	20	
2,4-Dimethylphenol	ug/l		
2,4-Dinitrotoluene	ug/l		
2,6-Dinitrotoluene	ug/l		

No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Installation Details of Maximum Concentration	No. Data Exceeding EQS	No. Data Exceeding DWS
16	16	24	4.8	BH425 @ Deep	0	9
10	10	4200	760	BH425 @ Shallow	7	9
16	14	53	1	BH425 @ Deep		1
16	14	21	1.37	BH425 @ Deep	6	0
16	7	10	0.188	CH 32 @	2	0
16	16	20.9	1.82	BHM4CAN025 @ Single	12	1
16	16	53.2	4	BHM4CAN025 @ Single		9
16	6	2.32	0.176	BHM4CAN025 @ Single	6	0
16	16	75	1.08	BH425 @ Shallow	0	
6	6	10.9	0.596	BHM4CAN025 @ Single		0
16	1	0.3	0.3	CH 32 @	1	0
15	15	1900	87.5	BH426 @ Deep		
1	1	65.5	65.5	CH 32 @		
15	15	5720	273	BHM4CAN025 @ Single	15	15
15	15	10	0.65	BH426 @ Deep	15	
6	0	None > LOD	None > LOD			0
6	0	None > LOD	None > LOD			0
10	1	0.05	0.05	BH426 @ Deep	1	0
9	0	None > LOD	None > LOD			
16	16	10.8	7.1	CH 32 @	0	0
6	6	14.1	1.33	BHM4CAN025 @ Single		
7	0	None > LOD	None > LOD		0	
1	1	0.06	0.06	CH 32 @		
9	0	None > LOD	None > LOD		0	
13	0	None > LOD	None > LOD			
15	0	None > LOD	None > LOD		0	0
15	0	None > LOD	None > LOD		0	
15	0	None > LOD	None > LOD		0	
15	0	None > LOD	None > LOD		0	
15	0	None > LOD	None > LOD		0	
1	1	4150	4150	CH 32 @		
1	1	14000	14000	CH 32 @		
6	0	None > LOD	None > LOD			0
15	0	None > LOD	None > LOD			
15	0	None > LOD	None > LOD			
15	0	None > LOD	None > LOD			
15	1	10	10	BHM4CAN024 @ Single		
15	1	49	49	BH426 @ Deep		
15	2	23	17	BH426 @ Deep		
15	3	260	70	BH426 @ Deep		
9	1	1	1	BH426 @ Deep		
15	0	None > LOD	None > LOD			
15	0	None > LOD	None > LOD			
15	0	None > LOD	None > LOD			
15	0	None > LOD	None > LOD			
15	1	17	17	BH426 @ Deep		
15	2	16	11	BHM4CAN024 @ Single		
15	1	36	36	BH426 @ Deep		
9	1	0.97	0.97	BH426 @ Deep		
15	4	330	17	BH426 @ Deep		
15	2	65	16	BH426 @ Deep		
15	6	400	15	BH426 @ Deep		
16	3	0.333	0.297	BHM4CAN024 @ Single		
16	1	0.0162	0.0162	BHM4CAN024 @ Single		
16	4	0.0888	0.0587	BHM4CAN024 @ Single	0	
16	6	0.12	0.017	CH 32 @		
16	6	0.092	0.00942	BHM4CAN025 @ Single	6	5
16	5	0.171	0.0299	BHM4CAN025 @ Single	5	1
16	1	0.0617	0.0617	BHM4CAN025 @ Single	1	0
16	4	0.1	0.0325	BHM4CAN025 @ Single	4	0
16	4	0.0761	0.0256	BHM4CAN025 @ Single		0
16	6	0.0698	0.0145	BHM4CAN025 @ Single		
16	1	0.0243	0.0243	BHM4CAN025 @ Single		
16	7	0.381	0.0375	BHM4CAN024 @ Single	7	
16	4	0.63	0.125	CH 32 @		
16	2	0.11	0.102	BHM4CAN024 @ Single	0	
16	5	0.513	0.0255	BHM4CAN024 @ Single		
16	7	0.319	0.0357	BHM4CAN024 @ Single		
16	4	2.11	0.774	BHM4CAN024 @ Single		
1	1	0.8	0.8	CH 32 @	1	1
1	0	None > LOD	None > LOD		0	0
1	0	None > LOD	None > LOD		0	0
6	0	None > LOD	None > LOD		0	0
6	0	None > LOD	None > LOD		0	0
6	0	None > LOD	None > LOD		0	0
6	0	None > LOD	None > LOD		0	0
7	0	None > LOD	None > LOD		0	0
6	0	None > LOD	None > LOD		0	0
6	0	None > LOD	None > LOD		0	0
1	0	None > LOD	None > LOD		0	0
1	0	None > LOD	None > LOD		0	0
6	0	None > LOD	None > LOD		0	0
6	0	None > LOD	None > LOD		0	0
6	0	None > LOD	None > LOD		0	0
6	0	None > LOD	None > LOD		0	0
1	0	None > LOD	None > LOD		0	0
6	0	None > LOD	None > LOD		0	0
4	0	None > LOD	None > LOD			
4	0	None > LOD	None > LOD			
4	0	None > LOD	None > LOD		0	
4	0	None > LOD	None > LOD			
4	0	None > LOD	None > LOD		0	0
4	0	None > LOD	None > LOD		0	0
4	0	None > LOD	None > LOD		0	0
4	0	None > LOD	None > LOD		0	0
4	0	None > LOD	None > LOD			
4	0	None > LOD	None > LOD			
4	0	None > LOD	None > LOD		0	
4	0	None > LOD	None > LOD			
4	0	None > LOD	None > LOD		0	0
4	0	None > LOD	None > LOD		0	
4	0	None > LOD	None > LOD			
4	0	None > LOD	None > LOD			
11	0	None > LOD	None > LOD		0	
4	0	None > LOD	None > LOD			0
4	0	None > LOD	None > LOD			0
11	0	None > LOD	None > LOD			
11	0	None > LOD	None > LOD			
11	0	None > LOD	None > LOD		0	
11	0	None > LOD	None > LOD			
11	0	None > LOD	None > LOD			
11	0	None > LOD	None > LOD			

M4CAN
Groundwater Sample Analysis & Screening Assessment
CL-15
14/07/2015

Screening Values & Assessment

(orange)	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion
N/A	Not Available

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: chromium, copper, lead, nickel and zinc
X Inferred from fieldwork records (standpipe depths)

Monitoring Round	Units	Screening Criteria								
Location										
Location Type										
Depth (m)										
Installation Details		EQS	DWS							
Response Zone										
Date Sampled				No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Installation Details of Maximum Concentration	No. Data Exceeding EQS	No. Data Exceeding DWS
2-Chloronaphthalene	ug/l			11	0	None > LOD	None > LOD			
2-Chlorophenol	ug/l	50		11	0	None > LOD	None > LOD		0	
2-Methyl-4,6-Dinitrophenol	ug/l			11	0	None > LOD	None > LOD			
2-Methylnaphthalene	ug/l			11	0	None > LOD	None > LOD			
2-Methylphenol	ug/l	100		11	0	None > LOD	None > LOD		0	
2-Nitroaniline	ug/l			11	0	None > LOD	None > LOD			
2-Nitrophenol	ug/l			11	0	None > LOD	None > LOD			
3-Nitroaniline	ug/l			11	0	None > LOD	None > LOD			
4-Bromophenyl Phenyl Ether	ug/l			11	0	None > LOD	None > LOD			
4-Chloro-3-Methylphenol	ug/l	40		11	0	None > LOD	None > LOD		0	
4-Chloroaniline	ug/l			11	0	None > LOD	None > LOD			
4-Chlorophenyl Phenyl Ether	ug/l			11	0	None > LOD	None > LOD			
4-Methylphenol	ug/l	100		11	0	None > LOD	None > LOD		0	
4-Nitroaniline	ug/l			11	0	None > LOD	None > LOD			
Azobenzene	ug/l			11	0	None > LOD	None > LOD			
Bis(2-chloroethoxy)methane	ug/l			11	0	None > LOD	None > LOD			
Bis(2-chloroethyl)ether	ug/l			11	0	None > LOD	None > LOD			
Bis(2-chloroisopropyl)ether	ug/l			11	0	None > LOD	None > LOD			
Bis(2-ethylhexyl)phthalate	ug/l	1.3		11	0	None > LOD	None > LOD		0	
Butylbenzylphthalate	ug/l	20		11	0	None > LOD	None > LOD		0	
Carbazole	ug/l			11	0	None > LOD	None > LOD			
Dibenzofuran	ug/l			11	0	None > LOD	None > LOD			
Diethylphthalate	ug/l	200		11	0	None > LOD	None > LOD		0	
Dimethylphthalate	ug/l	800		11	0	None > LOD	None > LOD		0	
Di-N-Butyl Phthalate	ug/l	8		11	0	None > LOD	None > LOD		0	
Di-N-Octyl Phthalate	ug/l	20		11	0	None > LOD	None > LOD		0	
Hexachlorobenzene (HCB)	ug/l	0.05		11	0	None > LOD	None > LOD		0	
Hexachlorocyclopentadiene	ug/l			11	0	None > LOD	None > LOD			
Hexachloroethane	ug/l			11	0	None > LOD	None > LOD			
Isophorone	ug/l			11	0	None > LOD	None > LOD			
Nitrobenzene	ug/l			11	0	None > LOD	None > LOD			
n-nitrosodimethylamine	ug/l			11	0	None > LOD	None > LOD			
N-Nitroso-Di-N-Propylamine	ug/l			11	0	None > LOD	None > LOD			
Pentachlorophenol (PCP)	ug/l	0.4		11	0	None > LOD	None > LOD		0	
Phenol	ug/l	7.7		11	0	None > LOD	None > LOD		0	
VOCs										
1,1,1,2-Tetrachloroethane	ug/l			11	0	None > LOD	None > LOD			
1,1,1-Trichloroethane	ug/l	100		11	0	None > LOD	None > LOD		0	
1,1,2-Trichloroethane	ug/l	400		11	0	None > LOD	None > LOD		0	
1,1-Dichloroethane	ug/l			11	0	None > LOD	None > LOD			
1,1-Dichloroethene	ug/l			11	0	None > LOD	None > LOD			
1,1-Dichloropropene	ug/l			11	0	None > LOD	None > LOD			
1,2,3-Trichlorobenzene	ug/l	0.4		11	0	None > LOD	None > LOD		0	
1,2,3-Trichloropropane	ug/l			11	0	None > LOD	None > LOD			
1,2,4-Trichlorobenzene	ug/l	0.4		11	0	None > LOD	None > LOD		0	
1,2,4-Trimethylbenzene	ug/l			11	0	None > LOD	None > LOD			
1,2-Dibromo-3-Chloropropane	ug/l			11	0	None > LOD	None > LOD			
1,2-Dibromoethane	ug/l			11	0	None > LOD	None > LOD			
1,2-Dichlorobenzene	ug/l	20		11	0	None > LOD	None > LOD		0	
1,2-Dichloroethane	ug/l	10	3	11	0	None > LOD	None > LOD		0	0
1,2-Dichloropropane	ug/l			11	0	None > LOD	None > LOD			
1,3,5-Trimethylbenzene	ug/l			11	0	None > LOD	None > LOD			
1,3-Dichloropropane	ug/l			11	0	None > LOD	None > LOD			
1,4-Dichlorobenzene	ug/l	20		11	0	None > LOD	None > LOD		0	
2-Chlorotoluene	ug/l			11	0	None > LOD	None > LOD			
4-Chlorotoluene	ug/l			11	0	None > LOD	None > LOD			
4-Isopropyltoluene	ug/l			11	0	None > LOD	None > LOD			
Benzene	ug/l	10	1	13	0	None > LOD	None > LOD		0	0
Bromobenzene	ug/l			11	0	None > LOD	None > LOD			
Bromochloromethane	ug/l		100	11	0	None > LOD	None > LOD			0
Bromodichloromethane	ug/l			11	0	None > LOD	None > LOD			
Bromomethane	ug/l			11	0	None > LOD	None > LOD			
Chlorobenzene	ug/l			11	0	None > LOD	None > LOD			
Chloroethane	ug/l			11	0	None > LOD	None > LOD			
Chloroethene	ug/l			11	0	None > LOD	None > LOD			
Chloroform	ug/l	2.5	100	11	0	None > LOD	None > LOD		0	0
Chloromethane	ug/l			11	0	None > LOD	None > LOD			
cis-1,2-Dichloroethene	ug/l			11	0	None > LOD	None > LOD			
cis-1,3-Dichloropropene	ug/l			11	0	None > LOD	None > LOD			
Dibromochloromethane	ug/l		100	11	0	None > LOD	None > LOD			0
Dibromomethane	ug/l			11	0	None > LOD	None > LOD			
Dichlorodifluoromethane	ug/l			11	0	None > LOD	None > LOD			
Ethylbenzene	ug/l	20		13	0	None > LOD	None > LOD		0	
Hexachlorobutadiene (HCBD)	ug/l	0.6		11	0	None > LOD	None > LOD		0	
Isopropylbenzene	ug/l			11	0	None > LOD	None > LOD			
m,p xylenes	ug/l	30		13	0	None > LOD	None > LOD		0	
Methyl tert-butyl ether (MTBE)	ug/l			11	0	None > LOD	None > LOD			
n-Butylbenzene	ug/l			11	0	None > LOD	None > LOD			
n-propylbenzene	ug/l			11	0	None > LOD	None > LOD			
O-Xylene	ug/l	30		13	0	None > LOD	None > LOD		0	
Sec-Butylbenzene	ug/l			11	0	None > LOD	None > LOD			
Styrene	ug/l	50		11	0	None > LOD	None > LOD		0	
Tert-Butylbenzene	ug/l			11	0	None > LOD	None > LOD			
Tetrachloroethene	ug/l	10	10	11	0	None > LOD	None > LOD		0	0
Tetrachloromethane (Carbon Tetra Chloride)	ug/l	12	3	11	0	None > LOD	None > LOD		0	0
Toluene	ug/l	50		13	0	None > LOD	None > LOD		0	
trans-1,2-Dichloroethene	ug/l			11	0	None > LOD	None > LOD			
trans-1,3-Dichloropropene	ug/l			11	0	None > LOD	None > LOD			
Tribromomethane	ug/l		100	11	0	None > LOD	None > LOD			0
Trichloroethene	ug/l	10	10	11	0	None > LOD	None > LOD		0	0
Trichlorofluoromethane	ug/l			11	0	None > LOD	None > LOD			
Vinyl Chloride	ug/l	0	0.5	4	0	None > LOD	None > LOD		0	0

M4CAN
Groundwater Sample Analysis & Screening Assessment
CL-15
14/07/2015

Screening Values & Assessment

	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion
N/A	Not Available

Geological Formation Legend

TFD	Tidal Flat Deposits
GFD	Glaciofluvial Deposits
MM	Mercia Mudstone

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni and Zn
X Inferred from fieldwork records (standpipe depths)

Monitoring Round	Units	Screening Criteria			1		2		3		1	2	3	1	2	3	1	2	3
Location				CH 32	BH425	BH425	BH425	BH425	BH425	BH425	BH426	BH426	BH426	BHM4CAN024	BHM4CAN024	BHM4CAN024	BHM4CAN025	BHM4CAN025	BHM4CAN025
Location Type				WS	BH						BH			BH			BH		
Depth (m)				0.1	10.14	15.66	11.42	16.53	11.83	16.34	5.7	8.54	7.79						
Installation Details					Shallow	Deep	Shallow	Deep	Shallow	Deep	Deep	Deep	Deep	Single	Single	Single	Single	Single	Single
Response Zone				MG	GFD	MM	GFD	MM	GFD	MM	TDF	TDF	TDF	MG/TFD	MG/TFD	MG/TFD	MM	MM	MM
Date Sampled				2000	28/04/2015		06/05/2015		12/05/2015		28/04/2015	06/05/2015	12/05/2015	04/05/2016	17/05/2016	01/06/2016	04/05/2016	17/05/2016	01/06/2016
Metals																			
Arsenic Dissolved	ug/l	50	10	7	4.8	12	8.9	12	13	24	7.2	11	19	5.71	8	9.44	19.6	19.9	16
Boron	ug/l	2000	1000	760	3300	3800	3300	3900	4200	3300	1800	3000	1800						
Chromium Dissolved	ug/l		50	1	39	53	15	15	<1	7.2	38	16	<1	4.28	4.08	1.44	1.49	2.12	1.55
Copper Dissolved	ug/l	10	2000	19	5.2	11	13	17	4.7	21	7	13	2.2	<0.85	1.37	<0.85	9.75	7.33	5.47
Lead Dissolved	ug/l	1.2	10	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	0.539	0.348	0.233	2.09	0.716	0.188
Nickel Dissolved	ug/l	4	20	9	3.1	4.8	6.3	8.2	5.5	9.9	7.6	20	5.7	2.91	2.45	1.82	16.9	20.9	15.1
Selenium Dissolved	ug/l		10	4	6.1	23	13	18	7.1	15	16	17	7.3	5.6	6.41	5.92	53.2	51.7	43.6
Cadmium Dissolved	ug/l	0.15	5	<0.1	<0.08	<0.08	0.33	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	0.294	0.176	<0.1	2.32	1.69	0.651
Zinc Dissolved	ug/l	75		3	75	64	33	32	46	36	22	8.2	7.1	1.29	1.67	1.08	17	23.2	25.1
Vanadium Dissolved	ug/l													1.47	1.59	0.596	10.6	10.9	8.95
Mercury Dissolved	ug/l	0.07	1	0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Non-Metal Inorganics																			
Total Alkalinity as CaCO3	mg/l				620	750	1300	1100	1700	1600	1900	1100	1200	255	240	280	105	140	87.5
Total Diss Sulphur	mg/l			65.5															
Chloride	mg/l	250	250		280	1600	3000	2900	1300	3400	1800	2300	1100	377	273	311	5600	5720	5520
Ammoniacal Nitrogen as N	mg/l	0.6			0.65	1.2	5	4.3	7.1	5.9	3.9	10	5.3	2.65	2.47	2.57	1.76	1.82	1.77
Nitrate as NO3	mg/l													<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Nitrite as NO2	mg/l													<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Cyanide	mg/l	0.001	0.05	<0.025	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05						
Free Cyanide	mg/l				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05						
pH Value	pH units	6-9	6.5-10	10.8	8.5	8.2	7.6	7.5	7.1	7.3	8.2	7.4	7.6	8	7.87	8.09	7.66	7.52	7.66
Conductivity uS/cm @25C	mS/cm													1.53	1.35	1.33	13.5	14.1	14.1
Phenols																			
Phenol	ug/l	7.7					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5						
Phenol Index	mg/l			0.06															
Phenols	mg/l	0.0077			<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03						
BTEX																			
MTBE	ug/l						<1	<1	<1	<1	<1	<1	<1	<3	<3	<3	<3	<3	<3
Benzene	ug/l	10	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<7	<7	<7	<7	<7	<7
Toluene	ug/l	50			<1	<1	<1	<1	<1	<1	<1	<1	<1	<4	<4	<4	<4	<4	<4
Ethyl benzene	ug/l	20			<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<5	<5	<5	<5	<5
m & p Xylene	ug/l	30			<1	<1	<1	<1	<1	<1	<1	<1	<1	<8	<8	<8	<8	<8	<8
o Xylene	ug/l	30			<1	<1	<1	<1	<1	<1	<1	<1	<1	<3	<3	<3	<3	<3	<3
TPH																			
TPH FTIR	ug/l			4150															
TPH GC	ug/l			14000															
GRO >C5-C12	ug/l													<50	<50	<50	<50	<50	<50
Aliphatics C5-C6	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10	<10	<10	<10	<10	<10
Aliphatics >C6-C8	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10	<10	<10	<10	<10	<10
Aliphatics >C8-C10	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10	<10	<10	<10	<10	<10
Aliphatics >C10-C12	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10	<10	<10	<10	<10	<10
Aliphatics >C12-C16 Aqueous	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	49	<0.1	<10	<10	<10	<10	<10	<10
Aliphatics >C16-C21 Aqueous	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	23	<0.1	<10	17	<10	<10	<10	<10
Aliphatics >C21-C35 Aqueous	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	260	<0.1	<10	<10	<10	72	70	<10
Aliphatics >C35-44	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1	<0.1						
Aromatics >C5-C7	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10	<10	<10	<10	<10	<10
Aromatics >C7-C8	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10	<10	<10	<10	<10	<10
Aromatics >EC10-EC12	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10	<10	<10	<10	<10	<10
Aromatics >EC12-EC16 Aqueous	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	17	<0.1	<10	<10	<10	<10	<10	<10
Aromatics >EC16-EC21 Aqueous	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	11	<0.1	16	<10	<10	<10	<10	<10
Aromatics >EC21-EC35 Aqueous	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	36	<0.1	<10	<10	<10	<10	<10	<10
Aromatics >C35-44	ug/l				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.97	<0.1						

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Screening Values & Assessment

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X	Exceeds DWS
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N/A	Not Available

Geological Formation Legend

TFD	Tidal Flat Deposits
GFD	Glaciofluvial Deposits
MM	Mercia Mudstone

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni and Zn	
X	Inferred from fieldwork records (standpipe depths)

Monitoring Round	Units	Screening Criteria			1		2		3		1	2	3	1	2	3	1	2	3
Location		EQS	DWS	CH 32	BH425	BH425	BH425	BH425	BH425	BH425	BH426	BH426	BH426	BHM4CAN024	BHM4CAN024	BHM4CAN024	BHM4CAN025	BHM4CAN025	BHM4CAN025
Location Type				WS	BH						BH			BH			BH		
Depth (m)				0.1	10.14	15.66	11.42	16.53	11.83	16.34	5.7	8.54	7.79						
Installation Details					Shallow	Deep	Shallow	Deep	Shallow	Deep	Deep	Deep	Deep	Single	Single	Single	Single	Single	Single
Response Zone				MG	GFD	MM	GFD	MM	GFD	MM	TDF	TDF	TDF	MG/TFD	MG/TFD	MG/TFD	MM	MM	MM
Date Sampled				2000	28/04/2015		06/05/2015		12/05/2015		28/04/2015	06/05/2015	12/05/2015	04/05/2016	17/05/2016	01/06/2016	04/05/2016	17/05/2016	01/06/2016
Total Aliphatic TPH	ug/l				<5	<5	<5	<5	<5	<5	<5	330	<5	<10	17	<10	72	70	<10
Total Aromatic TPH	ug/l				<5	<5	<5	<5	<5	<5	<5	65	<5	16	<10	<10	<10	<10	<10
Total petroleum hydrocarbons	ug/l				<10	<10	<10	<10	<10	<10	<10	400	<10	48	17	15	72	70	<10
Speciated PAHs																			
Acenaphthene	ug/l			<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.333	0.297	0.317	<0.015	<0.03	<0.03
Acenaphthylene	ug/l			<1.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.011	0.0162	<0.011	<0.011	<0.022	<0.022
Anthracene	ug/l	0.1		0.06	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.0888	0.0587	0.082	<0.015	<0.03	<0.03
Benzo(a)anthracene	ug/l			0.12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.017	0.0484	0.0523	0.017	0.0876	0.0597
Benzo(a)pyrene	ug/l	0.00017	0.01	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.0171	0.00942	0.0382	0.092	0.0627	0.0433
Benzo(b)fluoranthene	ug/l	0.017	0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.0299	<0.023	0.056	0.171	0.0878	0.079
Benzo(k)fluoranthene	ug/l	0.017	0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.027	<0.027	<0.027	0.0617	<0.054	<0.054
Benzo(ghi)perylene	ug/l	0.0082	0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.016	<0.016	0.0325	0.1	0.0887	0.051
Indeno(1,2,3-cd)pyrene	ug/l		0.1	<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.014	<0.014	0.0256	0.0719	0.0761	0.0437
Chrysene	ug/l			<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.0315	0.0145	0.0398	0.0698	0.0357	0.0302
Dibenzo(a,h)anthracene	ug/l			<0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.016	<0.016	<0.016	0.0243	<0.032	<0.032
Fluoranthene	ug/l	0.0063		0.17	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.32	0.299	0.381	0.0745	0.0516	0.0375
Fluorene	ug/l			0.63	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.157	0.125	0.155	<0.014	<0.028	<0.028
Naphthalene	ug/l	2		<1.00	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.11	0.102	<0.1	<0.2	<0.2
Phenanthrene	ug/l			0.38	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.43	0.293	0.513	0.0255	<0.044	<0.044
Pyrene	ug/l			0.21	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.249	0.231	0.319	0.0667	0.0468	0.0357
Total PAHs (USEPA 16)	ug/l			<3.97	<2	<2	<2	<2	<2	<2	<2	<2	<2	1.66	1.5	2.11	0.774	<0.688	<0.688
PCBs																			
PCB- ARO	ug/l	0	0	0.8															
Pcb-28 2,4,4' - Trichlororbiphenyl	ug/l	0	0									<0.01							
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	ug/l	0	0									<0.01							
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	ug/l	0	0											<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	ug/l	0	0											<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	ug/l	0	0									<0.01							
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	ug/l	0	0											<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	ug/l	0	0											<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	ug/l	0	0									<0.01		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	ug/l	0	0											<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	ug/l	0	0											<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	ug/l	0	0									<0.01							
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	ug/l	0	0									<0.01							
Pcb-156 2,3,3',4,4',5-Hexachlorobiphenyl	ug/l	0	0											<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	ug/l	0	0											<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0											<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0											<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	ug/l	0	0									<0.01							
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	ug/l	0	0											<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
SVOCs																			
PAHs																			
Acenaphthene	ug/l													<1	<1		<1	<1	
Acenaphthylene	ug/l													<1	<1		<1	<1	
Anthracene	ug/l	0.1												<1	<1		<1	<1	
Benzo(a)anthracene	ug/l													<1	<1		<1	<1	
Benzo(a)pyrene	ug/l	0.00017	0.01											<1	<1		<1	<1	
Benzo(b)fluoranthene	ug/l	0.017	0.1											<1	<1		<1	<1	
Benzo(ghi)perylene	ug/l	0.0082	0.1											<1	<1		<1	<1	
Benzo(k)fluoranthene	ug/l	0.017	0.1											<1	<1		<1	<1	
Chrysene	ug/l													<1	<1		<1	<1	
Dibenzo(ah)anthracene	ug/l													<1	<1		<1	<1	
Fluoranthene	ug/l	0.0063												<1	<1		<1	<1	

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Screening Values & Assessment

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N/A	Not Available

Geological Formation Legend

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MM	Mercia Mudstone

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni and Zn	
X	Inferred from fieldwork records (standpipe depths)

Monitoring Round	Units	Screening Criteria			1		2		3		1	2	3	1	2	3	1	2	3
Location		EQS	DWS	CH 32	BH425	BH425	BH425	BH425	BH425	BH425	BH426	BH426	BH426	BHM4CAN024	BHM4CAN024	BHM4CAN024	BHM4CAN025	BHM4CAN025	BHM4CAN025
Location Type				WS	BH						BH			BH			BH		
Depth (m)				0.1	10.14	15.66	11.42	16.53	11.83	16.34	5.7	8.54	7.79						
Installation Details					Shallow	Deep	Shallow	Deep	Shallow	Deep	Deep	Deep	Deep	Single	Single	Single	Single	Single	Single
Response Zone				MG	GFD	MM	GFD	MM	GFD	MM	TDF	TDF	TDF	MG/TFD	MG/TFD	MG/TFD	MM	MM	MM
Date Sampled				2000	28/04/2015		06/05/2015		12/05/2015		28/04/2015	06/05/2015	12/05/2015	04/05/2016	17/05/2016	01/06/2016	04/05/2016	17/05/2016	01/06/2016
Fluorene	ug/l													<1	<1		<1	<1	
Indeno(123cd)pyrene	ug/l	N/A	0.1											<1	<1		<1	<1	
Naphthalene	ug/l	2												<1	<1		<1	<1	
Phenanthrene	ug/l													<1	<1		<1	<1	
Pyrene	ug/l													<1	<1		<1	<1	
Other SVOCs																			
1,3-Dichlorobenzene	ug/l	20					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
1,2,4-Trichlorobenzene	ug/l													<1	<1		<1	<1	
1,2-Dichlorobenzene	ug/l													<1	<1		<1	<1	
2,4,5-Trichlorophenol	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
2,4,6-Trichlorophenol	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
2,4-Dichlorophenol	ug/l	20					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
2,4-Dimethylphenol	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
2,4-Dinitrotoluene	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
2,6-Dinitrotoluene	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
2-Chloronaphthalene	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
2-Chlorophenol	ug/l	50					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
2-Methyl-4,6-Dinitrophenol	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
2-Methylnaphthalene	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
2-Methylphenol	ug/l	100					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
2-Nitroaniline	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
2-Nitrophenol	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
3-Nitroaniline	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
4-Bromophenyl Phenyl Ether	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
4-Chloro-3-Methylphenol	ug/l	40					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
4-Chloroaniline	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
4-Chlorophenyl Phenyl Ether	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
4-Methylphenol	ug/l	100					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
4-Nitroaniline	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Azobenzene	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Bis(2-chloroethoxy)methane	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Bis(2-chloroethyl)ether	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Bis(2-chloroisopropyl)ether	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Bis(2-ethylhexyl)phthalate	ug/l	1.3					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Butylbenzylphthalate	ug/l	20					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Carbazole	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Dibenzofuran	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Diethylphthalate	ug/l	200					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Dimethylphthalate	ug/l	800					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Di-N-Butyl Phthalate	ug/l	8					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Di-N-Octyl Phthalate	ug/l	20					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Hexachlorobenzene (HCB)	ug/l	0.05					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Hexachlorocyclopentadiene	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Hexachloroethane	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Isophorone	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Nitrobenzene	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
n-nitrosodimethylamine	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
N-Nitroso-Di-N-Propylamine	ug/l						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Pentachlorophenol (PCP)	ug/l	0.4					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
Phenol	ug/l	7.7					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1		<1	<1	
VOCs																			
1,1,1,2-Tetrachloroethane	ug/l						<2	<2	<2	<2	<2	<2	<2	<1	<1		<1	<1	
1,1,1-Trichloroethane	ug/l	100					<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
1,1,2-Trichloroethane	ug/l	400					<10	<10	<10	<10	<10	<10	<10	<1	<1		<1	<1	
1,1-Dichloroethane	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	

M4CAN
Groundwater Sample Analysis & Screening Assessment
CL-15
14/07/2015

Screening Values & Assessment

	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion
N/A	Not Available

Geological Formation Legend

TFD	Tidal Flat Deposits
GFD	Glaciofluvial Deposits
MM	Mercia Mudstone

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni and Zn	
X	Inferred from fieldwork records (standpipe depths)

Monitoring Round	Units	Screening Criteria			1		2		3		1	2	3	1	2	3	1	2	3
Location		EQS	DWS	CH 32	BH425	BH425	BH425	BH425	BH425	BH425	BH426	BH426	BH426	BHM4CAN024	BHM4CAN024	BHM4CAN024	BHM4CAN025	BHM4CAN025	BHM4CAN025
Location Type				WS	BH						BH			BH			BH		
Depth (m)				0.1	10.14	15.66	11.42	16.53	11.83	16.34	5.7	8.54	7.79						
Installation Details					Shallow	Deep	Shallow	Deep	Shallow	Deep	Deep	Deep	Deep	Single	Single	Single	Single	Single	Single
Response Zone				MG	GFD	MM	GFD	MM	GFD	MM	TDF	TDF	TDF	MG/TFD	MG/TFD	MG/TFD	MM	MM	MM
Date Sampled				2000	28/04/2015		06/05/2015		12/05/2015		28/04/2015	06/05/2015	12/05/2015	04/05/2016	17/05/2016	01/06/2016	04/05/2016	17/05/2016	01/06/2016
1,1-Dichloroethene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
1,1-Dichloropropene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
1,2,3-Trichlorobenzene	ug/l	0.4					<2	<2	<2	<2	<2	<2	<2	<1	<1		<1	<1	
1,2,3-Trichloropropane	ug/l						<50	<50	<50	<50	<50	<50	<50	<1	<1		<1	<1	
1,2,4-Trichlorobenzene	ug/l	0.4					<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
1,2,4-Trimethylbenzene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
1,2-Dibromo-3-Chloropropane	ug/l						<50	<50	<50	<50	<50	<50	<50	<1	<1		<1	<1	
1,2-Dibromoethane	ug/l						<5	<5	<5	<5	<5	<5	<5	<1	<1		<1	<1	
1,2-Dichlorobenzene	ug/l	20					<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
1,2-Dichloroethane	ug/l	10	3				<2	<2	<2	<2	<2	<2	<2	<1	<1		<1	<1	
1,2-Dichloropropane	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
1,3,5-Trimethylbenzene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
1,3-Dichloropropane	ug/l						<2	<2	<2	<2	<2	<2	<2	<1	<1		<1	<1	
1,4-Dichlorobenzene	ug/l	20					<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
2-Chlorotoluene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
4-Chlorotoluene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
4-Isopropyltoluene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Benzene	ug/l	10	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Bromobenzene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Bromochloromethane	ug/l		100				<5	<5	<5	<5	<5	<5	<5	<1	<1		<1	<1	
Bromodichloromethane	ug/l						<5	<5	<5	<5	<5	<5	<5	<1	<1		<1	<1	
Bromomethane	ug/l						<5	<5	<5	<5	<5	<5	<5	<1	<1		<1	<1	
Chlorobenzene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Chloroethane	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Chloroethene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Chloroform	ug/l	2.5	100				<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Chloromethane	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
cis-1,2-Dichloroethene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
cis-1,3-Dichloropropene	ug/l						<10	<10	<10	<10	<10	<10	<10	<1	<1		<1	<1	
Dibromochloromethane	ug/l		100				<10	<10	<10	<10	<10	<10	<10	<1	<1		<1	<1	
Dibromomethane	ug/l						<10	<10	<10	<10	<10	<10	<10	<1	<1		<1	<1	
Dichlorodifluoromethane	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Ethylbenzene	ug/l	20			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Hexachlorobutadiene (HCBD)	ug/l	0.6					<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Isopropylbenzene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
m,p xylenes	ug/l	30			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Methyl tert-butyl ether (MTBE)	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
n-Butylbenzene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
n-propylbenzene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
O-Xylene	ug/l	30			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Sec-Butylbenzene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Styrene	ug/l	50					<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Tert-Butylbenzene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Tetrachloroethene	ug/l	10	10				<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Tetrachloromethane (Carbon Tetra Chloride)	ug/l	12	3				<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Toluene	ug/l	50			<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
trans-1,2-Dichloroethene	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
trans-1,3-Dichloropropene	ug/l						<10	<10	<10	<10	<10	<10	<10	<1	<1		<1	<1	
Tribromomethane	ug/l		100				<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Trichloroethene	ug/l	10	10				<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Trichlorofluoromethane	ug/l						<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	<1	
Vinyl Chloride	ug/l	0	0.5											<1	<1		<1	<1	

Appendix 5

Tabulated Soil Leachate Laboratory Data

M4CAN
Leachate Sample Analysis & Screening Assessment
CL-15
14/07/2015

Screening Values & Assessment

	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion
N/A	Not Available

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: chromium, copper, lead, nickel and zinc

Sample Reference	Units	Screening Criteria	
Specimen Depth (m)		EQS	DWS
OD Level (m)			
Sample Type			
Geology Code			
Cluster Code			

	Units	EQS	DWS	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	No. Data Exceeding EQS	No. Data Exceeding DWS
2:1 Leachate Results										
Arsenic Dissolved	ug/l	50	10	10	9	44.5	1.97	BHM4CANA032 @ 0.5mbGL	0	2
Boron Dissolved	ug/l	2000	1000	4	4	350	60	STPG01 @ 0.3mbGL	0	0
Boron	ug/l	2000	1000	4	4	370	90	TP410 @ 0.9 - 1mbGL	0	0
Barium Dissolved	ug/l			6	4	62	19	STPG02 @ 0.3mbGL		
Cadmium Dissolved	ug/l	0.15	5	10	1	2.5	2.5	TP410 @ 0.9 - 1mbGL	1	0
Chromium Dissolved	ug/l		50	12	9	160	2	STPG01 @ 0.3mbGL		1
Chromium III Dissolved	ug/l	4.7		3	0	None > LOD	None > LOD		0	
Chromium VI Dissolved	ug/l	3.4		2	0	None > LOD	None > LOD		0	
Copper Dissolved	ug/l	10	2000	12	12	39	2.5	STPG01 @ 0.3mbGL	4	0
Mercury Dissolved	ug/l	0.07	1	8	1	0.0216	0.0216	BHM4CAN025 @ 0.4mbGL	0	0
Molybdenum Dissolved	ug/l			6	4	20	5	STPG01 @ 0.3mbGL		
Nickel Dissolved	ug/l	4	20	10	7	3.21	1.7	BHM4CANA032 @ 0.5mbGL	0	0
Lead Dissolved	ug/l	1.2	10	10	4	1.55	0.024	BHM4CANA032 @ 0.5mbGL	1	0
Antimony Dissolved	ug/l		5	4	2	19	12	STPG01 @ 1.2mbGL		2
Selenium Dissolved	ug/l		10	10	9	13	0.867	TP410 @ 0.9 - 1mbGL		3
Vanadium Dissolved	ug/l			3	3	188	19.1	BHM4CANA032 @ 0.5mbGL		
Zinc Dissolved	ug/l	75		10	5	8.5	0.469	BH426 @ 1.5 - 1.6mbGL	0	
Iron Dissolved	ug/l	1000	200	2	1	44.7	44.7	BHM4CAN025 @ 0.4mbGL	0	0
Total Cyanide	mg/l	0.001	0.05	7	0	None > LOD	None > LOD		0	0
Cyanide Free	mg/l			5	0	None > LOD	None > LOD			
pH	pH units	6-9	6.5-10	7	7	11	8.3	BHM4CAN025 @ 0.4mbGL	4	3
Conductivity uS/cm @25C	uS/cm			3	3	260	230	BHM4CAN025 @ 0.4mbGL		
Organics										
TPH GC	ug/l			2	0	None > LOD	None > LOD			
Phenol	ug/l	7.7		3	0	None > LOD	None > LOD		0	
Phenols Monohydric	ug/l			5	0	None > LOD	None > LOD			
Cresols	ug/l			3	0	None > LOD	None > LOD			
Xylenols	ug/l			3	0	None > LOD	None > LOD			
BTEX										
Benzene	ug/l	10	1	6	0	None > LOD	None > LOD		0	0
Toluene	ug/l	50		6	0	None > LOD	None > LOD		0	
Ethylbenzene	ug/l	20		6	0	None > LOD	None > LOD		0	
m,p xylenes	ug/l	30		6	1	1.4	1.4	BH426 @ 1.5 - 1.6mbGL	0	
O-Xylene	ug/l	30		6	0	None > LOD	None > LOD		0	
Sum of Detected BTEX	ug/l			3	0	None > LOD	None > LOD			
Sum of Detected Xylenes	ug/l			3	0	None > LOD	None > LOD			
PCBs										
Pcb-28 2,4,4' - Trichlororbiphenyl	ug/l	0	0	3	0	None > LOD	None > LOD		0	0
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	ug/l	0	0	3	0	None > LOD	None > LOD		0	0
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	ug/l	0	0	2	0	None > LOD	None > LOD		0	0
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	ug/l	0	0	2	0	None > LOD	None > LOD		0	0
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	ug/l	0	0	3	0	None > LOD	None > LOD		0	0
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	ug/l	0	0	2	0	None > LOD	None > LOD		0	0
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	ug/l	0	0	2	0	None > LOD	None > LOD		0	0
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	ug/l	0	0	5	0	None > LOD	None > LOD		0	0
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	ug/l	0	0	2	0	None > LOD	None > LOD		0	0
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	ug/l	0	0	2	0	None > LOD	None > LOD		0	0
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	ug/l	0	0	3	0	None > LOD	None > LOD		0	0
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	ug/l	0	0	3	0	None > LOD	None > LOD		0	0
Pcb-156 2,3,3',4,4',5-Hexachlorobiphenyl	ug/l	0	0	2	0	None > LOD	None > LOD		0	0
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	ug/l	0	0	2	0	None > LOD	None > LOD		0	0
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0	2	0	None > LOD	None > LOD		0	0
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0	2	0	None > LOD	None > LOD		0	0
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	ug/l	0	0	3	0	None > LOD	None > LOD		0	0
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	ug/l	0	0	2	0	None > LOD	None > LOD		0	0
TPH										
GRO (C5-C12)	ug/l			3	0	None > LOD	None > LOD			
Aliphatics >C5-C6	ug/l			6	0	None > LOD	None > LOD			
Aliphatics >C6-C8	ug/l			6	0	None > LOD	None > LOD			
Aliphatics >C8-C10	ug/l			6	0	None > LOD	None > LOD			
Aliphatics >C10-C12	ug/l			6	0	None > LOD	None > LOD			
Aliphatics >C12-C16	ug/l			5	0	None > LOD	None > LOD			
Aliphatics >C16-C21	ug/l			5	0	None > LOD	None > LOD			
Aliphatics >C21-C35	ug/l			5	0	None > LOD	None > LOD			
Aliphatics >C35-44	ug/l			3	0	None > LOD	None > LOD			
Aromatics >C5-C7	ug/l			6	0	None > LOD	None > LOD			
Aromatics >C7-C8	ug/l			6	0	None > LOD	None > LOD			
Aromatics >C8-C10	ug/l			6	0	None > LOD	None > LOD			
Aromatics >C10-C12	ug/l			6	0	None > LOD	None > LOD			
Aromatics >C12-C16	ug/l			5	0	None > LOD	None > LOD			
Aromatics >C16-C21	ug/l			5	1	27	27	BH425 @ 1.5 - 1.6mbGL		
Aromatics >C21-C35	ug/l			5	0	None > LOD	None > LOD			
Aromatics >C35-44	ug/l			3	0	None > LOD	None > LOD			
Total Aliphatic TPH	ug/l			3	0	None > LOD	None > LOD			
Total Aromatic TPH	ug/l			3	1	27	27	BH425 @ 1.5 - 1.6mbGL		
Total Aliphatics >C12-C35	ug/l			2	0	None > LOD	None > LOD			
Total Aromatics >EC12-EC35	ug/l			2	0	None > LOD	None > LOD			
TPH (Aliphatics and Aromatics C5-C35)	ug/l			5	1	27	27	BH425 @ 1.5 - 1.6mbGL		
PAH										
Acenaphthene	ug/l			6	0	None > LOD	None > LOD			
Acenaphthylene	ug/l			6	0	None > LOD	None > LOD			
Anthracene	ug/l	0.1		6	0	None > LOD	None > LOD		0	
Benz(a)anthracene	ug/l			6	0	None > LOD	None > LOD			
Benzo(a)pyrene	ug/l	0.00017	0.01	6	0	None > LOD	None > LOD		0	0
Benzo(b)fluoranthene	ug/l	0.017	0.1	6	0	None > LOD	None > LOD		0	0
Benzo(ghi)perylene	ug/l	0.0082	0.1	6	0	None > LOD	None > LOD		0	0
Benzo(k)fluoranthene	ug/l	0.017	0.1	6	0	None > LOD	None > LOD		0	0
Chrysene	ug/l			6	0	None > LOD	None > LOD			
Dibenzo(ah)anthracene	ug/l			6	0	None > LOD	None > LOD			
Fluoranthene	ug/l	0.0063		6	1	0.018	0.018	BHM4CAN025 @ 0.4mbGL	1	
Fluorene	ug/l			6	0	None > LOD	None > LOD			
Indeno(123cd)pyrene	ug/l	N/A	0.1	6	0	None > LOD	None > LOD		0	0
Naphthalene	ug/l	2		6	0	None > LOD	None > LOD		0	
Phenanthrene	ug/l			6	1	0.0276	0.0276	BHM4CANA032 @ 0.5mbGL		
Pyrene	ug/l			6	1	0.0172	0.0172	BHM4CAN025 @ 0.4mbGL		
PAH 16 Total	ug/l			6	0	None > LOD	None > LOD			

M4CAN
Leachate Sample Analysis & Screening Assessment
CL-15
14/07/2015

Screening Values & Assessment

	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion
N/A	Not Available

Geological Formation Legend

MG	Made Ground
TFD	Tidal Flat Deposit

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni and Zn

Sample Reference	Units	Screening Criteria		CH31	CH32	STPG01	STPG02	BH425	BH426	TP410	STPG01	STPG02	BHM4CAN025	BHM4CANA029	BHM4CANA032
Specimen Depth (m)		EQS	DWS	0	0	0.3	0.3	1.5 - 1.6	1.5 - 1.6	0.9 - 1	1.2	1	0.4	0-1.1	0.5
OD Level (m)				7.96	8.13	7.54	7.57	6.35	6.25	6.3	6.64	6.87			
Sample Type				D	D	D	B	ES	ES	ES	B	B	ES	ES	ES
Geology Code				MG	MG	MG	MG	MG	MG	MG	TFD	TFD	MG	MG	MG
Cluster Code				2000 GI	2000 GI	2007 GI	2007 GI	2015 GI	2015 GI	2015 GI	2007 GI	2007 GI	2016 GI	2016 G1	2016 GI
2:1 Leachate Results															
Arsenic Dissolved	ug/l	50	10			<1	8	21	2.3	8.4	2	2	1.97	9.54	44.5
Boron Dissolved	ug/l	2000	1000			350	60				250	340			
Boron	ug/l	2000	1000	90	140			92		370					
Barium Dissolved	ug/l					41	62				19	25			
Cadmium Dissolved	ug/l	0.15	5			<0.5	<0.5	<0.08	<0.08	2.5	<0.5	<0.5	<0.1	<0.1	<0.1
Chromium Dissolved	ug/l		50	35	5	160	2	<1	<1	22	4	<1	2.49	2.38	3.02
Chromium III Dissolved	ug/l	4.7											<30	<30	<30
Chromium VI Dissolved	ug/l	3.4											<30	<30	
Copper Dissolved	ug/l	10	2000	14	8	39	10	3.8	2.5	25	3.5	8.4	9.28	16.7	8.36
Mercury Dissolved	ug/l	0.07	1			<0.01		<0.5	<0.5	<0.5	<0.01		0.0216	<0.01	<0.01
Molybdenum Dissolved	ug/l					20	8				17	5			
Nickel Dissolved	ug/l	4	20			2.3	<1.5	<1	<1	2.7	1.7	1.8	2.25	1.82	3.21
Lead Dissolved	ug/l	1.2	10			<0.5	0.6	<1	<1	<1	<0.5	<0.5	0.024	0.309	1.55
Antimony Dissolved	ug/l		5			<1	12				19	<1			
Selenium Dissolved	ug/l		10			5	<1	1.1	11	13	7	3	0.867	3.04	12.4
Vanadium Dissolved	ug/l												19.1	90.4	188
Zinc Dissolved	ug/l	75				<5	<5	3.4	8.5	7.2	<5	<5	0.775	0.469	<0.41
Iron Dissolved	ug/l	1000	200										44.7	<19	
Total Cyanide	mg/l	0.001	0.05			<50	<50	<0.05	<0.05	<0.05	<50	<50			
Cyanide Free	mg/l								<0.05	<0.05			<0.05	<0.05	<0.05
pH	pH units	6-9	6.5-10	10.8	9.4			9	8.9	8.3			11	11	
Conductivity uS/cm @25C	uS/cm												260	231	230
Organics															
TPH GC	ug/l			<100	<100										
Phenol	ug/l	7.7											<2	<2	<2
Phenols Monohydric	ug/l								<30	<30			<16	<16	<16
Cresols	ug/l												<6	<6	<6
Xylenols	ug/l												<8	<8	<8
BTEX															
Benzene	ug/l	10	1					<1	<1	<1			<7	<7	<7
Toluene	ug/l	50						<1	<1	<1			<4	<4	<4
Ethylbenzene	ug/l	20						<1	<1	<1			<5	<5	<5
m,p xylenes	ug/l	30						<1	1.4	<1			<8	<8	<8
O-Xylene	ug/l	30						<1	<1	<1			<3	<3	<3
Sum of Detected BTEX	ug/l												<28	<28	<28
Sum of Detected Xylenes	ug/l												<11	<11	<11
PCBs															
Pcb-28 2,4,4' - Trichlororbiphenyl	ug/l	0	0					<0.01	<0.01	<0.01					
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	ug/l	0	0					<0.01	<0.01	<0.01					
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	ug/l	0	0											<0.015	<0.015
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	ug/l	0	0											<0.015	<0.015
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	ug/l	0	0					<0.01	<0.01	<0.01					
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	ug/l	0	0											<0.015	<0.015
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	ug/l	0	0											<0.015	<0.015
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	ug/l	0	0					<0.01	<0.01	<0.01				<0.015	<0.015
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	ug/l	0	0											<0.015	<0.015
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	ug/l	0	0											<0.015	<0.015
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	ug/l	0	0					<0.01	<0.01	<0.01					
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	ug/l	0	0					<0.01	<0.01	<0.01					
Pcb-156 2,3,3',4,4',5-Hexachlorobiphenyl	ug/l	0	0											<0.015	<0.015
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	ug/l	0	0											<0.015	<0.015
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0											<0.015	<0.015
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0											<0.015	<0.015
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	ug/l	0	0					<0.01	<0.01	<0.01					
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	ug/l	0	0											<0.015	<0.015
TPH															
GRO (C5-C12)	ug/l												<5	<5	<5
Aliphatics >C5-C6	ug/l							<0.1	<0.1	<0.1			<10	<10	<10
Aliphatics >C6-C8	ug/l							<0.1	<0.1	<0.1			<10	<10	<10
Aliphatics >C8-C10	ug/l							<0.1	<0.1	<0.1			<10	<10	<10
Aliphatics >C10-C12	ug/l							<0.1	<0.1	<0.1			<10	<10	<10
Aliphatics >C12-C16	ug/l							<0.1	<0.1	<0.1			<10	<10	
Aliphatics >C16-C21	ug/l							<0.1	<0.1	<0.1			<10	<10	
Aliphatics >C21-C35	ug/l							<0.1	<0.1	<0.1			<10	<10	
Aliphatics >C35-44	ug/l							<0.1	<0.1	<0.1					
Aromatics >C5-C7	ug/l							<0.1	<0.1	<0.1			<10	<10	<10
Aromatics >C7-C8	ug/l							<0.1	<0.1	<0.1			<10	<10	<10
Aromatics >C8-C10	ug/l							<0.1	<0.1	<0.1			<10	<10	<10
Aromatics >C10-C12	ug/l							<0.1	<0.1	<0.1			<10	<10	<10
Aromatics >C12-C16	ug/l							<0.1	<0.1	<0.1			<10	<10	
Aromatics >C16-C21	ug/l							27	<0.1	<0.1			<10	<10	
Aromatics >C21-C35	ug/l							<0.1	<0.1	<0.1			<10	<10	
Aromatics >C35-44	ug/l							<0.1	<0.1	<0.1					
Total Aliphatic TPH	ug/l							<5	<5	<5					
Total Aromatic TPH	ug/l							27	<5	<5					
Total Aliphatics >C12-C35	ug/l												<10	<10	
Total Aromatics >EC12-EC35	ug/l												<10	<10	
TPH (Aliphatics and Aromatics C5-C35)	ug/l							27	<10	<10			<10	<10	
PAH															
Acenaphthene	ug/l							<0.1	<0.1	<0.1			<0.015	<0.015	<0.015
Acenaphthylene	ug/l							<0.1	<0.1	<0.1			<0.011	<0.011	<0.011
Anthracene	ug/l	0.1						<0.1	<0.1	<0.1			<0.015	<0.015	<0.015
Benz(a)anthracene	ug/l							<0.1	<0.1	<0.1			<0.017	<0.017	<0.017
Benzo(a)pyrene	ug/l	0.00017	0.01					<0.1	<0.1	<0.1			<0.009	<0.009	<0.009
Benzo(b)fluoranthene	ug/l	0.017	0.1					<0.1	<0.1	<0.1			<0.023	<0.023	<0.023
Benzo(ghi)perylene	ug/l	0.0082	0.1					<0.1	<0.1	<0.1			<0.016	<0.016	<0.016
Benzo(k)fluoranthene	ug/l	0.017	0.1					<0.1	<0.1	<0.1			<0.027	<0.027	<0.027
Chrysene	ug/l							<0.1	<0.1	<0.1			<0.013	<0.013	<0.013
Dibenzo(ah)anthracene	ug/l							<0.1	<0.1	<0.1			<0.016	<0.016	<0.016
Fluoranthene	ug/l	0.0063						<0.1	<0.1	<0.1			0.018	<0.017	<0.017
Fluorene	ug/l							<0.1	<0.1	<0.1			<0.014	<0.014	<0.014
Indeno(123cd)pyrene	ug/l	N/A	0.1					<0.1	<0.1	<0.1			<0.014	<0.014	<0.014
Naphthalene	ug/l	2						<0.1	<0.1	<0.1			<0.1	<0.1	<0.1
Phenanthrene	ug/l							<0.1	<0.1	<0.1			<0.022	<0.022	0.0276
Pyrene	ug/l							<0.1	<0.1	<0.1			0.0172	<0.015	<0.015
PAH 16 Total	ug/l							<2	<2	<2			<0.344	<0.344	<0.344

Appendix 6

Relevant Extract of Additional Environmental Data

Plate 01: Extract of 1991 Aerial Photograph

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: Oct 2015

Plate 02: Extract of 2006 Aerial Photograph

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: Oct 2015

Plate 03: Extract of 2013/14 Aerial Photograph

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: Oct 2015

Welsh Government

M4 Corridor around Newport

Environmental Statement Supplement
Land Contamination Assessment Report Annex D
CL-17 Solutia Chemical Works

M4CaN-DJV-EGT-ZG_GEN-RP-EN-0015

At Issue | September 2016

CVJV/AAR
3rd Floor
Longross Court,
47 Newport Road,
Cardiff
CF24 0AD

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1 Introduction

1.1 Background

1.1.1 This report relates to an area of land potentially affected by contamination (CL-17) known as the 'Solutia Chemical Works' herein referred to as the 'Site'. CL-17 is situated in proximity to a number of other significant industrial sites that have also been assessed. Due to the proximity it is important that this report is read in conjunction with reports relating to areas CL-15 (incorporating CL-20) and CL18.

1.1.2 The Site is located between chainage 11,100 and 11,800 (see Figure 1), at an operational chemical works.

1.2 Reporting Context

1.2.1 The Site has been assessed as part of ground investigations and monitoring associated with the wider works for the M4 Corridor around Newport (M4CaN) (hereafter referred to as the 'Scheme') and informs the baseline for the environmental impact assessment (EIA) for the Scheme. The EIA is reported in the M4CaN Environmental Statement (ES) published in March 2016 and the Land Contamination Assessment Reports formed an annex to Appendix 11.1 to the chapter on Geology and Soils.

1.2.2 A subsequent phase of investigation has been undertaken since the publication of the March 2016 ES. The additional data, herein referred to as the 2016 Additional Ground Investigation, have been incorporated into the summary tables, risk assessment, conceptual site model and associated text of this report where relevant. The conclusions and recommendations have also been refined to reflect the improved understanding of status of the site and associated risk. Therefore this report replaces the original CL-17 report published in Appendix 11.1 of the March 2016 ES.

1.2.3 In 2014, a Preliminary Sources Study Report (PSSR) was prepared as an initial land contamination appraisal (Ove, Arup & Partners, 2014) as part of DMRB Stage 2 Assessments for a number of potential route options. This identified a number of individual areas that may have been affected by contamination as a result of historical activities. This report therefore draws upon the 2015 Supplementary Ground Investigation Works undertaken on behalf of the Welsh Government (Geotechnical Engineering, 2015) and the 2016 Additional Ground Investigation. This report relates to the area defined in the Site Location Plan Figure 1.

1.2.4 The overarching rationale and approach for the assessment of areas of land along the proposed new section of motorway with potential contamination is detailed in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES).

1.3 Objectives

1.3.1 The key objectives of this report are as follows.

- Undertake a risk assessment of the Site and determine whether potential risks to human health or controlled waters could exist based upon the Scheme.
- Undertake a human health and controlled waters risk assessment based on the dataset available from all phases of investigation (1997 to 2016) in order to refine potential land contamination risks including suitability for reuse / disposal and inform on the need for remediation / mitigation.
- Provide the information required under DMRB HD22/08 (Highways Agency, 2008).

1.4 Report Structure

1.4.1 The remainder of this report is structured as follows.

- Section 2: Site Location and Description – This section summarises the Site description.
- Section 3: The Scheme – This section details the new section of motorway alignment and associated features at the Site.
- Section 4: Site History – This section summarises the history of the Site based on historical maps and historical land photographs.
- Section 5: Environmental Setting – This section summarises the Site description, published geology, hydrology and hydrogeology and any relevant environmental information presented in the 2014 PSSR.
- Section 6: Scope of Ground Investigations Work – This section describes the previous and supplementary ground investigation data available for the Site.
- Section 7: Ground Conditions – This section describes the main findings of the intrusive site investigation including the ground conditions encountered and visual or olfactory evidence of contamination identified.
- Section 8: Contamination Assessment – This section describes the findings of the Tier 1 and Tier 2 contamination risk assessment based upon potential contamination sources, potential receptors and potential contaminant linkages and presents the human health and controlled waters assessments.
- Section 9: Refined Conceptual Site Model – This section presents the Conceptual Site Model (CSM) for the Site and identifies potential contaminant linkages, based upon the findings of the data presented within Sections 2 to 7.
- Section 10: Conclusions and Recommendations – This section provides conclusions concerning the likelihood of land contamination associated with the Site affecting the Scheme and requirements for remediation/mitigation.

2 Site Location and Description

2.1.1 The Site comprises an active chemical plant which occupies some 126 ha of flat ground on the north-east side of Corporation Road, Newport, National Grid References ST 334 853 to ST 338 852 as shown on Figure 1.

2.1.2 The Site is situated at a general elevation of 7 m above ordnance datum (AOD). East of the Site the land is mostly open fields, whereas elsewhere the surroundings of the Site are used for various industrial/commercial purposes.

2.1.3 The Site area is generally covered by buildings, hardstanding and landscaping.

2.1.4 A Site walkover was completed in August 2015. The walkover included visits to both the operational area of the Site and the disused area to the south of the Site. The latter was predominantly scrubland with large concrete bases from previous Site operations. The remnants of a butane sphere could be seen in the south-east of the Site. A water treatment system was also located in the south-west of the Site that collected Site drainage and run-off. Selected photographs of the areas visited are included in Appendix 7. The site investigation by RPS in 2016 confirmed the findings of the 2015 walkover and did not identify any additional contamination sources of significance.

2.1.5 Of particular importance is that the Site has an area of buried chemical waste, mainly polychlorinated biphenyls (PCB), that occupies land between the railway line and the fenced boundary of the chemical plant as shown on Figure 1 (also shown in Appendix 9). This burial area is also known as the 'PCB Cell' and is discussed further in Section 4.1. Within the PCB Cell is an electricity pylon, understood to have been piled in the 1960's. Anecdotal information indicated the piling crew complained of '*strong odours coming from the ground'.* The PCB Cell is located adjacent to a cycle path that bounds the south of the main works Site. A network of monitoring boreholes and leachate extraction infrastructure were seen to be in reasonable condition situated at intervals throughout the PCB Cell.

2.1.6 The Site is bounded to the west by a railway line, beyond which lies Stephenson Street Industrial Estate. Details of the land contamination for the estate are provided in Land Contamination Assessment Report CL-15 (Annex D of Appendix 11.1 of the March 2016 ES).

2.1.7 To the south, the Site is bounded by Mir Steelworks and associated lagoons (CL-20). The information relating to the land contamination specific to the steelworks are very limited and these are provided within the Land Contamination Assessment Report CL-15 (Annex D of Appendix 11.1 of the March 2016 ES).

2.1.8 A report undertaken by WSP in 2008, as reported within the 2014 PSSR, identified one area where disposal of hazardous substances has taken place, two areas of historic in-filled ground and five areas of onsite disposal which are shown on the drawing contained within Appendix 9.

2.1.9 The Site layout is shown in Figure 1.

3 The Scheme

3.1.1 From west to east the new section of motorway would cross an active railway line before entering the Site. Within the western Site area the alignment crosses the PCB Cell and the Solutia Landfill (see Table 2) in the southern part of the Site.

3.1.2 The construction of the new section of motorway in the western part of the Site would comprise the motorway being supported on a viaduct which is designed to bridge the PCB Cell. As the motorway heads eastwards from the viaduct section, a piled embankment is to be constructed in the eastern part of the Site as well as band drains being proposed further east to aid surcharging.

3.1.3 It is proposed that no construction will be undertaken within the PCB Cell, so as not to affect its integrity.

4 Site History

4.1 Site History

4.1.1 The 2014 PSSR historical searches have been based on Ordnance Survey plans, literature reviews, information provided by Natural Resources Wales (NRW) (formerly Environment Agency Wales), Newport City Council and aerial photographic interpretation.

4.1.2 This is supplemented by a review of historical maps obtained in 2015 from Welsh Government. Relevant extracts are presented in Appendix 8.

4.1.3 A summary of the Site's history is presented in Table 1 below.

Table 1: Site History

Date	Use	Source of Information
1843 - 1893	The Site consists of agricultural fields traversed by drainage ditches. Great Traston Farm and a small copse are located in the north of Site. Traston Road runs northeast–southwest to the north of the Site.	1:10,560 Historical Mapping
1891 - 1912	The Great Western railway (East Usk Branch Line) runs along the Site's south-western boundary.	1:10,560 Historical Mapping
1904 - 1939	No significant change.	1:10.560 Historical Mapping
1964 - 1965	A works consisting of many small industrial buildings has been built in the centre of Site. Works have also been developed to the north and to the west of the Site.	1:10,560 Historical Mapping
1969 / 1971	The Site has been largely developed with the chemical works, bounded by the railway to the west and fields to the north, east and south with a large industrial site to the north-west.	2014 PSSR Aerial Photograph
1970 - 1973	An electrical sub-station has been built in the north-west corner of Site.	1:10,000 Historical Mapping
1979 / 1981	Infilling activity within an area in the south of the Site with a road leading off towards another earthworks site approximately 430 m to the east (Llanwern Research Laboratories). The PCB Cell located on the western boundary is slightly visible and looks to have been capped. A haul road is indicated to lead from the southern entrance of the Site towards CL-22 (Former Llanwern Research Laboratories).	2014 PSSR Aerial Photograph
1981 - 1989	No significant change.	1:10,000 Historical Mapping
1985 - 1996	The works has extended into the south of the Site.	1:10,000 Historical Mapping

Date	Use	Source of Information
1991	Works extension in the southern area of the Site appears to consist of additional hardstanding and a tank of unknown use with associated pipe infrastructure.	Aerial Photograph
2006	The south of Site has been landscaped and a track separates the works are to the north from a wooded area to the south. The works area has extended in the south-eastern corner onto what was previously agricultural land. This area comprises bare ground and vegetation. Tank and above ground pipework identified in 1991 no longer present.	Aerial Photography
2009 - 2010	Two wind turbines are under construction in the south-east and south centre of Site.	Aerial Photography
2014	Hardstanding to the south of the main works complex appears in poor condition with surface vegetation.	Aerial Photography

Note: Potential contamination sources are underlined. Those within the temporary and permanent land take are shown in **bold.**

4.1.4 The sources of information presented in Table 1 supplement those used in the 2014 PSSR. In particular, the 1991 image shows the presence of a tank within the proposed the new section of motorway alignment. Relevant extracts of photographs are presented in Appendix 8.

4.1.5 The 2014 PSSR states the Solutia Chemical Works were constructed in the 1940's and identifies areas of tipping within the chemical works from 1949 to the present.

4.1.6 The summary below is taken from Solutia's 2007 Annual Review and Environmental Statement. (Solutia 2014 Environmental Statement has a similar though slightly less detailed summary.)

http://www.eastman.com/Company/Worldwide/our_sites/Documents/Newport_HSE_Review.pdf:

'In the past PCB (polychlorinated biphenyls), PCP (pentachlorophenol) and chlorine (made in a mercury cellhouse) were manufactured on Site. These activities left a legacy of soil contamination. Consultants completed a comprehensive risk assessment in 1992, to determine if these activities had resulted in any unacceptable risks. This assessment concluded that the Site was stable and did not pose a threat to human health or the environment. A risk management strategy was developed to ensure this stability was maintained and some voluntary remediation work was completed in 1996.' (Ove Arup and Partners, 2014).

4.1.7 The remediation works comprised the following.

- Encapsulation of a disused landfill at the western perimeter (the PCB Cell). Further details are provided below.
- Installation of an interceptor trench around the Therminols plant, where PCB used to be manufactured.
- Installation of sediment traps in reen systems. The effectiveness of these actions is checked during an annual monitoring programme. Any significant changes will trigger contingency actions to prevent migration.

4.1.8 The risk assessment completed in 1992 was not available at the time of writing this report and therefore has not been discussed further within this report.

4.1.9 The 1996 Arup risk assessment report (Ove Arup & Partners, 1996) includes information from Solutia on eight identified on site disposal areas at the factory complex where chemical wastes have been buried; two are located within the west of the Site whilst the others are located in the south-west of the Site. The disposal area at the south-western boundary of the Solutia complex, adjacent to the active railway line is reported to be approximately rectangular measuring approximately 70 m by 20 m and orientated north-west to south-east. This is the PCB Cell referred to in the previous sections.

4.1.10 The 1996 Arup report states that: *'The quantitative assessment has shown that the concentrations of PCB detected in the surface soils within the Study Area do not pose a significant risk to the site investigation staff, even without normal protective clothing. However, the number of sampling points on which this assessment is based is limited and previous investigations carried out adjacent to the Study Area suggest that if the concentrations of PCB detected there are found within the Study Area, then the risk to site investigation staff would be several times higher. In view of this and in accordance with good practice, it is recommended that precautions to limit the amount of contact with the soil be required for all ground investigations undertaken by the Welsh Office in this area.'*

4.1.11 As discussed above, the PCB Cell was constructed in the mid 1990's. It comprises using a cut-off wall of flexible membrane liner set in bentonite clay, with an impermeable cap consisting of a polypropylene membrane overlain with clay and topsoil. The design relies on the low permeability clay of the Tidal Flat Deposits to provide water tightness of the PCB Cell at the base. The objective of the PCB Cell is to prevent the escape of PCB and other chemical compounds. Details of the PCB Cell are set out in Appendix 6.

4.1.12 The PCB Cell has monitoring and leachate extraction infrastructure installed within it and this is shown on photos in Appendix 7 (Plates 15-18). Based on discussions with Solutia staff during the Site walkover, leachate is pumped out of the PCB Cell periodically and typically 1 m^3 of leachate is removed indicating little leachate is being generated.

4.1.13 The southern area of the Solutia complex was landfilled with debris of hardcore and rubble arising from demolition of former plant and buildings from within the factory area. This is also confirmed by information provided from Natural Resources Wales' (NRW, formerly the Environment Agency) website (see also Table 2). In addition, Newport City Council has informed that various boreholes have been installed to monitor groundwater and three boreholes were installed within the last few years in order for the Site to be compliant with its new waste management permit. The landfill is shown on Figure 3.

4.1.14 A drawing provided by Newport City Council identifies a redundant benzene pipeline to enter the Solutia Site from Llanwern Research Laboratories. This location is approximately 280 m north of the new section of motorway alignment and is shown in Figure 4. The pipeline is discussed further within the Land Contamination Assessment Report CL-22 report (Annex D of Appendix 11.1 of the March 2016 ES).

4.1.15 Historically the Site is in close proximity to areas of bombing during World War II which is described within the 2014 PSSR and the Explosive Ordnance Threat Assessment Report (Bactec, 2014). The latter report categorises the Site as medium to high risk with respect to unexploded ordnance.

5 Environmental Setting

5.1 Geology

5.1.1 British Geological Survey (BGS) data indicate that the Site is underlain by Tidal Flat Deposits overlying bedrock of the Mercia Mudstone Group.

5.1.2 It is expected that the Site is overlain by fill materials associated with the various landfills and waste disposal areas.

5.2 Hydrology

5.2.1 A number of drainage ditches and reens traverse the south of the Site and are part of the wider network of ditches and reens that make up the Caldicot Levels as shown in Figure 1.

5.2.2 The River Usk is approximately 650 m to the west of the Site.

5.3 Hydrogeology

5.3.1 NRW records indicate the Tidal Flat Deposits to be non-productive strata (negligibly permeable).

5.3.2 The Mercia Mudstone Group bedrock is indicated to be a Secondary B aquifer. However, as is shown in the Baseline Water Environment Report (Appendix 16.2 of the March 2016 ES), the groundwater contained within the Glaciofluvial Deposits / bedrock underlying the Tidal Flat Deposits on the Site is characterised by an elevated salinity and is non-potable in nature.

5.3.3 The Site does not lie within a groundwater source protection zone.

5.4 Environmental Information

5.4.1 Solutia is a regulated facility which falls under the permit EPR/BR9715IB. The permit boundary comprises the main infrastructure footprint.

5.4.2 The 2014 PSSR reports that Solutia's 2007 Environmental Statement (published in 2008) reports four effluent exceedances at the works in March 2007 which comprised one mercury residue in soil and three PCB incidents.

5.4.3 NRW's website ('What's in your back yard?') reports the following information regarding the Site.

- Five pollution incidents within the Solutia Chemical Works, two of which have minor air impacts involving atmospheric pollutants with the remaining three recording no impact to land, water or air.
- A further three minor impact pollution incidents have been recorded within 300 m of the Site.
- No discharge consents or abstraction licences were recorded within the Site or within 300 m of the Site boundary.
- Two registered landfill sites have been recorded within the Site boundary and are summarised in Table 2.

- Newport City Council and NRW have provided information on Solutia Landfill Site at National Grid Reference ST 33892 85433. The landfill was created in two phases (Phase I and II). The information suggests that Phase I may have been covered by previous licence 30/82 issued 24/08/1981.
- One authorised landfill was recorded to the south of the Site, within 300 m of the Site boundary and is described in Table 3.

Table 2: Historic Landfills Within Site Boundary

Landfill Name and Address	Location	Material Type	Date Waste First and Last Received
Solutia Landfill Solutia, Corporation Road, Newport	Within the south of the Site. Created in two phases.	Inert and industrial waste	Dec 1981 – Dec 1996
Corporation Road (Phase III Monsanto), Corporation Road, Newport	Within the south of the Site.	Inert waste	March 1997 – unknown date

Table 3: Authorised Landfills Within 300 m of Site

Landfill Name	Location	Material Type	Date Waste First and Last Received	License Status
Sloblands: East Of Alphasteel Corporation Road, Newport	Adjacent to the southern Site boundary	Industrial waste landfill	Unknown	Expired

5.4.4 Residual levels of potential contamination associated with these historical pollution incidents are unlikely to be present. However, the landfills are considered to represent potential off site pollutant sources.

5.4.5 The new section of motorway alignment would require a pier construction within the south-eastern corner of the regulated chemical facility. The permit EPR/BR9715IB will require a variation to allow partial surrender in order to remove the permanent land take required for the new section of motorway from the regulated boundaries.

5.4.6 Following discussion with NRW, no permit variation is understood to be required for the land take associated with the two historical landfills within the Site.

5.4.7 Figure 3 provides an overview of the permit boundaries at the Site and surrounding.

6 Scope of Investigations

6.1 General

6.1.1 Six intrusive ground investigations at the Site include works that have been undertaken within the proposed new section of motorway alignment corridor. The information provided covers the original route corridor and has been summarised below.

6.2 Scope of Works

6.2.1 The various intrusive ground investigations undertaken within the Site are summarised in Table 4.

Table 4: Site Investigation Summary

Date	Contractor	Site Location	Boreholes	Window Sampler	Trial Pits	Sampling	Note
1997	Norwest Holst	South-west	BHG5, BHG6, BHH1	-	-	Soil	-
2000	Exploration Associates	South	CH33	-	CH34, CH35, CH36, CH37, CH38, CH39, CH40, CH41, CH42, CH43, CH44, CH45, CH46, CH47, CH47A, CH48	Soil, leachate and groundwater	-
2008 a	Unknown	Central south	CP/RH01, CP/RH02,	-	TP03, TP04, TP05, TP06, TP07, TP08, TP09, TP10, TP11	Soil, leachate	Borehole logs unavailable
2008 b	Unknown	Unknown	BH1, BH2	-	-	Groundwater	Borehole logs unavailable
2008	WSP	Unknown	-	-	T1/1, T1/2, T1/3, T1/4, T1/5, T1/6, T1/7, T1/8, T1/9, T1/10, T1/11, T1/12, T1/13, T1/14, T1/15, T2/1, T2/2, T2/3, T2/4, T2/5, T2/5, T2/7, T2/8, T2/9, T2/10, T2/11, T2/12, T2/13, T2/14, T2/15, T2/16, T2/17, T2/18	Soil	Logs unavailable and depth / strata of samples unknown
2016	RPS	South along alignment	BHM4CANA022, BHM4CAN029, BHM4CAN030	WSM4CAN008, WSM4CAN009, WSM4CAN010, WSM4CAN011, WSM4CAN012, WSM4CAN014	HPM4CAN001, HPM4CAN002, HPM4CAN003	Soil, leachate and groundwater	-

6.2.2 The 2016 Additional Ground Investigation undertaken by RPS specifically targeted some of the previously identified data gaps to enable the verification of the risk levels at the Site and need for any remedial measures. The scope of the 2016 Additional Ground Investigation included the following.

- Additional coverage especially around the PCB cell allowing for further soils and leachate analysis (including speciated PCB analysis).
- Construction of further groundwater and gas monitoring wells targeting shallow deposits (Made Ground and underlying strata), shallow and deep groundwater (Glaciofluvial Deposits).

6.2.3 It is noted that access constraints were significant on site requiring holes to be re-located from their originally proposed positions.

6.2.4 The construction details of all boreholes installed on the Site are summarised in Table 5.

Table 5: Summary of On Site Borehole Construction Details

Borehole ID	Diameter (mm)	Total Drilled Depth (m)	Top of Slotted Well Casing / Gravel Pack (mbGL)	Base of Slotted Well Casing / Gravel Pack (mbGL)	Targeted Geology
BHG6	not confirmed	40	13.5	16.5	Glaciofluvial Deposits
BHM4CANA022	50	16.5	7.5	12.5	Tidal Flat Deposits
WSM4CAN008	50	1.3	0.2	1.2	Made Ground
WSM4CAN009	50	6.0	4.0	6.0	Tidal Flat Deposits
WSM4CAN010	50	5.0	4.0	5.0	Tidal Flat Deposits
WSM4CAN011	50	6.0	2.0	5.5	Tidal Flat Deposits
WSM4CAN012	50	6.0	5.0	6.0	Tidal Flat Deposits
WSM4CAN014	50	5.0	0.5	2.5	Made Ground / Tidal Flat Deposits
BHM4CAN029	35	16.7	0.3	1.2	Made Ground
	50		12.3	16.3	Glaciofluvial Deposits
BHM4CAN030	50	18.3	14.2	17.2	Glaciofluvial Deposits

6.3 Surface Water Quality Monitoring

6.3.1 Surface water monitoring has been undertaken at four locations in the general vicinity of the Site, one of which was part of the Titan monitoring round in 2007/2008 (Titan, 2008) and the remainder in 2015 by RPS (Appendix 16.2 of the March 2016 ES).

6.3.2 The results for these samples are reported within the Baseline Water Environment Report (Appendix 16.2 of the March 2016 ES). Tabulated data are included in Appendix 3 of this report.

Table 6: Surface Water Monitoring Locations

Surface Water Monitoring Point ID	Water Body	Position	Field Observations
12.1 / IDB78	Lakes Reen	Approximately 500 m east of the Site.	No flow recorded with flowmeter.
12.2 / IDB78	Lakes Reen	Approximately 570 m east of the Site.	No flow recorded with flowmeter.
13.1 / IDB78	Lakes Reen	Approximately 450 m east of the Site.	No flow recorded with flowmeter.
R8 / IDB78	Lakes Reen	Approximately 530 m east of the Site.	Slack and turbid, no obvious direction

6.3.3 It is not considered that these locations are close enough of the Site to be of relevance and indeed may be up hydraulic gradient.

6.3.4 The analytical data has not been considered further within this report.

6.4 Field Testing

6.4.1 Photo-ionisation detector (PID) monitoring for Volatile Organic Compounds (VOCs) was not undertaken in any exploratory locations during the previous ground investigations.

6.5 Groundwater Monitoring

6.5.1 A summary of groundwater sampling, groundwater monitoring and ground gas monitoring rounds are shown in Table 7.

Table 7: Summary of Monitoring Rounds

Location Ref.	Number rounds (date of sampling)	Monitoring details	Notes
BHG6	4no.	Groundwater level	-
BH1, BH2	Unknown	Groundwater sampling	-
CH35, CH40, CH41, CH45	During ground investigation. (Unspecified dates - 2000)	Groundwater sampling	-
BHM4CANA022	3 no. (4th May 2016, 24th May 2016, 2nd June 2016)	Groundwater levels and sampling Ground gas	
WSM4CAN008	3 no. (4th May, 19th May 2016, 31st May 2016)	Groundwater levels Ground gas	No gas data obtained on 4th May due to gas box failure
WSM4CAN009	3 no. (4th May 2016, 19th May 2016, 31st May 2016)	Groundwater levels and sampling Ground gas	
WSM4CAN010	3 no. (4th May 2016, 19th May 2016, 31st May 2016)	Groundwater levels and sampling Ground gas	
WSM4CAN011	3 no. (4th May 2016, 20th May 2016. 1st June 2016)	Groundwater levels and sampling Ground gas	
WSM4CAN012	3 no. (4th May 2016, 20th May 2016. 1st June 2016)	Groundwater levels and sampling Ground gas	
WSM4CAN014	3 no. (4th May 2016, 23rd May 2016. 1st June 2016)	Groundwater levels Ground gas	
BHM4CAN029 (35 mm)	3 no. (4th May 2016, 23rd May 2016. 2nd June 2016)	Groundwater levels and sampling Ground gas	Only deep installation sampled on all rounds
BHM4CAN029 (50 mm)			
BHM4CAN030	3 no. (4th May 2016, 23rd May 2016. 2nd June 2016)	Groundwater levels and sampling Ground gas	

6.5.2 Semi-continuous groundwater level data have been collected for an approximately 2 week period at locations BHM4CAN030, WSM4CAN011 and WSM4CAN012 using an automatic level logger.

6.6 Laboratory Chemical Testing

6.6.1 A summary of all laboratory analysis on soil, leachate, groundwater and surface water is summarised in Tables 8 to 11.

Table 8: Summary of Previous Investigation Sampling

Site Investigation Date	No. of Soil Samples	No. of Leachate Samples	No. of Water Samples	Suites of Testing
1997	11	0	0	Metals, pH, phenols, sulphate, cyanide, mineral oil, PCB, VOCs, pentachlorophenol and PAH
2000	31	5	4	Metals, pH, phenols, sulphate, cyanide, TPH, PAH, VOCs, SVOCs, chloride, ammonia, cresols and pentachlorophenol.
2008a	21	4	0	Metals, pH, phenol, sulphate, cyanide, asbestos, ammonia, TPH, PAH, PCB, BTEX, VOCs and SVOCs
2008b	0	0	2	Metals, pH, TPH, PCB, phenols, PAHs, VOCs
2008 WSP	33	0	0	PCB, asbestos
2016	16	6	21	Metals, pH, TPH, PCB, phenols, cyanide, PAHs, BTEX, VOCs, SVOCs, Asbestos

Soil Analysis

6.6.2 The following section summarises the laboratory analytical results for the soil samples collected during the various intrusive investigation phases. The available data set has been tabulated and is presented in Appendix 3. The supporting laboratory certificates are available in the relevant original ground investigation report.

6.6.3 To inform the conceptual site model the analytical data from the Made Ground has been assessed separately from those of the natural soils (namely the Tidal Flat Deposits, Glaciofluvial Deposits and Mercia Mudstone bedrock).

6.6.4 The available information used in this assessment is summarised below for both within the route corridor and outside the route corridor.

Table 9: Summary of Analytical Soil Data

Formation Unit	Number of Soil Analysis per Analytical Suite									
	Metals & Inorganics	PCB	PAH	TPH	Phenol	Pthalates	VOC	SVOC	Asbestos	BTEX
Pre-2015 Data										
Made Ground	44	69	30	43	44	39	17	39	0	19
Superficial Deposits	19	16	12	18	19	12	3	17	0	7
Bedrock	2	2	2	2	2	0	0	2	0	0
2016 Data										
Made Ground	8	11	11	11	7	3	3	4	8	11
Superficial Deposits	5	4	5	5	5	1	1	0	4	5
Total Data										
Total	78	102	60	79	95	53	24	62	12	42

Soil Leachate Analysis

6.6.5 Leachate analysis was undertaken on 15 soil samples within the route corridor. The available information is presented in Appendix 5 and summarised in Table 10.

Table 10: Summary of Soil Leaching Analytical Data

Formation Unit	Number of Soil Leachate Analysis per Analytical Suite						
	Metals	PCB	TPH	Phenol	PAH	VOCs	SVOCs
Pre-2015 Data							
Made Ground	9	0	5	5	0	0	0
2016 Data							
Made Ground	6	5	0	4	6	2	2
Total Data							
Total	15	5	5	9	6	2	2

Groundwater Analysis

6.6.6 The following section summarises the laboratory analytical results for groundwater samples collected during the various intrusive investigation phases. The available data has been tabulated and is presented in Appendix 4 with the supporting laboratory certificates available in the relevant original reports.

6.6.7 The available onsite data relate to grab samples taken during trial pitting at CH35, CH40, CH41 and CH45 during the 2000 investigation within the route corridor, BH1 and BH2 during a 2008 investigation at an unknown location and boreholes installed as part of the 2016 Additional Ground Investigation. These

relate to perched water samples taken in the Made Ground, Tidal Flat Deposits and Glaciofluvial Deposits / Mercia Mudstone Group.

6.6.8 The available information is summarised in Table 11 below.

Table 11: Summary of Analytical Groundwater Data

Groundwater Unit	Number of Groundwater Analysis Per Analytical Suite (Number of Locations)					
	Metals & Inorganics	PAH	TPH	Phenol	VOCs	PCBs
Pre-2015 Data						
Perched (Made Ground)	6 (6)	6 (6)	4 (6)	4 (6)	6 (6)	0 (6)
2016 Data						
Tidal Flat Deposits	15 (5)	15 (5)	15 (5)	15 (5)	15 (5)	15 (5)
Glaciofluvial Deposits	6 (2)	6 (2)	6 (2)	6 (2)	6 (2)	6 (2)
Total Data						
Total	27 (13)	27 (13)	25 (13)	25 (13)	27 (13)	21 (13)

6.7 Review of Available Data

6.7.1 The distribution of investigation data available for the Site is considered to be reasonable in terms of the historical activities identified on the Site and the hydrogeological units sampled. Constraints from access and overhead power lines have limited the number of locations in the Site most notably around the PCB cell and areas to the south of the cycle path crossing the southern area of the Site shown in Figure 1. The analytical testing covers a comprehensive range of parameters that includes speciated PCBs, PAHs and TPH and asbestos screening. Physical and chemical groundwater and ground gas data have also been obtained for all key units on the site (i.e. Made Ground, Tidal Flat Deposits and underlying groundwater bearing units). It is of note that a borehole proposed to target a disposal area within the footprint of the alignment was not completed and no intrusive investigation has been undertaken within the factory area (northern half of the Site). However, this area is not going to be directly affected by the new section of motorway, as it is not located along the route of the proposed new section of motorway.

7 Ground Conditions

7.1 Geology

7.1.1 The geological logs for all available exploratory holes excavated on or in close proximity to the Site are provided in Appendix 1. The observed geological sequence is consistent with that discussed in the 2014 PSSR report and is summarised in the following sections.

7.1.2 The ground conditions detailed below relate to the area south of the main factory buildings only, which includes the area directly affected by the proposed new section of motorway. No intrusive investigation has been undertaken within the factory area (northern half of the Site) and as such the ground conditions remain unproven.

Made Ground

7.1.3 Made Ground was encountered in all exploratory locations (with the exception of BHG5) with thicknesses ranging between 0.2 and 2.6 m as summarised in Table 12. A topsoil layer was present above the Made Ground within two locations at thicknesses of 0.2 and 0.25 m, as well as two Hand Pit locations from the 2016 Additional Ground Investigation.

7.1.4 Made Ground is commonly present as sandy, gravelly clay or clayey sandy gravels of concrete, brick, sandstone, limestone, slag, ash, wood, metal and plastic. Silty clays with variable proportions of slag, ash, concrete, sandstone and brick were also noted across the Site.

7.1.5 Within the Solutia landfill identified within Table 3 and shown in Figure 3 the Made Ground ranged between 0.7 m and 2.15 m depth, typically between 1 and 1.5 m. It generally comprised predominantly granular materials consistent with that described above.

Superficial Deposits

7.1.6 Unconsolidated superficial deposits were encountered beneath the Made Ground in all locations. These comprised Tidal Flat Deposits (sometimes referred to as Estuarine Alluvium in the logsheets), generally very soft or firm to stiff bluish grey organic clays.

7.1.7 A 1.65 m layer of fibrous peat with occasional lamination of soft organic clay was encountered within BHH1 at 6.7 mbGL. A thinner layer (0.2 m) of fibrous peat with soft grey clay was noted within BHM4CAN030 and a layer of amorphous peat encountered within WSM4CAN009 at 5.9 mbGL (unproven thickness). Other deep boreholes have not identified the presence of peat layers, indicating a discontinuous feature.

7.1.8 All four deep boreholes advanced on the Site encountered sandy gravels or sands and gravels beneath the predominantly fine and cohesive Tidal Flat Deposits. These are considered to represent Glaciofluvial Deposits (referred to as Fluvial Alluvium in some of the logsheets) and are present at a depth below 12.0 to 13.45 m bGL, with a thickness that varies from 2 m to more than 6 m. The presence of the Glaciofluvial Deposits beneath this Site contrasts with CL-14

situated immediately to the east, where they thin rapidly away from the Usk becoming absent across much of the site.

Solid Geology

7.1.9 Below the Tidal Flat Deposits and Glaciofluvial Deposits the Mercia Mudstone formation was encountered at depths of 16.2 to 17.2 mbGL. The Mercia Mudstone was typically described as a reddish brown thinly bedded moderately weathered sandy mudstone.

Geological Sequence Summary

7.1.10 The general geological sequence identified during the previous ground investigations is summarised in Table 12.

Table 12: Summary of Geological Sequence

Unit	Description	Thickness Range (m)	Basal Depth (mbGL)
Topsoil	Clay topsoil	0.2 – 0.25	0.2 – 0.25
Made Ground	Predominantly coarse including concrete, brick, sandstone, limestone, slag, ash, wood, metal and plastic.	0.2 - 2.6	0.2 - 2.6
Superficial Deposits (Tidal Flat Deposits)	Blue grey organic clay.	8.8 - 13.1	9 - 13.45
Superficial Deposits (Glaciofluvial Deposits)	Sandy gravels with some cobbles.	3.6 - 4.45	16.2 - 17.2
Mercia Mudstone (Mudstone)	Reddish brown very weak to moderately strong bedded mudstone.	>23.1	unproven

7.2 Visual and Olfactory Evidence of Contamination

7.2.1 Visual and olfactory evidence of contamination was recorded at seven separate locations within the Made Ground across the central area of the Site during the previous ground investigations. The observed contamination during the ground investigations is summarised in Table 13 below.

Table 13: Visual and Olfactory Evidence of Contamination Summary

Location ID	Depth (mbGL)	Strata	Evidence of Potential Contamination
BHH1	0 - 2.15	Made Ground	Strong hydrocarbon odour. A moderate petroleum odour at 0.9 m depth
CH35	0 - 0.2	Made Ground	Strong acid odour
CH41	1.6	Made Ground	Oil film on groundwater
CP1 (Source PSSR – unconfirmed)	0.25 - 0.6	Unknown (logs not available)	Possible slight stale solvent odour

Location ID	Depth (mbGL)	Strata	Evidence of Potential Contamination
TP03 (Source PSSR – unconfirmed)	0.7	Unknown (logs not available)	Slight solvent odour
TP03 (Source PSSR – unconfirmed)	1.1	Unknown (logs not available)	Slight hydrocarbon odour
TP11 (Source PSSR – unconfirmed)	0 - 0.6	Unknown (logs not available)	Presence of occasional tar

7.2.2 Full details and observations noted during the drilling and trial pitting are presented on the exploratory logs attached in Appendix 1.

7.3 Gas Monitoring

7.3.1 Nine gas monitoring wells were installed onsite during the 2016 Additional Ground Investigation. The gas monitoring data set collected during each of three monitoring rounds is summarised in the field data sheets provided in Appendix 2. The maximum gas concentrations (minimum for oxygen) are presented in Table 14 below.

Table 14: Summary of Ground Gas

Location ID and Targeted Geological Formation	Flow (l/hr)	CH_4 (%/vol)	Peak LEL (%)	CO_2 (%/vol)	O_2 (%/vol)	CO (ppm)	H_2S (ppm)
	Max.	Max.	Max.	Max.	Min.	Max.	Max.
BHM4CANA022 (TFD)	0.4	36	88	6.5	6.1	2	0
WSM4CAN008 (Made Ground)	0	0.3	1	0.6	19.1	5	1
WSM4CAN009 (TFD)	-0.7	0.5	1	0.3	17.9	1	0
WSM4CAN010 (TFD)	0	0.3	1	0.1	19.7	5	1
WSM4CAN011 (TFD)	0.4	0.3	2	4	16.1	0	0
WSM4CAN012 (TFD)	0.4	0.4	2	5.3	15.4	1	0
WSM4CAN014 (Made Ground / TFD)	0.4	0.4	2	1	19.6	0	0
BHM4CAN029 Shallow (Made Ground)	0.5	85.8	>>>	4.2	0.2	4	0
BHM4CAN029 Deep (GFD)	-5.6	3.9	54	1.7	18.2	2	0
BHM4CAN030 (GFD)	-9.1	0.4	6	6.8	15.5	2	0

7.4 Groundwater

Groundwater Encountered During Investigation

7.4.1 All water strikes encountered during the investigations are detailed on the geological logs provided in Appendix 1. These are summarised in Table 15.

Table 15: Summary of Groundwater Strike Data During Investigation

Location	Strike Depth (mbGL)	Geological Formation	Level After 20 Minutes (mbGL)	Comment
BHG5	12.8	Tidal Flat Deposits / Glaciofluvial Deposits	9.7	Fast flow
	-	-	-	Water level recorded at 6.3 mbGL when borehole complete within Mercia Mudstone Group (17.47 mbGL)
BHH1	1.4	Made Ground	1.0	Slow flow
	13.45	Tidal Flat Deposits	8.75	Fast flow
	-	-	-	Water level recorded at 7.9 mbGL when borehole complete within Mercia Mudstone Group (18.2 mbGL)
CH35	0.8	Interface Made Ground / Tidal Flat Deposits	-	Medium inflow
CH37	2.0	Tidal Flat Deposits	-	Slight seepage
CH39	1.4	Made Ground	-	Slight seepage
CH40	1.1	Interface Made Ground / Tidal Flat Deposits		Fast strike
CH41	1.1	Made Ground	-	Medium inflow
CH42	1.6	Made Ground	-	Medium inflow
CH44	1.7	Tidal Flat Deposits	-	Slight seepage
CH45	1.3	Interface Made Ground / Tidal Flat Deposits	-	Medium inflow
CH47A	1.2	Tidal Flat Deposits	-	Slight seepage
BHM4CAN029	0.9	Made Ground	0.7	-
	12.0	Glaciofluvial Deposits	8.1	-
BHM4CAN030	2.8	Tidal Flat Deposits	2.4	-
BHM4CANA022	7.7	Tidal Flat Deposits	5.7	-
WSM4CAN009	3.7	Tidal Flat Deposits	0.8	-

Location	Strike Depth (mbGL)	Geological Formation	Level After 20 Minutes (mbGL)	Comment
WSM4CAN010	4.2	Tidal Flat Deposits	-	-
WSM4CAN011	2.5	Tidal Flat Deposits	-	-
WSM4CAN012	5.0	Tidal Flat Deposits	-	-
WSM4CAN014	1.8	Tidal Flat Deposits	-	-

7.4.2 Groundwater was not recorded in any other boreholes and trial pits during the previous investigations.

Groundwater Level During Monitoring

7.4.3 The entire groundwater level data set gathered on Site is provided in Appendix 2 and summarised in Table 16.

Table 16: Summary of Groundwater Level Data During Monitoring

Location	Installation	Depth of response zone (mbGL) and Geological Formation	No. Measurements	Minimum Depth (mbGL)	Maximum Depth (mbGL)	Comments
BHG6	19	13.5 - 16.5 Glaciofluvial Deposits	4	4.03	4.72	-
BHM4CAN029	35	0.3 - 1.2 Made Ground	2	0.94	Dry	-
	50	12.3 - 16.3 Glaciofluvial Deposits	2	3.85	3.94	-
BHM4CAN030	50	14.2 - 17.2 Glaciofluvial Deposits	2	3.78	4.73	-
BHM4CANA022	50	7.5 - 12.5 Tidal Flat Deposits	2	3.75	3.88	-
WSM4CAN008	50	0.2 - 1.2 Made Ground	1	1.38	1.38	-
WSM4CAN009	50	4 - 6 Tidal Flat Deposits	3	0.86	0.92	-
WSM4CAN010	50	4 - 5 Tidal Flat Deposits	3	0.99	1.45	-
WSM4CAN011	50	2 - 5.5 Tidal Flat Deposits	3	1.36	1.41	-
WSM4CAN012	50	5 - 6 Tidal Flat Deposits	3	1.02	1.16	-

Location	Installation	Depth of response zone (mbGL) and Geological Formation	No. Measurements	Minimum Depth (mbGL)	Maximum Depth (mbGL)	Comments
WSM4C AN014	50	0.5 - 2.5 Made Ground / Tidal Flat Deposits	2	1.38	1.38	-

7.4.4 Semi-continuous groundwater level data for three boreholes on the site demonstrate that the water level in the shallow Tidal Flat Deposits is perennially higher than in the underlying aquifer by several meters. No tidal influence is evident in the groundwater level dataset obtained for the Glaciofluvial Deposits.

Groundwater Summary

7.4.5 The intrusive investigation confirms the generic hydrogeological model details in the Baseline Water Environment report (Appendix 16.2 of the March 2016 ES).

7.4.6 The main groundwater body is within the granular Glaciofluvial Deposits confined by the overlying Tidal Flat Deposits. This demonstrates the latter to represent an aquitard to the groundwater flow. Groundwater levels within the confined aquifer are approximately 4 to 5 mbGLs.

7.4.7 A discontinuous perched groundwater is also seen within the upper formation of the Tidal Flat Deposits. These are considered to represent discrete bodies with little vertical or lateral flow.

7.4.8 A perched water body was also identified within the Made Ground. It is anticipated that this water body is strongly influenced by rainfall events and water levels within the reen and ditch system.

7.4.9 Perched groundwater levels in the Tidal Flat Deposits and Made Ground are perennially higher than in the underlying aquifer unit, demonstrating a downward vertical hydraulic potential with respect to deep groundwater.

8 Contamination Assessment

8.1 Introduction

8.1.1 The following sections provide details of the assessment of land contamination at the Site.

8.1.2 The Conceptual Site Model (CSM) presented within the 2014 PSSR has been reviewed and updated based on data from the Supplementary Ground Investigation (Geotechnical Engineering, 2015) and the 2016 Additional Ground Investigation. The main alterations to the 2014 PSSR CSM are summarised as follows.

- Additional gas pollutant (methane and/or carbon dioxide) considered from peat.
- Sub-artesian pressures within the Glaciofluvial Deposits and Mercia Mudstone considered within the Scheme.
- Addition of piled foundations as a potential pathway.
- Proposed band drains considered as a potential new pathway.
- Update of the source-pathway-receptor linkages taking account of the above and more detailed assessments.

8.2 Preliminary Risk Assessment

Potential Sources

8.2.1 The potential sources of contamination and associated contaminants which may be present on Site are detailed in Table 17.

8.2.2 The Made Ground was identified within the 2014 PSSR as a potential contaminant source based on the Site's historical and current usage associated with the chemical works.

Table 17: Potential Sources of Contamination

Potential Sources	Potential Contaminants
Chemical works	The main products that have been manufactured are organochlorines and aromatic based organic compounds such as PCB, terphenyl, pentachlorophenol, dodecylbenzene and phthalic anhydride. Other chemicals include phenolic waste, heavy metals, phthalic waste. Expected soil and groundwater contamination includes mainly PCB and dioxins.
Historical haul road	Construction vehicles which used a former haul road indicated to lead from the southern entrance of the Site towards CL-22 (Llanwern Research Laboratory) may have had possible fuel leak/spillage incidents.
Solutia Landfill and Corporation Road Landfill	Located within the south of the Site. Inert and industrial wastes were deposited within the Solutia Landfill and inert waste was deposited in the Corporation Road Landfill as per the information provided by the NRW.

Potential Sources	Potential Contaminants
Hazardous waste cell (the 'PCB Cell')	This cell is thought to contain PCB waste but may also contain other waste generated from the chemical works. The bunded and clay lined PCB cell is periodically pumped to remove the leachate that collects therein.
Area of known historical infilling	Area to the north of the PCB Cell is thought to have been used to dispose of effluent retention tank sludge. Piling from the bridge may disturb this.
Ground gas generation from fill material and natural soils including peat	Methane, carbon dioxide, carbon monoxide, hydrogen sulphide

8.2.3 To the west and south lies Stephenson Street Industrial Estate (CL-15) and Mir Steelworks (CL-20) which have been identified as potential off site sources of contamination.

8.2.4 Within CL-15, some discrete areas of impacted soils found to include PCB, organics and metals have been identified. High pH in the Made Ground soils is widespread. Perched water within the Made Ground was recorded to be locally impacted with hydrocarbons although it is not considered to be a widespread status across the Site. Groundwater quality was identified to be impacted by various contaminants of concern although at a level considered to be in line with the overall baseline seen in this part of Newport associated with heavy industrial legacy.

8.2.5 Within CL-20 'Sloblands' an active authorised industrial waste landfill is located immediately beyond the southern boundary of the Site representing a potential gas/leachate migration source on the route alignment to the north.

Potential Receptors

8.2.6 Potential receptors during the construction and the operational stages of the Scheme have been considered.

Construction

- Construction workers during site development works.
- General public and workers adjacent to construction works.
- Groundwater within the Glaciofluvial Deposits/Mercia Mudstone.
- Surface waters (reens) - Reens and ditches in the south of the Site and surrounding fields to the east. This land drainage likely connects with the Gwent Levels SSSI wider network of reens and ditches.

Operational

- Maintenance workers.
- General public end users.
- General public and workers adjacent to permanent land take.
- Groundwater within the Glaciofluvial Deposits and/or Mercia Mudstone.

- Surface waters (reens) - Reens and ditches in the south of the Site and surrounding fields to the east. This land drainage likely connects with the Gwent Levels SSSI wider network of reens and ditches.

Potential Pathways

8.2.7 Pathways during the construction and operational stages of the Scheme have been considered.

- Construction activity including piling impacting the integrity of PCB cell, leading to release of contaminants into controlled waters (surface waters and groundwater).
- Construction activity affecting the integrity of the PCB Cell leading to spread of contamination and exposure to construction workers.
- Dermal contact, ingestion, inhalation pathways of potentially contaminated soils possible during construction and maintenance works.
- Accumulation of ground gas within confined spaces during the earthworks.
- Surface water run-off into existing/new drainage system.
- Leaching of contaminants from the Made Ground to shallow perched groundwater
- Lateral migration of impacted shallow perched water within the Made Ground and/or leachate from the Made Ground into surface water receptors including existing/new drainage system.
- Vertical migration of impacted perched water within the Made Ground and/or leachate from the Made Ground via piled foundations/band drains into main groundwater bodies in Glaciofluvial Deposits/Mercia Mudstone.
- Vertical and/or lateral migration of ground gas associated with Made Ground and underlying natural soils, principally associated with the Tidal Flat Deposits.
- Creation of potential new pathways with installation of band drain through Made Ground, Tidal Flat Deposits and Peat into the Glaciofluvial Deposits and/or Mercia Mudstone.

Preliminary Risk Evaluation

8.2.8 Source-pathway-receptor linkages were considered in the 2014 PSSR using the historical data available up to 2008. With review of the other data described herein, the following risk evaluations have been reconsidered and include the following.

- The new section of motorway is to be carried via a viaduct or high embankment some 4 m or more above ground level. Motorway users will be within an open environment with no proposed structures or other confined spaces. Pathway linkages to new section of motorway users are therefore limited to airborne dust.
- The design of the new section of motorway on a viaduct enables the PCB Cell to be bridged and no construction will be undertaken within the cell itself thus mitigating the risk of impacting the integrity of the liners. Piers are however to be located in close proximity and on either side of the PCB Cell. There is a risk for piles to provide a pathway for any potentially impacted

groundwaters to migrate downwards into the aquifer. As such, only the aquifer has been considered as a receptor in the Conceptual Site Model in relation to the PCB Cell potential source.

- The Site has been subject to a range of potential contaminating uses including a chemical works and landfilling. Off site sources associated with the industrial estate and steelworks area are also identified.
- Proposed piled viaduct and embankment with overlying hardstanding cover which is to encompass most of the motorway corridor reducing pathways to motorway users. Remaining areas (outside embankment) are to be landscaped within the permanent land take.
- Superficial deposits are classified as non-productive and overlie a Secondary B Aquifer associated with the Mercia Mudstone.
- The cohesive Tidal Flat Deposits (TFD) (of over 10 m thickness) separates the Made Ground and Aquifer and thus the aquifer is confined by the TFD.
- Perched groundwater within the TFD is not considered a water resource due to its anticipated low vertical hydraulic continuity with the aquifer beneath, low permeability and storage capacity. Indeed, the TFD provides a layer of protection to the underling aquifer.
- Piled foundations and band drains may create pathways to the lower aquifer. Pathways may allow increase in the influx of water within the Made Ground given the recorded sub-artesian pressures.
- Foundation construction such as pile caps for the construction of the piers may constitute confined spaces in which ground gases may accumulate.
- Gas migration requires consideration in relation to proposed piling for the embankment and viaduct foundations.
- Motorway users will be within open environment with no proposed structure or other confined spaces.

8.3 Human Health Risk Assessment

8.3.1 The rationale and approach for the human health (Tier 2) screening assessment is detailed in the Land Contamination Assessment Report (Appendix 11.1 of the ES). Soil chemical analysis results and the findings of the generic tier 2 human health risk assessment are presented in Appendix 3.

Made Ground

8.3.2 All exceedances to the relevant generic risk assessment criteria of Made Ground within the route corridor are summarised in Table 18 and described below.

Table 18: Summary of Human Health Soil Screening Exceedances (Made Ground)

Determinant	Units	Range	Screening Criteria	No. Samples Exceeding Screening Criteria (Total Number of Results)	Locations of Exceedances
pH	pH units	7.5 - 11.8	6 – 9	29 (52)	BHH1 (x2), CH35, CH36, CH37, CH38, CH39 (x2), CH40 (x2), CH41 (x2), CH42, CH43, CH44 (x2), CH45, CH46, CH47, CH47A, CH48, CP/RH01, CP/RH02, TP05, TP07, TP09, TP10, TP11, WSM4CAN012
Chromium	mg/kg	0.025 - 426	33	36 (52)	BHG6, BHH1 (x3), CH33, CH34 (x2), CH35, CH38, CH39 (x2), CH40, CH41 (x2), CH43, CH44 (x2), CH45, CH46, CH47 (x2), CH47A, CH48, CP/RH02, TP03, TP04, TP05, TP07, TP11, BHM4CAN029, BHM4CANA022, WSM4CAN008, WSM4CAN009, WSM4CAN010, WSM4CAN011, WSM4CAN012
Mercury	mg/kg	0.07 - 34	30	3 (52)	BHH1, CH44, WSM4CAN012
PAH (screen)	mg/kg	<0.1 - 2370	1.1	25 (30)	BHH1 (x3), CH33, CH35 (x2), CH36, CH37, CH39 (x2), CH40 (x2), CH41 (x2), CH42 (x2), CH43, CH44 (x2), CH45, CH46, CH47 (x2), CH47A, CH48
TPH FTIR	mg/kg	24 – 2,400	2,000	1 (26)	CH41
Arsenic	mg/kg	3.41 - 460	170	4 (52)	TP03, TP04, TP05, TP11

Determinant	Units	Range	Screening Criteria	No. Samples Exceeding Screening Criteria (Total Number of Results)	Locations of Exceedances
PCB (ARO)	mg/kg	1.1 - 1691.2	0.24	29 (29)	BHG6, BHH1 (x3), CH33, CH34 (x2), CH35 (x3), CH36, CH37, CH38, CH39 (x2), CH40 (x2), CH41 (x2), CH42 (x2), CH43, CH44 (x2), CH45, CH46, CH47 (x2), CH47A
PCB (7 congeners)	mg/kg	<0.01 - 110	0.24	33 (40)	CP/RH01, TP03 , TP04 (x3), TP05 (x2), TP06, T1/1, T1/2, T1/3, T1/4, T1/5, T1/6, T1/7, T1/8, T1/10, T2/1, T2/2, T2/3, T2/4, T2/7, T2/8, T2/9, T2/10, T2/11, T2/12, T2/13, T2/14, T2/15, T2/16, T2/17, T2/18
PCB (12 congeners)	mg/kg	<0.003 – 14.1	0.24	8 (11)	BHM4CAN029, BHM4CANA022, WSM4CAN009, WSM4CAN012, WSM4CAN014, HPM4CAN001, HPM4CAN002, HPM4CAN003
Chrysene	mg/kg	<0.01 - 158	93	1 (50)	CH46
Benzo(a)pyrene	mg/kg	<0.01 - 12.3	11	1 (50)	WSM4CAN014
Benzo(b)fluoranthene	mg/kg	<0.01 - 19.3	13	1 (50)	WSM4CAN014
Dibenzo(ah)anthracene	mg/kg	<0.01 - 3.14	1.1	1 (50)	WSM4CAN014

8.3.3 Alkaline soil conditions have been identified within Made Ground across the Site typically including ash and limestone gravel.

8.3.4 Although exceedances of chromium are identified throughout the Made Ground, the criterion relates to the hexavalent form. The majority of the results are considered to be within normal background data range (<95 mg/kg) and therefore are not considered to represent a contaminant of concern (Appendix 11.1 of the ES). A total of seven locations (namely CH38, CH39, CH41, CH48 and WSM4CAN009) of which 5 are situated beneath the proposed embanked section of the Scheme at c. 11+500m exceed this background range with a maximum of up to 426 mg/kg.

8.3.5 Elevated arsenic concentrations were identified within exploratory holes advanced during the WSP 2008 investigation. The exploratory records were not available for review at the time of writing however the borehole locations are indicated to be north of the route alignment and the risk to the Scheme from arsenic is therefore considered low.

8.3.6 Three marginally elevated concentrations of mercury were identified for locations in within the route alignment and permanent land take to the north representing a potential cluster of elevated concentrations.

8.3.7 For the total PAH analysis, the most stringent criterion applicable for any PAH compound has been used for screening purposes (i.e. dibenzo(ah)anthracene). The greatest concentrations were identified within a number of Made Ground samples typically including brick, concrete, slag, ash and wood, metal and plastic although no visual or olfactory evidence of hydrocarbon contamination was identified. Hydrocarbon contamination was noted within two locations of elevated PAHs; hydrocarbon odour within BHH1 and an oil film noted on the groundwater within CH41. Recent speciated PAH results obtained as part of the 2016 Additional Ground Investigation confirm that the criteria for specific PAHs are rarely exceeded. Slight exceedances were identified within CH45 located outside the area of permanent land take and WSM4CAN014 located beneath the proposed embankment.

8.3.8 Within the VOC suite, concentrations of BTEX compounds are identified within several Made Ground samples above laboratory limit of detection but none are exceeding the screening criteria.

8.3.9 PCBs are generally elevated across the Site in Made Ground however the tests for aroclors may mean PCB concentrations detected will not necessarily comprise entirely of concentrations of dioxin-like PCBs. The screening criterion is for dioxins, furans and dioxin-like PCB and thus the assessment is considered conservative. The tests for PCB (7 congeners) excludes many dioxin-like PCBs. Notwithstanding this the concentrations identified are typically up to 3 to 4 orders of magnitude greater that the screening criterion which suggests risks to construction workers and future Site users.

8.3.10 The dataset for the most recent 2016 Additional Ground Investigation confirms the presence of PCBs (12 congeners) across the site and a general pattern of increasing concentrations to the east within the footprint of the Scheme. The route alignment passes through the inert and industrial waste landfill in the east details of which are identified within Table 2. Exceedances of the screening criterion are however identified across the Site and as such exposure to PCBs is considered to represent a risk to human health however it is noted that all concentrations of the two most toxic congeners (PCB126 and PCB169) were reported at <LOD.

8.3.11 A sample obtained during the WSP Ground Investigation conducted in 2008 was tested positive for asbestos (amosite and crocidolite). This sample location is unknown, though reportedly in the vicinity of the wind turbines north of the permanent and temporary land take. During the 2016 Additional Ground Investigation three Made Ground samples (BHM4CANA022, WSM4CAN009 and WSM4CAN012) located along the cycle path to the south of the site tested positive for amosite and chrysotile. BHM4CANA022 is located within a proposed

pier location bridging the PCB cell. WSM4CAN009 and WSM4CAN012 are located within the footprint of the proposed piled embankment.

Natural Ground

8.3.12 All exceedances to the relevant criteria within natural ground are summarised in in Table 19.

Table 19: Summary of Human Health Soil Screening Exceedances (Natural Ground)

Determinant	Units	Range	Screening Criteria	No. Samples Exceeding Screening Criteria (Total Number of Results)	Locations of Exceedances
Arsenic	mg/kg	3.9 - 370	170	7 (26)	CP/RH01, CP/RH02, TP03 (x2), TP04, TP05, TP06 (all TFD)
Chromium	mg/kg	0.101 - 250	33	22 (26)	BHG5 (x2 TFD, x1 MMG), BHG6 (x1 TFD, x1 GFD, x1 MMG), CH37, CH38, CH43 (all TFD) CH48, CP/RH01, CP/RH02, TP03 (x2), TP04, TP05, TP06, BHM4CAN029, BHM4CAN030, BHM4CANA022, WSM4CAN011, WSM4CAN014 (all TFD)
PAH (screen)	mg/kg	<0.1 – 2,400	1.1	7 (14)	BHG5 (x2), BHG6, CH33, CH37, CH43, (all TFD), CH46 (TFD)
pH	pH units	7.48 - 11	6 - 9	3 (25)	BHG5 (GFD), CP/RH02 (TFD), TP03 (TFD)
PCB (ARO)	mg/kg	<0.1 - 44	0.24	6 (13)	CH33, CH36, CH37, CH38, CH43 (all TFD), CH46 (TFD)
PCB (7 congeners)	mg/kg	0.015 – 1.3	0.24	1 (3)	TP03 (TFD)
PCB (12 congeners)	mg/kg	<0.036	0.24	0 (4)	-

8.3.13 Although exceedances of chromium are identified within natural deposits, the criterion relates to the hexavalent form and this is considered to be a conservative approach. With the exception of a single sample, all results are considered to be within normal background data range (<95 mg/kg) and therefore chromium is not considered to represent a contaminant of concern (Appendix

11.1 of the March ES). The single elevated chromium concentration is identified for an exploratory hole advanced during the WSP 2008 investigation in which a lower concentration was reported (57 mg/kg) for a sample of Made Ground at his location. The exploratory records were not available for review at the time of writing however the borehole location is indicated to be north of the new section of motorway and the risk to the Scheme from chromium in natural soils is considered low. Further consideration of chromium is also provided in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES).

8.3.14 In line with elevated arsenic concentrations identified within the Made Ground within exploratory holes advanced during the WSP 2008 investigation similar concentrations were identified within the natural ground. The exploratory records were not available for review at the time of writing however the borehole locations are indicated to be north of the route alignment and the risk to the Scheme from arsenic is therefore considered low.

8.3.15 For the PAH screen analysed without speciation, the most stringent criterion applicable for any PAH compound is used for screening purposes (i.e. dibenzo(ah)anthracene). Elevated concentrations are identified within the organic clays of the Tidal Flat Deposits. Whilst the concentrations are generally lower than those of the Made Ground, some degree of downwards migration into the upper part of the TFD is evident. Speciated PAH analysis has not identified any exceedances of the specific criteria and as such confirms the low risk associated with PAHs on the Site.

8.3.16 PCBs have been identified in natural soils on the Site, albeit only occasionally in the most recent intrusive investigation. As for the PAH, the concentrations are generally lower than those of the Made Ground although some degree of downward migration is also evident. Generally the risk associated with exposure PCBs associated with natural soils is considered to be low on the site.

8.3.17 Elevated concentrations of benzene and naphthalene were identified within a sample (TP03) collected north of the permanent and temporary land take at a location where solvent and hydrocarbon odours were noted in the logs. However, concentrations are below the screening criteria. Petroleum hydrocarbons are not therefore considered a risk on the site.

8.4 Controlled Waters Screening Assessment

8.4.1 The rationale and approach for the controlled waters (Tier 1) screening assessment is detailed in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES) and the groundwater chemical results are presented in Appendix 4.

8.4.2 Where an Environmental Quality Standard (EQS) is dependent on water hardness, i.e. some heavy metals, the hardness of the surface water receptor would normally be used. The Baseline Water Environment Report (Appendix 16.2 of the March 2016 ES) indicates surface water to be generally moderately hard with hardness in a range of 100 to 150 mg/l as calcium carbonate. Therefore EQSs within this water hardness range have been used for screening purposes for this Site.

Soil Leachate Results

8.4.3 Fifteen soil samples have been subject to leachate analysis. No exceedances of the screening criteria were identified within samples from early ground investigations (i.e. 2000 and 2008) however laboratory detection limits for cadmium, nickel, lead, copper and pentachlorophenol are higher than the screening criterion for these samples. TPH is identified as leachable with a maximum concentration of 4 mg/l at CH43 (330 mg/kg recorded in the soil matrix at this location). There are no screening criteria for TPH contaminants.

8.4.4 Samples from the 2016 Additional Ground Investigation identified concentrations above the applied screening criteria as summarised in Table 20. All relate to samples of Made Ground taken from along the cycle path.

Table 20: Controlled Waters Screening Exceedances – Soil Leachate

Determinant	Units	Range	EQS	DWS	No. Exceeded EQS Screening Criteria (Total Number of Results)	Location	No. Exceeded DWS Screening Criteria (Total Number of Results)	Location
Arsenic	ug/l	0.164 - 12	50	10	0 (10)	-	1 (10)	BHM4CAN029
Copper	ug/l	<0.85 – 17.4	10	2000	1 (15)	WSM4CAN012	0 (15)	-
Mercury	ug/l	<0.01 – 3.5	0.07	1	1 (6)	WSM4CAN012	1 (6)	WSM4CAN012
pH	pH units	7.5 – 10.4	6-9	6.5-10	1 (14)	WSM4CAN012	1 (14)	WSM4CAN012
Benzene	ug/l	<1 – 1.13	10	1	0 (2)	-	1 (2)	WSM4CAN012 (Made Ground)
Benzo(a) pyrene	ug/l	<0.009 – 0.0331	0.00017	0.01	2 (6)	WSM4CAN011WSM4CAN014	2 (6)	WSM4CAN011 WSM4CAN014
Benzo(b) fluoranthene	ug/l	<0.023 – 0.0608	0.017	0.1	2 (6)	WSM4CAN011WSM4CAN014	0 (6)	-
Benzo(ghi) perylene	ug/l	<0.016 – 0.0484	0.0082	0.1	2 (6)	WSM4CAN011WSM4CAN014	0 (6)	-
Fluoranthene	ug/l	<0.017 – 0.171	0.0063	-	3 (6)	WSM4CAN011WSM4CAN012WSM4CAN014	-	-
Pcb-105	ug/l	<0.015 – 0.031	Detect	Detect	2	WSM4CAN012WSM4CAN014	2	WSM4CAN012 WSM4CAN014
Pcb-118	ug/l	<0.015 – 0.0693	Detect	Detect	3	BHM4CANA022 WSM4CAN012WSM4CAN014	3	BHM4CANA022 WSM4CAN012 WSM4CAN014
Pentachloro-phenol	ug/l	<1 – 2.92	0.4	-	1 (2)	WSM4CAN012	-	-

8.4.5 The result of leachate analysis confirms that the general quality of soils in the Made Ground is unlikely to generate perched groundwater with unacceptably high concentrations of heavy metals or petroleum hydrocarbons. Certain PAHs have been found to be leached from some samples of Made Ground however the concentrations observed represent only small exceedance of their respective screening criteria.

8.4.6 Leachate data for some Made Ground samples do identify a small number of PCBs at concentrations that exceed the Limit of Detection, albeit low. However PCBs are not identified in all Made Ground samples tested, concentrations are low, and do not exceed the LOD for all congeners analysed. Although limited in extent the PCB leachate dataset suggests that the general contamination status of the Made Ground is unlikely to result in perched waters characterised by widespread and high concentrations of PCBs.

Groundwater Results

8.4.7 Groundwater samples have been obtained from seven groundwater monitoring installations on the site, and six grab samples of perched water within the Made Ground taken during ground investigation in 2000 and 2008. Exceedances to the relevant criteria from the groundwater are summarised in Table 21.

Table 21: Controlled Waters Screening Exceedances

Determinant	Units	Range	EQS	DWS	No. Exceeded EQS Screening Criteria (Total Number of Results)	Location of Exceedances	No. Exceeded DWS Screening Criteria (Total Number of Results)	Location of Exceedances
Perched Water (Made Ground)								
Arsenic	µg/l	7 - 21	50	10	0 (6)	-	3 (6)	CH41, BH1, BH2,
Cadmium	µg/l	<0.1 – 0.5	0.15	5	1 (6)	BH1,	0 (6)	-
Nickel	µg/l	4 - 10	4	20	5 (6)	CH35, CH40, CH41, BH1, BH2,	0 (6)	-
Ammoniacal Nitrogen as N	mg/l	<0.2 - 17	0.6	-	3 (6)	CH35, BH1, BH2, WSM4CAN012 (x2)	-	-
BOD	mg/l	2 - 17	5	-	1 (4)	CH35	0 (4)	-
Total Cyanide	mg/l	<0.025 - 0.05	0.001	0.05	2 (4)	CH35, CH40	0 (4)	-
TPH FTIR	µg/l	170 - 660	-	-	-	-	-	-
TPH GC	µg/l	800 - 10000	-	-	-	-	-	-
Total petroleum hydrocarbons (2016)	µg/l	<10 - 392	-	-	-	-	-	-
PCBs ARO	µg/l	2.3 - 66	Detect	Detect	4 (4)	CH35, CH40, CH41, CH45	4 (4)	CH35, CH40, CH41, CH45
Anthracene	µg/l	<0.015 - 0.64	0.1	-	1 (6)	CH35,	-	-
Benzo(a)pyrene	µg/l	<0.05 - 0.16	0.00017	0.01	1 (6)	CH41,	1 (6)	CH41,
Benzo(b)fluoranthene	µg/l	<0.05 - 0.16	0.017	0.1	1 (6)	CH41,	1 (6)	CH41,

Determinant	Units	Range	EQS	DWS	No. Exceeded EQS Screening Criteria (Total Number of Results)	Location of Exceedances	No. Exceeded DWS Screening Criteria (Total Number of Results)	Location of Exceedances
Benzo(k)fluoranthene	µg/l	<0.0020.06	0.017	0.1	1 (6)	CH41,	0 (6)	-
Benzo(ghi)perylene	µg/l	<0.05 - 0.07	0.0082	0.1	1 (6)	CH41,	0 (6)	-
Fluoranthene	µg/l	<0.05 - 0.21	0.0063	-	1 (6)	CH41,	0 (6)	-
Benzene	µg/l	<1 - 130	10	1	1 (6)	CH35	1 (6)	CH35,
Ethylbenzene	µg/l	<1 - 255	20	-	1 (6)	CH35	-	-
m/p Xylene	µg/l	<1 - 872	30	-	1 (6)	CH35	-	-
Pentachlorophenol	µg/l	<0.05 - 4.275	0.4	-	1 (6)	CH35	-	-
1,2,4 Trichlorobenzene	µg/l	<1 - 204	0.4	-	1 (15)	CH35	-	-
Perched Water (Tidal Flat Deposits)								
Arsenic	µg/l	2.34 - 20.3	50	10	0 (15)	-	7 (15)	BHM4CANA022 (x3), WSM4CAN009, WSM4CAN010 (x3)
Cadmium	µg/l	<0.1 – 1.97	0.15	5	3 (15)	BHM4CANA022 (x3)	0 (15)	-
Lead	µg/l	<0.02 – 2.64	1.2	10	3 (15)	BHM4CANA022 (x2), WSM4CAN011	0 (15)	-
Nickel	µg/l	1.36 – 12.9	4	20	4 (15)	WSM4CAN010, WSM4CAN011 (x3)	0 (15)	-
Selenium	µg/l	1.62 - 27.2	-	10	-	-	9 (15)	BHM4CANA022 (x3), WSM4CAN009 (x3), WSM4CAN010 (x3)
Chloride	mg/l	24.8 - 2,360	250	250	6 (15)	BHM4CANA022 (x3), WSM4CAN009 (x3)	6 (15)	BHM4CANA022 (x3), WSM4CAN009 (x3)
Ammoniacal Nitrogen as N	mg/l	<0.2 – 7.68	0.6	-	11 (15)	BHM4CANA022 (x3), WSM4CAN009 (x3), WSM4CAN010 (x3), WSM4CAN012 (x2)	-	-

Determinant	Units	Range	EQS	DWS	No. Exceeded EQS Screening Criteria (Total Number of Results)	Location of Exceedances	No. Exceeded DWS Screening Criteria (Total Number of Results)	Location of Exceedances
Benzo(a)pyrene	µg/l	<0.009 - 0.617	0.00017	0.01	6 (15)	BHM4CANA022 (x3), WSM4CAN009 (x2), WSM4CAN010	6 (15)	BHM4CANA022 (x3), WSM4CAN009 (x2), WSM4CAN010
Benzo(b)fluoranthene	µg/l	<0.0023 - 0.82	0.017	0.1	6 (15)	BHM4CANA022 (x3), WSM4CAN009 (x2), WSM4CAN010	4 (15)	BHM4CANA022 (x2), WSM4CAN009 (x2),
Benzo(k)fluoranthene	µg/l	<0.0027 - 0.288	0.017	0.1	4 (15)	BHM4CANA022 (x2), WSM4CAN009 (x2),	1 (15)	WSM4CAN009
Benzo(ghi)perylene	µg/l	<0.0016 - 0.728	0.0082	0.1	6 (15)	BHM4CANA022 (x3), WSM4CAN009 (x2), WSM4CAN010	3 (15)	BHM4CANA022, WSM4CAN009 (x2)
Indeno(1,2,3-cd)pyrene	µg/l	<0.014 – 0.631	-	0.1	-	-	3 (15)	BHM4CANA022, WSM4CAN009 (x2)
Fluoranthene	µg/l	<0.017 – 0.402	0.0063	-	6 (15)	BHM4CANA022 (x3), WSM4CAN009 (x2), WSM4CAN010	-	-
Bis(2-ethylhexyl) phthalate	µg/l	<2 – 96.2	1.3	-	3 (15)	BHM4CANA022 (x3)	-	-
PCB-77	µg/l	<0.015 – 0.02	Detect	Detect	1 (15)	WSM4CAN009	1 (15)	WSM4CAN009
PCB-105	µg/l	<0.015 – 0.153	Detect	Detect	3 (15)	BHM4CANA022, WSM4CAN009 (x2)	3 (15)	BHM4CANA022, WSM4CAN009 (x2)
PCB-118	µg/l	<0.015 – 0.341	Detect	Detect	6 (15)	BHM4CANA022 (x3), WSM4CAN009 (x2), WSM4CAN010	6 (15)	BHM4CANA022 (x3), WSM4CAN009 (x2), WSM4CAN010
PCB-126	µg/l	<0.015 – 0.0582	Detect	Detect	1 (15)	WSM4CAN009	1 (15)	WSM4CAN009
PCB-156	µg/l	<0.015 – 0.0623	Detect	Detect	2 (15)	WSM4CAN009 (x2)	2 (15)	WSM4CAN009 (x2)
PCB-167	µg/l	<0.015 – 0.0869	Detect	Detect	1 (15)	WSM4CAN009	1 (15)	WSM4CAN009
Groundwater (Glaciofluvial Deposits)								

Determinant	Units	Range	EQS	DWS	No. Exceeded EQS Screening Criteria (Total Number of Results)	Location of Exceedances	No. Exceeded DWS Screening Criteria (Total Number of Results)	Location of Exceedances
Arsenic	µg/l	20.6 - 206	50	10	3 (6)	BHM4CAN030 (x3)	6 (6)	BHM4CAN029 (x3), BHM4CAN030 (x3)
Cadmium	µg/l	0.387 - 1.95	0.15	5	6 (6)	BHM4CAN029 (x3), BHM4CAN030 (x3)	0 (6)	-
Lead	µg/l	0.402 - 1.78	1.2	10	2 (6)	BHM4CAN029, BHM4CAN030	0 (6)	-
Nickel	µg/l	2.87 - 6.02	4	20	3 (6)	BHM4CAN029 (x2), BHM4CAN030	0 (6)	-
Selenium	µg/l	18.2 - 34.3	-	10	-	-	6 (6)	BHM4CAN029 (x3), BHM4CAN030 (x3)
Chloride	mg/l	2,060 - 3,250	250	250	6 (6)	BHM4CAN029 (x3), BHM4CAN030 (x3)	6 (6)	BHM4CAN029 (x3), BHM4CAN030 (x3)
Ammoniacal Nitrogen as N	mg/l	11.6 - 22.1	0.6	-	6 (6)	BHM4CAN029 (x3), BHM4CAN030 (x3)	-	-
Benzo(a)pyrene	µg/l	<0.009 - 0.038	0.00017	0.01	1 (6)	BHM4CAN029	1 (6)	BHM4CAN029
Benzo(b)fluoranthene	µg/l	<0.0023 - 0.0693	0.017	0.1	1 (6)	BHM4CAN029	0 (6)	-
Benzo(ghi)perylene	µg/l	<0.0016 - 0.0412	0.0082	0.1	1 (6)	BHM4CAN029	0 (6)	-
Fluoranthene	µg/l	<0.017 – 0.0275	0.0063	-	1 (6)	BHM4CAN029	-	-

8.4.8 Groundwater quality data have been obtained for samples taken from Made Ground, the Tidal Flat Deposits and the combined Glaciofluvial / Mercia Mudstone aquifer unit at depth. Although the Tidal Flat Deposits are considered "unproductive strata" the quality data for this unit are considered in Table 21 along with the data for the Made Ground, as the depth of Made Ground identified on the site was very shallow at many locations on the Site.

8.4.9 The chloride concentration is elevated (i.e. above 250mg/l) at many locations and indicative of brackish conditions. High chloride concentrations are associated with the Tidal Flat Deposits and Glaciofluvial Deposits, whereas perched groundwater within Made Ground is fresh in nature.

8.4.10 The concentration of some heavy metals in shallow perched water exceeds their respective assessment criteria. The observed exceedances occur infrequently and are not indicative of widespread or gross contamination by metals.

Ammoniacal nitrogen is observed more routinely at concentrations above the respective EQS for that parameter.

8.4.11 Petroleum hydrocarbons are observed predominantly in the Tidal Flat Deposits in approximately half the samples analysed. The observed exceedances are greater and more frequent than those observed within the Made Ground.

8.4.12 PCBs have been detected in shallow groundwater within the Made Ground and the Tidal Flat Deposits at concentrations above the limit of detection. However not all locations sampled contain PCBs, nor are all PCB congeners identified where PCBs are detected. The observed PCBs occurrence within shallow waters is generally consistent with the leachate data that suggested widespread elevated concentrations of PCBs in perched waters are unlikely to be generated.

8.4.13 TPH has been identified in perched groundwater, although concentrations are typically low and dominated by longer chain hydrocarbon fractions. BTEX hydrocarbons are not generally identified in shallow groundwater.

8.4.14 The groundwater quality dataset for the underling aquifer unit (i.e. Glaciofluvial Deposits) is summarised in Appendix 4 and confirms the non-potable nature of groundwater contained therein. Although only two installations have been sampled, as part of the 2016 Additional Ground Investigation, the resulting dataset confirms the presence of certain metals at concentrations that exceed assessment criteria. Ammoniacal nitrogen is present in groundwater at elevated concentrations that exceed those identified in shallow perched waters. Groundwater quality at depth is generally characterised by the absence of organic contaminants.

8.5 Ground Gas Risk Assessment

8.5.1 The ground gas dataset collected during the 2016 Additional Ground Investigation is provided in Appendix 2 and summarised in Table 14. The key observations are as follows.

- Boreholes for which data is available are completed within all key units onsite though the majority within the Tidal Flat Deposits. Borehole BHM4CAN029 is a dual installation location completed in the shallow surface Made Ground and deep Glaciofluvial Deposits, borehole BHM4CAN030 is completed in the Glaciofluvial Deposits and WSM4CAN008 completed within the Made Ground.
- No monitoring rounds have been undertaken at low pressures (< 1000mbar) and as such worst case scenarios may not have been recorded.
- The dataset for the majority of monitoring installations (Tidal Flat Deposits) is typically characterised by the presence of oxygen at concentrations above 15%, with low concentrations of carbon monoxide (below) and low concentrations of methane (below). Carbon dioxide concentrations are more variable ranging from 0.1 to 5.3% and Hydrogen sulphide generally absent.
- The shallow installation completed in the Made Ground at location BHM4CAN029 is characterised by extremely high methane concentrations (maximum of 86%), depleted oxygen (minimum of 1.2%) with maximum carbon dioxide and carbon monoxide concentrations of 4.2% and 4 ppm respectively. The deep installation at location BHM4CAN029 shows an

elevated methane concentration relative to other boreholes, albeit significantly lower than seen in the shallow borehole.

- Borehole BHM4CANA022 also shows elevated methane concentrations (maximum of 36%), low levels of oxygen and maximum carbon dioxide and carbon monoxide concentrations of 6.5% and 2 ppm respectively. This borehole is installed within the deep Tidal Flat Deposits, immediately above the Glaciofluvial Deposits.
- Although the source of the gas generation observed in Borehole BHM4CAN029 and BHM4CANA022 is not known, these boreholes are both located in close proximity to the PCB cell, although elevated gas generation was not observed in WSM4CAN008 which was installed at shallow depth within the Made Ground in the vicinity.

8.5.2 No monitoring wells were installed on Site during early investigations and therefore no further gas monitoring data are available.

8.5.3 A gas risk assessment has been undertaken and is set out within the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES). When compared with the screening criteria values outlined in the Contamination Assessment Report, the gas data presented in Table 14 indicate gas generation within shallow deposits across the site is unlikely to represent a significant risk to human health. The notable exception is from the deeper installations around the PCB cell where the screening criteria for methane (and to a lesser extent carbon dioxide) are significantly exceeded in boreholes BHM4CANA022 and BHM4CAN029.

8.6 Summary

8.6.1 The widespread presence of PCBs has been identified in the soils of the Made Ground. These represent a potential risk to human health although the concentrations of the two most toxic PCBs were noted to be reported as below the LOD in all samples. A degree of vertical (downward) migration of PCB contaminants impacting the natural soils beneath the Made Ground is noted. The available data suggest that soils do not readily leach PCBs to water and this is consistent with the limited presence of PCBs typically observed in perched waters on the Site.

8.6.2 Asbestos fibres were detected within three shallow Made Ground samples tested as part of the 2016 Additional Ground Investigation. The samples were obtained from a proposed pier location bridging the PCB cell and the piled embankment. As such asbestos control measures will be required during ground disturbance in these areas.

8.6.3 The Made Ground has exhibited limited leachability and no exceedances of the relevant screening criteria have been identified. Presence of leachable TPH is noted.

8.6.4 Perched water within the Made Ground contains metals, inorganics, organics, PAHs and VOCs. These water qualities are considered to be within the baseline of this area of Newport associated with heavy industry legacy. However, the organic contamination including PAHs may have resulted from historical activities undertaken at the Site. However, high levels of TPH and also elevated PCBs have also been encountered that are most likely associated with operations

undertaken at the Site and this potential contaminant source needs to be carefully managed to ensure no new pathways to receptors are created during construction.

8.6.5 With the exception of the elevated PCBs and high TPH concentrations identified at certain locations, the water quality seen in the Made Ground is consistent with that seen within this general area of Newport, in particular the docks (CL-13 and CL-14) and Stephenson Street Industrial Estate (CL-15). The presence of a number of PAH compounds may indicate a soil–water linkage. However, the elevated PAHs, BTEX and pentachlorophenol observed may indicate contamination is leaching from the Made Ground or previous historical activities have introduced contaminants into the perched water.

8.6.6 The gas dataset confirms that in localised areas, principally around the PCB cell, gas generation on the site may represent risk to human health. This corresponds to the area where piled foundations for the viaduct are proposed, as opposed to piles / band drains associated with the embankment proposed to the east.

9 Refined Conceptual Site Model

9.1.1 The incorporation of data from the 2015 Supplementary Ground Investigation and 2016 Additional Ground Investigation has enabled the original CSM presented in the 2014 PSSR to be updated. Relevant contaminant (source-pathway-receptor) linkages are considered within the refined CSM. The assessment is based on the Scheme during construction and operational phases.

9.1.2 A CSM representing general ground conditions, overall Scheme layout and relevant source-pathway-receptors (each of which having a specific alpha-numerical symbol attached) are presented in Figure 2 and described in Table 22.

Table 22: Conceptual Site Model

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
On Site Organochlorines and aromatic based organic compounds such as TPH, PCB, terphenyl, pentachlorophenol, dodecylbenzene and phthalic anhydride. Other chemicals include phenolic waste, heavy metals, phthalic waste in soil and groundwater associated with historical spills, inert and industrial waste landfills. Off site Stephenson Street Industrial Estate (CL-15) Mir Steelworks lagoons (CL-20)	**Construction**					
	Construction Workers (B)	Direct dermal (1)	Likely	High	High	Elevated concentrations of PCBs and the localised presence of chromium and mercury have been confirmed in Made Ground. Asbestos fibres have also been identified at some localities on the Site within shallow soils which will require asbestos control measures to be implemented during construction. Although exposure duration will be short term only, prior to construction, a specific risk assessment will be required in line with health and safety legislation. This will enable safe methods of work and appropriate levels of PPE to be put in place. As such all risk will be duly considered and suitably mitigated to protect construction workers. Widespread presence of PCBs are identified however the congener profile indicates these consist of less toxic PCBs. The local presence of asbestos fibres within the shallow soils, represents abnormal constraints to construction workers health and safety over and above those typical of a brownfield site.
		Ingestion (3)	Likely	High	High	
		Inhalation of soil dust (2)	Likely	High	High	
		Inhalation of ground gas or vapours (2)	Low	High	Moderate	
	General public/site neighbours during construction works (C)	Dermal contact of soil derived dust (1)	Likely	High	High	During construction period there is the possibility of inhalation/ingestion of soil dust. Elevated concentrations of PCBs (though congener profile indicates less toxic PCBs) and the localised presence of chromium and mercury have been confirmed in Made Ground. Asbestos fibres have also been identified at some localities on the Site within shallow soils.
		Ingestion of soil derived dust (3)	Likely	High	High	

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
		Inhalation of soil derived dust (2)	Likely	High	High	Dust suppression measures will be required during construction works. Further asbestos control measures will be required during construction. Adjacent off site receptors present associated with industrial activities. Adjacent industrial estate is associated with ground gas from Made Ground and natural soils. Generally elevated ground gas has not been encountered with the exception of the area around the PCB cell which is assessed later in this table.
		Inhalation of ground gas or vapours (2)	Unlikely	Moderate	Low	
	Aquifers (superficial and bedrock) (Da) Groundwater in Glaciofluvial Deposits and/or Mercia Mudstone	Leaching and/or vertical migration along piles (4)	Unlikely	Moderate	Low	The migration of priority hazardous substances (most notably PCBs) to groundwater may occur during piling, principally through the displacement of contaminated Made Ground. Although the potential introduction of such pollutants into the underlying aquifer cannot be precluded, their presence is not considered a risk to human health (groundwater is not a potable resource) or surface water receptors (considering the potential for attenuation along the long saturated pathway to such receptors). The limited leachability of PCBs from soils and limited presence of PCBs in shallow perched water on the Site suggest that perched waters contaminated by PCBs and other priority substances are unlikely to affect groundwater quality by their infiltration along piles, particularly as the thickness of the TFD exceeds 10m. The likely severity of impact associated with other metals, PAHs and hydrocarbons identified in Made Ground and associated perched waters is considered to be low considering: their general infrequent occurrence in perched waters at concentrations above

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
						water quality standards; the attenuating capacity of the organic rich tidal flat deposits; the non-potable nature of groundwater; the potential for significant mixing with in the aquifer; and the distance of the lateral pathway to the nearest surface water receptor. A piling risk assessment is required to minimise the potential for the displacement of priority hazardous substances. Contaminated perched water will require management during construction although this is likely to be of limited extent.
	Surface waters (reens) (E)	Leaching from Made Ground and/or lateral saturated flow of contaminated perched water to receptors (4)	Unlikely	Moderate	Low	Reens and associated drainage are located in the south of the Site. A laterally continuous perched water system, likely to be in hydraulic continuity with surface water receptors has not been identified on the Site. The risk to reens and associated drainage will therefore be restricted to localised areas of perched water with potential continuity with the surface water system. Leachable contaminants have been identified within the soils. Perched water within the Made Ground has elevated metals, PCBs and organics. However, piling and embankment construction is not expected to result in a significant change to the shallow, perched water flow regime on the Site and hence is unlikely to alter baseline water quality in potential receptors.

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
		Contaminated surface water run-off (5)	Likely	Moderate	Moderate	Reens and associated drainage are located in the south of the Site. Leachable organics have been identified within the soils. Perched water within the Made Ground has elevated metals, PCBs and organics. Without the application of appropriate surface water run-off control measures during construction works, there is the potential for contaminated run-off to enter surface water receptors. Where surface water control measures are applied they will break this pollution linkage.

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
PCB Cell	Aquifers (superficial and bedrock) (Da) Groundwater in Glaciofluvial Deposits and/or Mercia Mudstone	Leaching and/or vertical migration along piles (4)	Low	High	Moderate	The general risk to groundwater in Glaciofluvial Deposits and/or Mercia Mudstone posed by priority hazardous substances (most notably PCBs) contained in Made Ground and associated perched water has been assessed previously. Although site dataset has not identified significantly higher PCB concentrations or more frequent occurrence thereof around the PCB cell, this remains a possibility. Piling works are to be undertaken outside the PCB Cell and its containment integrity should not be compromised. However, should the integrity of containment be affected during construction the resulting effects may be considered to be of high severity (despite the non-potable nature of the aquifer and characteristics of the pathway to nearest surface water receptors). The performance of the retrospectively installed containment infrastructure is not proven and perched water in Made Ground or perched groundwater within the Tidal Flat Deposit may be contaminated with PCB and other contaminants. Contaminated perched water will require management during construction and a piling risk assessment is required.

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
	Surface waters (reens) (E)	Leaching from Made Ground and/or lateral saturated flow of contaminated perched water to receptors (4)	Unlikely	High	Moderate	Piling works are to be undertaken outside the PCB Cell and its containment integrity should not be compromised. However should the integrity of containment be affected during construction the resulting effect on surface waters may be considered to be of high severity (despite the non-potable nature of the aquifer and characteristics of the pathway to nearest surface water receptors). However the PCB Cell is situated a significant distance from surface water reens / drainage and a laterally continuous perched water system has not been identified on the Site. Thus the likelihood of a high severity effect on surface water occurring is therefore considered unlikely.
	Construction workers (B)	Inhalation of ground gas/ explosion (2)	Likely	High	High	Elevated methane concentrations that could pose a potential risk to human health have been identified in two monitoring locations located near the PCB cell. This risk will require management during the construction phase.
Ground gas from peat / organic rich soils within Tidal Flat Deposits and/or Glaciofluvial Deposits	Construction workers (B)	Inhalation of ground gas/ explosion (2)	Unlikely	High	Moderate to low	New pathways to be created with piles and band drains and thus construction operation may need a gas mitigation controls to protect construction operatives. Dataset for 2016 Additional Ground Investigation suggests gas generation in the TFD is generally low, with the possible exception of around the PCB cell (as described above). Construction to be largely within open space. Any earthworks within confined space would require specific risk assessment, control measures and PPE.

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
	Off site users during construction works (C)	Inhalation of ground gas/ explosion (2)	Unlikely	High	Moderate to low	Dataset indicates ground gas generation in the TFD is generally low, with the possible exception of around the PCB cell (as described above). Limited potential for lateral gas migration given the presence of low permeability Tidal Flat Deposits to shallow depth.
On Site Organochlorines and aromatic based organic compounds such as TPH, PCB, terphenyl, pentachlorophenol, dodecylbenzene and phthalic anhydride. Other chemicals include phenolic waste, heavy metals, phthalic waste, heavy metals, phthalic waste in soil and groundwater associated with historical spills, inert and industrial waste landfills. Off site Stephenson Street Industrial Estate (CL-15) Mir Steelworks lagoons	**Operational**					
	Maintenance Workers (B)	Direct dermal (1)	Low	High	Moderate	Maintenance workers may come into contact with Made Ground materials remaining *in situ* outside the pier footprints or embankment footprint. Ground investigation soil analysis data has identified a number of contaminants exceeding the screening criteria. Areas outside the pier or embankment are likely to receive topsoil cover and vegetation establishment or some form of hardstanding, reducing potential of exposure. Exposure duration will be short term only. Site specific risk assessment will be required in line with health and safety guidance. This will enable safe methodology and appropriate levels of PPE to be put in place. As such all risks will be duly considered and suitably mitigated.
		Ingestion of soil (3)	Low	High	Moderate	
		Inhalation of soil dust (2)	Low	High	Moderate	

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
(CL-20)		Inhalation of ground gas or vapours (2)	Unlikely	Moderate	Low	Dataset for 2016 Additional Ground Investigation suggests gas generation in the TFD is generally low, with the possible exception of around the PCB cell (as described above). Risks will be limited to confined entry for which compliance with health and safety legislation will be required anyway.
	Future motorway users (A) and off site users (C)	Dermal contact with soil derived dust (1)	Unlikely	Moderate	Low	Future Site users are very unlikely to be exposed to soil contamination as the Scheme will cross the Site on a viaduct and a raised embankment and the PCB Cell is being bridged to retain its integrity. However gaps in the data have been identified and further investigations are required to delineate any potential contamination and confirm the risks.
		Ingestion of soil derived dust (3)	Unlikely	Moderate	Low	
		Inhalation of soil derived dust (2)	Unlikely	Moderate	Low	
		Inhalation of ground gas or vapours (2)	Unlikely	Low	Very low	
	Aquifers (superficial and bedrock) (Da) Groundwater Aquifer in Glaciofluvial Deposits and/or Mercia Mudstone	Leaching and/or vertical migration along piles (4)	Unlikely	Moderate	Low	The migration of priority hazardous substances (most notably PCBs) to underlying groundwater may occur by the leaching of contaminants from the Made Ground materials and infiltration of the associated perched waters via piles. However, the limited leachability of PCBs from soils and limited presence of PCBs currently observed in shallow perched water on the Site suggest the likelihood of this is low, particularly as the thickness of the TFD exceeds 10m. The likely severity of impact associated with other metals, PAHs and hydrocarbons associated with Made Ground and perched waters is considered likely to be low considering: their infrequent presence in

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
						perched waters; the attenuating capacity of the organic rich tidal flat deposits; the non-potable nature of groundwater; the potential for significant mixing with in the aquifer; and the distance of the lateral pathway to the nearest surface water receptor.
	Surface waters (reens) (E)	Leaching from Made Ground. Lateral saturated flow of contaminated perched water to receptors (4)	Unlikely	Moderate	Low	Reens and associated drainage are located in the south of the Site. A laterally continuous perched water system, likely to be in hydraulic continuity with surface water receptors has not been identified on the Site. The risk to reens and associated drainage will therefore be restricted to localised areas of perched waters with potential continuity with the surface water system. Leachable organics identified within the soils. Perched water within the Made Ground has elevated metals, PCBs and organics. However, piling and embankment construction is not expected to result in a significant change to the shallow, perched water flow regime on the Site and is considered unlikely to alter baseline water quality in potential receptors.

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
PCB Cell	Aquifers (superficial and bedrock) (Da) Groundwater aquifer in the Glaciofluvial Deposits and/or Mercia Mudstone	Leaching and/or vertical migration along piles (4)	Unlikely	High	Moderate to Low	The general risk to groundwater in Glaciofluvial Deposits and/or Mercia Mudstone posed by priority hazardous substances (most notably PCBs) contained in Made Ground and associated perched water has been assessed previously. Although site dataset has not identified significantly higher PCB concentrations or more frequent occurrence thereof around the PCB cell, this remains a possibility. Piling works are to be undertaken outside the PCB Cell and its containment integrity should not be compromised. However should the integrity of containment be affected during construction the resulting effects on groundwater have the potential to be of high severity (despite the non-potable nature of the aquifer and characteristics of the pathway to nearest surface water receptors). In the absence of any adverse effects on the integrity of the PCB during construction it is considered unlikely that adverse effects will result. However their potential severity remains high.
	Maintenance workers (B)	Inhalation of ground gas/ explosion (2)	Unlikely	High	Moderate to low	Elevated methane concentrations that could pose a potential risk to human health have been identified in two monitoring locations located near the PCB cell. These risk will require management during the construction phase, which may mitigated risks associated with the operational phase

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
Ground gas from peat / organic rich soils within Tidal Flat Deposits and/or Glaciofluvial Deposits	Maintenance workers (B)	Inhalation of ground gas/ explosion (2)	Unlikely	Low	Very Low	Dataset for 2016 Additional Ground Investigation suggests gas generation in the TFD is generally low, with the exception of around the PCB cell (as described above). New pathways to be created with piles thus construction operation may need a gas mitigation controls to protect construction operatives. Low gas flux likely to achieve equilibrium after construction. Pathways along piles likely to 'heal' with increase in soil contact along shaft.
	Future motorway users (A) and off site users (C)	Inhalation of ground gas/ explosion (2)	Unlikely	Low	Very Low	Dataset for 2016 Additional Ground Investigation suggests gas generation in the TFD is generally low, with the exception of around the PCB cell (as described above). New pathways to be created with piles thus construction operation may need a gas mitigation controls to protect construction operatives. Low gas flux likely to achieve equilibrium after construction. Pathways along piles likely to 'heal' with increase in soil contact along shaft. Motorway to be built on raised embankment and viaduct providing a further barrier to migration gases. Pathways along piles likely to 'heal' with increase in soil contact along pile shaft preventing gas migration. However band drains could still allow localised gas migration.

10 Conclusions and Recommendations

10.1 Conclusions

10.1.1 Ground investigations have been undertaken at the Site to assess risks from land contamination associated with the construction and operation of the Scheme including human health and controlled waters risks.

10.1.2 Made Ground has been identified across the Site, although its thickness and lithology is highly variable. The Made Ground overlies at least 10 m of Tidal Flat Deposits, but does not appear to support a laterally continuous perched water body. The Tidal Flat Deposits overlie Glaciofluvial Deposits / Mercia Mudstone, which constitute an aquifer unit at depth.

10.1.3 Asbestos fibres have been detected within three shallow Made Ground samples in areas being utilised during the construction activities i.e. pier excavation and the piled embankment.

10.1.4 Widespread PCB contamination associated with the Site's historical use has been identified, although speciated testing undertaken as part of the 2016 Additional Ground Investigation has identified the concentrations to comprise less toxic PCBs and therefore may not pose unacceptable risk to human health.

10.1.5 PCBs are not readily leached form soils on the Site, although some PCBs have been identified in shallow perched waters. No PCBs have been identified in groundwater at depth. Soils also contain a variety of metals and organic contaminants. No gross contamination of soils has been identified during intrusive works.

10.1.6 A cluster of marginally elevated mercury concentrations was identified within the route alignment and immediately north within an area of permanent land take. The risk associated with these concentrations is considered low however further delineation of these concentrations will be required.

10.1.7 Shallow perched water is not identified as being grossly contaminated but is characterised by the presence of a variety of potential contaminants, most notably metals, ammoniacal nitrogen and some organic compounds (principally PCBs, PAHs and BTEX hydrocarbons). However, assessment criteria are infrequently exceeded and a low risk to controlled waters is concluded.

10.1.8 Groundwater in the Glaciofluvial Deposits / Mercia Mudstone is non-potable on the basis of its salinity. Groundwater does contain certain metals (most notably cadmium that is not identified in shallow perched waters) and ammoniacal nitrogen, with the general absence of organic contaminants.

10.1.9 The risk assessment has identified that residual risks to human health and controlled waters could exist and control measures would be required to facilitate the construction and ongoing operation of the Scheme.

10.1.10 The PCB Cell will be spanned by the new section of motorway viaduct and no construction work is to be undertaken on the PCB Cell. This will mitigate potential risks of affecting its integrity during construction. However an emergency plan will be required to deal with the potential for accidental breaches of the PCB cell.

10.1.11 Piled foundations are proposed within the permanent land take on the Site. Piled foundations will be used to support the proposed viaduct at the eastern end of the Site (in the vicinity of the PCB cell) and the proposed new section of motorway to the west constructed on high embankment.

10.1.12 The construction of piles through Made Ground has the potential to drive soils that may be contaminated by priority hazardous substances (most notably PCBs) into the underlying aquifer unit. Although the infiltration of contaminated perched waters to groundwater via piles may theoretically occur during the construction phase, this is not a significant risk considering the generally low contamination status of these waters and presence of a thick sequence of cohesive and organic rich Tidal Flat Deposits that are unlikely to create hydraulically significant open pathways. Although the groundwater contained in the Glaciofluvial deposits / Mercia Mudstone are non-potable in nature and considering the distance to surface water receptors dependent on lateral flow therein, measures have been proposed that will minimise the risk to groundwater. These measures would be determined through a piling risk assessment agreed with the regulator (NRW) in advance of construction and may include consideration of localised removal of contaminated Made Ground, measures to prevent ingress of perched waters around pile head etc. Specific design measures would also be required during construction in the vicinity of the PCB cells to ensure the integrity of the cell is not compromised and/or runoff/infiltration associated with that feature does not enter the subsurface around piles.

10.1.13 The use of piles and construction of piled embankments is considered unlikely to increase the baseline risk to surface water receptors (reens) via shallow, perched pathways (principally within the Made Ground) during the construction or operational phase, particularly if a piling risk assessment and a discovery strategy is delivered through the remediation strategy.

10.1.14 The risk associated with ground gases generated from natural ground and Made Ground across the Site is generally low. The only exception appears to be an area near the PCB cell where elevated methane concentrations were identified in two monitoring boreholes. The source of observed ground gas emissions is uncertain, hence this will require management during construction. Additionally despite the monitoring results the potential for encountering elevated methane concentrations associated with peat within the Tidal Flat Deposits when piling cannot be discounted.

10.1.15 A suitable water management strategy will be required to prevent potential impact to surface waters from contaminant runoff during construction.

10.1.16 By the adoption of the mitigation measures recommended in the comments section of Table 22 the residual risk to human health and controlled water receptors will be reduced to acceptable levels.

10.1.17 Materials are unlikely to be suitable for direct reuse and some form of restricted use or remediation is anticipated.

10.2 Recommendations

10.2.1 The presence of elevated methane has been identified around the PCB cell. This is likely to require ground gas monitoring during construction.

10.2.2 Detailed Quantified Risk Assessment (DQRA) will be required to further demonstrate the anticipated low risk associated with the widespread presence of PCBs at the Site in relation to human health risks during construction and operation of the Scheme. Additional risk assessments will be delivered as part of the remediation strategy for the site. The ground investigation data have indicated that potential contamination is present that could cause an unacceptable risk to the identified receptors. This will require appropriate remedial mitigation measures to be implemented. These measures would be identified within a remediation strategy for the Scheme. The remediation strategy is anticipated to include but is not limited to the following.

- Strategy for dealing with potentially contaminated soils and appropriate reuse within the Scheme.
- Foundation works and piling risk assessment to mitigate residual risk to controlled waters, with due consideration of relevant EA guidance (EA, 2001 and EA, 2002).
- Dealing with unexpected contamination.
- Verification sampling to confirm suitability of soils for reuse or verify imported topsoils.
- Control measures to prevent risks to construction workers and the general public during construction (i.e. gas management, presence of asbestos and potential PCB contamination).

  The emergency response plan should also include an emergency plan to deal with potential accidental breaching of the PCB cell.

10.2.3 The remediation strategy shall include a remediation options appraisal, remediation implementation plan and remediation verification plan. The remediation strategy should be supported by a Scheme wide Materials Management Plan prepared in accordance with CL:AIRE Code of Practice (CL:AIRE, 2011).

11 References

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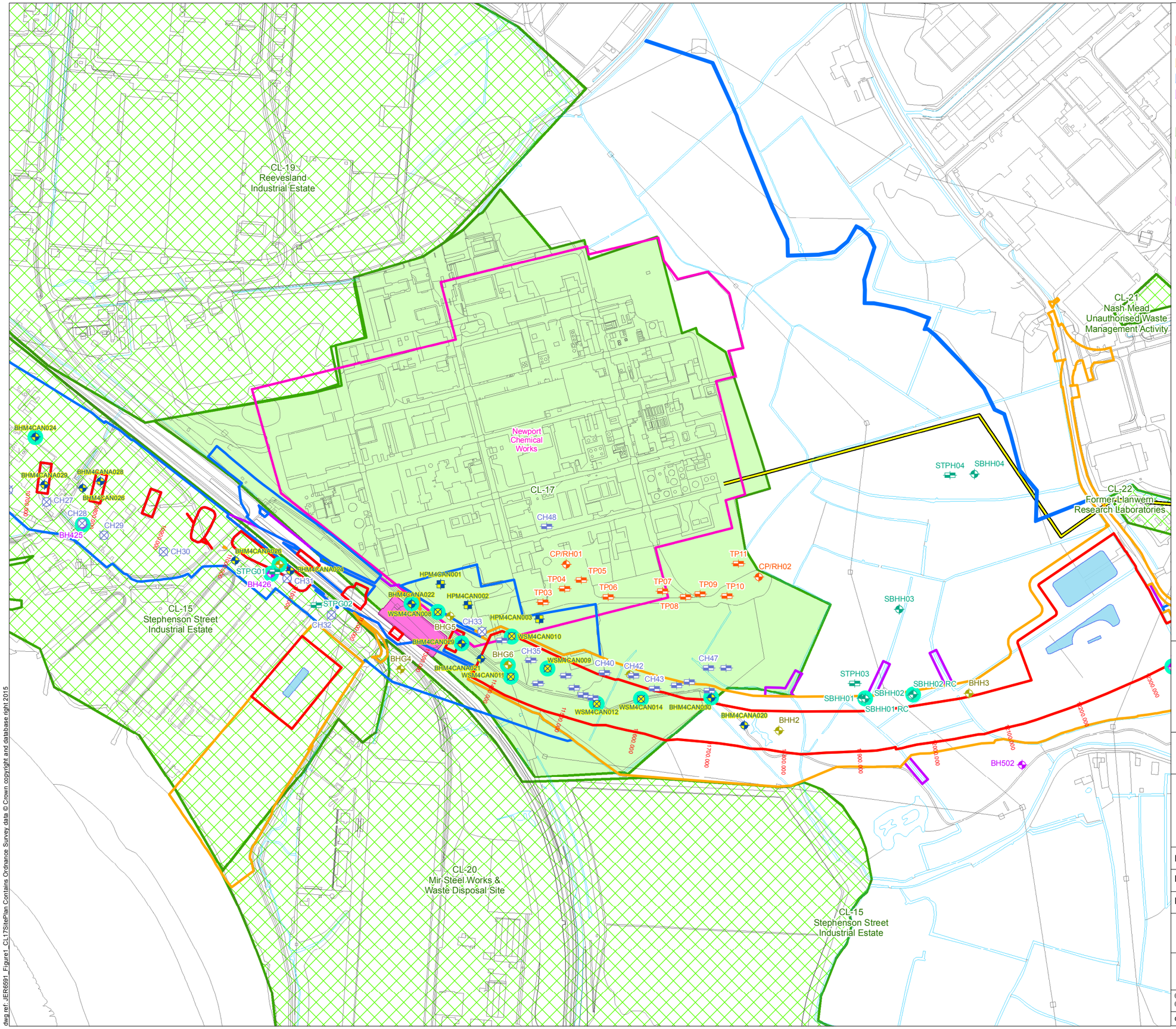
Titan Environmental Surveys Ltd (2008) New M4 Magor to Castleton Baseline Surface Water Quality Final Report for Arup, Report Number HS0442/F1/2

12 Glossary

BF	Blast Furnace
BGS	British Geological Survey
BOD	Biochemical Oxygen Demand
BOS	Basic Oxygen Slag
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CAT	Cable Avoidance Tool
CDM	Construction Design Management
CH_4	Methane
CLEA	Contaminated Land Exposure Assessment
CO_2	Carbon Dioxide
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CSM	Conceptual Site Model
DMRB	Design Manual for Roads and Bridges
DO	Dissolved Oxygen
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standard
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
ES	Environmental Statement
ESG	Environmental Scientifics Group
EQS	Environmental Quality Standard
FTIR	Fourier Transform Infrared (spectroscopy)
GAC	Generic Assessment Criteria
GRO	Gasoline Range Organics
LEL	Lower Explosive Limit
LOD	Limit of Detection
mAOD	Metres Above Ordnance Datum
mb	Millibars
mbGL	Metres below Ground Level

MTBE	Methyl Tert-butyl Ether
NRW	Natural Resources Wales
ORP	Oxidation Reduction Potential
O_2	Oxygen
OS	Ordnance Survey
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCSM	Preliminary Conceptual Site Model
PID	Photo Ionisation Detector
PPE	Personnel Protection Equipment
PSSR	Preliminary Sources Study Report
SGVs	Soil Guideline Values
SSAC	Site Specific Assessment Criteria
SSSI	Site of Special Scientific Interest
SVOCs	Semi-Volatile Organic Compounds
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbon
TPH CWG	Total Petroleum Hydrocarbon Criteria Working Group
UKAS	United Kingdom Accreditation Service
VOCs	Volatile Organic Compounds
WFD	Water Framework Directive
UXO	Unexploded Ordnance Survey

Figures



Legend

- Permanent Highway Land within Fenceline (including Water Treatment Areas)
- Other Permanent Land Take
- Temporary Construction Land
- Easement Only
- Proposed Water Treatment Area (WTA)
- Potential Area of Land Contamination based on 2014 PSSR
- Other Potential Area of Land Contamination
- Solutia PCB Cell
- Redundant Benzene Pipeline
- Permit Boundary

Investigation Locations

2015-2016 (RPS)
- Borehole
- Window Sample
- Hand Dug Pit

2015 (Geotechnical Engineering)
- Borehole

2008 (WSP)
- Borehole
- Trial Pit

2007 (Norwest Holst)
- Borehole
- Trial Pit

2000 (Exploration Associates)
- Trial Pit
- Window Sample

1997 (Norwest Holst)
- Borehole
- Monitoring Well Installation

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Welsh Government

Appendix R11.1 Annex D CL-17

Site Plan for CL-17

Figure: 1	Revision: 1
Date: September 2016	Status: At Issue
Drawn: RJJ	Checked: FB

Scale: A3 @ 1:5,000
0 80 160m

N

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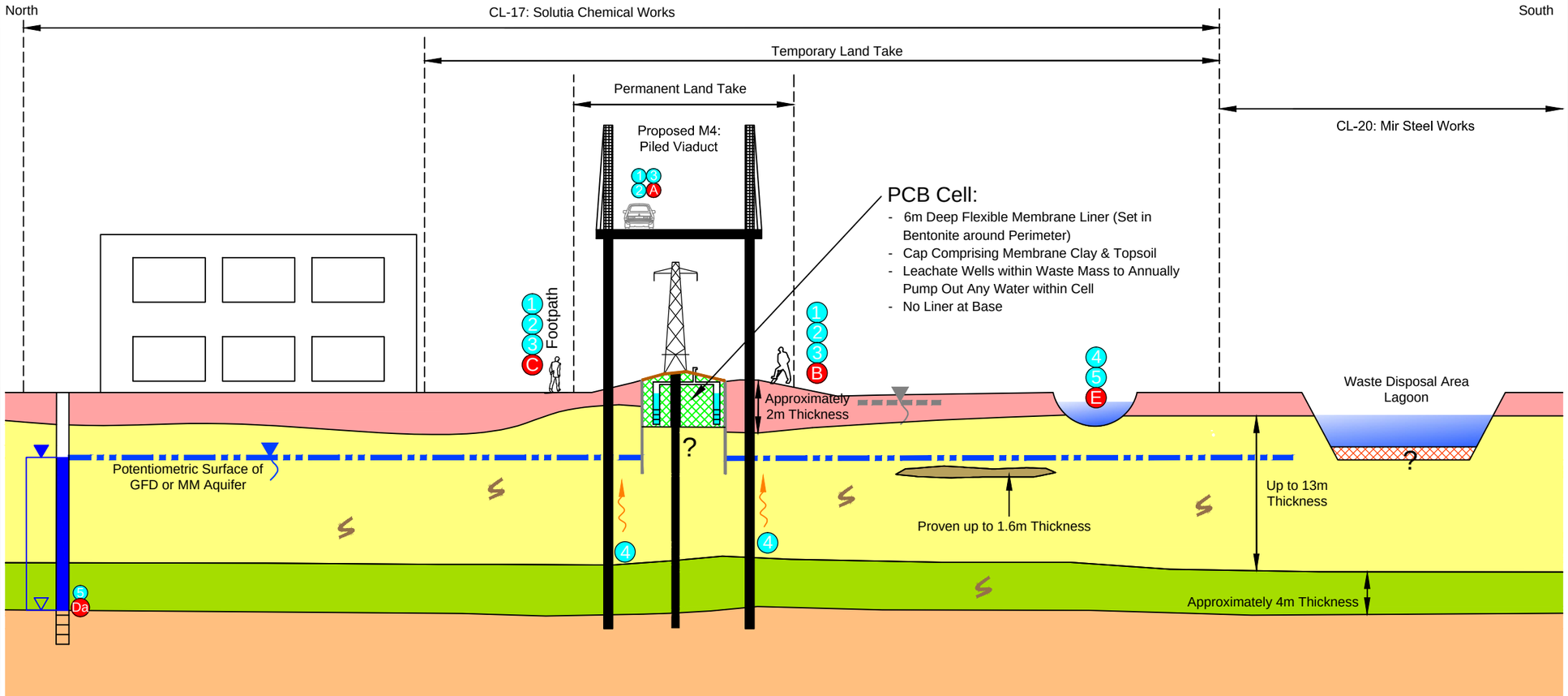
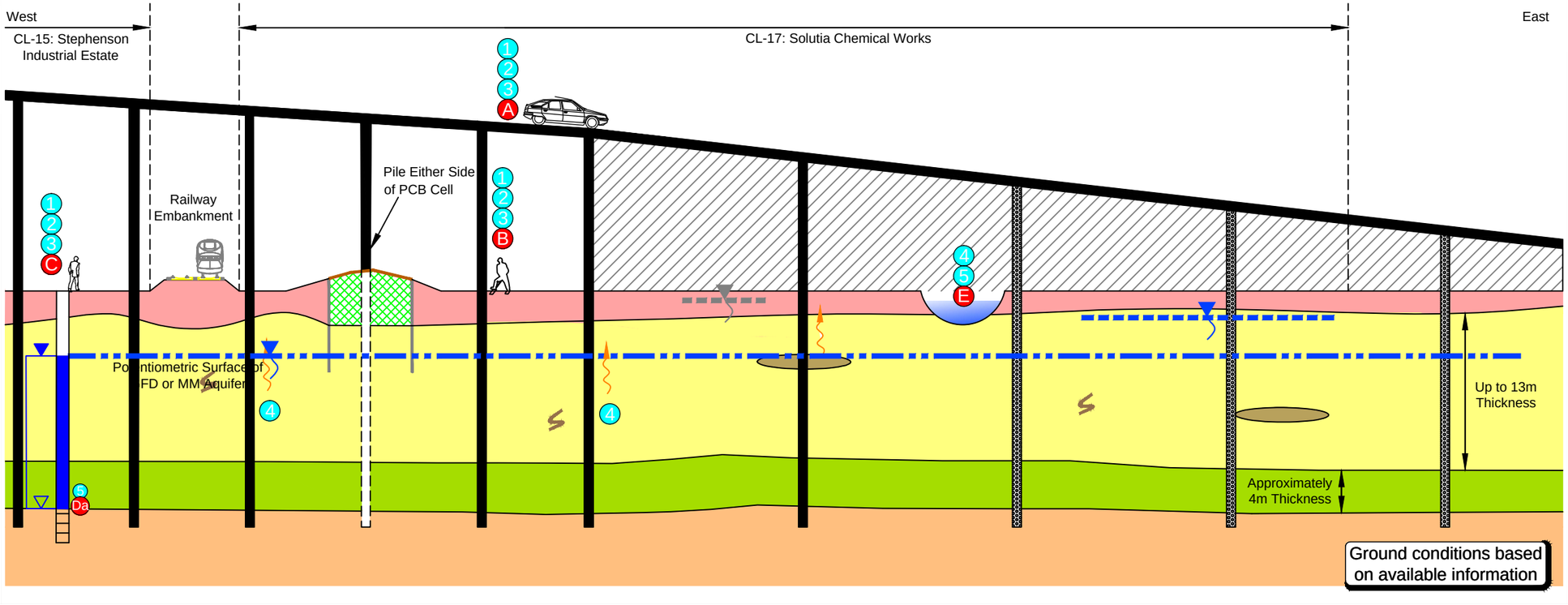
CL-17 Solutia Chemical Works





Legend

- Made Ground - MG (including PCB Contamination)
- PCB Cell
- Potentially Contaminated Sediments within Lagoon
- Tidal Flat Deposits - TFD
- Peat
- Glaciofluvial Deposits - GFD
- Organic Inclusions within TFD & GFD
- Mercia Mudstone - MM
- Proposed Embankment
- Proposed Piled Pier
- Proposed Band Drain
- No Information Available
- Perched Water (MG)
- Perched Water (TFD)
- Groundwater (GFD and MM)
- Water Strike
- Rest Water Level
- Gas Migration Pathway

Potential Receptors

- A Humans On-Site (M4 User)
- B Humans On-Site (Construction/Maintenance)
- C Humans Off-Site (Site Neighbours)
- Da Groundwater (Aquifer)
- E Surface Water

Potential Pathways

- 1 Dermal Contact
- 2 Inhalation
- 3 Ingestion
- 4 Leaching / Migration
- 5 Surface Run Off

Potential Sources of Contamination

Possible contamination present on site associated with :

On-Site

- PCB Cell
- Previous industrial uses including; timber yards, coal sidings, fuel works, railway land
- Elevated concentrations of PCB's identified across the site
- Strong acid and hydrocarbon odours noted in the shallow made ground

Off-Site

- CL-15: Stephenson Industrial Estate
- CL-20: Mir Steelworks

NOTE
Drawing refined from PSSR Drawing Reference
M4-OA-17-00DR-Z-XX-0120 (January 2014)

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Appendix R11.1 Annex D CL-17

Conceptual Site Model for CL-17

Figure: 2	Revision: 1
Date: September 2016	Status: At Issue
Drawn: RJJ	Checked: FB

Not to Scale

dwg ref:JER6591_Figure2_CL17ConceptualSiteModel

dwg ref: JER6591_Figure2_CL17ConceptualSiteModel

CL-19
Reevesland
Industrial Estate

Great Spytty Reen

CL-21
Nash Mead
Unauthorised Waste
Management Activity

Lakes Reen

CL-22
Former Llanwern
Research Laboratories

CL-15
Stephenson Street
Industrial Estate

CL-20 Mir Steel Works and associated Waste Disposal Site

CL-20
Mir Steel Works &
Waste Disposal Site

CL-15
Stephenson Street
Industrial Estate

Legend

- Permanent Highway Land within Fenceline (including Water Treatment Areas)
- Other Permanent Land Take
- Temporary Construction Land
- Easement Only
- Proposed Water Treatment Area (WTA)
- Potential Area of Land Contamination based on 2014 PSSR
- Other Potential Area of Land Contamination
- Solutia PCB Cell
- Solutia PCB Cell (Original Defined Extent)
- Redundant Benzene Pipeline
- Chemical Works - Permit EPR/BR9715IB
- Historical Solutia Landfill (Inert and Industrial Waste)
- Historical Landfill - Sloblands (Industrial Waste)
- Historical Landfill - Phase III Monsanto (Inert Waste)
- Disposal Area
- Historical Disposal Area
- Historical Filled Ground

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Appendix R11.1 Annex D CL-17

Overview Site Plan for CL-17 with Permit Boundaries

Figure: 3	Revision: 1
Date: September 2016	Status: At Issue
Drawn: RJJ	Checked: FB

Scale: A3 @ 1:5,000
0 80 160m

N

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dwg ref: JER6591_Figure3_CL17Overview Contains Ordnance Survey data © Crown copyright and database right 2015

Legend

- Permanent Highway Land within Fenceline (including Water Treatment Areas)
- Other Permanent Land Take
- Temporary Construction Land
- Easement Only
- Proposed Water Treatment Area (WTA)
- Potential Area of Land Contamination based on 2014 PSSR
- Other Potential Area of Land Contamination
- Redundant Benzene Pipeline

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Appendix 11.1 Annex D CL-17

Redundant Benzene Pipeline Location

Figure: 4	Revision: -
Date: July 2016	Status: At Issue
Drawn: RJJ	Checked: FB

Scale: A3 @ 1:4,000

0 100 200 m

N

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Great Spytty Reen

CL-21
Nash Mead
Unauthorised Waste
Management Activity

CL-22
Llanwern Research
Laboratories/Accomodation
Camp

CL-17
Solutia
Chemical Works

CL-20
Mir Steel Works &
Waste Disposal Site

CL-23
Pye Corner Millitary
Base & Gun Battery

Lakes Reen

Julians Reen

1600.000
1700.000
1800.000
1900.000
2000.000
2100.000
2200.000
2300.000
2400.000
2500.000
2600.000
2700.000
2800.000

Appendices

Appendix 1

Exploratory Records

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHG5** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	333430.1 E
Project	M4 Relief Road Magor to Castleton Stage 2				185316.9 N
		Drilling Rig	Pilcon	Ground Level	7.40m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	16/11/1997
Consultant	Ove Arup and Partners			Date Completed	17/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
16/11/1997	1800	8.00	7.70	Dry	
17/11/1997	0800	8.00	7.70	Dry	
17/11/1997	1800	17.47	17.00	6.30	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
14.00	14.20	0.75	
16.95	17.40	2.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	17.47	150	17.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
17/11/1997	0000	12.80	9.70	20.0	fast	12.70	0.00

GENERAL NOTES

1. Rotary follow on cancelled, borehole grouted to ground level on completion.

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=6 (2,1,2,2,1,1)
4.00	S	N=3 (1,0,0,1,1,1)
6.00	S	1/450mm
8.00	S	N=1 (0,0,0,1,0,0)
11.00	S	N=6 (1,2,1,1,2,2)
12.70	C	N=19 (3,4,4,4,5,6)
14.20	C	N=35 (4,5,8,8,9,10)
15.50	C	N=32 (6,6,7,6,8,11)
17.20	C	50/30mm (25,50)
17.40	S	55/20mm (25,55)

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHG5** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	333430.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185316.9 N
		Driller	I.M	Ground Level	7.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	16/11/1997
Consultant	Ove Arup and Partners			Date Completed	17/11/1997

Description of Strata	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
TOPSOIL	0.20	7.20	D 0.40 B 0.50 - 1.00			
Soft becoming brown mottled greyish brown occasional thinly laminated CLAY. (Estuarine Alluvium) ---from 0.20 to 1.45m with occasional rootlets			U 1.00 - 1.45 D 1.45 D 1.70 D 2.00 B 2.45 - 2.70	(8) S6	S 2.00 - 2.45	
	2.85	4.55	D 2.85 U 3.00 - 3.45	(6)		
Very soft to soft grey occasionally mottled dark grey CLAY. (Estuarine Alluvium)			D 3.45 D 3.80 D 4.00 B 4.45 - 5.00	S3	S 4.00 - 4.45	
	5.00	2.40	D 5.10 U 5.20 - 5.65	(1)		
Very soft dark grey CLAY. (Estuarine Alluvium) ---from 7.45m very silty			D 5.65 D 5.80 D 6.00 B 6.45 - 7.00 U 7.00 - 7.45 D 7.45 D 7.70 D 8.00 B 8.45 - 9.00	S1/450mm (1) S1	S 6.00 - 6.45 S 8.00 - 8.45	
	9.00	-1.60				
Very soft becoming soft firm dark grey occasionally organic very silty CLAY. (Estuarine Alluvium)			U 9.50 - 9.95 W 9.70 D 9.95	(4)		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHG5** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	333430.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185316.9 N
		Driller	I.M	Ground Level	7.40m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	16/11/1997
Consultant	Ove Arup and Partners			Date Completed	17/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Very soft becoming soft firm dark grey occasionally organic very silty CLAY. (Estuarine Alluvium)				D 10.50			
				D 11.00	S6	S 11.00	
---from 11.00m with occasional to some gravel size pockets of blackish brown firm fibrous peat				B 11.45 - 12.00		11.45	
				D 12.10			
				U 12.30 - 12.55	NR		
		12.55	-5.15				
Medium dense greyish brown silty sandy sub-rounded and occasionally sub-angular siliceous GRAVEL with some cobbles. (Fluvial Alluvium)				D 12.70	C19	C 12.70	
				B 13.15 - 14.00		13.15	
---from 14.20m dense				D 14.20	C35	C 14.20	
				B 14.65 - 15.10		14.65	
				D 15.50	C32	C 15.50	
						15.95	
		16.95	-9.55				
Greyish green slightly to moderately weathered sandy MUDSTONE, moderately strong. (Mercia Mudstone Group)				D 17.10			
				D 17.20	C50/30mm	C 17.20	
		17.47	-10.07	D 17.40	S55/20mm	S 17.40 17.31	
						17.47	
Cable Percussion boring complete at 17.47 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG6** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333509.1 E 185250.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	7.00m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Saw Tooth		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
14/11/1997	1800	8.00	7.70	Dry	
15/11/1997	0800	8.00	7.70	6.60	
15/11/1997	1800	18.00	17.55	5.40	
16/11/1997	0800	18.00	17.55	4.80	
16/11/1997	1800	18.00	17.85	4.25	
17/11/1997	1800	20.25	18.06	15.60	
18/11/1997	0800	20.25	18.06	Dry	
18/11/1997	1800	31.15	18.06	4.40	
19/11/1997	0800	30.15	18.06	4.00	
19/11/1997	1800	40.00	18.06	0.00	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
16.10	16.35	1.00	
16.60	16.70	0.50	
17.55	17.85	1.00	
17.85	18.00	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	18.06	150	17.85

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
18.06	40.00	foam	100%	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
2.00	S	N=4 (1,0,0,1,1,2)
4.00	S	N=1 (1,0,0,1,0,0)
6.00	S	N=1 (1,0,1,0,0,0)
8.00	S	N=1 (1,0,1,0,0,0)
12.50	C	N=19 (2,4,3,4,5,7)
14.00	C	N=36 (2,3,3,8,9,16)
15.45	C	N=38 (5,7,8,10,10,10)
17.10	S	N=43 (4,6,7,7,14,15)
17.95	S	75/105mm*
20.25	C	50/70mm (25/60,50/70)
21.25	C	50/75mm (25/135,50/75)
22.25	C	50/50mm (25/120,50/50)
23.25	C	50/75mm (25/110,50/75)
24.25	C	50/60mm (25/90,50/60)
25.25	C	50/50mm (25/80,50/50)
27.75	C	50/50mm (25/75,50/50)

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG6** Sheet 1 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333509.1 E 185250.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	7.00 m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	19/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI100	SPT N & depth	Install-ation
MADE GROUND: Dark grey sandy gravelly brick and concrete fill.				D 0.30			
		0.60	6.40	D 0.60 B 0.70 - 0.90			
Firm becoming very soft to soft dark brown slightly sandy CLAY. (Estuarine Alluvium)				D 0.95 U 1.00 - 1.45	(17)		
---at 0.95m becoming mottled grey sandy with occasional thin laminations of bluish grey silt				D 1.45			
				D 1.70			
---at 1.70m becoming slightly sandy				D 2.00		S4 2.00 2.45	
				B 2.45 - 2.70			
				D 2.80			
---from 2.80 to 4.00m slightly sandy				U 3.00 - 3.45	(7)		
				D 3.45			
				D 3.80			
				D 4.00		S1 4.00 4.45	
				B 4.45 - 5.00			
				U 5.00 - 5.45			
				D 5.45			
				D 5.85			
				D 6.00		S1 6.00 6.45	
---at 6.00m becoming slightly organic				B 6.45 - 7.00 W 6.60			
				U 7.00 - 7.45	(2)		
				D 7.45			
				D 7.70			
				D 8.00		S1 8.00 8.45	
---at 8.00m becoming pale grey				B 8.60 - 8.90			
		9.60	-2.60	U 9.50 - 9.95	(3)		
CLAY - SD As Sheet 2				D 9.95			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG6** Sheet 2 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333509.1 E 185250.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	7.00 m AOD
Client	Welsh Office	Drillers	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	19/11/1997
		Core Bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Very soft grey mottled black very sandy CLAY. (Estuarine Alluvium)	10.40	-3.40	D 10.20 D 10.60			
Very soft to soft dark grey mottled black slightly sandy CLAY with occasionally medium to coarse gravel sized pockets of black fibrous peat. (Estuarine Alluvium)			U 11.50 - 11.95 D 11.95			
Medium dense becoming dense brownish grey sandy sub-rounded to sub-angular GRAVEL with some cobbles. (Fluvial Alluvium)	12.45	-5.45	D 12.50 B 13.00 - 13.50		C19 12.50 12.95	
---at 14.00m becoming dense very sandy			D 14.00 B 14.50 - 15.00 D 15.40 B 16.35 - 16.60		C36 14.00 14.45 C38 15.45 15.90	
Reddish brown mottled greyish green highly to completely weathered sandy MUDSTONE, weak to weak. (Mercia Mudstone Group)	16.90	-9.90	D 17.00 D 17.10		S43 17.10 17.55	
---at 17.10m becoming highly weathered moderately weak	17.55	-10.55	D 17.85 D 18.00		S75/105mm*17.95 18.06	
Reddish brown mottled greyish green moderately weathered sandy MUDSTONE (marl), moderately weak to moderately strong. (Mercia Mudstone Group)	18.06	-11.06	18.06 - 19.10	TCR 96 SCR 56 RQD 0 FI 5 NI 3 NI		
MUDSTONE As Sheet 3			19.10 - 20.25	30 17 9 NI 0 NA		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG6** Sheet 3 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333509.1 E 185250.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	7.00 m AOD
Client	Welsh Office	Driller	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Saw Tooth		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Greyish green occasionally mottled reddish brown thinly to medium sub-horizontally bedded highly to completely weathered MUDSTONE, very weak to weak with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)	20.25	-13.25						C50/70mm 20.25 20.38	
			20.25 - 21.25	25	0	0	NI NA		
Reddish brown occasionally mottled greyish green very thinly to thinly sub-horizontally bedded moderately to highly weathered MUDSTONE, moderately strong completely fractured. (Mercia Mudstone Group) ---from 20.50 to 21.25m no recovery	21.50	-14.50						C50/75mm 21.25 21.46	
			21.25 - 22.25	65	30	0	NI NI 3 NA		
Purplish brown mottled greyish green thinly to medium sub-horizontally bedded highly weathered sandy MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group) ---from 21.50 to 21.75m completely fractured ---from 21.90 to 22.25m no recovery ---from 22.25 to 22.30m greyish green calcareous slightly weathered strong ---from 22.25 to 22.45m completely fractured ---from 22.45 to 23.25m no recovery	22.55	-15.55						C50/50mm 22.25 22.42	
			22.25 - 23.25	20	0	0	NI NA		
			23.25 - 24.24	35	20	0	NI 5 NA	C50/75mm 23.25 23.44	
			24.24 - 25.25	60	25	0	NI 6 NA	C50/60mm 24.25 24.40	
			25.25 - 26.25	100	75	40	NI 8	C50/50mm 25.25 25.38	
Reddish brown mottled greyish green medium to thinly sub-horizontally to inclined bedding moderately to highly weathered MUDSTONE, very weak to weak locally moderately strong with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group) ---from 23.25 to 23.40m completely fractured ---from 23.40m moderately weathered ---from 23.60 to 24.25m no recovery ---from 24.25 to 24.60m completely fractured ---from 24.85 to 25.25m no recovery ---from 25.25 to 25.45m completely fractured ---from 27.35 to 27.75m no recovery			26.25 - 27.75	73	67	28	14 NA	C50/50mm 27.75 27.88	
			27.75 - 28.75	95	70	0	18		
			28.75 - 30.15	93	50	34	NI 4		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG6** Sheet 4 of 4

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	333509.1 E 185250.1 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/Hands England	Ground Level	7.00 m AOD
Client	Welsh Office	Driller	I.M/D.D	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	14/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Saw Tooth		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown mottled greyish green medium to thinly sub-horizontally to inclined bedding moderately to highly weathered MUDSTONE, very weak to weak locally moderately strong with closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)		30.15	-23.15	30.15 - 30.75	97	92	53	5		
Reddish brown occasionally mottled green thinly to medium sub-horizontally bedded moderately weathered silty MUDSTONE, very weak to moderately weak to moderately strong with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)				30.75 - 32.25	99	79	29	5 NI 9		
---from 30.15 to 31.15m slightly to moderately weathered										
---from 31.20 to 31.32m highly weathered very weak completely fractured				32.25 - 33.80	100	66	16	5 NI 6		
---from 32.95 to 33.10m highly weathered weak completely fractured										
---from 34.00 to 34.20m highly weathered weak completely fractured								3 NI		
from 34.20m medium bedded with medium to widely spaced sub-horizontal to inclined fractures planar rough tight				33.80 - 35.35	100	75	40	8		
Reddish brown medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)		35.35	-28.35	35.35 - 35.80	100	0	0	NI		
				35.80 - 36.90	100	42	15	NI		
Reddish brown thinly to medium sub-horizontally bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with closely to medium spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)		36.55	-29.55					4		
---from 37.35 to 37.90m moderately to highly weathered weak				36.90 - 38.40	97	50	21	1 3 NI		
---from 37.90 to 38.95m very weak completely fractured				38.40 - 39.50	91	55	18	NI 6 NI		
---from 39.40 to 39.80m very weak completely fractured				39.50 - 40.00	96	52	22	NI 7		
Borehole complete at 40.00 m.		40.00	-33.00							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH1** Header

Contract No.	F10895	Method	Cable Percussion	Coordinates	333676.1 E
Project	M4 Relief Road Magor to Castleton Stage 2				185237.1 N
		Drilling Rig	Pilcon	Ground Level	7.70m AOD
Client	Welsh Office	Driller	I.M	Orientation	Vertical
		Logged by	C.D	Date Started	13/11/1997
Consultant	Ove Arup and Partners			Date Completed	14/11/1997

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
13/11/1997	1800	15.00	15.00	8.50	
14/11/1997	0800	15.00	15.00	6.30	
14/11/1997	1800	18.20	17.85	7.90	

DRILLING DETAILS

Hardbore from depth	Hardbore to depth	Chiselling hours	Remarks
0.55	0.90	1.00	
16.20	16.40	0.50	
17.85	18.10	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	18.20	150	17.82

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
13/11/1997	0000	1.40	1.00	20.0	slow	0.00	4.50
13/11/1997	0000	13.45	8.75	20.0	fast	13.30	0.00

GENERAL NOTES

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.00	S	N=30 (2,16,19,4,3,4)
2.00	S	N=14 (3,4,6,3,2,3)
4.00	S	N=2 (2,1,1,0,0,1)
6.00	S	N=1 (0,0,0,1,0,0)
8.50	S	N=1 (0,0,1,0,0,0)
11.50	S	N=1 (0,0,0,0,0,1)
13.70	C	N=37 (4,7,9,9,10,9)
15.00	C	N=38 (4,7,8,8,10,12)
16.50	C	N=40 (3,5,8,10,11,11)
17.20	S	N=30 (4,5,6,7,8,9)
18.10	S	25/50mm, 50/50mm

* Seating blows only.

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, chiselling time in hours.

Form	CP HEADER
Version	2.00
Revised	25/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH1** Sheet 1 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	333676.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185237.1 N
		Driller	I.M	Ground Level	7.70m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	13/11/1997
Consultant	Ove Arup and Partners			Date Completed	14/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
MADE GROUND: Brownish grey sandy clay with some sub-angular gravel size fragments of brick, concrete and rubble, with occasional fragments of wood, strong hydrocarbon odour.				D 0.20 B 0.30 - 0.55			
---at 0.90m moderate petroleum odour				D 0.90 D 1.00 W 1.00	S30	S 1.00 1.45	
				B 1.45 - 1.70			
				D 1.85 D 2.00	S14	S 2.00 2.45	
		2.15	5.55				
Firm brown mottled grey thinly laminated CLAY. (Estuarine Alluvium)				B 2.45 - 3.00			
				U 3.00 - 3.45	(7)		
		3.30	4.40				
Very soft to soft grey organic CLAY. (Estuarine Alluvium)				D 3.45			
---from 3.45 to 4.00m with occasional vegetation				D 3.80 D 4.00	S1	S 4.00 4.45	
---from 4.00m becomes dark grey				B 4.45 - 5.00			
				B 5.00 - 6.00 U 5.00	NR		
				U 5.50	NR		
				D 6.00	S1	S 6.00 6.53	
		6.70	1.00	D 6.70			
Blackish brown firm fibrous PEAT with occasionally thin and thick laminations of very soft grey silty organic clay. (Peat)				U 6.90 - 7.35	(4)		
				D 7.35			
				D 8.00			
		8.35	-0.65	D 8.35			
Very soft grey very silty sandy CLAY. (Estuarine Alluvium)				D 8.50	S1	S 8.50 8.95	
---from 9.00m with occasional gravel size pockets of blackish brown firm fibrous peat				W 8.90 - 9.50 B 8.95			
				U 10.00 - 10.45	(2)		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE PERCUSSION

Borehole No. **BHH1** Sheet 2 of 2

Contract No.	F10895	Method	Cable Percussion	Coordinates	333676.1 E
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon		185237.1 N
		Driller	I.M	Ground Level	7.70m AOD
Client	Welsh Office	Logged by	C.D	Orientation	Vertical
				Date Started	13/11/1997
Consultant	Ove Arup and Partners			Date Completed	14/11/1997

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling	SPT N & (U blows)	SPT type & depth	Install-ation
Very soft grey very silty sandy CLAY. (Estuarine Alluvium)				U 10.00 - 10.45	(2)		
				D 10.45			
				D 11.00			
				D 11.50	S1	S 11.50 - 11.95	
				B 12.00 - 12.50			
		12.85	-5.15	D 12.85			
Firm reddish brown occasionally mottled greyish brown sandy CLAY with occasional sub-angular and sub-rounded sandstone and mudstone gravel. (Estuarine Alluvium)				U 13.00 - 13.43	(20)		
		13.45	-5.75				
---from 13.00m stiff to very stiff				D 13.70 - 14.15	C37	C 13.70 - 14.15	
Dense reddish brown clayey sandy sub-rounded siliceous GRAVEL, with many cobbles. (Fluvial Alluvium)				B 14.15 - 14.75			
				D 15.00	C38	C 15.00 - 15.45	
				B 15.45 - 16.00			
				B 16.50 - 17.05	C40	C 16.50 - 16.95	
				D 16.50			
		17.05	-9.35	D 17.05			
Reddish brown mottled greyish green highly weathered sandy MUDSTONE , weak to moderately weak. (Mercia Mudstone Group)				D 17.20	S30	S 17.20 - 17.65	
		17.85	-10.15				
Reddish brown moderately weathered sandy MUDSTONE, moderately weak. (Mercia Mudstone Group)		18.00	-10.30	D 18.10	S25/50mm, 50/50mm	S 18.10 - 18.23	
Cable Percussion boring complete at 18.20 m.							

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH CP LOG
Version	2.00
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Sampling

Depth	Type	Casing Depth	Date/ Water	SPT N (Cu)
			08/02 0000	
0.20-0.50	TO		DRY	
0.50-1.00	B			
1.50-2.00	TO			
2.00-2.50	B			
2.50-3.00	TO			
3.00		NIL	DRY	

Strata

Description	Depth (Thickness)	Level
MADE GROUND: Stiff brown mottled grey very silty organic clay with a little sub-rounded fine to coarse gravel of brick and slag and with much root material	G.L.	8.28
	(1.20)	
Firm to stiff blue grey mottled brown very silty organic CLAY with some root material	1.20	7.08
	(1.30)	
Firm to stiff brown mottled grey very silty organic CLAY with much root material	2.50	5.78
	(0.50)	
End of Borehole.	3.00	5.28

Legend

Equipment: Hand Held Window Sampler

Borehole Dia (mm) Casing Dia (mm)
80 to 1.00m
60 to 3.00m

Groundwater
No. Struck Behaviour Sealed

No groundwater encountered

Ground Level 8.28 m OD
Coordinates 333473.63 mE
185296.04 mN

Drilled by DC
Logged by DC
Checked by AF

Remarks CH33 Changed from trial pit to window sample due to unsuitable access for JCB.

See key sheet and appendices for explanations.

Form 1/0

Borehole Record

Exploration Associates

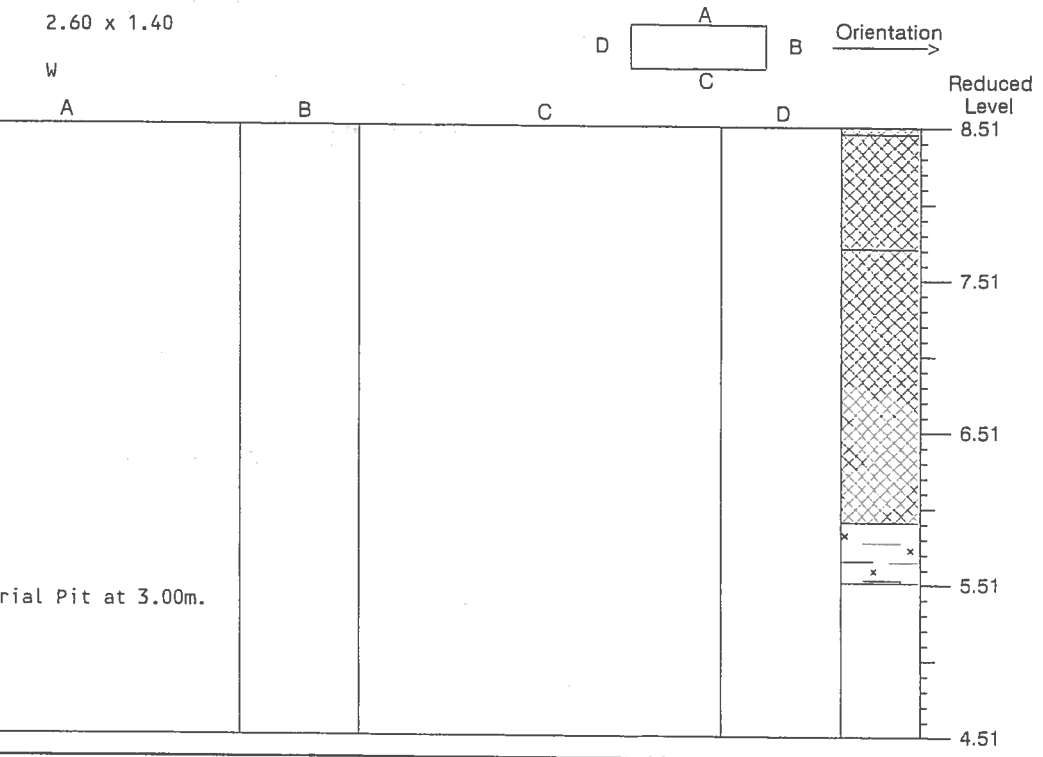
Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Borehole CH33(1 of 1)

Dimensions : 2.60 x 1.40

Orientation : W



Strata

Depth (m)	No.	Description
0.00-0.05	1	MADE GROUND: Loose brown sandy angular to sub-angular fine to coarse gravel of limestone (hardcore).
0.05-0.80	2	MADE GROUND: Firm brown mottled grey very silty clay with occasional sub-angular to sub-rounded fine to coarse gravel of siltstone with much root material.
0.80-2.60	3	MADE GROUND: Firm to stiff grey mottled brown very silty clay with occasional to some root material. ....at 1.00m a little sub-angular fine to coarse gravel of slag ....at 2.00m some pockets of brown fibrous peat ....at 2.40m much root material
2.60-3.00	4	Firm to stiff brown mottled blue grey very silty CLAY with some root material

Samples and Tests

Depth (m)	Type	Results
0.15-0.50	BTO	
1.40-1.60	BTO	
2.60-2.70	BTO	

Date of Excavation 01/02/00
Equipment JCB 3CX
Stability Stable

Groundwater
No. Struck Behaviour
Not encountered during excavation

Ground Level 8.51 m OD
Coordinates 333500.60 mE
185283.99 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

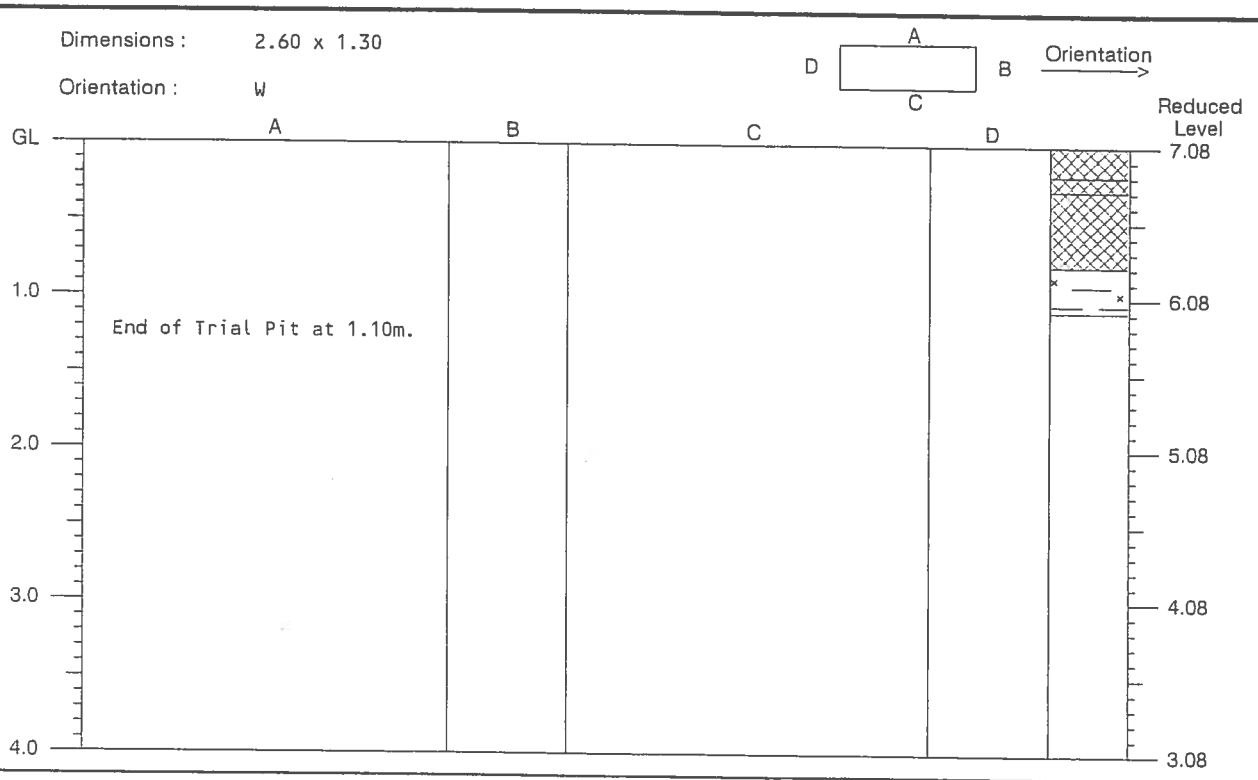
Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Trial Pit CH34

Dimensions : 2.60 x 1.30

Orientation : W



Strata

Depth (m)	No.	Description
0.00-0.20	1	MADE GROUND: Moderately compact grey and brown slightly silty sand sub-angular to sub-rounded fine to coarse gravel and cobbles of slag, ash, concrete, brick, limestone (strong acidic odour).
0.20-0.30	2	MADE GROUND: Moderately compact brown sandy angular to sub-angular fine to coarse gravel of limestone (sub-base).
0.30-0.80	3	MADE GROUND: Moderately compact grey sandy very silty very clayey sub-angular fine to coarse gravel and cobbles of concrete, slag, ash, limestone and siltstone with some boulders (<440mm) of slag and concrete and some metal piping (5%).
0.80-1.10	4	Stiff blue grey mottled brown very silty organic CLAY with much root material.

Samples and Tests

Depth (m)	Type	Results
0.00-0.20	BTO	
0.20-0.30	BTO	
0.50-0.70	BTO	
0.80	W	
0.80-1.10	BTO	

Date of Excavation 01/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No.	Struck	Behaviour
1	0.80	medium inflow

Ground Level 7.08 m OD
Coordinates 333540.67 mE
185256.56 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project

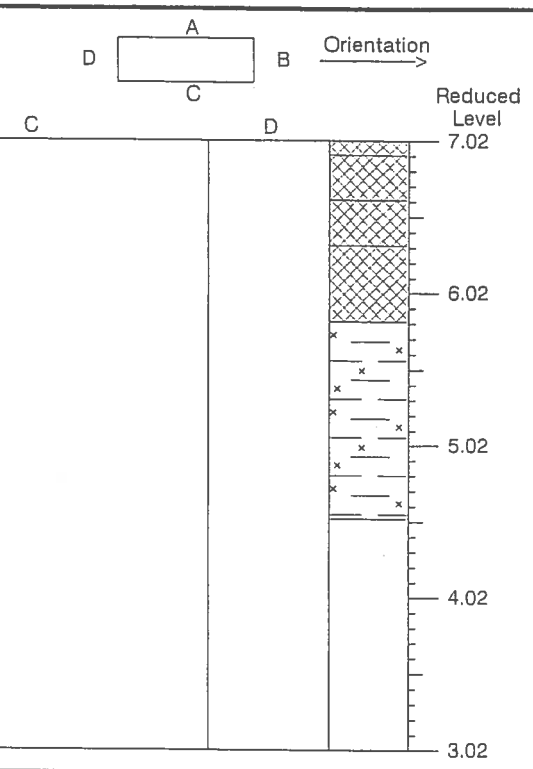
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Trial Pit CH35

Dimensions : 1.00 x 1.80

Orientation : S



Strata

Depth (m)	No.	Description
0.00-0.10	1	MADE GROUND: Loose dark grey sandy slightly silty angular to sub-angular fine to coarse gravel of limestone and sandstone.
0.10-0.40	2	MADE GROUND: Loose brown sandy angular to sub-angular fine to coarse gravel and cobbles of limestone (sub-base).
0.40-0.70	3	Firm grey very silty organic CLAY.
0.70-1.20	4	Firm to stiff grey and brown very silty organic CLAY with much root material.
1.20-2.50	5	Firm brown mottled grey very silty CLAY with some root material. ....from 1.90m becoming soft to firm

Samples and Tests

Depth (m)	Type	Results
0.00-0.10	BTO	
0.10-0.40	BTO	
0.70-1.00	BTO	
1.50-1.70	BTO	

Date of Excavation 01/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No.	Struck	Behaviour
		Not encountered during excavation

Ground Level 7.02 m OD
Coordinates 333550.07 mE
185225.06 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

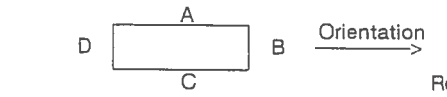
Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

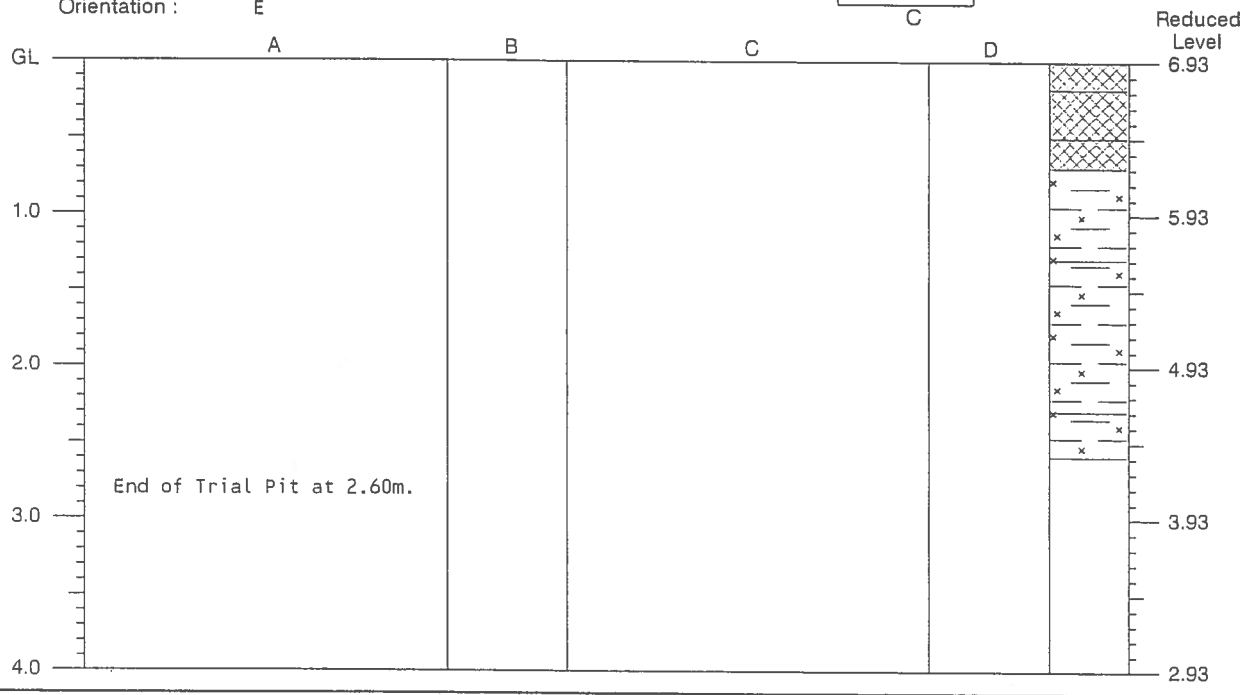
Contract 150006

Trial Pit CH36

Dimensions : 1.00 x 2.00

Orientation : E





Strata

Depth (m)	No.	Description
0.00-0.18	1	MADE GROUND: Loose dark grey sandy angular to sub-angular fine to coarse gravel of limestone (hardcore).
0.18-0.50	2	MADE GROUND: Brown and grey slightly silty slightly clayey angular to sub-angular cobbles and boulders (<880mm) of brick and concrete with some refuse of plastic (1%).
0.50-0.70	3	MADE GROUND: Firm blue grey very silty clay with many sub-angular fine to coarse gravel and cobbles of brick and much root material and refuse of plastic (1%).
0.70-1.30	4	Firm to stiff blue grey mottled brown very silty organic CLAY.
1.30-2.30	5	Firm stiff brown mottled blue grey very silty CLAY with much root material.
2.30-2.60	6	Soft to firm blue grey very silty CLAY with occasional root material.

Samples and Tests

Depth (m)	Type	Results
0.00-0.18	BTO	
1.20-1.30	BTO	
1.50-2.00	BTO	
2.30-2.60	BTO	

Date of Excavation 01/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No.	Struck	Behaviour
1	2.00	slight seepage

Ground Level 6.93 m OD
Coordinates 333588.39 mE
185235.73 mN

Logged by DC
Checked by Af

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project

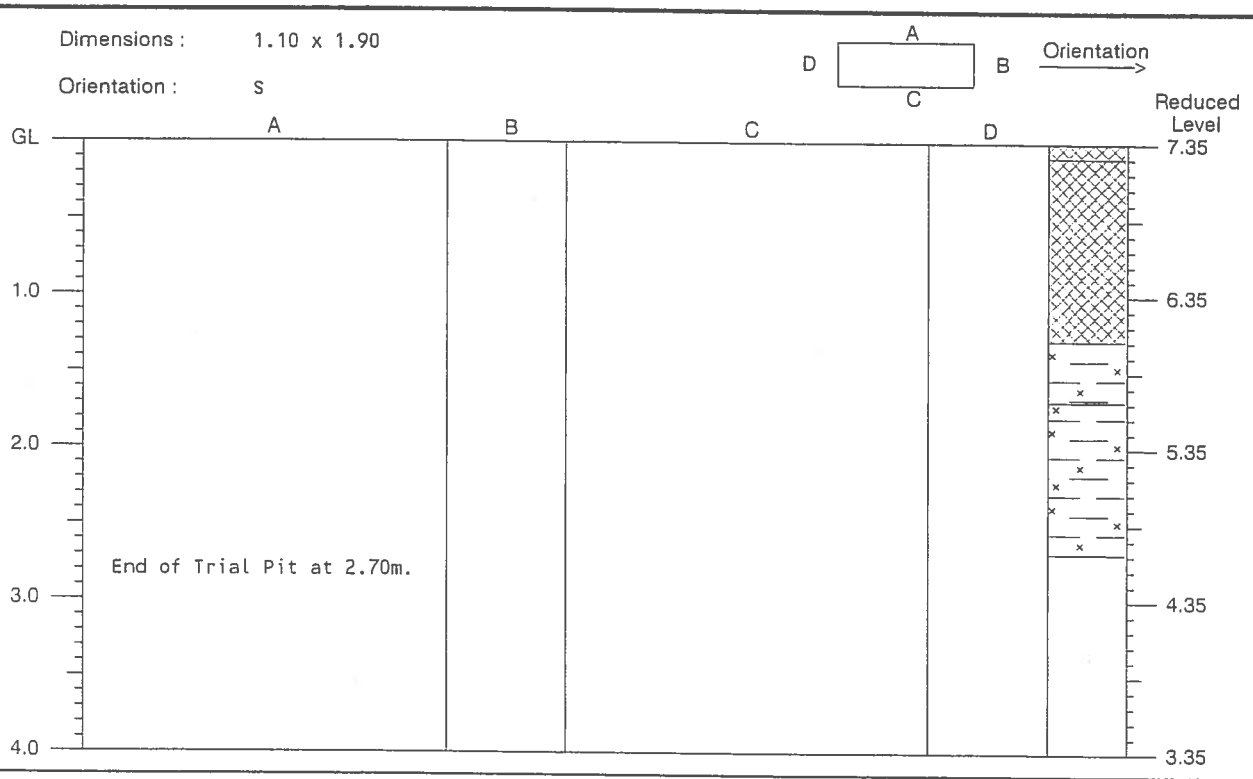
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Trial Pit CH37

Dimensions : 1.10 x 1.90

Orientation : S



Strata

Depth (m)	No.	Description
0.00-0.10	1	MADE GROUND: Loose dark grey sandy angular to sub-angular fine to coarse gravel of limestone and siltstone (hardcore).
0.10-1.30	2	MADE GROUND: Brown sandy sub-angular cobbles and boulders (>900mm) of concrete and brick with much refuse of wood (5%), metal (5%) and plastic (1%).
1.30-1.70	3	Firm to stiff blue grey mottled brown very silty CLAY with much root material.
1.70-2.70	4	Soft to firm brown mottled blue grey very silty CLAY with much root material.

Samples and Tests

Depth (m)	Type	Results
0.10-0.80	BTO	
1.30-1.70	BTO	
2.50-2.70	BTO	

Date of Excavation 01/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No.	Struck	Behaviour
		Not encountered during excavation

Ground Level 7.35 m OD
Coordinates 333599.73 mE
185219.05 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project

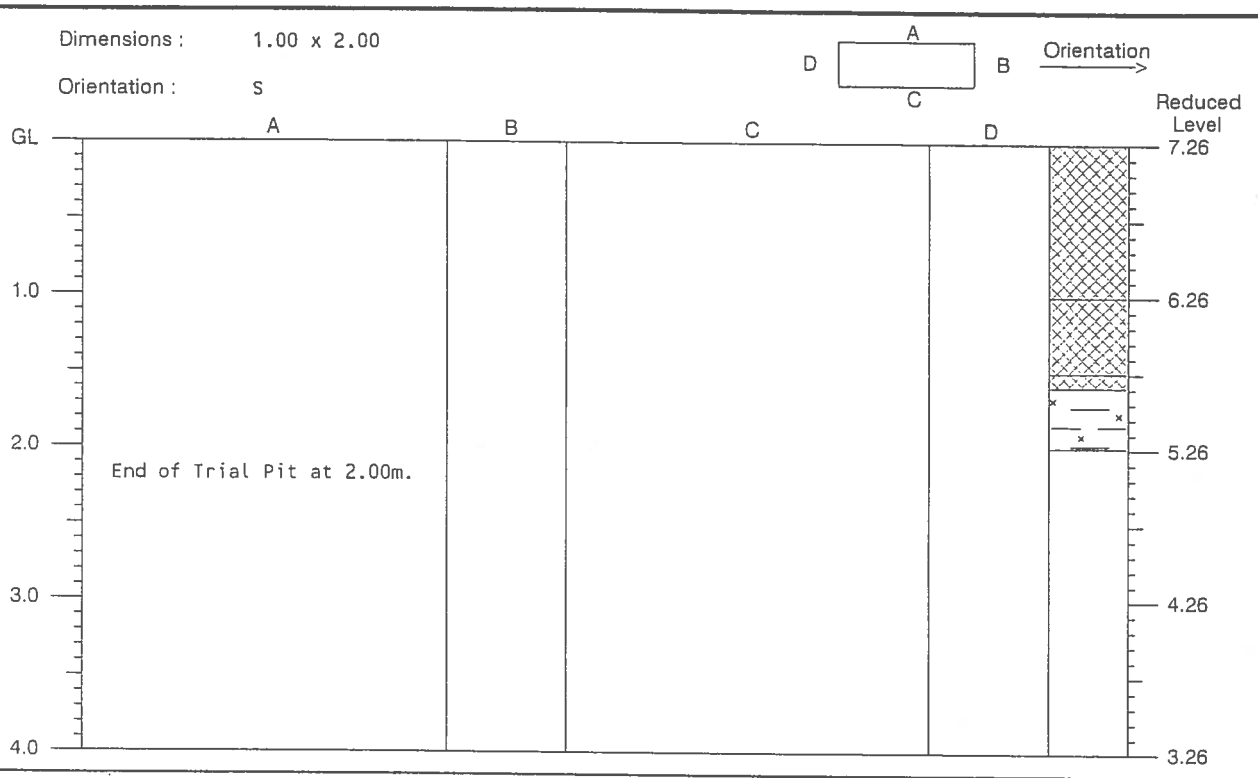
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Trial Pit CH38

Dimensions : 1.00 x 2.00

Orientation : S



Strata

Depth (m)	No.	Description
0.00-1.00	1	MADE GROUND: Soft to firm brown very silty sandy clay with much sub-rounded to sub-angular fine to coarse gravel and cobbles of concrete, brick, sandstone and boulders (<560mm) of concrete and occasional refuse of plastic (1%).
1.00-1.50	2	MADE GROUND: Moderately compact brown sandy very silty clayey sub-angular to sub-rounded fine to coarse gravel and cobbles of concrete, brick, slate, sandstone and slag with some boulders (<500mm) of concrete and refuse of wood (5%) and metal (5%).
1.50-1.60	3	MADE GROUND: Concrete.
1.60-2.00	4	Firm to stiff blue grey mottled brown very silty organic CLAY with much root material.

Samples and Tests

Depth (m)	Type	Results
0.00-0.60	BTO	
1.00-1.30	BTO	
1.60-2.00	BTO	

Date of Excavation 02/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No.	Struck	Behaviour
1	1.40	slight seepage

Ground Level 7.26 m OD
Coordinates 333612.01 mE
185209.37 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project

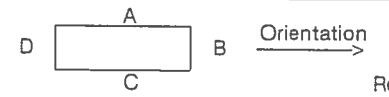
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

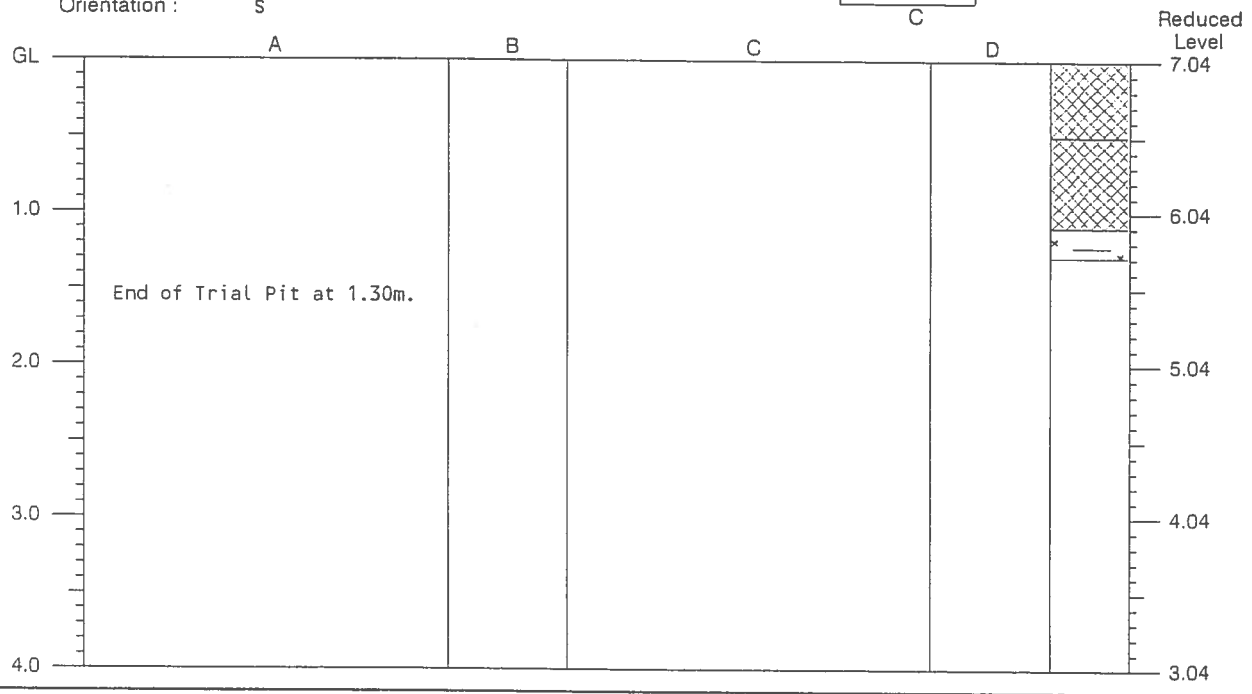
Contract 150006

Trial Pit CH39

Dimensions : 1.20 x 2.50

Orientation : S





Strata

Depth (m)	No.	Description
0.00-0.50	1	MADE GROUND: Loose brown sandy angular to sub-angular fine to coarse gravel of limestone (hardcore). ....at 0.50m a layer of "terram".
0.50-1.10	2	MADE GROUND: Moderately compact brown and grey sandy angular to sub-angular fine to coarse gravel and cobbles of concrete, brick, slag, sandstone and limestone with many boulders (<1400mm) of concrete and some refuse of plastic (5%) and metal (10%).
1.10-1.30	3	Firm to stiff blue grey mottled brown very silty organic CLAY.

Samples and Tests

Depth (m)	Type	Results
0.00-0.50	BTO	
0.50-0.80	BTO	
1.10-1.30	BTO	
1.10	W	

Date of Excavation 02/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No.	Struck	Behaviour
1	1.10	fast strike

Ground Level 7.04 m OD
Coordinates 333641.12 mE
185239.97 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

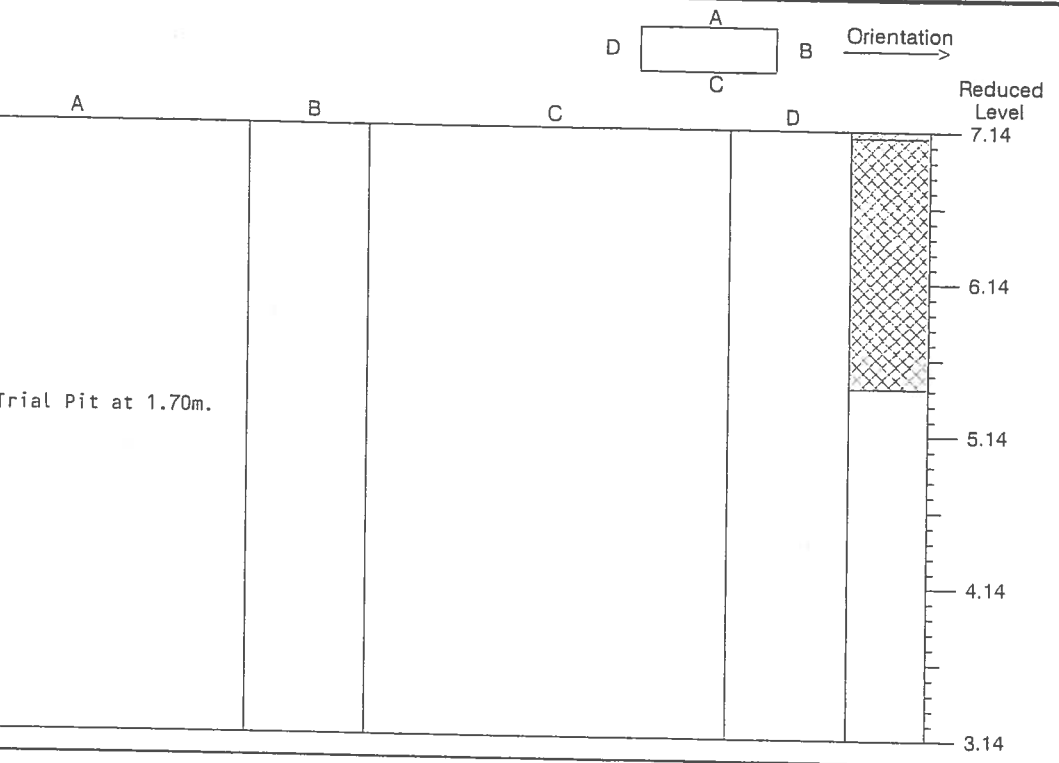
Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Trial Pit CH40

Dimensions :

Orientation :



Strata

Depth (m)	No.	Description
0.00-0.05	1	Brown sandy TOPSOIL.
0.05-1.70	2	MADE GROUND: Brown and grey sandy very silty clayey sub-angular fine to coarse gravel and cobbles of concrete, brick and sandstone and many boulders (<900mm) of concrete "bollards". ....from 1.40m becoming dark grey ("oil film" noticed on water in pit and on spoil excavated).

Samples and Tests

Depth (m)	Type	Results
0.05-0.40	BTO	
1.10	W	
1.40	BTO	

Date of Excavation 01/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No.	Struck	Behaviour
1	1.10	medium inflow

Ground Level 7.14 m OD
Coordinates 333625.63 mE
185205.04 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project

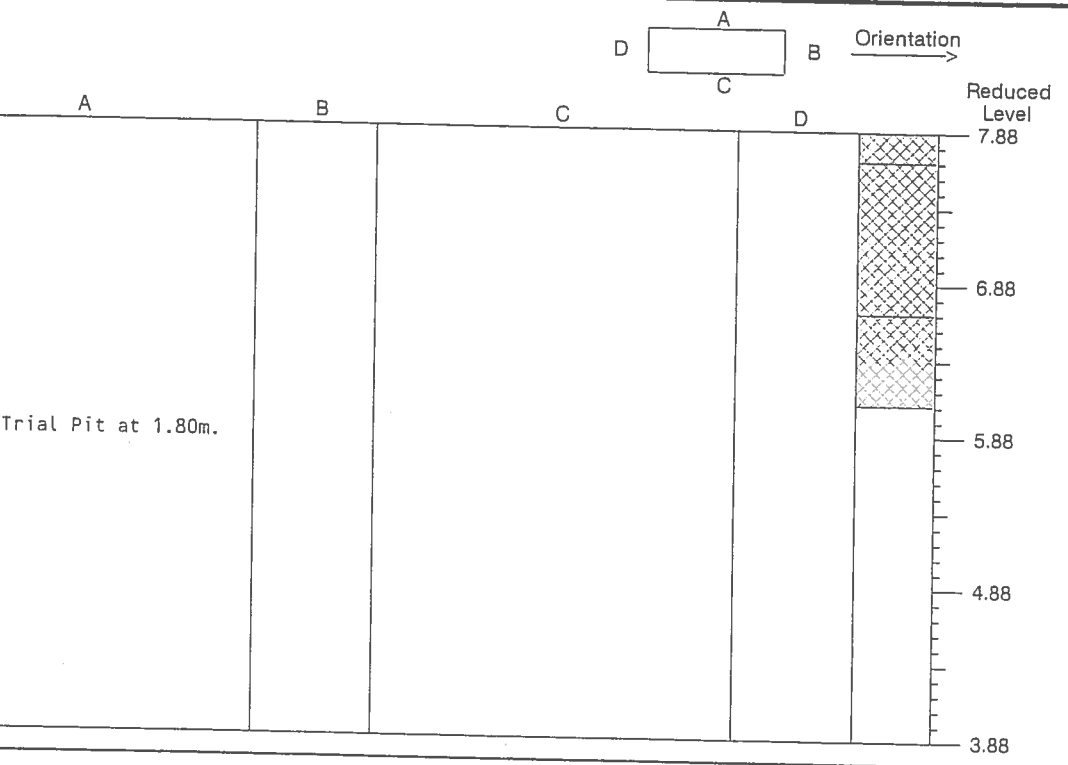
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Trial Pit CH41

Dimensions :

Orientation :



Strata

Depth (m)	No.	Description
0.00-0.20	1	Brown sandy very silty clayey TOPSOIL.
0.20-1.20	2	MADE GROUND: Loose brown sandy very silty very clayey sub-angular to sub-rounded fine to coarse gravel and cobbles of brick, concrete, slag and ash.
1.20-1.80	3	MADE GROUND: Moderately compact brown slightly sandy cobbles and boulders (<1000mm) of concrete, brick and slag with some refuse of plastic (1%) and metal (5%).

Samples and Tests

Depth (m)	Type	Results
0.20-0.70	BTO	
1.20-1.30	BTO	—

Date of Excavation 01/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No.	Struck	Behaviour
1	1.60	medium inflow

Ground Level 7.88 m OD
Coordinates 333681.23 mE
185236.03 mN

Logged by DC
Checked by Af

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project

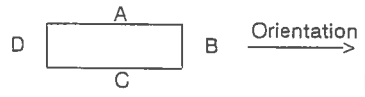
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

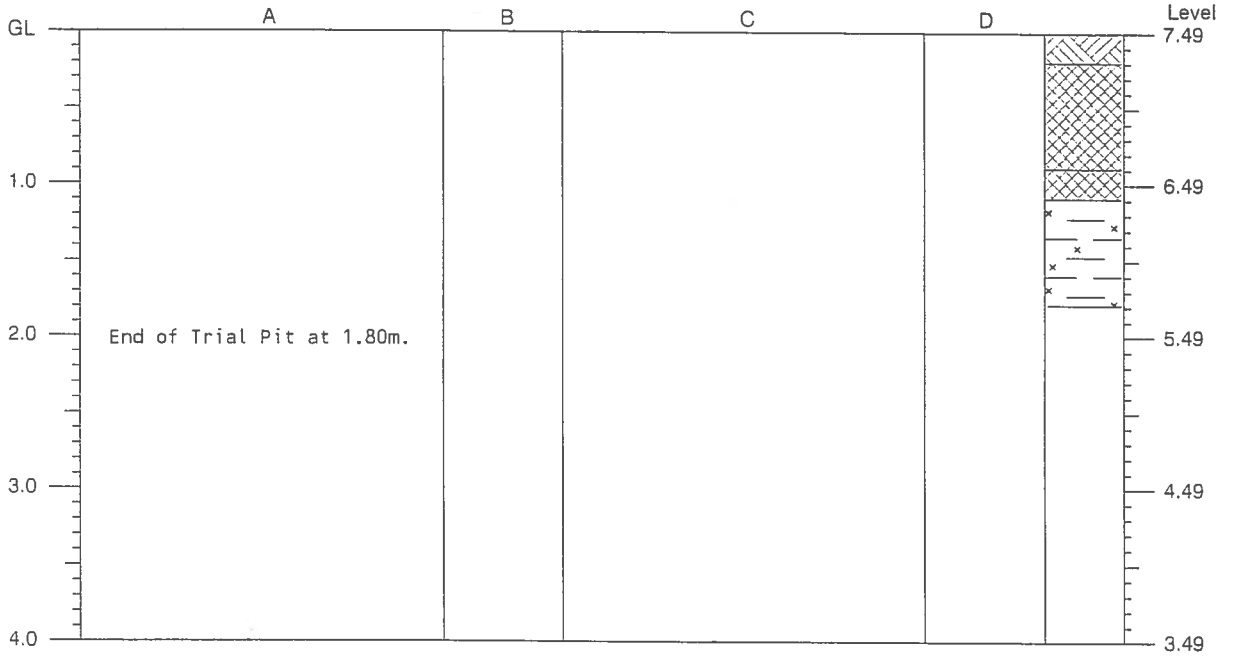
Contract 150006

Trial Pit CH42

Dimensions :

Orientation :





Strata

Depth (m)	No.	Description
0.00-0.20	1	Brown sandy very silty clayey TOPSOIL.
0.20-0.90	2	MADE GROUND: Firm stiff blue grey and brown very silty clay with much sub-rounded to sub-angular fine to coarse gravel and cobbles of concrete, brick, sandstone and slag and with some wooden sleepers.
0.90-1.10	3	MADE GROUND: Compact brown and grey slightly sandy cobbles and boulders (<1200) of concrete and brick.
1.10-1.80	4	Firm to stiff blue grey mottled brown very silty slightly organic CLAY with much root material.

Samples and Tests

Depth (m)	Type	Results
0.20-0.70	BTO	
1.30-1.80	BTO	

Date of Excavation 02/02/00
Equipment JCB 3CX
Stability Stable

Groundwater
No. Struck Behaviour
Not encountered during excavation

Ground Level 7.49 m OD
Coordinates 333709.24 mE
185218.15 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

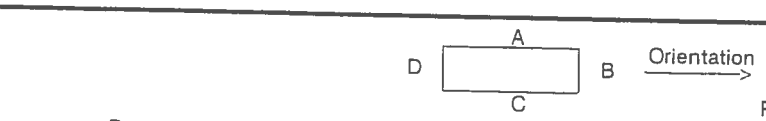
Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

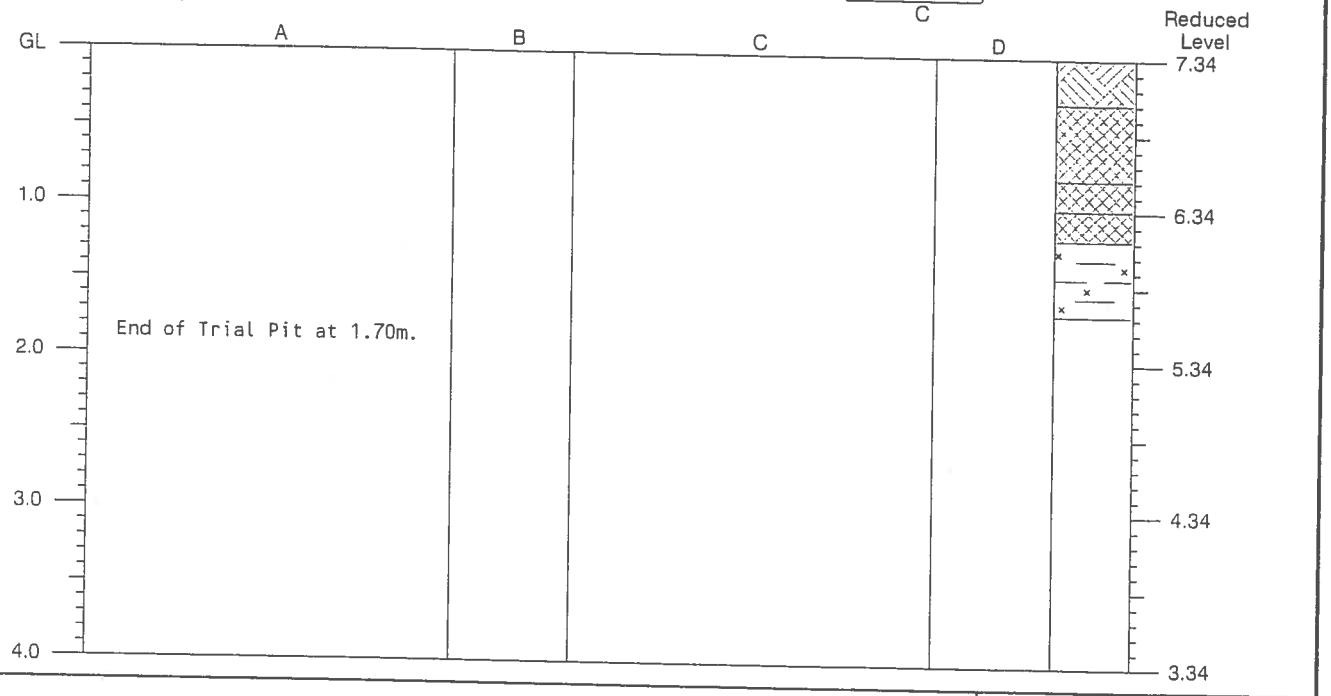
Contract 150006

Trial Pit CH43

Dimensions :

Orientation :





Strata

Depth (m)	No.	Description
0.00-0.30	1	Brown very silty clayey TOPSOIL.
0.30-0.80	2	MADE GROUND: Loose grey and brown sandy very silty clayey angular to sub-angular fine to coarse gravel and cobbles of brick, concrete, slag, ash and sandstone with some <400mm of concrete.
0.80-1.00	3	MADE GROUND:- Compact brown and grey cobbles and boulders (<450mm) of concrete and brick with some refuse of metal (5%).
1.00-1.20	4	MADE GROUND: Moderately compact brown and grey sandy sub-angular to sub-rounded fine to coarse gravel and cobbles of concrete, brick and sandstone.
1.20-1.70	5	Soft to firm blue grey mottled brown very silty organic CLAY with some root material.

Samples and Tests

Depth (m)	Type	Results
0.30-0.80	BTO	
1.00-1.20	BTO	
1.20-1.50	BTO	

Date of Excavation 02/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No.	Struck	Behaviour
1	1.70	slight seepage

Ground Level 7.34 m OD
Coordinates 333740.12 mE
185222.28 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project

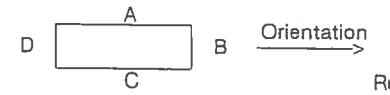
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

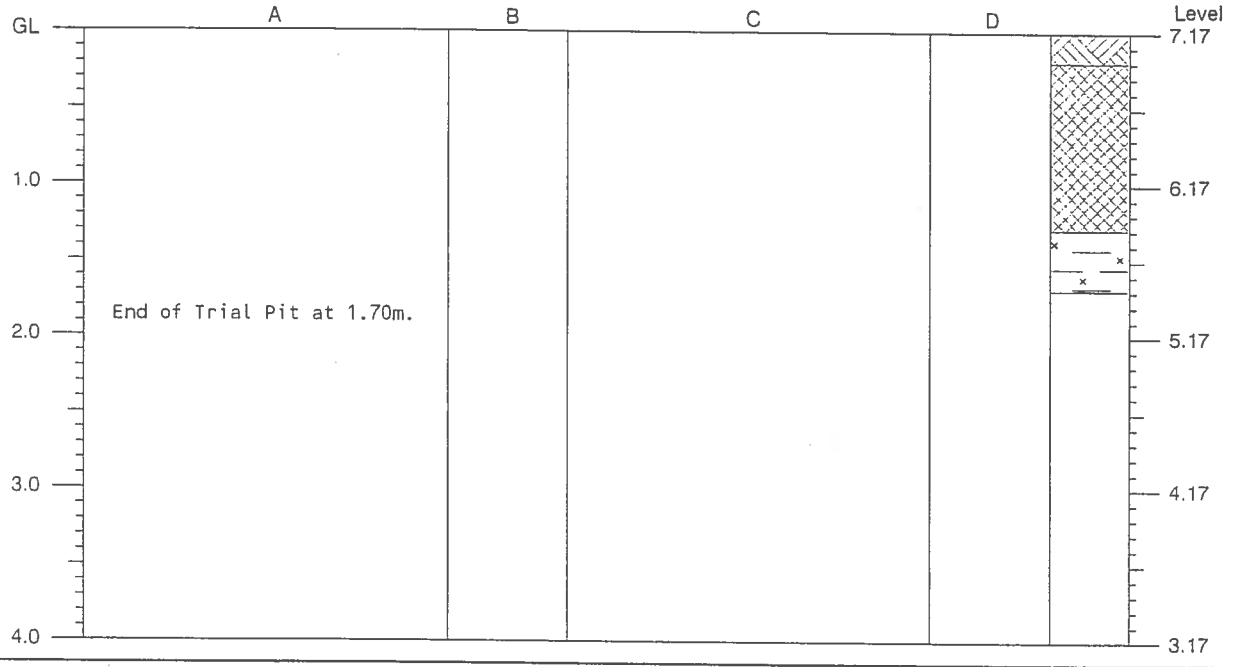
Contract 150006

Trial Pit CH44

Dimensions :

Orientation :





Strata

Depth (m)	No.	Description
0.00-0.20	1	Brown very silty slightly clayey TOPSOIL.
0.20-1.30	2	MADE GROUND: Moderately compact brown and grey sandy angular to sub-angular fine to coarse gravel and cobbles of concrete, brick and sandstone with some boulders (<560mm) of concrete and much refuse of metal (5%).
1.30-1.70	3	Firm to stiff brown mottled orange brown and blue grey very silty organic CLAY.

Samples and Tests

Depth (m)	Type	Results
0.20-0.50	BTO	
1.30-1.70	BTO	
1.30	W	

Date of Excavation 02/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No.	Struck	Behaviour
1	1.30	medium inflow

Ground Level 7.17 m OD
Coordinates 333784.67 mE
185215.33 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project

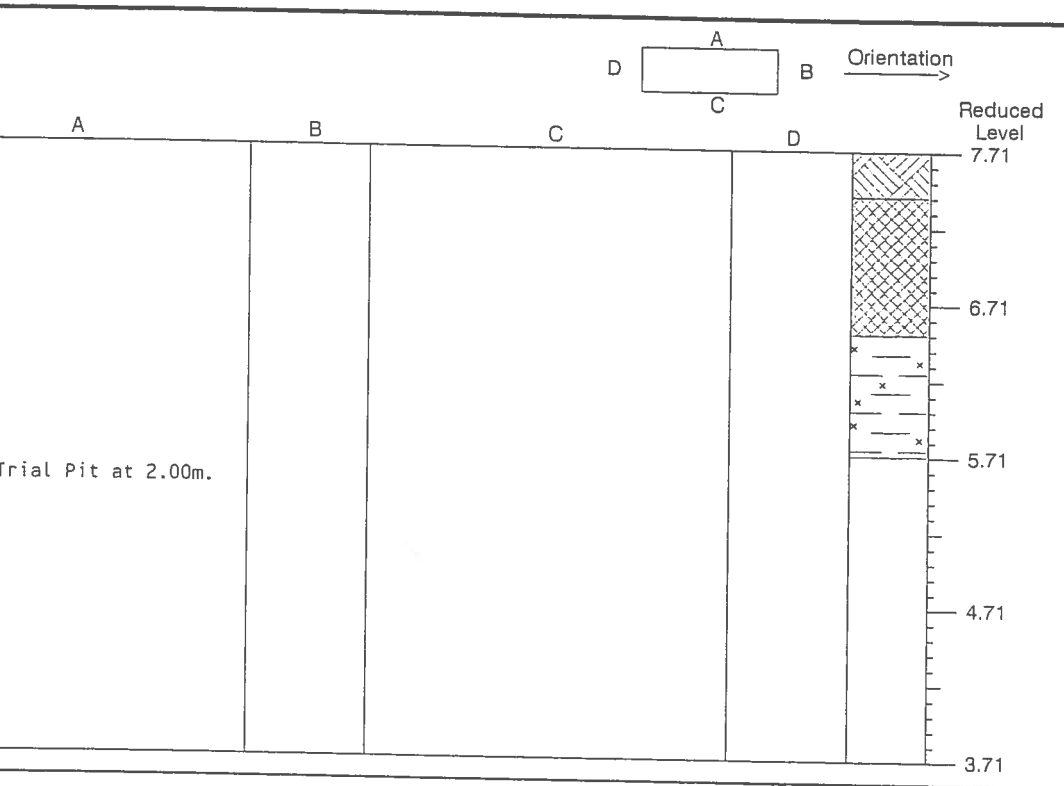
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Trial Pit CH45

Dimensions :

Orientation :



Strata

Depth (m)	No.	Description
0.00-0.30	1	Brown very silty clayey TOPSOIL with a little angular to sub-angular fine to coarse gravel of sandstone.
0.30-1.20	2	MADE GROUND: Loose brown sandy very silty very clayey sub-rounded to sub-angular fine to coarse gravel and cobbles of concrete, brick, slag, ash, slate, sandstone and limestone with occasional boulders (<650mm) of concrete and some refuse of plastic (1%) and metal (5%).
1.20-2.00	3	Firm to stiff blue grey very silty organic CLAY with much root material.

Samples and Tests

Depth (m)	Type	Results
0.50-0.90	BTO	
1.20-1.70	BTO	

Date of Excavation 02/02/00
Equipment JCB 3CX
Stability Stable

Groundwater
No. Struck Behaviour
Not encountered during excavation

Ground Level 7.71 m OD
Coordinates 333757.41 mE
185226.90 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

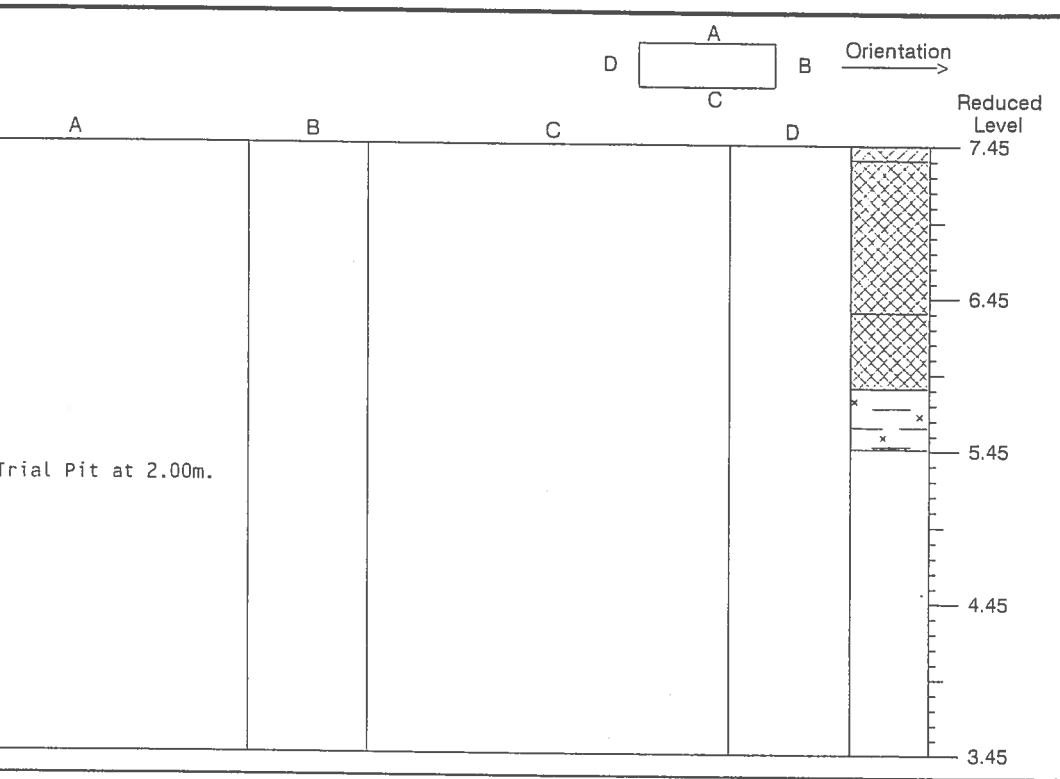
Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Trial Pit CH46

Dimensions :

Orientation :



Strata

Depth (m)	No.	Description
0.00-0.10	1	Brown sandy very silty slightly clayey TOPSOIL.
0.10-1.10	2	MADE GROUND: Moderately compact brown sandy very silty very clayey angular to sub-angular fine to coarse gravel of concrete, brick, slag, ash and sandstone with some boulders (<1080mm) of concrete and some refuse of plastic (1%), metal (5%) and wood (1%).
1.10-1.60	3	MADE GROUND: Firm to stiff blue grey very silty slightly organic clay with a little angular to sub-angular fine to coarse gravel of concrete and brick.
1.60-2.00	4	Firm to stiff brown very silty organic CLAY.

Samples and Tests

Depth (m)	Type	Results
0.20-0.60	BTO	
1.10-1.60	BTO	
1.60-2.00	BTO	

Date of Excavation 02/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No.	Struck	Behaviour
		Not encountered during excavation

Ground Level 7.45 m OD
Coordinates 333783.57 mE
185246.27 mN

Logged by DC
Checked by Af

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project

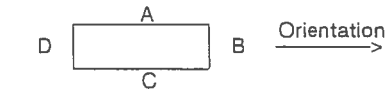
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

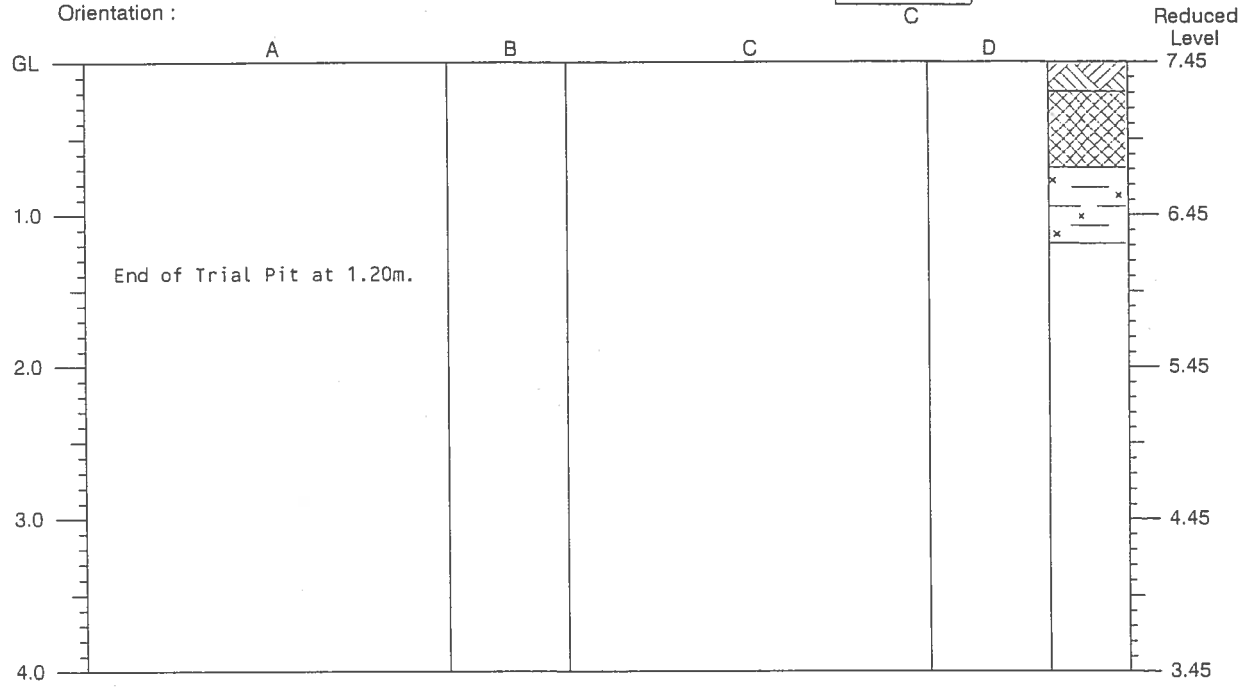
Contract 150006

Trial Pit CH47

Dimensions :

Orientation :





Strata

Depth (m)	No.	Description
0.00-0.20	1	Brown very silty clayey TOPSOIL.
0.20-0.70	2	MADE GROUND: Soft to firm brown very silty clay with occasional refuse of plastic (1%).
0.70-1.20	3	Firm to stiff blue grey very silty slightly organic CLAY.

Samples and Tests

Depth (m)	Type	Results
0.20-0.70	BTO	
0.70-1.20	BTO	

Date of Excavation 02/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No.	Struck	Behaviour
1	1.20	slight seepage

Ground Level 7.45 m OD
Coordinates 333807.57 mE
185246.27 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

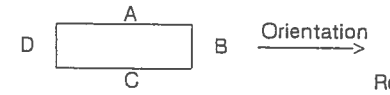
Project
M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

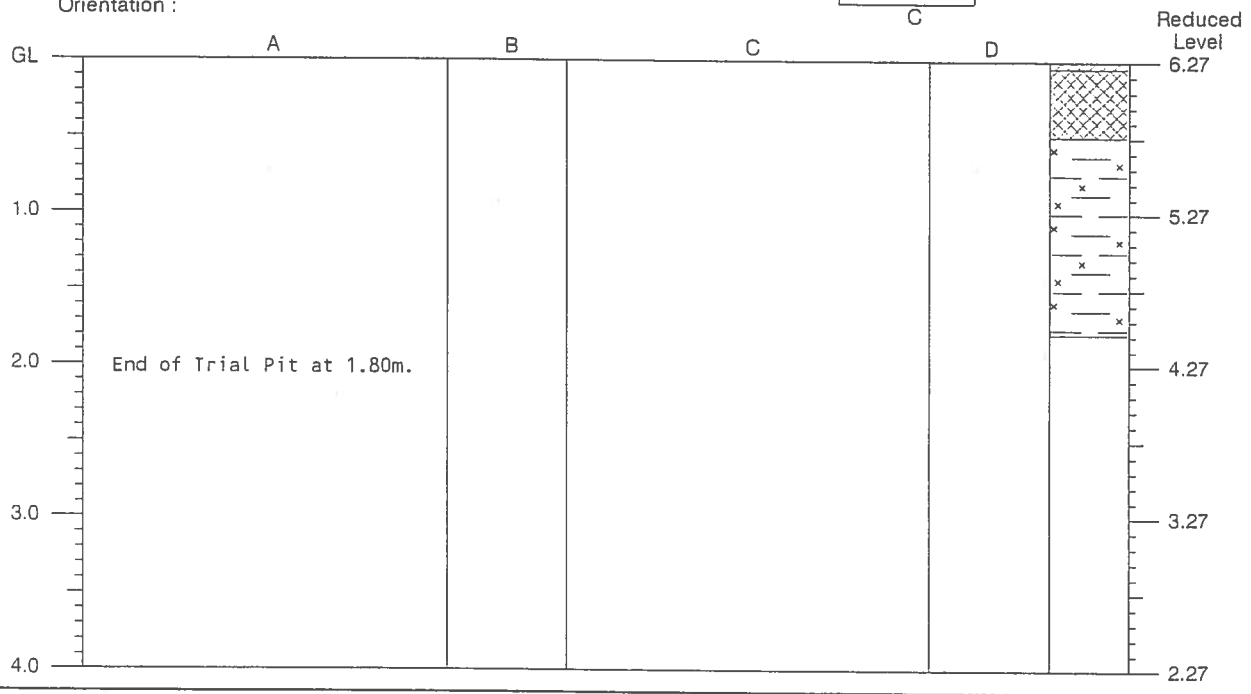
Contract 150006

Trial Pit CH47A

Dimensions :

Orientation :





Strata

Depth (m)	No.	Description
0.00-0.05	1	Brown very silty clayey TOPSOIL.
0.05-0.50	2	MADE GROUND: Very compact brown and grey sandy sub-angular to sub-rounded fine to coarse gravel and cobbles of slag, ash, limestone and sandstone with some boulders (<400mm) of slag.
0.50-1.80	3	Firm to stiff blue grey mottled brown very silty slightly organic CLAY with occasional some root matrial. ....from 1.50m becoming soft to firm.

Samples and Tests

Depth (m)	Type	Results
0.05-0.50	BTO	
1.00-1.20	BTO	
1.50-1.80	BTO	

Date of Excavation 04/02/00
Equipment JCB 3CX
Stability Stable

Groundwater

No. Struck Behaviour
Not encountered during excavation

Ground Level 6.27 m OD
Coordinates 333562.09 mE
185439.87 mN

Logged by DC
Checked by AF

Remarks

See key sheet and appendices for explanations.

Form 2/0

Trial Pit Record

Exploration Associates

Project

M4 Relief Road - Stage 2. Preliminary Chemical Investigation
Ove Arup & Partners

Contract 150006

Trial Pit CH48

SUPPLEMENTARY HOLE INFORMATION

BHM4CAN029

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
17/03/2016 07:30:00	0.00	0.00	
17/03/2016 18:00:00	9.00	7.70	
18/03/2016 07:30:00	9.00	7.70	
18/03/2016 18:00:00	16.70	16.40	8.8

Sample Information

Type/Ref	Depth (m)	Date
W1D		28-04-2016
W3D		02-06-2016
W2D		24-05-2016
B	0.25	
B	0.30 - 0.75	
D	1.00	
ES	1.00 - 1.60	17-03-2016
B	1.20 - 1.65	
D	2.00	
D	2.01 - 2.45	
D	3.00	
D	3.50 - 3.95	
B	3.50 - 3.95	
D	4.00	
D	5.00	
ES	5.00 - 6.00	17-03-2016
D	5.01 - 5.45	
D	6.00	
D	6.50 - 6.95	
B	6.50 - 6.95	
D	7.00	
B	7.10 - 7.55	
D	8.00	
B	8.00 - 8.45	
D	8.01 - 8.45	
D	9.00	
D	9.50 - 9.95	
B	9.50 - 9.95	
D	10.00	
D	11.00	
B	11.00 - 11.45	
D	11.01 - 11.45	
ES	11.50 - 12.00	
D	12.00	
B	12.00 - 12.45	
B	12.50 - 12.95	
B	14.00 - 14.45	
B	15.50 - 15.95	
D	16.20 - 16.75	
B	16.50 - 16.70	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	C	N=6 (8,9/2,2,1,1)
2.00	S	0 (0 for 450mm/0 for 0mm)
3.50	S	0 (0 for 450mm/0 for 0mm)
5.00	S	0 (0 for 450mm/0 for 0mm)
6.50	S	0 (0 for 450mm/0 for 0mm)
8.00	S	0 (0 for 450mm/0 for 0mm)
9.50	S	0 (0 for 450mm/0 for 0mm)
11.00	S	0 (0 for 450mm/0 for 0mm)
12.50	C	N=24 (3,5/5,6,6,7)
14.00	C	N=21 (4,4/4,5,6,6)
15.50	C	50 (8,9/50 for 275mm)
16.50	C	50 (25 for 40mm/50 for 40mm)
16.70	C	50 (25 for 30mm/50 for 40mm)

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)
24/05/2016 00:00:00	2S	0.94
24/05/2016 00:00:00	2D	3.85
02/06/2016 11:55:00	3D	3.94

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CAN030

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
08/03/2016 07:30:00	0.00	0.00	
08/03/2016 18:00:00	11.00	10.50	
11/03/2016 07:30:00	11.00	10.50	5.2
11/03/2016 18:00:00	18.30	18.00	8.1

Sample Information

Type/Ref	Depth (m)	Date
W1		28-04-2016
W3		02-06-2016
W2		24-05-2016
B	0.00 - 0.35	
B	0.40 - 0.85	
D	1.00	
ES	1.00 - 1.20	29-02-2016
D	1.20 - 1.65	
B	1.20 - 1.65	
D	2.00	
B	2.00 - 2.45	
D	2.80	
B	3.00 - 3.45	
D	3.80	
B	4.00 - 4.45	
D	4.80	
B	5.00 - 5.45	
B	5.50 - 5.95	
B	6.00 - 6.45	
D	6.70	
B	7.00 - 7.45	
D	7.70	
B	8.00 - 8.45	
D	8.70	
B	9.00 - 9.45	
D	9.70	
B	10.00 - 10.45	
D	10.70	
B	11.00 - 11.45	
D	11.60	
B	12.00 - 12.45	
D	12.60	
B	12.80 - 12.95	
B	13.00 - 13.45	
B	14.00 - 14.45	
B	15.00 - 15.45	
B	16.00 - 16.45	
B	17.00 - 17.45	
B	18.00 - 18.30	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	S	N=4 (1,1/1,1,1,1)
2.00	S	N=3 (1,0/1,1,0,1)
3.00	S	2 (1 for 225mm/2 for 225mm)
4.00	S	0 (0 for 450mm/0 for 0mm)
5.00	S	0 (0 for 450mm/0 for 0mm)
6.00	S	0 (0 for 450mm/0 for 0mm)
7.00	S	0 (0 for 450mm/0 for 0mm)
8.00	S	0 (0 for 450mm/0 for 0mm)
9.00	S	0 (0 for 450mm/0 for 0mm)
10.00	S	0 (0 for 450mm/0 for 0mm)
11.00	S	0 (0 for 450mm/0 for 0mm)
12.00	S	N=4 (1,1/1,1,1,1)
13.00	S	N=17 (2,3/3,4,5,5)
14.00	C	N=22 (5,5/6,4,5,7)
15.00	C	N=37 (8,11/8,10,10,9)
16.00	C	N=48 (5,8/10,12,13,13)
17.00	C	N=40 (7,10/10,9,10,11)
18.00	S	50 (25 for 115mm/50 for 60mm)
18.30	C	50 (25 for 40mm/50 for 40mm)

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)
24/05/2016 00:00:00	2	4.73
02/06/2016 13:04:00	3	3.78

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CANA022

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
21/03/2016 07:30:00	0.00	0.00	
21/03/2016 18:00:00	4.50	4.50	
22/03/2016 07:30:00	4.50	4.50	
22/03/2016 18:00:00	16.50	16.20	7.4

Sample Information

Type/Ref	Depth (m)	Date
W1		28-04-2016
W3		02-06-2016
W2		24-05-2016
ES	0.00 - 0.20	21-03-2016
B	0.00 - 0.15	
B	0.20 - 0.65	
B	0.80 - 0.95	
D	1.00	
ES	1.20	21-03-2016
D	2.00	
UT	2.00 - 2.45	
D	2.50	
D	3.00	
B	3.00 - 3.45	
D	3.01 - 3.45	
D	4.00	
UT	4.00 - 4.45	
D	4.50	
B	4.50 - 4.95	
D	4.51 - 4.95	
D	6.00	
B	6.00 - 6.45	
D	6.01 - 6.45	
D	7.00	
UT	7.00 - 7.45	
D	7.50	
B	9.00 - 9.45	
D	10.00	
D	10.50 - 10.95	
D	11.00	
B	11.40	
D	12.00	
B	12.00 - 12.45	
D	12.01 - 12.45	
B	13.50 - 13.95	
B	15.00 - 15.45	
B	16.20 - 16.50	
D	16.50 - 16.70	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	S	N=4 (1,1/1,1,1,1)
3.00	S	N=2 (1,0/1,0,1,0)
4.50	S	0 (0 for 450mm/0 for 0mm)
6.00	S	0 (0 for 450mm/0 for 0mm)
7.50	S	0 (0 for 450mm/0 for 0mm)
9.00	S	0 (0 for 450mm/0 for 0mm)
10.50	S	0 (0 for 450mm/0 for 75mm)
12.00	S	N=16 (1,2/3,4,4,5)
13.50	S	N=29 (4,5/6,8,8,7)
15.00	S	N=34 (4,4/8,9,8,9)
16.50	S	50 (25 for 105mm/50 for 105mm)

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)
24/05/2016 00:00:00	2	3.75
02/06/2016 11:45:00	3	3.88

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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BOREHOLE LOG

Borehole No. **BHM4CAN029**

Sheet 1 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 17/03/2016 - 21/03/2016		Final Depth:
Project No:	JFR8703	Easting:	333446	Drilling Method:	Pipe Diameter: 35mm	16.70m
Location:	Newport	Northing:	185280	Dando 2000	Casing Diameter (mm) / Casing Depth (m): 150 / 16.40; 200 / 1.50	Scale: 1:50
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.84	Logged By: EJH		

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
					0.00	(0.30)	6.84		Brown clayey GRAVEL of aggregate and hardcore. (MADE GROUND)	
		0.25	B							
		0.30 - 0.75	B		0.30		6.54		Loose dark grey fine to medium gravelly SAND of ash. Gravels are subangular to subrounded of clinker and hardcore. (MADE GROUND)	
						(1.10)				
		1.00	D							1
		1.00 - 1.60	ES							
		1.20	SPT(C)	N=6 (8,9/2,2,1,1)						
		1.20 - 1.65	B		1.40		5.44		Soft to very soft dark grey CLAY. (TIDAL FLAT DEPOSITS)	
		2.00	D							2
		2.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						
		2.01 - 2.45	D							
		3.00	D							3
		3.50	SPT(S)	0 (0 for 450mm/0 for 0mm)						
		3.50 - 3.95	B							
		3.50 - 3.95	D							
		4.00	D			(5.40)				4
		5.00	D							5
		5.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						
		5.00 - 6.00	ES							
		5.01 - 5.45	D							
		6.00	D							6
		6.50	SPT(S)	0 (0 for 450mm/0 for 0mm)						
		6.50 - 6.95	B		6.80	(0.10)	0.04		Soft grey CLAY with rare peat lenses. (TIDAL FLAT DEPOSITS)	
		6.50 - 6.95	D		6.90		-0.06		Soft dark grey CLAY. (TIDAL FLAT DEPOSITS)	7
		7.00	D							
		7.10 - 7.55	B							
		8.00	D							8
		8.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						
		8.00 - 8.45	B			(5.10)				
		8.01 - 8.45	D							
		9.00	D							9
		9.50	SPT(S)	0 (0 for 450mm/0 for 0mm)						
		9.50 - 9.95	B							
		9.50 - 9.95	D							
		10.00	D						Continued on next sheet	10

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Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.7m. Borehole terminated within bedrock upon SPT refusal.B
ACKFILL: On completion hole backfilled with bentonite 16.7 - 16.3m, 12.3 - 1.4m and 0.4 - 0.2m, gravel 16.3 - 12.3m and 1.4 - 0.4m and concrete 0.2 - 0.0m. One standpipe (50mm) was installed with slotted section between 16.3 - 12.3m and a second standpipe (35mm) was installed with slotted section between 1.4 - 0.4m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.4 - 12.0m. No anomalies encountered. The SPT hammer sunk under its own weight from 2-12.5m on SPT tests. Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
0.90	12.00	0.70	01:00	15.70	16.00
12.00		8.10	00:30	16.10	16.20
			01:00	16.50	16.70

AGS

BOREHOLE LOG

Borehole No. **BHM4CAN029**

Sheet 2 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 17/03/2016 - 21/03/2016		Final Depth:
Project No:	JFR8703	Easting:	333446	Drilling Method:	Pipe Diameter: 35mm	16.70m
Location:	Newport	Northing:	185280	Dando 2000	Casing Diameter (mm) / Casing Depth (m): 150 / 16.40; 200 / 1.50	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.84	Logged By: EJH		1:50

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		11.00	D							11
		11.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						
		11.00 - 11.45	B							
		11.01 - 11.45	D							
		11.50 - 12.00	ES							
		12.00	D		12.00		-5.16			12
		12.00 - 12.45	B						Medium dense becoming very dense fine to medium rounded GRAVEL with frequent rounded cobbles of various lithologies. (GLACIOFLUVIAL DEPOSITS)	
		12.50	SPT(C)	N=24 (3,5/5,6,6,7)						
		12.50 - 12.95	B							13
		14.00	SPT(C)	N=21 (4,4/4,5,6,6)						
		14.00 - 14.45	B			(4.30)				14
		15.50	SPT(C)	50 (8,9/50 for 275mm)						15
		15.50 - 15.95	B							
		16.20 - 16.75	D							16
					16.30		-9.46			
		16.50	SPT(C)	50 (25 for 40mm/50 for 40mm)		(0.40)			Dark red weathered MUDSTONE. Recovered as angular gravel. (Weathering Grade V). (WEATHERED MERCIA MUDSTONE)	
		16.50 - 16.70	B						End of Borehole at 16.70m	
		16.70	SPT(C)	50 (25 for 30mm/50 for 40mm)						17
										18
										19
										20

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.7m. Borehole terminated within bedrock upon SPT refusal.B
ACKFILL: On completion hole backfilled with bentonite 16.7 - 16.3m, 12.3 - 1.4m and 0.4 - 0.2m, gravel 16.3 - 12.3m and 1.4 - 0.4m and concrete 0.2 - 0.0m. One standpipe (50mm) was installed with slotted section between 16.3 - 12.3m and a second standpipe (35mm) was installed with slotted section between 1.4 - 0.4m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (2.0 - 1.0m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.4 - 12.0m. No anomalies encountered. The SPT hammer sunk under its own weight from 2-12.5m on SPT tests. Installed with flush cover.

Groundwater: Depth Strike (m)	Depth Casing (m)	Level After 20 Mins
0.90	12.00	0.70
12.00		8.10

Chiselling: Duration (hh:mm)	Top Depth (m)	Base Depth (m)
01:00	15.70	16.00
00:30	16.10	16.20
01:00	16.50	16.70

AGS

BOREHOLE LOG

Borehole No. **BHM4CAN030**

Sheet 1 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 08/03/2016 - 11/03/2016		Final Depth:
Project No:	JFR8703	Easting:	333787	Drilling Method:	Pipe Diameter: 50mm	18.30m
Location:	Newport	Northing:	185206	Dando 2000	Casing Diameter (mm) 150 / Casing Depth (m) 18.00	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.69	Logged By: EJH		1:50

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		0.00 - 0.35	B		0.00	(0.20)	6.69		Red fine GRAVEL.	
					0.20		6.49		(MADE GROUND)	
		0.40 - 0.85	B						Firm grey mottled orange CLAY with occasional black organic flecks. (TIDAL FLAT DEPOSITS)	
		1.00	D							1
		1.00 - 1.20	ES							
		1.20	SPT(S)	N=4 (1,1/1,1,1,1)		(2.20)				
		1.20 - 1.65	B							
		1.20 - 1.65	D							
		2.00	D							2
		2.00	SPT(S)	N=3 (1,0/1,1,0,1)						
	▼	2.00 - 2.45	B		2.40		4.29		Very soft grey mottled orange CLAY with occasional black organic flecks. (TIDAL FLAT DEPOSITS)	
	▽	2.80	D							
		3.00	SPT(S)	2 (1 for 225mm/2 for 225mm)						3
		3.00 - 3.45	B							
		3.80	D							
		4.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						4
		4.00 - 4.45	B							
		4.80	D							
		5.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						5
		5.00 - 5.45	B							
		5.50 - 5.95	B							
		6.00	SPT(S)	0 (0 for 450mm/0 for 0mm)		(9.20)				6
		6.00 - 6.45	B							
		6.70	D							
		7.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						7
		7.00 - 7.45	B							
		7.70	D							
		8.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						8
		8.00 - 8.45	B							
		8.70	D							
		9.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						9
		9.00 - 9.45	B							
		9.70	D							
		10.00	SPT(S)	0 (0 for 450mm/0 for 0mm)					Continued on next sheet	10

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Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.3m. Borehole terminated within bedrock upon SPT refusal.
BACKFILL: On completion hole backfilled with bentonite 18.3 - 17.2m and 14.2 - 0.2m, gravel 17.2 - 14.2m and concrete 0.2 - 0.0m. One standpipe (50mm) was installed with slotted section between 14.2 - 17.2m.
REMARKS: Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 13.3m. No anomalies encountered. Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
2.80	1.70	2.40	00:30 01:00	16.30 18.00	16.50 18.30

AGS

BOREHOLE LOG

Borehole No. **BHM4CAN030**

Sheet 2 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 08/03/2016 - 11/03/2016		Final Depth:
Project No:	JFR8703	Easting:	333787	Drilling Method:	Pipe Diameter: 50mm	18.30m
Location:	Newport	Northing:	185206	Dando 2000	Casing Diameter (mm) 150 / Casing Depth (m) 18.00	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.69	Logged By: EJH		1:50

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		10.00 - 10.45	B							
		10.70	D							
		11.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						11
		11.00 - 11.45	B							
		11.60	D		11.60	(0.20)	-4.91		Fibrous PEAT with soft grey clay. (PEAT)	
		12.00	SPT(S)	N=4 (1,1/1,1,1,1)	11.80		-5.11		Soft light grey CLAY. (TIDAL FLAT DEPOSITS)	12
		12.00 - 12.45	B			(1.00)				
		12.60	D							
		12.80 - 12.95	B		12.80		-6.11		Stiff red CLAY with rare fine gravels. (TIDAL FLAT DEPOSITS)	
		13.00	SPT(S)	N=17 (2,3/3,4,5,5)		(0.50)				13
		13.00 - 13.45	B		13.30		-6.61		Dense red brown coarse SAND AND GRAVEL with rare rounded cobbles. (GLACIOFLUVIAL DEPOSITS)	
		14.00	SPT(C)	N=22 (5,5/6,4,5,7)						14
		14.00 - 14.45	B							
		15.00	SPT(C)	N=37 (8,11/8,10,10,9)						15
		15.00 - 15.45	B			(3.90)				
		16.00	SPT(C)	N=48 (5,8/10,12,13,13)						16
		16.00 - 16.45	B							
		17.00	SPT(C)	N=40 (7,10/10,9,10,11)						17
		17.00 - 17.45	B		17.20		-10.51		Stiff reddish brown CLAY. (Weathering Grade V) (WEATHERED MERCIA MUDSTONE)	
						(0.80)				
		18.00	SPT(S)	50 (25 for 115mm/50 for 60mm)	18.00		-11.31		Reddish brown weathered MUDSTONE. Recovered as gravel. (Weathering Grade V). (WEATHERED MERCIA MUDSTONE)	18
		18.00 - 18.30	B			(0.30)				
		18.30	SPT(C)	50 (25 for 40mm/50 for 40mm)					End of Borehole at 18.30m	
										19
										20

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.3m. Borehole terminated within bedrock upon SPT refusal.
BACKFILL: On completion hole backfilled with bentonite 18.3 - 17.2m and 14.2 - 0.2m, gravel 17.2 - 14.2m and concrete 0.2 - 0.0m. One standpipe (50mm) was installed with slotted section between 14.2 - 17.2m.
REMARKS: Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 13.3m. No anomalies encountered. Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
2.80	1.70	2.40	00:30 01:00	16.30 18.00	16.50 18.30

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA022**

Sheet 1 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 21/03/2016 - 23/03/2016	Final Depth:
Project No:	JFR8703	Easting:	333377	Drilling Method: Pipe Diameter: 50mm	16.50m
Location:	Newport	Northing:	185334	Dando 2000	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.82	Logged By: EJH	1:50

Casing Diameter (mm)	Casing Depth (m)
150	16.20
200	1.20

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		0.00 - 0.15	B		0.00	(0.20)	6.82		Light pinkish red sandy coarse GRAVEL of aggregate. (MADE GROUND)	
		0.00 - 0.20	ES		0.20	(0.20)	6.62		Black coarse SAND of ash and clinker. (MADE GROUND)	
		0.20 - 0.65	B		0.40		6.42		Soft to very soft dark grey CLAY with rare fibrous rootlets. (TIDAL FLAT DEPOSITS)	
		0.80 - 0.95	B							
		1.00	D							1
		1.20	ES							
		1.20	SPT(S)	N=4 (1,1/1,1,1,1)						
						(2.60)				
		2.00	D							2
		2.00 - 2.45	UT							
		2.50	D							
		3.00	D		3.00		3.82			3
		3.00	SPT(S)	N=2 (1,0/1,0,1,0)					Very soft light grey CLAY. (TIDAL FLAT DEPOSITS)	
		3.00 - 3.45	B							
		3.01 - 3.45	D							
		4.00	D							4
		4.00 - 4.45	UT							
		4.50	D							
		4.50	SPT(S)	0 (0 for 450mm/0 for 0mm)						
		4.50 - 4.95	B							5
		4.51 - 4.95	D							
		6.00	D							6
		6.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						
		6.00 - 6.45	B							
		6.01 - 6.45	D			(9.20)				
		7.00	D							7
		7.00 - 7.45	UT							
		7.50	D							
		7.50	SPT(S)	0 (0 for 450mm/0 for 0mm)						8
		9.00	SPT(S)	0 (0 for 450mm/0 for 0mm)						9
		9.00 - 9.45	B							
		10.00	D						Continued on next sheet	10

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.50m. Borehole terminated within bedrock upon cable percussive SPT refusal.
BACKFILL: On completion hole backfilled with bentonite 16.5 - 12.5m and 7.5 - 0.2m, gravel 12.5 - 7.5m and concrete 0.2 - 0.0m. One standpipe (50mm) was installed with slotted section between 7.5 - 12.5m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.2m. No anomalies encountered. Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
7.70	6.20	5.70	01:00	15.80	16.10
			01:30	16.20	16.50

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA022**

Sheet 2 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 21/03/2016 - 23/03/2016	Final Depth:
Project No:	JFR8703	Easting:	333377	Drilling Method: Pipe Diameter: 50mm	16.50m
Location:	Newport	Northing:	185334	Dando 2000	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.82	Logged By: EJH	1:50

Casing Diameter (mm)	Casing Depth (m)
150	16.20
200	1.20

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		10.50	SPT(S)	0 (0 for 450mm/0 for 75mm)						
		10.50 - 10.95	D							
		11.00	D						*From 11.0-11.4m with sandy peat inclusions*	11
		11.40	B							
		12.00	D							12
		12.00	SPT(S)	N=16 (1,2/3,4,4,5)	12.20		-5.38			
		12.00 - 12.45	B						Medium dense brown SAND and angular to subangular GRAVEL with occasional cobbles. (GLACIOFLUVIAL DEPOSITS)	
		12.01 - 12.45	D							
		13.50	SPT(S)	N=29 (4,5/6,8,8,7)						13
		13.50 - 13.95	B							
						(4.00)				14
		15.00	SPT(S)	N=34 (4,4/8,9,8,9)					*From 15.0m dense*	15
		15.00 - 15.45	B							
		16.20 - 16.50	B		16.20		-9.38			16
						(0.30)			Reddish brown weathered MUDSTONE. (Weathering Grade IVa) (WEATHERED MERCIA MUDSTONE)	
		16.50	SPT(S)	50 (25 for 105mm/50 for 105mm)					End of Borehole at 16.50m	
		16.50 - 16.70	D							17
										18
										19
										20

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 16.50m. Borehole terminated within bedrock upon cable percussive SPT refusal.
BACKFILL: On completion hole backfilled with bentonite 16.5 - 12.5m and 7.5 - 0.2m, gravel 12.5 - 7.5m and concrete 0.2 - 0.0m. One standpipe (50mm) was installed with slotted section between 7.5 - 12.5m.
REMARKS: Bentonite seal for aquifer protection installed during drilling (1.5 - 0.5m) prior to reduction in casing diameter. Downhole magnetometry for UXO risk mitigation undertaken 1.2 - 12.2m. No anomalies encountered. Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
7.70	6.20	5.70	01:00	15.80	16.10
			01:30	16.20	16.50

AGS

WINDOW SAMPLE LOG

Borehole No.
WSM4CAN008
Sheet 1 of 1

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 24/03/2016 - 24/04/2016		Final Depth:
Project No:	JFR8703	Easting:	333413	Drilling Method:	Pipe Diameter: 35mm	1.30m
Location:	Newport	Northing:	185323	Dando Terrier	Casing Diameter (mm) 87 / Casing Depth (m) 1.30	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.36	Logged By: EJH		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description
					0.00	(0.20)	7.36		Dark brown coarse sandy CLAY with frequent rootlets. (TOPSOIL)
		0.20 - 0.60	ES		0.20		7.16		Very stiff light grey CLAY with frequent coarse sandy black deposits of clinker. (MADE GROUND)
						(1.10)			
		1.20 - 1.30	Core	0% Recovery					
									End of Borehole at 1.30m

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Window sampled 1.2 - 1.3m. Terminated at 1.3m after refusal due to ballast / slag.
BACKFILL: On completion hole backfilled with gravel 1.3 - 0.3m, bentonite 0.3 - 0.2m and concrete 0.2 - 0.0m. One standpipe (50mm) installed with slotted section 0.3 - 1.3m.
REMARKS: Location moved 0.3m after termination of original position due to hitting metal (possible rail tracks). No groundwater strike identified. Installed with raised cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)

WINDOW SAMPLE LOG

Borehole No. **WSM4CAN009**

Sheet 1 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 03/03/2016 - 04/03/2016		Final Depth:
Project No:	JFR8703	Easting:	333563	Drilling Method:	Pipe Diameter: 50mm	6.00m
Location:	Newport	Northing:	185245	Dando Terrier	Casing Diameter (mm) / Casing Depth (m)	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.18	Logged By: JA		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
					0.00		7.18		Firm brown gravelly CLAY. Gravel is sub-angular to sub-rounded, of concrete and brick. (MADE GROUND)	
		0.50 0.50	B ES			(1.10)			*Occasional wood fragments from 0.5-1.1m.*	1
					1.10		6.08		Firm grey mottled light brown silty CLAY. (TIDAL FLAT DEPOSITS)	
		1.20 - 2.00 1.30	Core ES	100% Recovery						
		2.00 - 3.00	Core	100% Recovery		(2.20)				2
		3.00 - 4.00	Core	100% Recovery						3
					3.30		3.88		Soft blueish grey silty CLAY with rare decaying organic material. (TIDAL FLAT DEPOSITS)	
		4.00 - 5.00	Core	100% Recovery		(2.60)				4
		5.00 - 6.00	Core	50% Recovery						5
									Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Window sampled 1.2 - 6.0m. Terminated upon achieving proposed depth.
BACKFILL: On completion hole backfilled with gravel 6.0 - 4.0 m, bentonite 4.0 - 0.2m and concrete 0.2 - 0.0m. One standpipe (50mm) installed with slotted section 6.0 - 4.0m.
REMARKS: Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
3.70		0.80			

AGS

WINDOW SAMPLE LOG

Borehole No.
WSM4CAN009
Sheet 2 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 03/03/2016 - 04/03/2016		Final Depth:
Project No:	JFR8703	Easting:	333563	Drilling Method:	Pipe Diameter: 50mm	6.00m
Location:	Newport	Northing:	185245	Dando Terrier	Casing Diameter (mm) / Casing Depth (m)	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.18	Logged By: JA		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
					5.90	(0.10)	1.28		Soft brown amorphous PEAT. (PEAT)	6
									End of Borehole at 6.00m	7
										8
										9
										10

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Window sampled 1.2 - 6.0m. Terminated upon achieving proposed depth.
BACKFILL: On completion hole backfilled with gravel 6.0 - 4.0 m, bentonite 4.0 - 0.2m and concrete 0.2 - 0.0m. One standpipe (50mm) installed with slotted section 6.0 - 4.0m.
REMARKS: Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
3.70		0.80			

AGS

WINDOW SAMPLE LOG

Borehole No. **WSM4CAN010**

Sheet 1 of 1

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 02/03/2016 - 03/03/2016		Final Depth:
Project No:	JFR8703	Easting:	333514	Drilling Method:	Pipe Diameter: 50mm	5.00m
Location:	Newport	Northing:	185289	Dando Terrier	Casing Diameter (mm) / Casing Depth (m)	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	8.03	Logged By: JA		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
					0.00		8.03		Firm grey mottled brown silty CLAY. (MADE GROUND)	
		0.50 0.50	B ES			(1.40)				
		1.00	ES							1
		1.20 - 2.00	Core	100% Recovery						
					1.40		6.63		Firm grey mottled brown silty CLAY. (TIDAL FLAT DEPOSITS) *Thin veneer of decaying topsoil at 1.4m.* *Occasional rootlets between 1.4 - 1.8m.*	
		1.50	ES							
		2.00 - 3.00	Core	100% Recovery						2
						(3.00)				
		3.00 - 4.00	Core	100% Recovery						3
									Mottled (blue grey brown) with rare decaying organic material between 3.8 - 4.4m.	
	▼	4.00 - 5.00	Core	100% Recovery						4
					4.40		3.63		Soft blueish grey silty CLAY with rare decaying organic material (TIDAL FLAT DEPOSITS)	
						(0.60)				
									End of Borehole at 5.00m	5

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Window sampled 1.2 - 5.0m. Terminated upon achieving proposed depth.
BACKFILL: On completion hole backfilled with gravel 5.0 - 4.0m, bentonite 4.0 - 0.2m and concrete 0.2 - 0.0m. One standpipe (50mm) installed with slotted section 4.0 - 5.0m.
REMARKS: Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
4.20					

AGS

WINDOW SAMPLE LOG

Borehole No. **WSM4CAN011**

Sheet 1 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 01/03/2016 - 02/03/2016		Final Depth:
Project No:	JFR8703	Easting:	333513	Drilling Method:	Pipe Diameter: 35mm	6.00m
Location:	Newport	Northing:	185234	Dando Terrier	Casing Diameter (mm) 100 / Casing Depth (m) 5.00	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.16	Logged By: JA		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
					0.00	(0.25)	7.16		Brown sandy CLAY. (TOPSOIL)	
					0.25	(0.35)	6.91		Firm brown slightly gravelly CLAY with occasional rootlets. Gravel is subangular to subrounded, of mudstone. (MADE GROUND)	
		0.50	B							
		0.50	ES		0.60		6.56		Firm grey mottled brown silty CLAY. (TIDAL FLAT DEPOSITS)	
		0.80	ES						*Occasional rootlets from 0.6 - 2m.*	1
		1.20 - 2.00	Core	100% Recovery						
						(2.40)				
		2.00 - 3.00	Core	100% Recovery						2
	▼								*Rare decaying organic material from 2.5 - 3.0m.*	
		3.00 - 4.00	Core	40% Recovery	3.00		4.16		Very soft blueish grey silty CLAY with rare decaying organic material. (TIDAL FLAT DEPOSITS)	3
		4.00 - 5.00	Core	100% Recovery		(3.00)				4
		5.00 - 6.00	Core	40% Recovery						5
									Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Window sampled 1.2 - 6.0m. Terminated upon achieving proposed depth.
BACKFILL: On completion hole backfilled with gravel 5.5 - 2.5m, bentonite 2.5 - 0.2m and concrete 0.2 - 0.0m. One standpipe (50mm) installed with slotted section 2.5 - 5.5m.
REMARKS: Collapsed from 6.0m up to 5.5m upon completion. Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
2.50					

AGS

WINDOW SAMPLE LOG

Borehole No.
WSM4CAN011
Sheet 2 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 01/03/2016 - 02/03/2016		Final Depth:
Project No:	JFR8703	Easting:	333513	Drilling Method:	Pipe Diameter: 35mm	6.00m
Location:	Newport	Northing:	185234	Dando Terrier	Casing Diameter (mm): 100 / Casing Depth (m): 5.00	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.16	Logged By: JA		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
									End of Borehole at 6.00m	6
										7
										8
										9
										10

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Window sampled 1.2 - 6.0m. Terminated upon achieving proposed depth.
BACKFILL: On completion hole backfilled with gravel 5.5 - 2.5m, bentonite 2.5 - 0.2m and concrete 0.2 - 0.0m. One standpipe (50mm) installed with slotted section 2.5 - 5.5m.
REMARKS: Collapsed from 6.0m up to 5.5m upon completion. Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
2.50					

AGS

WINDOW SAMPLE LOG

Borehole No. **WSM4CAN012**

Sheet 1 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 01/03/2016		Final Depth:
Project No:	JFR8703	Easting:	333631	Drilling Method:	Pipe Diameter: 35mm	6.00m
Location:	Newport	Northing:	185197	Dando Terrier	Casing Diameter (mm) 100 / Casing Depth (m) 4.00	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.20	Logged By: JA		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
					0.00	(0.30)	7.20		Reddish brown sandy angular to sub-angular GRAVEL of mudstone. (MADE GROUND)	
					0.30		6.90		Grey with sub-angular GRAVEL fragments of concrete and brick. Occasional sub-angular brick cobbles (up to 180mm). (MADE GROUND)	
		0.50 0.50	B ES			(0.80)				1
		1.20 - 2.00 1.30	Core ES	100% Recovery	1.10		6.10		Firm grey mottled orangish brown, silty CLAY (TIDAL FLAT DEPOSITS)	
		2.00 - 3.00	Core	90% Recovery		(2.20)				2
		3.00 - 4.00	Core	100% Recovery	3.30		3.90		Very soft blueish grey silty CLAY with occasional decaying organic material. (TIDAL FLAT DEPOSITS)	3
		4.00 - 5.00	Core	20% Recovery		(2.70)				4
	▼	5.00 - 6.00	Core	80% Recovery					Continued on next sheet	5

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Window sampled 1.2 - 6.0m. Terminated upon achieving proposed depth.
BACKFILL: On completion hole backfilled with gravel 6.0 - 5.0m, bentonite 5.0 - 0.2m and concrete 0.2 - 0.0m. One standpipe (50mm) installed with slotted section 5.0 - 6.0m.
REMARKS: Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
5.00					

AGS

WINDOW SAMPLE LOG

Borehole No.
WSM4CAN012
Sheet 2 of 2

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 01/03/2016		Final Depth:
Project No:	JFR8703	Easting:	333631	Drilling Method:	Pipe Diameter: 35mm	6.00m
Location:	Newport	Northing:	185197	Dando Terrier	Casing Diameter (mm) 100 / Casing Depth (m) 4.00	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.20	Logged By: JA		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
									End of Borehole at 6.00m	6 / 7 / 8 / 9 / 10

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Window sampled 1.2 - 6.0m. Terminated upon achieving proposed depth.
BACKFILL: On completion hole backfilled with gravel 6.0 - 5.0m, bentonite 5.0 - 0.2m and concrete 0.2 - 0.0m. One standpipe (50mm) installed with slotted section 5.0 - 6.0m.
REMARKS: Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
5.00					

WINDOW SAMPLE LOG

Borehole No. **WSM4CAN014**

Sheet 1 of 1

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 02/03/2016		Final Depth:
Project No:	JFR8703	Easting:	333691	Drilling Method:	Pipe Diameter: 35mm	5.00m
Location:	Newport	Northing:	185204	Dando Terrier	Casing Diameter (mm) 100 / Casing Depth (m) 4.00	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	7.70	Logged By: JA		1:25

Well	Water Strike(s)	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
					0.00	(0.20)	7.70		Reddish brown sandy angular to sub-rounded GRAVEL of mudstone. (MADE GROUND)	
		0.15	ES		0.20		7.50		Brown clayey sandy angular to sub-angular GRAVEL of mudstone, brick and concrete with occasional sub-angular brick and concrete cobbles (up to 190mm). (MADE GROUND)	
		0.50 0.50	B ES			(0.70)				
		1.00	ES		0.90		6.80		Firm greyish brown slightly gravelly CLAY. Gravel is angular to sub-angular, of mudstone and concrete. (MADE GROUND)	1
		1.20 - 2.00	Core	100% Recovery		(0.80)				
	▼				1.70		6.00		Firm to soft to greyish brown silty CLAY. (TIDAL FLAT DEPOSITS)	
		2.00 2.00 - 3.00	ES Core	 80% Recovery					*Grey mottled, bluish grey, brown below 2m.*	2
						(2.30)				
		3.00 - 4.00	Core	100% Recovery						3
		4.00 - 5.00	Core	100% Recovery	4.00		3.70		Soft blueish grey silty CLAY. (TIDAL FLAT DEPOSITS)	4
						(1.00)				
									End of Borehole at 5.00m	5

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Window sampled 1.2 - 5.0m. Terminated at 5m due to splitting of rods.
BACKFILL: On completion hole backfilled with gravel 2.5 - 0.5m, bentonite 4.5 - 2.5m and 0.5 - 0.2m and concrete 0.2 - 0.0m. One standpipe (50mm) installed with slotted section 2.5 - 4.5m.
REMARKS: Hole collapsed back to 4.5m. Installed with flush cover.

Groundwater			Chiselling		
Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
1.80					

AGS

Appendix 2

Tabulated Groundwater Monitoring

NORWEST HOLST SOIL ENGINEERING LTD.

M4 RELIEF ROAD MAGOR TO CASTLETON STAGE 2

PIEZOMETER RECORDS BHG6

DATE	TIME(24hr)	WATER LEVEL(m)	WATER LEVEL mOD
11/27/97	9:30	4.72	2.28
12/3/97	9:05	4.03	2.97
12/11/97	13:00	4.52	2.48
12/17/97	11:55	4.68	2.32

TIP DEPTH:16.00m

TYPE OF COVER:BARREL

HEIGHT OF COVER A.B.G.L:0.11m

HEIGHT OF PIPE A.B.G.L:0.09m

COMMENTS:

M4CAN
Gas Monitoring
CL-17

Loc. Ref.	Install Ref. *1	Reading Ref. *2	Location Notes	Gas Monitoring																	al Notes / C
				Date	Time	Min	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak LEL	Flow Rate (l/hr)	Differential Pressure (pa)	Air Pressure (mb)	Air Temperature (°C)	
						Oxygen (O_2) %		Carbon Dioxide (CO_2) %		Carbon Monoxide (CO) ppm		Hydrogen Sulphide (H_2S) ppm		Methane (CH_4) %							
BHM4CAN029	1	1	Shallow	04/05/16	04:30 PM	0.20	1.20	4.20	2.40	0.00	0.00	0.00	0.00	85.80	75.50	>>	0.00	0.39	1024.00		
BHM4CAN029	2	1	Deep	04/05/16	04:35 PM	19.60	20.50	0.50	0.20	0.00	0.00	0.00	0.00	2.80	1.20	54.00	-5.60	0.39	1024.00		
BHM4CAN029	1	2	Shallow	23/05/16		7.70	16.50	1.10	0.20	4.00	1.00	0.00	0.00	66.50	17.00		0.40	-0.03	1024.00		
BHM4CAN029	2	2	Deep	23/05/16		18.20	18.20	1.70	1.70	2.00	1.00	0.00	0.00	4.00	3.90		0.40	-19.19	1024.00		
BHM4CAN029	1	3	Shallow	02/06/16	12:05 PM	16.10	18.30	2.90	1.20	1.00	1.00	0.00	0.00	2.40	1.10		0.50				
BHM4CAN029	2	3	Deep	02/06/16	11:55 AM	19.00	19.00	1.10	1.10	2.00	2.00	0.00	0.00	1.50	1.50		0.40				
BHM4CAN030	1	1		04/05/16	04:00 PM	17.40	17.40	4.40	4.40	0.00	0.00	0.00	0.00	0.30	0.30	5.00	-9.10	0.37	1025.00		
BHM4CAN030	1	2		23/05/16		15.50	15.50	6.80	6.80	0.00	0.00	0.00	0.00	0.40	0.40	0.00					
BHM4CANA022	1	1		04/05/16	04:40 PM	17.50	20.20	1.30	0.20	0.00	0.00	0.00	0.00	4.50	0.90	88.00	0.00	0.40	1024.00		
BHM4CANA022	1	2		23/05/16		18.20	18.20	6.50	4.40	2.00	1.00	0.00	0.00	36.00	25.20		0.40	-0.23	1021.00		
BHM4CANA022	1	3		02/06/16	11:45 AM	8.40	19.60	2.20	1.80	1.00	1.00	0.00	0.00	8.80	3.40		0.40				
WSM4CAN008	1	2		19/05/16	03:00 PM	20.90	21.00	0.10	0.10	0.00	0.00	0.00	0.00	0.30	0.30	0.00					
WSM4CAN008	1	3		31/05/16	02:15 PM	19.10	20.10	0.60	0.20	5.00	5.00	1.00	0.00	0.30	0.30	0.00					
WSM4CAN009	1	1		04/05/16	08:45 AM	17.90	17.90	0.30	0.30	0.00	0.00	0.00	0.00	0.10	0.10	1.00	-0.70	1.00	1026.00		
WSM4CAN009	1	2		19/05/16	01:37 PM	19.50	20.10	0.20	0.10	0.00	0.00	0.00	0.00	0.50	0.30	0.00					
WSM4CAN009	1	3		31/05/16	01:00 PM	19.20	19.90	0.30	0.20	1.00	1.00	0.00	0.00	0.30	0.30	0.00	0.40				
WSM4CAN010	1	1		04/05/16	09:30 AM	19.70	19.70	0.10	0.10	2.00	0.00	0.00	0.00	0.10	0.10	1.00	0.00	-0.26	1026.00		
WSM4CAN010	1	2		19/05/16	02:00 PM	20.70	20.70	0.10	0.10	0.00	0.00	0.00	0.00	0.30	0.30	0.00					
WSM4CAN010	1	3		31/05/16		20.00	20.20	0.10	0.10	5.00	4.00	1.00	1.00	0.30	0.30	0.00	0.10				
WSM4CAN011	1	1		04/05/16	03:45 PM	20.50	20.60	0.40	0.10	0.00	0.00	0.00	0.00	0.10	0.10	2.00	0.30	0.35	1024.00		
WSM4CAN011	1	2		20/05/16	04:23 PM	16.00	16.10	4.00	4.00	0.00	0.00	0.00	0.00	0.30	0.30	0.00					
WSM4CAN011	1	3		01/06/16	04:20 PM	15.40	15.40	5.30	5.30	1.00	1.00	0.00	0.00	0.40	0.30	0.00	0.40	-0.03			
WSM4CAN012	1	1		04/05/16		20.70	20.70	0.20	0.10	0.00	0.00	0.00	0.00	0.10	0.10	2.00	0.00	0.37	1024.00		
WSM4CAN012	1	2		20/05/16	03:20 PM	20.40	20.40	0.30	0.20	0.00	0.00	0.00	0.00	0.30	0.30	0.00					
WSM4CAN012	1	3		01/06/16	03:40 PM	19.80	19.80	1.20	1.20	0.00	0.00	0.00	0.00	0.40	0.40	0.00	0.40	-0.19			
WSM4CAN014	1	1		04/05/16		20.20	20.20	0.60	0.60	0.00	0.00	0.00	0.00	0.10	0.10	2.00	0.00	0.35	1024.00		
WSM4CAN014	1	3		01/06/16	03:55 PM	19.60	19.60	1.00	1.00	0.00	0.00	0.00	0.00	0.40	0.40	0.00	0.40	-0.97			

M4CAN
Groundwater Monitoring
CL-17

Legend

DO	Dissolved Oxygen	ORP	Oxidation Reduction Potential	mAOD	meters Above Ordnance Datum
RWL	Resting Water Level	mbGL	meters below Ground Level		

Loc. Ref.	Install Ref. *1	Monitoring Round *2	Location Notes	Groundwater & Product Levels							Water Quality									Additional Notes / Comments
				Date	Time	Depth to Product (mbGL)	Groundwater Level (mbGL)	Depth to Base (mbGL)	Ground Level (mAOD)	RWL (mAOD)	Measurement Approach *3	Temperature (°C)	pH	Electrical Conductivity (µS/cm)	DO (%)	ORP (mV)	Stabilised Water Level (mbGL)	Time (min)	Logged Data Available (Y/N)	
WSM4CAN011	1	1		29/04/16			1.38	5.02	7.16	5.78	GS	10.74	7.4	778	15	-44	2.42			Purged dry on 28/04/16. Recovery rate slow.
WSM4CAN011	1	2		20/05/16	04:26 PM		1.36	5.02	7.16	5.80	GS	11.83	7.5	930	27.30	-36.10	3.38			3 well volumes (10.65 l) purged prior to sampling.
WSM4CAN011	1	3		01/06/16	04:20 PM		1.41	4.99	7.16	5.75	GS	12.92	7.6	1038	22.30	-91.00	2.54		Y	3 well volumes (10.32 l) purged prior to sample. Diver placed at 2.5m 16:46.
WSM4CAN009	1	1		04/05/16	08:39 AM		0.88	5.22	7.18	6.30	GS	12.92	7.5	2821	6	-115	2.36			Milky in colour. Recovery rate OK.
WSM4CAN009	1	2		19/05/16	01:30 PM		0.86	5.26	7.18	6.32	GS	12.76	7.6	2378	11.50	-111.40	2.21			3 well volumes (25.91 l) purged prior to sampling.
WSM4CAN009	1	3		31/05/16	01:00 PM		0.92	5.27	7.18	6.26	GS	15.12	7.5	2852	3.90	-129.80				3 well volumes (25.62 l) purged prior to sampling. Salinity 1.9 psu.
WSM4CAN010	1	1		04/05/16	09:45 AM		1.45	4.71	8.03	6.58	GS	13.51	7.7	630	39	-25	2.69			Salinity 0.4 psu. Recovery rate poor.
WSM4CAN010	1	2		19/05/16	02:00 PM		0.99	4.72	8.03	7.04	GS	12.40	7.9	9110	2.90	-54.20	4.20			3 well volumes (21.97 l) purged prior to sampling.
WSM4CAN010	1	3		31/05/16	01:30 PM		1.20	4.73	8.03	6.83	GS	15.03	7.9	862	24.50	9.50				3 well volumes (20.79 l) purged prior to sampling. Salinity 0.5 psu.
WSM4CAN012	1	1		29/04/16			1.10	5.18	7.20	6.10	GS	15.31	8.2	1706	96	-32				Purged dry 28/4/16.
WSM4CAN012	1	2		20/05/16	03:20 PM		1.02	5.16	7.20	6.18	GS	14.65	7.7	1751	25.70	-76.50				3 well volumes (11.94 l) purged prior to sampling.
WSM4CAN012	1	3		01/06/16	03:40 PM		1.16	5.10	7.20	6.04	GS	14.61	7.7	1686	26.30	-44.50			Y	Strong odour. 3 well volumes (11.3 l) taken prior to sampling. Diver placed 3m, 16:22.
WSM4CAN014	1	2		20/05/16	01:08 PM		1.38	1.65	7.70	6.32										Insufficient water to sample.
WSM4CAN014	1	3		01/06/16	03:55 PM		1.38	1.67	7.70	6.32										Insufficient water to take a sample.
BHM4CAN029	1	2	Shallow	24/05/16			0.94	1.35	6.84	5.90										Insufficient water to sample.
BHM4CAN029	2	2	Deep	24/05/16			3.85	16.06	6.84	2.99	GS	11.66	7.6	9360	5.30	-149.90	3.90			Salinity 7.2 psu. 3 well volumes (71.92 l) purged prioir to sampling.
BHM4CAN029	1	3	Shallow	02/06/16	11:50 AM		DRY	1.35	6.84	DRY										None
BHM4CAN029	2	3	Deep	02/06/16	11:55 AM		3.94	16.40	6.84	2.90	GS	11.97	7.6	1022	5.50	-164.50	3.94			Good recovery. 3 well volumes (73.4 l) purged prior to sampling.
BHM4CANA022	1	2		24/05/16			3.75	12.63	6.82	3.07	GS	13.80	7.6	7970	0.30	-120.90	7.47			Salinity 5.8 psu. Organic, sulphurous odour. 3 well volumes (52.3 l) purged.
BHM4CANA022	1	3		02/06/16	11:45 AM		3.88	12.01	6.82	2.94	GS	12.49	7.8	-7914	-0.30	232.40	4.49			Strong sulphurous odour. High sediment load, grey in appearance. 3 well volumes (44 l) purged prior to sampling.
BHM4CAN030	1	2		24/05/16			4.73	15.63	6.69	1.96	GS	11.71	7.5	6915	13.30	-136.40	3.75			Salinity 5.2 psu. 3 well volumes (64.2 l) purged prioir to smapling. Good recovery.
BHM4CAN030	1	3		02/06/16	01:04 PM		3.78	16.21	6.69	2.91	GS	11.62	7.5	7001	0.00	-152.00	3.84		Y	Clear water. Diver installed at 5m, 13:27. 3 well volumes (73.21 l) purged prior to sampling.

Appendix 3

Tabulated Soil Laboratory Data

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment	
	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Notes
N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference / Specimen Depth (m) / OD level (m) / Geology Code / Investigation Date	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
Metals								
Arsenic	mg/kg	52	52	460	3.41	TP11 @ 0.2-0.3mbGL	170	4
Boron	mg/kg	30	22	2.9	0.5	CH34 @ 0.15mbGL	46000	0
Cadmium	mg/kg	52	48	7.17	0.1	CH36 @ 0.1mbGL	190	0
Chromium	mg/kg	52	52	426	0.025	WSM4CAN009 @ 0.5mbGL	33	36
Copper	mg/kg	52	49	343	0.012	CH35 @ 0mbGL	44000	0
Lead	mg/kg	52	52	497	5.4	CH39 @ 0mbGL	1300	0
Mercury	mg/kg	52	39	34	0.07	CH44 @ 0.3mbGL	30	3
Nickel	mg/kg	52	52	221.7	3.4	BHH1 @ 1.85mbGL	980	0
Selenium	mg/kg	52	31	1.85	0.2	CH48 @ 0.05mbGL	1800	0
Vanadium	mg/kg	8	8	320	17	WSM4CAN009 @ 0.5mbGL	5000	0
Zinc	mg/kg	52	52	499	11	CH38 @ 0.1mbGL	170000	0
Non-Metal Inorganics								
Cyanide (total)	mg/kg	43	2	1	0.1	CH41 @ 1.4mbGL		
Cyanide (free)	mg/kg	36	1	0.1	0.1	BHG6 @ 0.3mbGL		
Thiocyanate	mg/kg	20	7	13	2	CH35 @ 0.5mbGL		
Ferro/ferricyanide	mg/kg	4	0	None > LOD	None > LOD			
Acid Soluble Sulphate	mg/kg	26	26	4810	424	CH48 @ 0.05mbGL		
Sulphate (total)	mg/kg	4	4	2525	1218	BHH1 @ 1.85mbGL		
Sulphide	mg/kg	30	27	803	2	CH41 @ 0.05mbGL		
Other								
pH Value	pH	52	52	11.8	7.5	CH45 @ 0.2mbGL	6-9	29
Asbestos Screen	None							
Asbestos Quantification - Total	%	3	1	0.0022	0.0022	WSM4CAN012 @ 0.5mbGL		
Asbestos Components	None	4	1	Amosite/Crocidolite	Amosite/Crocidolite	T1/9		
Analyst Comments	None	3	0	None > LOD	None > LOD			
BTEX								
GRO (C4-C12)	mg/kg	8	0	None > LOD	None > LOD			
MTBE	mg/kg	11	1	0.0119	0.0119	WSM4CAN012 @ 0.5mbGL		
Benzene	mg/kg	30	6	0.207	0.0537	WSM4CAN012 @ 0.5mbGL	27	0
Toluene	mg/kg	30	5	0.0249	0.00657	WSM4CAN012 @ 0.5mbGL	56000	0
Ethyl benzene	mg/kg	30	4	0.571	0.009	CH35 @ 0.5mbGL	5700	0
m & p Xylene	mg/kg	30	6	2.39	0.00342	CH35 @ 0.5mbGL	5900	0
o Xylene	mg/kg	30	5	0.7	0.0342	TP05 @ 0.6-0.7mbGL	6600	0
Sum of Detected BTEX	mg/kg	11	2	0.0325	0.0182	WSM4CAN012 @ 0.5mbGL		
Sum of Detected Xylenes	mg/kg	11	5	0.016	0.00228	BHM4CANA022 @ 0-0.2mbGL		
Organics								
PAH (Screening)	mg/kg	30	25	2370	16	CH43 @ 0.2mbGL	1.1	25
VOC (screen)	ug/kg	29	0	None > LOD	None > LOD			
Mineral Oil	mg/kg	29	4	1630	29	BHH1 @ 1.85mbGL		
TPH FTIR (AR)	mg/kg	26	26	2400	24	CH41 @ 1.4mbGL	2000	1
OIL FTIR	mg/kg	30	26	2900	74	CH39 @ 1mbGL		
Phenols								
Cresols	mg/kg	7	2	0.0456	0.0121	WSM4CAN014 @ 0.5mbGL		
Phenol Index	mg/kg	33	14	11.2	0.0108	CH43 @ 0.2mbGL	440	0
Phenols Monohydric	mg/kg	25	7	6.9	0.0456	TP10 @ 0.1-0.2mbGL	440	0
Phenols (total)	mg/kg	4	0	None > LOD	None > LOD		440	0
Xylenols	mg/kg	4	0	None > LOD	None > LOD			
TPH								
Aliphatics C5-C6	mg/kg	24	1	0.0125	0.0125	BHM4CANA022 @ 0-0.2mbGL	3200	0
Aliphatics >C6-C8	mg/kg	24	4	0.0445	0.012	BHM4CANA022 @ 0-0.2mbGL	7800	0
Aliphatics >C8-C10	mg/kg	24	3	0.0325	0.0114	WSM4CAN012 @ 0.5mbGL	2000	0
Aliphatics >C10-C12	mg/kg	24	6	71	0.0103	TP11 @ 0.2-0.3mbGL	9700	0
Aliphatics >C12-C16	mg/kg	24	6	170	0.538	TP04 @ 0.3-0.4mbGL	25000	0
Aliphatics >C16-C21	mg/kg	24	7	160	0.803	TP04 @ 0.3-0.4mbGL	450000	0
Aliphatics >C21-C35	mg/kg	24	15	360	1.07	TP06 @ 0.1-0.3mbGL	450000	0
Aliphatics >C35-C40	mg/kg	13	1	160	160	TP06 @ 0.1-0.3mbGL	450000	0
Aliphatics >C35-C44	mg/kg	11	7	42.7	0.792	WSM4CAN014 @ 0.5mbGL	450000	0
Aliphatics >C40-C44	mg/kg	13	0	None > LOD	None > LOD		450000	0
Total Aliphatics >C12-C44	mg/kg	11	11	148	1.07	WSM4CAN012 @ 0.5mbGL	25000	0
Aromatics C5-7	mg/kg	11	0	None > LOD	None > LOD		26000	0
Aromatics >C6-C7	mg/kg	13	0	None > LOD	None > LOD		26000	0
Aromatics >C7-C8	mg/kg	24	1	0.016	0.016	BHM4CANA022 @ 0-0.2mbGL	56000	0
Aromatics >EC8-EC10	mg/kg	24	4	0.0661	0.0131	WSM4CAN012 @ 0.5mbGL	3500	0
Aromatics >EC10-EC12	mg/kg	24	4	54	0.0325	TP09 @ 0.2-0.5mbGL	9200	0
Aromatics >EC12-EC16	mg/kg	24	8	57	0.149	TP05 @ 0.6-0.7mbGL	10000	0
Aromatics >EC16-EC21	mg/kg	24	10	400	0.73	TP04 @ 0.3-0.4mbGL	7600	0
Aromatics >EC21-EC35	mg/kg	24	18	2100	2.17	TP04 @ 0.3-0.4mbGL	7800	0
Aromatics >EC35-EC40	mg/kg	13	2	150000	210	TP04 @ 0.3-0.4mbGL	7800	1
Aromatics >EC35-EC44	mg/kg	11	11	196	0.596	WSM4CAN014 @ 0.5mbGL	7800	0
Aromatics >EC40-EC44	mg/kg	24	12	360	0.257	TP06 @ 0.1-0.3mbGL	7800	0
Total Aromatics >EC12-EC44	mg/kg	11	11	812	2.77	WSM4CAN014 @ 0.5mbGL	7600	0
Total Aliphatics & Aromatics >C5-C44	mg/kg	11	11	957	3.85	WSM4CAN014 @ 0.5mbGL	2000	0
PAHs								
Acenaphthene	mg/kg	11	3	0.62	0.0189	WSM4CAN014 @ 0.5mbGL	29000	0
Acenaphthylene	mg/kg	11	2	0.0492	0.0459	BHM4CAN029 @ 1-1.6mbGL	29000	0
Anthracene	mg/kg	11	4	1.5	0.0513	WSM4CAN014 @ 0.5mbGL	150000	0
Benzo(a)anthracene	mg/kg	11	6	11.9	0.0183	WSM4CAN014 @ 0.5mbGL	49	0
Benzo(a)pyrene	mg/kg	11	9	12.3	0.026	WSM4CAN014 @ 0.5mbGL	11	1
Benzo(b)fluoranthene	mg/kg	11	11	19.3	0.0242	WSM4CAN014 @ 0.5mbGL	13	1
Benzo(g,h,i)perylene	mg/kg	11	7	8.93	0.0339	WSM4CAN014 @ 0.5mbGL	1400	0
Benzo(k)fluoranthene	mg/kg	11	6	6.87	0.019	WSM4CAN014 @ 0.5mbGL	370	0
Chrysene	mg/kg	11	10	11.9	0.0163	WSM4CAN014 @ 0.5mbGL	93	0
Dibenzo(ah)anthracene	mg/kg	11	4	3.14	0.0336	WSM4CAN014 @ 0.5mbGL	1.1	1
Fluoranthene	mg/kg	11	11	14.5	0.0267	WSM4CAN014 @ 0.5mbGL	6300	0
Fluorene	mg/kg	11	3	0.577	0.0586	WSM4CAN014 @ 0.5mbGL	20000	0
Indeno(1,2,3-cd)pyrene	mg/kg	11	6	7.89	0.0334	WSM4CAN014 @ 0.5mbGL		
Naphthalene	mg/kg	11	10	0.152	0.0136	WSM4CAN012 @ 0.5mbGL	190	0
Phenanthrene	mg/kg	11	11	4	0.026	WSM4CAN014 @ 0.5mbGL	6200	0
Pyrene	mg/kg	11	11	11.4	0.0189	WSM4CAN014 @ 0.5mbGL	15000	0
PAH, Total Detected USEPA 16	mg/kg	11	10	115	0.142	WSM4CAN014 @ 0.5mbGL		
PCB								
PCB - ARO	mg/kg	29	29	1691.2	1.1	BHH1 @ 0.9mbGL	0.24	29
Pcb-28 2,4,4' - Trichlororbiphenyl	mg/kg	40	29	6	0.0063	TP05 @ 0.6-0.7mbGL	0.24	6

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference / Specimen Depth (m) / OD level (m) / Geology Code / Investigation Date	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	mg/kg	40	37	12	0.013	TP04 @ 0.3-0.4mbGL	0.24	16
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg	11	8	0.415	0.0111	WSM4CAN014 @ 0.5mbGL	0.24	1
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg	11	0	None > LOD	None > LOD		0.24	0
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	mg/kg	40	38	20	0.013	TP04 @ 0.3-0.4mbGL	0.24	19
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg	11	10	3.46	0.00613	WSM4CAN014 @ 0.5mbGL	0.24	4
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg	11	6	0.269	0.00467	WSM4CAN014 @ 0.5mbGL	0.24	1
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg	51	47	17	0.0119	TP04 @ 0.3-0.4mbGL	0.24	23
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg	11	0	None > LOD	None > LOD		0.24	0
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg	11	0	None > LOD	None > LOD		0.24	0
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	mg/kg	40	37	19	0.029	TP04 @ 0.3-0.4mbGL	0.24	21
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	mg/kg	40	37	24	0.027	TP04 @ 0.3-0.4mbGL	0.24	19
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg	11	9	1.33	0.00556	WSM4CAN014 @ 0.5mbGL	0.24	2
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg	11	8	0.261	0.0108	WSM4CAN014 @ 0.5mbGL	0.24	1
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg	11	8	0.415	0.0107	WSM4CAN014 @ 0.5mbGL	0.24	1
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg	11	0	None > LOD	None > LOD		0.24	0
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	mg/kg	40	37	12	0.029	TP04 @ 0.3-0.4mbGL	0.24	20
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	mg/kg	11	8	0.115	0.00515	WSM4CAN014 @ 0.5mbGL	0.24	0
Total PCB Congeners	mg/kg	40	40	110	0	TP04 @ 0.3-0.4mbGL	0.24	33
Sum of detected WHO 12 PCBs	mg/kg	11	9	14.1	0.0572	WSM4CAN014 @ 0.5mbGL	0.24	8
SVOCs								
Phenols								
2-Chlorophenol	mg/kg	46	0	None > LOD	None > LOD			
2-Methylphenol	mg/kg	46	0	None > LOD	None > LOD			
2-Nitrophenol	mg/kg	46	0	None > LOD	None > LOD			
2,4-Dichlorophenol	mg/kg	46	0	None > LOD	None > LOD			
2,4-Dimethylphenol	mg/kg	46	0	None > LOD	None > LOD			
2,4,5-Trichlorophenol	mg/kg	46	0	None > LOD	None > LOD			
2,4,6-Trichlorophenol	mg/kg	46	0	None > LOD	None > LOD			
4-Chloro-3-methylphenol	mg/kg	46	0	None > LOD	None > LOD			
4-Methylphenol	mg/kg	3	0	None > LOD	None > LOD			
4-Nitrophenol	mg/kg	46	0	None > LOD	None > LOD			
Pentachlorophenol	mg/kg	46	4	6.2	0.1	BHH1 @ 0.2mbGL		
Phenol	mg/kg	39	0	None > LOD	None > LOD		440	0
2,4-Dinitrophenol	mg/kg	43	0	None > LOD	None > LOD			
3- & 4-Methylphenol	mg/kg	43	0	None > LOD	None > LOD			
4,6-Dinitro-2-methylphenol	mg/kg	43	0	None > LOD	None > LOD			
4-Chlorophenol *	mg/kg	43	1	6	6	CH35 @ 0.5mbGL		
PAHs								
2-Chloronaphthalene	mg/kg	43	0	None > LOD	None > LOD			
1-Methylnaphthalene	mg/kg	40	0	None > LOD	None > LOD		#N/A	#N/A
2-Methylnaphthalene	mg/kg	43	0	None > LOD	None > LOD			
Acenaphthene	mg/kg	42	3	0.6	0.3	TP05 @ 0.6-0.7mbGL	29000	0
Acenaphthylene	mg/kg	42	1	0.3	0.3	TP06 @ 0.1-0.3mbGL	29000	0
Anthracene	mg/kg	42	4	4.1	0.4	CH46 @ 0.5mbGL	150000	0
Benzo(a)anthracene	mg/kg	42	8	2.7	0.143	TP06 @ 0.1-0.3mbGL	49	0
Benzo(a)pyrene	mg/kg	42	14	2.6	0.198	TP06 @ 0.1-0.3mbGL	11	0
Benzo(b)fluoranthene	mg/kg	42	13	2.5	0.195	TP06 @ 0.1-0.3mbGL	13	0
Benzo(g,h,i)perylene	mg/kg	42	9	1.6	0.185	TP06 @ 0.1-0.3mbGL	1400	0
Benzo(k)fluoranthene	mg/kg	42	9	1.8	0.173	TP06 @ 0.1-0.3mbGL	370	0
Chrysene	mg/kg	42	23	158	0.249	CH46 @ 0.5mbGL	93	1
Dibenzo(ah)anthracene	mg/kg	42	3	0.7	0.2	TP06 @ 0.1-0.3mbGL	1.1	0
Fluoranthene	mg/kg	42	16	4.1	0.253	TP06 @ 0.1-0.3mbGL	6300	0
Fluorene	mg/kg	42	6	22.5	0.4	CH46 @ 0.5mbGL	20000	0
Indeno(1,2,3-cd)pyrene	mg/kg	42	14	2.2	0.188	TP06 @ 0.1-0.3mbGL		
Naphthalene	mg/kg	42	2	0.9	0.3	TP05 @ 0.6-0.7mbGL	190	0
Phenanthrene	mg/kg	42	13	37.3	0.168	CH46 @ 0.5mbGL	6200	0
Pyrene	mg/kg	42	14	3.3	0.2	TP06 @ 0.1-0.3mbGL	15000	0
Pthalates								
bis(2-Ethylhexyl)phthalate	mg/kg	42	20	8.1	0.363	CH47 @ 1.1mbGL		
Butylbenzyl phthalate	mg/kg	42	0	None > LOD	None > LOD			
Di-n-butyl phthalate	mg/kg	42	0	None > LOD	None > LOD			
Diethyl phthalate	mg/kg	42	0	None > LOD	None > LOD			
Dimethyl phthalate	mg/kg	42	0	None > LOD	None > LOD			
Di-N-Octyl Phthalate	mg/kg	3	0	None > LOD	None > LOD			
Other Semi-Volatiles								
1,2-Dichlorobenzene	mg/kg	42	0	None > LOD	None > LOD			
1,2,4-Trichlorobenzene	mg/kg	39	5	14.9	0.145	CH41 @ 1.4mbGL	220	0
1,3-Dichlorobenzene	mg/kg	40	0	None > LOD	None > LOD			
1,4-Dichlorobenzene	mg/kg	40	1	3.9	3.9	CH35 @ 0.5mbGL		
2-Nitroaniline	mg/kg	40	0	None > LOD	None > LOD			
2,4-Dinitrotoluene	mg/kg	40	0	None > LOD	None > LOD			
2,6-Dinitrotoluene	mg/kg	40	0	None > LOD	None > LOD			
3-Nitroaniline	mg/kg	40	0	None > LOD	None > LOD			
4-Bromophenylphenylether	mg/kg	40	0	None > LOD	None > LOD			
4-Chloroaniline	mg/kg	40	1	19.2	19.2	CH35 @ 0.5mbGL		
4-Chlorophenylphenylether	mg/kg	40	0	None > LOD	None > LOD			
4-Nitroaniline	mg/kg	40	1	0.7	0.7	CH37 @ 0mbGL		
Azobenzene	mg/kg	3	0	None > LOD	None > LOD			
Bis(2-chloroethoxy)methane	mg/kg	40	0	None > LOD	None > LOD			
bis(2-Chloroethyl)ether	mg/kg	40	0	None > LOD	None > LOD			
Dibenzofuran	mg/kg	40	0	None > LOD	None > LOD			
Hexachlorobenzene	mg/kg	39	1	0.223	0.223	WSM4CAN012 @ 0.5mbGL	30	0
Hexachlorobutadiene	mg/kg	39	0	None > LOD	None > LOD		31	0
Hexachlorocyclopentadiene	mg/kg	41	0	None > LOD	None > LOD			
Hexachloroethane	mg/kg	42	0	None > LOD	None > LOD			
Isophorone	mg/kg	42	0	None > LOD	None > LOD			
N-Nitroso-di-npropylamine	mg/kg	42	0	None > LOD	None > LOD			
Nitrobenzene	mg/kg	42	0	None > LOD	None > LOD			
3,3'-Dichlorobenzidine	mg/kg	39	0	None > LOD	None > LOD			
bis(2-Chloroisopropyl)ether	mg/kg	39	0	None > LOD	None > LOD			
Benzoic Acid	mg/kg	39	0	None > LOD	None > LOD			
Benzyl alcohol	mg/kg	39	0	None > LOD	None > LOD			
Biphenyl *	mg/kg	39	13	50.7	0.2	CH46 @ 0.5mbGL		
Diphenyl ether *	mg/kg	39	0	None > LOD	None > LOD			

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment	
	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Notes
N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference Specimen Depth (m) OD level (m) Geology Code Investigation Date	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
VOCs								
Naphthalene	ug/kg	23	1	900	900	TP05 @ 0.6-0.7mbGL	190000	0
Hexachlorobutadiene	ug/kg	22	0	None > LOD	None > LOD		31000	0
1,2,4-Trichlorobenzene	ug/kg	20	3	72	25	CH41 @ 1.4mbGL	220000	0
1,2-Dichlorobenzene	ug/kg	20	3	174	5	CH35 @ 0.5mbGL		
1,3-Dichlorobenzene	ug/kg	20	3	39	6	CH35 @ 0.5mbGL		
1,4-Dichlorobenzene	ug/kg	20	4	594	30	CH35 @ 0.5mbGL		
1.1.1.2-Tetrachloroethane	ug/kg	20	0	None > LOD	None > LOD			
1.1.1-Trichloroethane	ug/kg	20	0	None > LOD	None > LOD			
1.1.2.2-Tetrachloroethane	ug/kg	20	0	None > LOD	None > LOD			
1.1.2-Trichloroethane	ug/kg	20	0	None > LOD	None > LOD			
1.1-Dichloropropene	ug/kg	20	0	None > LOD	None > LOD			
1.1-Dichloroethane	ug/kg	20	0	None > LOD	None > LOD			
1.1-Dichloroethene	ug/kg	20	0	None > LOD	None > LOD			
1.2.3-Trichlorobenzene	ug/kg	20	0	None > LOD	None > LOD		102000	0
1,2,3-Trichloropropane	ug/kg	3	0	None > LOD	None > LOD			
1.2.4-Trimethylbenzene	ug/kg	20	0	None > LOD	None > LOD			
1.2-Dibromo-3-chloropropane	ug/kg	20	0	None > LOD	None > LOD			
1,2-Dichlorobenzene	ug/kg	3	0	None > LOD	None > LOD			
1.2-Dichloroethane	ug/kg	20	0	None > LOD	None > LOD			
1,2-Dichloropropane	ug/kg	3	0	None > LOD	None > LOD			
cis-1-2-Dichloroethene	ug/kg	20	0	None > LOD	None > LOD			
1.2-Dibromoethane	ug/kg	20	0	None > LOD	None > LOD			
1.2-Dichloropropane	ug/kg	20	0	None > LOD	None > LOD			
1.3.5-Trimethylbenzene	ug/kg	20	0	None > LOD	None > LOD			
1.3.5-Trichlorobenzene	ug/kg	0	0	None > LOD	None > LOD		23000	0
cis-1-3-Dichloropropene	ug/kg	20	0	None > LOD	None > LOD			
1.3-Dichloropropane	ug/kg	20	0	None > LOD	None > LOD			
2.2-Dichloropropane	ug/kg	20	0	None > LOD	None > LOD			
2-Chlorotoluene	ug/kg	20	0	None > LOD	None > LOD			
4-Chlorotoluene	ug/kg	20	0	None > LOD	None > LOD			
4-Isopropyltoluene	ug/kg	3	0	None > LOD	None > LOD			
Benzene	ug/kg	3	0	None > LOD	None > LOD		27000	0
Bromobenzene	ug/kg	20	0	None > LOD	None > LOD			
Bromochloromethane	ug/kg	20	0	None > LOD	None > LOD			
Bromoform	ug/kg	20	0	None > LOD	None > LOD			
Bromomethane	ug/kg	20	0	None > LOD	None > LOD			
Bromodichloromethane	ug/kg	20	0	None > LOD	None > LOD			
Carbon Disulphide	ug/kg	3	0	None > LOD	None > LOD		11000	0
Chlorobenzene	ug/kg	20	2	56	17	CH35 @ 0.5mbGL	56000	0
Chloroethane	ug/kg	20	0	None > LOD	None > LOD			
Chloroform	ug/kg	20	0	None > LOD	None > LOD		99000	0
Chloromethane	ug/kg	20	0	None > LOD	None > LOD			
Carbontetrachloride	ug/kg	20	0	None > LOD	None > LOD			
Dichlorodifluoromethane	ug/kg	20	0	None > LOD	None > LOD			
Dibromochloromethane	ug/kg	20	0	None > LOD	None > LOD			
Dibromomethane	ug/kg	20	0	None > LOD	None > LOD			
Dichloromethane	ug/kg	3	0	None > LOD	None > LOD			
Ethylbenzene	ug/kg	3	0	None > LOD	None > LOD		5700000	0
Isopropylbenzene	ug/kg	20	0	None > LOD	None > LOD			
Methyl Tertiary Butyl Ether	ug/kg	3	0	None > LOD	None > LOD			
n-Butylbenzene	ug/kg	20	0	None > LOD	None > LOD			
o-Xylene	ug/kg	3	0	None > LOD	None > LOD		6600000	0
p/m-Xylene	ug/kg	3	0	None > LOD	None > LOD			
Propylbenzene	ug/kg	20	0	None > LOD	None > LOD			
p-Isopropyltoluene	ug/kg	17	1	20	20	TP08 @ 0.1-0.3mbGL		
sec-Butylbenzene	ug/kg	20	0	None > LOD	None > LOD			
Styrene	ug/kg	20	3	400	20	TP05 @ 0.6-0.7mbGL		
trans-1-2-Dichloroethene	ug/kg	20	0	None > LOD	None > LOD			
trans-1-3-Dichloropropene	ug/kg	20	0	None > LOD	None > LOD			
Trichlorofluoromethane	ug/kg	20	0	None > LOD	None > LOD			
tert-amyl methyl ether	ug/kg	3	0	None > LOD	None > LOD			
tert-Butylbenzene	ug/kg	20	0	None > LOD	None > LOD			
Tetrachloroethene	ug/kg	20	1	13.3	13.3	WSM4CAN012 @ 0.5mbGL	19000	0
Toluene	ug/kg	3	0	None > LOD	None > LOD		56000000	0
Trichloroethene	ug/kg	20	1	20	20	TP06 @ 0.1-0.3mbGL	1200	0
Vinyl Chloride	ug/kg	20	0	None > LOD	None > LOD		59	0

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	BHG6	BHH1	BHH1	BHH1	CH33	CH34	CH34	CH35	CH35	CH35	CH36	CH37	CH38	CH39	CH39	CH40	CH40	CH41	CH41	CH42	CH42	CH43	CH44	CH44	CH45	CH46	CH47
Specimen Depth (m)		0.3	0.2	0.9	1.85	0.2	0.15	1.4	0	0.5	0.8	0.1	0	0.1	0	1	0	0.5	0.05	1.4	0.2	1.2	0.2	0.3	1	0.2	0.5	0.1
OD level (m)																												
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Investigation Date		1997 GI	1997 GI	1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI
Metals																												
Arsenic	mg/kg	11.2	9.6	13.4	11	13.3	16	13	6.9	15	13	6	3.8	9.8	12	12	8.3	8.3	9.8	8.1	7.4	7.7	10.2	7.91	8.15	8.74	7.34	9.03
Boron	mg/kg	1.1	0.9	0.5	1	1.1	2.9	1	0.8	<2.4	2.9	<0.5	<0.5	<0.5	<0.5	0.5	0.7	0.7	<0.5	<0.5	0.6	<0.5	0.7	0.7	1	0.6	0.6	1
Cadmium	mg/kg	1.1	1.2	2	1	0.12	0.13	0.13	1.37	0.27	0.17	7.17	1.57	0.83	0.54	0.71	0.41	0.41	0.35	0.75	1.15	1.7	0.1	0.47	0.4	0.14	0.5	0.46
Chromium	mg/kg	35.8	39.2	55.1	41.1	40	45	38	56	0.031	0.03	0.025	18	221	142	184	10	74	120	272	0.037	0.043	41	49	50	76	87	54
Copper	mg/kg	17.5	33.8	44.1	37	16	17	14	343	0.022	0.012	0.022	35	52	40	34	20	20	31	64	0.025	0.026	15	41	16	19	31	22
Lead	mg/kg	50.9	74.8	71.1	73.5	56	59	45	95	71	45	128	75	368	497	98	53	53	85	61	54	64	44	62	46	45	124	54
Mercury	mg/kg	0.5	30.9	24.8	4.8	0.64	0.18	0.43	<15.2	<0.67	0.2	1.09	2.34	5.96	4.22	7.67	9.82	9.82	6.83	12.5	8.88	14.9	0.07	34	7.66	0.19	2.5	1.02
Nickel	mg/kg	17.9	31.9	40.5	221.7	33	34	33	31	25	28	11	14	29	34	46	24	24	28	32	26	33	31	28	15	11	37	24
Selenium	mg/kg	0.6	0.3	0.2	0.3	0.47	<0.5	<0.5	1.51	<0.89	<0.5	1.55	1.39	0.94	1.49	1.38	0.89	0.89	1.37	0.91	1.08	1.03	0.36	1.03	1.02	0.87	1.14	0.98
Vanadium	mg/kg																											
Zinc	mg/kg	191.5	188.9	225.6	178.4	103	113	100	239	112	90	303	206	499	243	151	134	134	386	488	128	133	91	123	70	37	145	125
Non-Metal Inorganics																												
Cyanide (total)	mg/kg	<0.2	<0.1	<0.1	0.1	<1	<1	<1	<1	<0.001	<0.001	<0.001	<1	<1	<1	<1	<1	<1	<1	1	<0.001	<0.001	<1	<1	<1	<1	<1	<1
Cyanide (free)	mg/kg	0.1	<0.1	<0.1	<0.1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Thiocyanate	mg/kg	<1	<1	<1	<1		8	<2	<2	13	4	<2	<2	2	2	5	<2	<2	2	<2	<2	<2						
Ferro/ferricyanide	mg/kg	<10	<10	<10	<10																							
Acid Soluble Sulphate	mg/kg					694	575	424	1630	944	485	2270	1450	1920	1600	2020	2440	2440	1360	1760	1050	987	1340	1690	2550	2950	1560	1210
Sulphate (total)	mg/kg	1709	2487	1218	2525																							
Sulphide	mg/kg	4.2	22.1	18.4	30.4	<1	5	<1	<1	13	6	10	2	25	363	122	4	4	803	23	24	10	7	6	17	11	25	44
Other																												
pH Value	pH	8.1	11.2	8.4	11.2	8	7.7	8.1	9.4	7.8	7.8	9.5	9.7	9.8	10.3	10.4	11.2	11.2	10.6	10.3	9.4	8.9	9.3	9.8	9.6	11.8	9.7	10
Asbestos Screen	None																											
Asbestos Quantification - Total	%																											
Asbestos Components	None																											
Analyst Comments	None																											
BTEX																												
GRO (C4-C12)	mg/kg																											
MTBE	mg/kg																											
Benzene	mg/kg								<0.005	0.168	0.096									<0.005	<0.005						<0.005	
Toluene	mg/kg								<0.005	0.023	0.01									<0.005	<0.005						<0.005	
Ethyl benzene	mg/kg								<0.005	0.571	0.244									0.009	<0.005						<0.005	
m & p Xylene	mg/kg								<0.005	2.39	0.968									0.012	<0.005						<0.005	
o Xylene	mg/kg								<0.005	0.496	0.213									<0.005	<0.005						<0.005	
Sum of Detected BTEX	mg/kg																											
Sum of Detected Xylenes	mg/kg																											
Organics																												
PAH (Screening)	mg/kg	<0.1	155.3	62.5	142.6	16	<10	<10	50	33	<18	432	23	<10	126	610	86	86	62	146	1470	1970	2370	2310	1430	55	1940	47
VOC (screen)	ug/kg	<100	<100	<100	<100																							
Mineral Oil	mg/kg	29	1557	452	1630																							
TPH FTIR (AR)	mg/kg					28	116	420	275	256	40	1530	258	843	245	609	524	524	141	2400	127	244	330	879	162	72	88	273
OIL FTIR	mg/kg					141	178	104	280	365	238	1749	185	1120	285	2900	894	894	566	866	548	656	906	805	657	251	487	401
Phenols																												
Cresols	mg/kg																											
Phenol Index	mg/kg					<0.5	<0.5	<0.5	<0.5	<1.3	<0.5	<0.5	<0.5	0.8	1.3	1.6	0.8	0.8	<0.5	0.5	0.8	1.1	11.2	0.6	0.7	<0.5	1.5	1.1
Phenols Monohydric	mg/kg	<1	<1	<1	<1																							
Phenols (total)	mg/kg	<1	<1	<1	<0.1																							
Xylenols	mg/kg																											
TPH																												
Aliphatics C5-C6	mg/kg																											
Aliphatics >C6-C8	mg/kg																											
Aliphatics >C8-C10	mg/kg																											
Aliphatics >C10-C12	mg/kg																											
Aliphatics >C12-C16	mg/kg																											
Aliphatics >C16-C21	mg/kg																											
Aliphatics >C21-C35	mg/kg																											

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

																		2008 WSP Investigation. Locations unknown - though to be in the south of the site (wind turbine								
Sample Reference	**Units**	**CH47**	**CH47A**	**CH48**	**CP/RH01**	**CP/RH02**	**TP03**	**TP04**	**TP04**	**TP04**	**TP05**	**TP05**	**TP06**	**TP07**	**TP08**	**TP09**	**TP10**	**TP11**	**T1/1**	**T1/2**	**T1/3**	**T1/4**	**T1/5**	**T1/6**	**T1/7**	**T1/8**	**T1/9**
Specimen Depth (m)		1.1	0.2	0.05	0.2-0.25	0.2-0.5	0.1-0.2	0.3-0.4	0.7-0.8	0.8-0.9	0.2-0.5	0.6-0.7	0.1-0.3	0.2-0.5	0.1-0.3	0.2-0.5	0.1-0.2	0.2-0.3									
OD level (m)																										
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG									
Investigation Date		2000 GI	2000 GI	2000 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI									
Metals																											
Arsenic	mg/kg	13.6	7.52	3.41	100	120	230	170	270	50	24	260	67	100	160	100	91	460									
Boron	mg/kg	1.3	1.2	1.8																							
Cadmium	mg/kg	0.14	0.43	0.13	0.78	1	1.2	0.71	0.88	<0.25	<0.25	0.92	0.96	0.55	0.73	0.51	0.44	1.9									
Chromium	mg/kg	51	67	349	14	39	57	28	43	8.1	8	42	13	38	26	20	16	45									
Copper	mg/kg	18	20	30	29	16	29	11	9.4	2.7	<2.5	18	10	15	15	9.4	17	77									
Lead	mg/kg	84	55	56	40	45	53	39	28	6.3	5.4	32	41	38	42	33	25	54									
Mercury	mg/kg	0.14	2.27	0.15	0.4	<0.2	<0.2	2.9	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	0.4	0.5	0.5									
Nickel	mg/kg	36	22	7	14	16	47	78	33	5.7	3.4	38	9.5	16	21	15	11	67									
Selenium	mg/kg	<0.5	0.91	1.85	<0.3	0.4	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	<0.3	0.4	0.7	0.3									
Vanadium	mg/kg																										
Zinc	mg/kg	118	115	41	240	190	440	93	100	39	11	130	98	200	110	100	160	110									
Non-Metal Inorganics																											
Cyanide (total)	mg/kg	<1	<1		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0									
Cyanide (free)	mg/kg	<1	<1																								
Thiocyanate	mg/kg																										
Ferro/ferricyanide	mg/kg																										
Acid Soluble Sulphate	mg/kg	1050	1100	4810																							
Sulphate (total)	mg/kg																										
Sulphide	mg/kg	9	29	762																							
Other																											
pH Value	pH	8.1	9.8	10.6	9.3	10	9	8.6	7.5	8.9	9.5	8.4	9	9.2	8.4	9.8	9.7	9.9									
Asbestos Screen	None																										
Asbestos Quantification - Total	%																										
Asbestos Components	None																										Amosite/ Crocidolite
Analyst Comments	None																										
BTEX																											
GRO (C4-C12)	mg/kg																										
MTBE	mg/kg																										
Benzene	mg/kg				<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01									
Toluene	mg/kg				<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01									
Ethyl benzene	mg/kg				<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	0.4	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01									
m & p Xylene	mg/kg				<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	1.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01									
o Xylene	mg/kg				<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	0.7	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01									
Sum of Detected BTEX	mg/kg																										
Sum of Detected Xylenes	mg/kg																										
Organics																											
PAH (Screening)	mg/kg	26	97	72																							
VOC (screen)	ug/kg																										
Mineral Oil	mg/kg																										
TPH FTIR (AR)	mg/kg	24	114	25																							
OIL FTIR	mg/kg	93	294	74																							
Phenols																											
Cresols	mg/kg																										
Phenol Index	mg/kg	<0.5	<0.5	<0.5																							
Phenols Monohydric	mg/kg				<2.5	0.4	1.3	1.6	<2.5	<2.5	<2.5	<2.5	4.2	<2.5	<2.5	<2.5	6.9	4.3									
Phenols (total)	mg/kg																										
Xylenols	mg/kg																										
TPH																											
Aliphatics C5-C6	mg/kg				<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2									
Aliphatics >C6-C8	mg/kg				<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2									
Aliphatics >C8-C10	mg/kg				<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2									
Aliphatics >C10-C12	mg/kg				<35	<35	<35	<35	<35		<35	<35	<35	<35	<35	54	70	71									
Aliphatics >C12-C16	mg/kg				<50	<50	<50	170	<50		<50	<50	<50	71	<50	<50	<50	<50									
Aliphatics >C16-C21	mg/kg				<100	<100	<100	160	<100		<100	<100	<100	<100	<100	<100	<100	<100									
Aliphatics >C21-C35	mg/kg				<100	<100	<100	220	<100		<100	<100	360	240	<100	<100	<100	120									

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

e area). Depths unknown

Sample Reference	Units	T1/10	T1/11	T1/12	T1/13	T1/14	T1/15	T2/1	T2/2	T2/3	T2/4	T2/5	T2/6	T2/7	T2/8	T2/9	T2/10	T2/11	T2/12	T2/13	T2/14	T2/15	T2/16	T2/17	T2/18	BHM4CAN029	BHM4CANA022
Specimen Depth (m)																										1-1.6	0-0.2
OD level (m)																										5.84-5.24	6.82-6.62
Geology Code																										MG	MG
Investigation Date																										2016 GI	2016 GI
Metals																											
Arsenic	mg/kg																									34.3	13.8
Boron	mg/kg																										
Cadmium	mg/kg																									0.671	0.633
Chromium	mg/kg																									40.1	44.4
Copper	mg/kg																									101	40.5
Lead	mg/kg																									94.7	34
Mercury	mg/kg																									<0.14	0.181
Nickel	mg/kg																									41.7	29
Selenium	mg/kg																									<1	<1
Vanadium	mg/kg																									80.3	58.9
Zinc	mg/kg																									363	151
Non-Metal Inorganics																											
Cyanide (total)	mg/kg																										
Cyanide (free)	mg/kg																									<0.5	<1
Thiocyanate	mg/kg																										
Ferro/ferricyanide	mg/kg																										
Acid Soluble Sulphate	mg/kg																										
Sulphate (total)	mg/kg																										
Sulphide	mg/kg																										
Other																											
pH Value	pH																									8.41	8.9
Asbestos Screen	None																									NFD	
Asbestos Quantification - Total	%																										<0.001
Asbestos Components	None																										Amosite
Analyst Comments	None																										N/C
BTEX																											
GRO (C4-C12)	mg/kg																									<0.01	<0.01
MTBE	mg/kg																									<0.003	<0.003
Benzene	mg/kg																									0.0537	0.172
Toluene	mg/kg																									0.00657	0.0148
Ethyl benzene	mg/kg																									<0.005	<0.005
m & p Xylene	mg/kg																									<0.003	0.00342
o Xylene	mg/kg																									<0.024	0.0342
Sum of Detected BTEX	mg/kg																									<0.009	0.0182
Sum of Detected Xylenes	mg/kg																									0.00548	0.016
Organics																											
PAH (Screening)	mg/kg																										
VOC (screen)	ug/kg																										
Mineral Oil	mg/kg																										
TPH FTIR (AR)	mg/kg																										
OIL FTIR	mg/kg																										
Phenols																											
Cresols	mg/kg																									<0.01	<0.01
Phenol Index	mg/kg																									<0.01	<0.01
Phenols Monohydric	mg/kg																									<0.01	<0.01
Phenols (total)	mg/kg																										
Xylenols	mg/kg																									<0.08	
TPH																											
Aliphatics C5-C6	mg/kg																									<0.01	0.0125
Aliphatics >C6-C8	mg/kg																									0.012	0.0445
Aliphatics >C8-C10	mg/kg																									<0.01	0.0285
Aliphatics >C10-C12	mg/kg																									<0.01	0.0137
Aliphatics >C12-C16	mg/kg																									0.538	0.803
Aliphatics >C16-C21	mg/kg																									1.56	2.56
Aliphatics >C21-C35	mg/kg																									23	19.3

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	WSM4CAN008	WSM4CAN009	WSM4CAN010	WSM4CAN011	WSM4CAN012	WSM4CAN014	HPM4CAN001	HPM4CAN002	HPM4CAN003
Specimen Depth (m)		0.2-0.6	0.5	1	0.5	0.5	0.5	GL	GL	GL
OD level (m)		7.16-6.76	6.68	7.03	6.66	6.7	7.2			
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG
Investigation Date		2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI
Metals										
Arsenic	mg/kg	16.1	15.8	13.3	14.9	8.46	8.06			
Boron	mg/kg									
Cadmium	mg/kg	0.472	0.544	<0.02	<0.02	0.483	0.791			
Chromium	mg/kg	92.7	426	52.7	37.7	89.3	13.7			
Copper	mg/kg	16.7	84.7	<1.4	<1.4	204	15.6			
Lead	mg/kg	31.9	57.5	33.5	33.1	48.6	39.7			
Mercury	mg/kg	<0.14	3.49	<0.14	0.254	31.4	0.472			
Nickel	mg/kg	37.4	48.7	33	37.3	13.9	11.5			
Selenium	mg/kg	<1	<1	<1	<1	<1	<1			
Vanadium	mg/kg	114	320	74.6	54	29.9	17			
Zinc	mg/kg	119	407	106	128	267	117			
Non-Metal Inorganics										
Cyanide (total)	mg/kg									
Cyanide (free)	mg/kg	<0.5	<1		<1	<1	<1			
Thiocyanate	mg/kg									
Ferro/ferricyanide	mg/kg									
Acid Soluble Sulphate	mg/kg									
Sulphate (total)	mg/kg									
Sulphide	mg/kg									
Other										
pH Value	pH	8.54	8.46	8.05	7.84	10.6	8.45			
Asbestos Screen	None	NFD		NFD	NFD		NFD			
Asbestos Quantification - Total	%		<0.001			0.0022				
Asbestos Components	None		Amosite & Chrysotile			Chrysotile				
Analyst Comments	None		N/C			N/C				
BTEX										
GRO (C4-C12)	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			
MTBE	mg/kg	<0.003	<0.003	<0.003	<0.003	0.0119	<0.003	<0.005	<0.005	<0.005
Benzene	mg/kg	<0.044	<0.044	<0.044	<0.044	0.207	0.0718	<0.01	<0.01	<0.01
Toluene	mg/kg	<0.006	<0.006	<0.006	<0.006	0.0249	<0.006	<0.002	<0.002	<0.002
Ethyl benzene	mg/kg	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.003	<0.003	<0.003
m & p Xylene	mg/kg	<0.003	<0.003	<0.003	<0.003	0.00759	<0.003	<0.006	<0.006	<0.006
o Xylene	mg/kg	<0.024	<0.024	<0.024	<0.024	0.0487	<0.024	<0.003	<0.003	<0.003
Sum of Detected BTEX	mg/kg	<0.009	<0.009	<0.009	<0.009	0.0325	<0.009	<0.024	<0.024	<0.024
Sum of Detected Xylenes	mg/kg	<0.002	0.00242	<0.002	<0.002	0.00434	0.00228	<0.009	<0.009	<0.009
Organics										
PAH (Screening)	mg/kg									
VOC (screen)	ug/kg									
Mineral Oil	mg/kg									
TPH FTIR (AR)	mg/kg									
OIL FTIR	mg/kg									
Phenols										
Cresols	mg/kg	<0.01	0.0121		<0.01	<0.01	0.0456			
Phenol Index	mg/kg	<0.01	<0.01		<0.01	0.0108	<0.01			
Phenols Monohydric	mg/kg	<0.01	<0.01		<0.01	<0.01	0.0456			
Phenols (total)	mg/kg									
Xylenols	mg/kg	<0.08			<0.08	<0.08				
TPH										
Aliphatics C5-C6	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aliphatics >C6-C8	mg/kg	<0.01	<0.01	<0.01	<0.01	0.0152	0.0171	<0.01	<0.01	<0.01
Aliphatics >C8-C10	mg/kg	<0.01	<0.01	<0.01	<0.01	0.0325	0.0114	<0.01	<0.01	<0.01
Aliphatics >C10-C12	mg/kg	<0.01	<0.01	<0.01	<0.01	0.0488	0.0103	<0.01	<0.01	<0.01
Aliphatics >C12-C16	mg/kg	<0.1	<0.1	<0.1	<0.1	3.36	2.26	<0.1	<0.1	<0.1
Aliphatics >C16-C21	mg/kg	0.803	6.02	<0.1	<0.1	25.1	11.7	<0.1	<0.1	<0.1
Aliphatics >C21-C35	mg/kg	9.52	30.3	3.32	1.07	99.8	88.4	6.08	12.8	14

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	BHG6	BHH1	BHH1	BHH1	CH33	CH34	CH34	CH35	CH35	CH35	CH36	CH37	CH38	CH39	CH39	CH40	CH40	CH41	CH41	CH42	CH42	CH43	CH44	CH44	CH45	CH46	CH47
Specimen Depth (m)		0.3	0.2	0.9	1.85	0.2	0.15	1.4	0	0.5	0.8	0.1	0	0.1	0	1	0	0.5	0.05	1.4	0.2	1.2	0.2	0.3	1	0.2	0.5	0.1
OD level (m)																												
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Investigation Date		1997 GI	1997 GI	1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI
Aliphatics >C35-C40	mg/kg																											
Aliphatics >C35-C44	mg/kg																											
Aliphatics >C40-C44	mg/kg																											
Total Aliphatics >C12-C44	mg/kg																											
Aromatics C5-7	mg/kg																											
Aromatics >C6-C7	mg/kg																											
Aromatics >C7-C8	mg/kg																											
Aromatics >EC8-EC10	mg/kg																											
Aromatics >EC10-EC12	mg/kg																											
Aromatics >EC12-EC16	mg/kg																											
Aromatics >EC16-EC21	mg/kg																											
Aromatics >EC21-EC35	mg/kg																											
Aromatics >EC35-EC40	mg/kg																											
Aromatics >EC35-EC44	mg/kg																											
Aromatics >EC40-EC44	mg/kg																											
Total Aromatics >EC12-EC44	mg/kg																											
Total Aliphatics & Aromatics >C5-C44	mg/kg																											
PAHs																												
Acenaphthene	mg/kg																											
Acenaphthylene	mg/kg																											
Anthracene	mg/kg																											
Benzo(a)anthracene	mg/kg																											
Benzo(a)pyrene	mg/kg																											
Benzo(b)fluoranthene	mg/kg																											
Benzo(g,h,i)perylene	mg/kg																											
Benzo(k)fluoranthene	mg/kg																											
Chrysene	mg/kg																											
Dibenzo(ah)anthracene	mg/kg																											
Fluoranthene	mg/kg																											
Fluorene	mg/kg																											
Indeno(1,2,3-cd)pyrene	mg/kg																											
Naphthalene	mg/kg																											
Phenanthrene	mg/kg																											
Pyrene	mg/kg																											
PAH, Total Detected USEPA 16	mg/kg																											
PCB																												
PCB - ARO	mg/kg	4.6	538	1691.2	418.2	1.1	1.2	2.8	17	18	7.8	27	117	117	94	165	96	96	103	80	1010	1430	136	58	19.9	2	35	238
Pcb-28 2,4,4' - Trichlororbiphenyl	mg/kg																											
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	mg/kg																											
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg																											
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg																											
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	mg/kg																											
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg																											
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg																											
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg																											
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg																											
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg																											
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	mg/kg																											
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	mg/kg																											
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg																											
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg																											
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg																											
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg																											
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	mg/kg																											
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	mg/kg																											
Total PCB Congeners	mg/kg																											

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

																		2008 WSP Investigation. Locations unknown - though to be in the south of the site (wind turbine								
Sample Reference	**Units**	**CH47**	**CH47A**	**CH48**	**CP/RH01**	**CP/RH02**	**TP03**	**TP04**	**TP04**	**TP04**	**TP05**	**TP05**	**TP06**	**TP07**	**TP08**	**TP09**	**TP10**	**TP11**	**T1/1**	**T1/2**	**T1/3**	**T1/4**	**T1/5**	**T1/6**	**T1/7**	**T1/8**	**T1/9**
Specimen Depth (m)		1.1	0.2	0.05	0.2-0.25	0.2-0.5	0.1-0.2	0.3-0.4	0.7-0.8	0.8-0.9	0.2-0.5	0.6-0.7	0.1-0.3	0.2-0.5	0.1-0.3	0.2-0.5	0.1-0.2	0.2-0.3									
OD level (m)																											
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG									
Investigation Date		2000 GI	2000 GI	2000 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI									
Aliphatics >C35-C40	mg/kg				<100	<100	<100	<100	<100		<100	<100	160	<100	<100	<100	<100	<100									
Aliphatics >C35-C44	mg/kg																										
Aliphatics >C40-C44	mg/kg				<100	<100	<100	<100	<100		<100	<100	<100	<100	<100	<100	<100	<100									
Total Aliphatics >C12-C44	mg/kg																										
Aromatics C5-7	mg/kg																										
Aromatics >C6-C7	mg/kg				<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01									
Aromatics >C7-C8	mg/kg				<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01									
Aromatics >EC8-EC10	mg/kg				<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01									
Aromatics >EC10-EC12	mg/kg				<35	<35	<35	<35	<35		<35	<35	<35	<35	<35	54	37	48									
Aromatics >EC12-EC16	mg/kg				<50	<50	<50	<50	<50		<50	57	<50	<50	<50	<50	<50	<50									
Aromatics >EC16-EC21	mg/kg				<100	<100	<100	400	<100		<100	<100	<100	<100	<100	<100	<100	<100									
Aromatics >EC21-EC35	mg/kg				<100	<100	160	2100	<100		<100	<100	480	240	180	140	<100	240									
Aromatics >EC35-EC40	mg/kg				<100	<100	<100	150000	<100		<100	<100	210	<100	<100	<100	<100	<100									
Aromatics >EC35-EC44	mg/kg																										
Aromatics >EC40-EC44	mg/kg				<100	<100	<100	<100	<100		<100	<100	360	<100	<100	120	<100	<100									
Total Aromatics >EC12-EC44	mg/kg																										
Total Aliphatics & Aromatics >C5-C44	mg/kg																										
PAHs																											
Acenaphthene	mg/kg																										
Acenaphthylene	mg/kg																										
Anthracene	mg/kg																										
Benzo(a)anthracene	mg/kg																										
Benzo(a)pyrene	mg/kg																										
Benzo(b)fluoranthene	mg/kg																										
Benzo(g,h,i)perylene	mg/kg																										
Benzo(k)fluoranthene	mg/kg																										
Chrysene	mg/kg																										
Dibenzo(ah)anthracene	mg/kg																										
Fluoranthene	mg/kg																										
Fluorene	mg/kg																										
Indeno(1,2,3-cd)pyrene	mg/kg																										
Naphthalene	mg/kg																										
Phenanthrene	mg/kg																										
Pyrene	mg/kg																										
PAH, Total Detected USEPA 16	mg/kg																										
PCB																											
PCB - ARO	mg/kg	7	72																								
Pcb-28 2,4,4' - Trichlororbiphenyl	mg/kg				0.11		0.72	1.1	0.0091	0.18	0.0063	6	0.051						0.018	0.033	<0.01	0.058	<0.01	0.017	0.042	0.034	
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	mg/kg				0.1		2.1	12	0.037	0.44	0.016	6.7	0.13						0.091	0.091	0.031	0.137	0.027	0.049	0.065	0.098	
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg																										
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg																										
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	mg/kg				0.14		2.7	20	0.062	0.66	0.041	7	0.32						0.158	0.139	0.041	0.221	0.063	0.081	0.095	0.139	
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg																										
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg																										
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg				0.18		2.1	17	0.072	0.92	0.049	7.8	0.45						0.101	0.077	0.025	0.157	0.049	0.05	0.066	0.077	
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg																										
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg																										
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	mg/kg				0.19		3	19	0.063	0.93	0.065	7.4	0.47						0.281	0.195	0.055	0.286	0.111	0.109	0.123	0.177	
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	mg/kg				0.25		3.8	24	0.089	1.2	0.084	9.7	0.65						0.225	0.165	0.05	0.235	0.095	0.099	0.11	0.168	
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg																										
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg																										
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg																										
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg																										
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	mg/kg				0.18		2.5	12	0.044	0.9	0.062	8.6	0.41						0.462	0.193	0.06	0.268	0.121	0.115	0.124	0.195	
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	mg/kg																										
Total PCB Congeners	mg/kg				1.2		17	110	0.38	5.2	0.32	53	2.5						1.336	0.893	0.262	1.362	0.466	0.52	0.625	0.888	

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

e area). Depths unknown

Sample Reference	Units	T1/10	T1/11	T1/12	T1/13	T1/14	T1/15	T2/1	T2/2	T2/3	T2/4	T2/5	T2/6	T2/7	T2/8	T2/9	T2/10	T2/11	T2/12	T2/13	T2/14	T2/15	T2/16	T2/17	T2/18	BHM4CAN029	BHM4CANA022
Specimen Depth (m)																										1-1.6	0-0.2
OD level (m)																										5.84-5.24	6.82-6.62
Geology Code																										MG	MG
Investigation Date																										2016 GI	2016 GI
Aliphatics >C35-C40	mg/kg																										
Aliphatics >C35-C44	mg/kg																									3.28	0.848
Aliphatics >C40-C44	mg/kg																										
Total Aliphatics >C12-C44	mg/kg																									28.4	23.5
Aromatics C5-7	mg/kg																									<0.01	<0.01
Aromatics >C6-C7	mg/kg																										
Aromatics >C7-C8	mg/kg																									<0.01	0.016
Aromatics >EC8-EC10	mg/kg																									0.0131	0.0388
Aromatics >EC10-EC12	mg/kg																									<0.01	<0.01
Aromatics >EC12-EC16	mg/kg																									1.25	0.98
Aromatics >EC16-EC21	mg/kg																									8.42	4.72
Aromatics >EC21-EC35	mg/kg																									54.3	29
Aromatics >EC35-EC40	mg/kg																										
Aromatics >EC35-EC44	mg/kg																									15.9	8.19
Aromatics >EC40-EC44	mg/kg																									6.19	3
Total Aromatics >EC12-EC44	mg/kg																									79.8	42.9
Total Aliphatics & Aromatics >C5-C44	mg/kg																									108	66.6
PAHs																											
Acenaphthene	mg/kg																									<0.008	<0.008
Acenaphthylene	mg/kg																									0.0492	0.0459
Anthracene	mg/kg																									0.13	0.0761
Benzo(a)anthracene	mg/kg																									0.491	0.163
Benzo(a)pyrene	mg/kg																									0.456	0.136
Benzo(b)fluoranthene	mg/kg																									0.756	0.374
Benzo(g,h,i)perylene	mg/kg																									0.29	0.0952
Benzo(k)fluoranthene	mg/kg																									0.304	0.0954
Chrysene	mg/kg																									0.444	0.156
Dibenzo(ah)anthracene	mg/kg																									0.105	0.0336
Fluoranthene	mg/kg																									0.797	0.232
Fluorene	mg/kg																									0.0586	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg																									0.266	0.0891
Naphthalene	mg/kg																									0.0636	0.045
Phenanthrene	mg/kg																									0.347	0.119
Pyrene	mg/kg																									0.618	0.215
PAH, Total Detected USEPA 16	mg/kg																									5.18	1.87
PCB																											
PCB - ARO	mg/kg																										
Pcb-28 2,4,4' - Trichlororbiphenyl	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.8	0.384	0.101	<0.01	<0.01	<0.01	0.538	0.116	0.205	0.074	0.15	0.121	0.21	0.163	0.016	0.078	0.022	0.06		
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	mg/kg	0.034	0.026	0.013	0.023	<0.01	<0.01	1.636	0.835	0.251	0.051	0.029	<0.01	1.414	0.493	0.832	0.214	0.38	0.574	0.861	0.842	0.103	0.368	0.155	0.537		
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg																									0.0111	0.0179
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg																									<0.003	<0.003
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	mg/kg	0.062	0.026	0.021	0.03	<0.01	<0.01	1.236	0.765	0.243	0.045	0.044	0.013	1.638	0.615	1.11	0.283	0.52	1.054	0.941	1.239	0.201	0.531	0.319	0.938		
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg																									0.138	0.388
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg																									<0.003	0.00779
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg	0.05	0.016	0.014	0.022	<0.01	<0.01	0.69	0.475	0.155	0.028	0.03	<0.01	1.164	0.36	0.753	0.164	0.35	0.699	0.565	0.895	0.122	0.311	0.137	0.509	0.266	0.756
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg																									<0.003	<0.003
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg																									<0.003	<0.003
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	mg/kg	0.08	0.029	0.032	0.037	<0.01	<0.01	1.373	0.912	0.215	0.054	0.039	<0.01	2.34	0.655	1.254	0.363	0.607	1.349	1.071	1.808	0.288	0.581	0.272	0.779		
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	mg/kg	0.064	0.027	0.03	0.034	<0.01	<0.01	1.018	0.733	0.186	0.048	0.037	<0.01	1.653	0.591	0.981	0.321	0.482	1.114	0.851	1.341	0.218	0.502	0.301	0.746		
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg																									0.0564	0.16
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg																									0.0134	0.037
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg																									0.0259	0.0399
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg																									<0.003	<0.003
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	mg/kg	0.07	0.031	0.039	0.038	<0.01	<0.01	1.136	0.868	0.179	0.056	0.029	<0.01	2.004	0.591	1.038	0.454	0.474	1.143	1.044	1.683	0.25	0.464	0.23	0.543		
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	mg/kg																									0.00659	0.0122
Total PCB Congeners	mg/kg	0.36	0.155	0.149	0.184	0	0	7.889	4.972	1.33	0.282	0.208	0.013	10.751	3.421	6.173	1.873	2.963	6.054	5.543	7.971	1.198	2.835	1.436	4.112		

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	WSM4CAN008	WSM4CAN009	WSM4CAN010	WSM4CAN011	WSM4CAN012	WSM4CAN014	HPM4CAN001	HPM4CAN002	HPM4CAN003
Specimen Depth (m)		0.2-0.6	0.5	1	0.5	0.5	0.5	GL	GL	GL
OD level (m)		7.16-6.76	6.68	7.03	6.66	6.7	7.2			
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG
Investigation Date		2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI
Aliphatics >C35-C40	mg/kg									
Aliphatics >C35-C44	mg/kg	<0.1	9.34	<0.1	<0.1	19.7	42.7	<0.1	0.792	3.26
Aliphatics >C40-C44	mg/kg									
Total Aliphatics >C12-C44	mg/kg	10.3	45.6	3.32	1.07	148	145	6.08	13.6	17.3
Aromatics C5-7	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >C6-C7	mg/kg									
Aromatics >C7-C8	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >EC8-EC10	mg/kg	<0.01	<0.01	<0.01	<0.01	0.0661	0.0171	<0.01	<0.01	<0.01
Aromatics >EC10-EC12	mg/kg	<0.01	<0.01	<0.01	<0.01	0.0325	<0.01	<0.01	<0.01	<0.01
Aromatics >EC12-EC16	mg/kg	0.209	<0.1	<0.1	<0.1	5.3	10.3	1.28	<0.1	0.149
Aromatics >EC16-EC21	mg/kg	1.66	11.1	<0.1	<0.1	25.9	123	3.33	0.73	3.02
Aromatics >EC21-EC35	mg/kg	11.2	29.7	5.36	2.17	81.1	483	19.9	17	24.5
Aromatics >EC35-EC40	mg/kg									
Aromatics >EC35-EC44	mg/kg	2.16	11.2	1.02	0.596	31	196	7.25	7.11	9.21
Aromatics >EC40-EC44	mg/kg	<0.1	4.44	0.278	0.257	11.7	72.1	3.43	3.59	3.36
Total Aromatics >EC12-EC44	mg/kg	15.2	52.1	6.38	2.77	143	812	31.7	24.8	36.9
Total Aliphatics & Aromatics >C5-C44	mg/kg	25.6	97.7	9.7	3.85	292	957	37.8	38.4	54.3
PAHs										
Acenaphthene	mg/kg	<0.01	<0.01	<0.008	<0.008	0.152	0.62	0.0189	<0.008	<0.008
Acenaphthylene	mg/kg	<0.01	<0.01	<0.012	<0.012	<0.01	<0.01	<0.012	<0.012	<0.012
Anthracene	mg/kg	<0.01	<0.01	<0.016	<0.016	0.0513	1.5	<0.016	<0.016	<0.016
Benzo(a)anthracene	mg/kg	<0.01	<0.01	0.0183	<0.014	0.359	11.9	0.103	<0.014	<0.014
Benzo(a)pyrene	mg/kg	<0.01	0.0364	0.026	<0.015	0.457	12.3	0.091	0.042	0.0296
Benzo(b)fluoranthene	mg/kg	0.0242	0.0686	0.0392	0.0277	0.719	19.3	0.147	0.0679	0.0533
Benzo(g,h,i)perylene	mg/kg	<0.01	0.0425	<0.024	<0.024	0.373	8.93	0.0903	<0.024	0.0339
Benzo(k)fluoranthene	mg/kg	<0.01	<0.01	<0.014	<0.014	0.23	6.87	0.0552	<0.014	0.019
Chrysene	mg/kg	0.0176	0.0225	0.0301	0.0163	0.405	11.9	0.0978	0.0557	<0.01
Dibenzo(ah)anthracene	mg/kg	<0.01	<0.01	<0.023	<0.023	0.0954	3.14	<0.023	<0.023	<0.023
Fluoranthene	mg/kg	0.0267	0.0386	0.0476	0.0309	0.727	14.5	0.164	0.1	0.0661
Fluorene	mg/kg	<0.01	<0.01	<0.01	<0.01	0.111	0.577	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg	<0.01	0.0334	<0.018	<0.018	0.321	7.89	0.0644	<0.018	<0.018
Naphthalene	mg/kg	<0.01	0.102	0.0136	0.017	0.152	0.109	0.0862	0.0634	0.0382
Phenanthrene	mg/kg	0.0265	0.0587	0.0466	0.026	0.592	4	0.119	0.0803	0.0513
Pyrene	mg/kg	0.0189	0.0367	0.0374	0.024	0.58	11.4	0.125	0.0734	0.0526
PAH, Total Detected USEPA 16	mg/kg	<0.118	0.439	0.259	0.142	5.32	115	1.16	0.483	0.344
PCB										
PCB - ARO	mg/kg									
Pcb-28 2,4,4' - Trichlororbiphenyl	mg/kg									
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	mg/kg									
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg	<0.003	0.191	<0.003	<0.003	0.0857	0.415	0.0451	0.0206	0.0174
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	mg/kg									
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg	0.0161	0.648	<0.003	0.00613	0.267	3.46	0.212	0.158	0.0932
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg	<0.003	0.0293	<0.003	<0.003	0.0149	0.269	0.0522	0.00467	<0.003
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg	0.0356	1.55	<0.003	0.0119	0.52	7.84	0.439	0.331	0.125
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	mg/kg									
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	mg/kg									
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg	0.00556	0.264	<0.003	<0.003	0.0802	1.33	0.0802	0.0633	0.0426
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg	<0.003	0.0557	<0.003	<0.003	0.0152	0.261	0.019	0.0153	0.0108
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg	<0.003	0.0942	<0.003	<0.003	0.0276	0.415	0.0213	0.0186	0.0107
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	mg/kg									
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	mg/kg	<0.003	0.0265	<0.003	<0.003	0.0086	0.115	0.00623	0.00515	0.00546
Total PCB Congeners	mg/kg									

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Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	BHG6	BHH1	BHH1	BHH1	CH33	CH34	CH34	CH35	CH35	CH35	CH36	CH37	CH38	CH39	CH39	CH40	CH40	CH41	CH41	CH42	CH42	CH43	CH44	CH44	CH45	CH46	CH47
Specimen Depth (m)		0.3	0.2	0.9	1.85	0.2	0.15	1.4	0	0.5	0.8	0.1	0	0.1	0	1	0	0.5	0.05	1.4	0.2	1.2	0.2	0.3	1	0.2	0.5	0.1
OD level (m)																												
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Investigation Date		1997 GI	1997 GI	1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI
Sum of detected WHO 12 PCBs	mg/kg																											
SVOCs																												
Phenols																												
2-Chlorophenol	mg/kg					<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
2-Methylphenol	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Nitrophenol	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
2,4-Dichlorophenol	mg/kg					<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
2,4-Dimethylphenol	mg/kg					<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
2,4,5-Trichlorophenol	mg/kg					<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
2,4,6-Trichlorophenol	mg/kg					<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
4-Chloro-3-methylphenol	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-Methylphenol	mg/kg																											
4-Nitrophenol	mg/kg					<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Pentachlorophenol	mg/kg	<0.1	6.2	0.1	0.2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Phenol	mg/kg					<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
2,4-Dinitrophenol	mg/kg					<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3- & 4-Methylphenol	mg/kg					<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
4,6-Dinitro-2-methylphenol	mg/kg					<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
4-Chlorophenol *	mg/kg					<2	<2	<2	<2	6	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
PAHs																												
2-Chloronaphthalene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1-Methylnaphthalene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
2-Methylnaphthalene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Acenaphthene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Acenaphthylene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Anthracene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	4.1	<0.2
Benzo(a)anthracene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.7	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	<0.2	0.5	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.8	0.6	<0.2	<0.2	<0.2	<0.2	0.6	0.2	<0.2	0.6	<0.2	<0.2	<0.2	<0.2
Benzo(b)fluoranthene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.8	0.5	<0.2	<0.2	<0.2	<0.2	0.6	0.2	<0.2	<0.2	0.6	<0.2	<0.2	<0.2
Benzo(g,h,i)perylene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.4	<0.2	0.6	0.4	<0.2	<0.2	<0.2	<0.2	0.4	<0.2	<0.2	<0.2	0.6	<0.2	<0.2	<0.2
Benzo(k)fluoranthene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.6	0.4	<0.2	<0.2	<0.2	<0.2	0.5	<0.2	<0.2	0.7	1.2	<0.2	<0.2	<0.2
Chrysene	mg/kg					<0.2	<0.2	<0.2	0.7	<0.2	<0.2	<0.2	0.3	2	1.1	1.9	<0.2	<0.2	<0.2	<0.2	0.8	1.6	44	20.4	27.8	<0.2	158	0.3
Dibenzo(ah)anthracene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Fluoranthene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.3	2.2	0.8	<0.2	<0.2	<0.2	<0.2	0.8	<0.2	<0.2	0.6	1.2	<0.2	2.8	<0.2
Fluorene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	2.2	0.8	1.3	<0.2	22.5	<0.2
Indeno(1,2,3-cd)pyrene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	0.3	0.5	<0.2	<0.2	<0.2	<0.2	0.5	<0.2	<0.2	0.4	0.7	<0.2	<0.2	<0.2
Naphthalene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Phenanthrene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.7	0.4	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	2.9	1.1	1.7	<0.2	37.3	<0.2
Pyrene	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1.5	0.6	<0.2	<0.2	<0.2	<0.2	0.7	<0.2	<0.2	0.5	0.6	<0.2	<0.2	<0.2
Pthalates																												
bis(2-Ethylhexyl)phthalate	mg/kg					<0.5	2.2	1.7	1.9	2.6	0.8	4.7	1.7	<0.5	4.1	6.9	<0.5	3.5	1.6	<0.5	1.8	0.9	6.9	4.4	7.7	<0.5	<0.5	3.8
Butylbenzyl phthalate	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-n-butyl phthalate	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diethyl phthalate	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dimethyl phthalate	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Di-N-Octyl Phthalate	mg/kg																											
Other Semi-Volatiles																												
1,2-Dichlorobenzene	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2,4-Trichlorobenzene	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	7.2	<0.5	<0.5	<0.5	2.6	<0.5	14.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	mg/kg					<0.5	<0.5	<0.5	<0.5	3.9	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Nitroaniline	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dinitrotoluene	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,6-Dinitrotoluene	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3-Nitroaniline	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-Bromophenylphenylether	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

																		2008 WSP Investigation. Locations unknown - though to be in the south of the site (wind turbine								
Sample Reference	**Units**	**CH47**	**CH47A**	**CH48**	**CP/RH01**	**CP/RH02**	**TP03**	**TP04**	**TP04**	**TP04**	**TP05**	**TP05**	**TP06**	**TP07**	**TP08**	**TP09**	**TP10**	**TP11**	**T1/1**	**T1/2**	**T1/3**	**T1/4**	**T1/5**	**T1/6**	**T1/7**	**T1/8**	**T1/9**
Specimen Depth (m)		1.1	0.2	0.05	0.2-0.25	0.2-0.5	0.1-0.2	0.3-0.4	0.7-0.8	0.8-0.9	0.2-0.5	0.6-0.7	0.1-0.3	0.2-0.5	0.1-0.3	0.2-0.5	0.1-0.2	0.2-0.3									
OD level (m)																										
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG									
Investigation Date		2000 GI	2000 GI	2000 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI									
Sum of detected WHO 12 PCBs	mg/kg																										
SVOCs																											
Phenols																											
2-Chlorophenol	mg/kg	<2	<2		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
2-Methylphenol	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
2-Nitrophenol	mg/kg	<0.2	<0.2		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
2,4-Dichlorophenol	mg/kg	<2	<2		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
2,4-Dimethylphenol	mg/kg	<2	<2		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
2,4,5-Trichlorophenol	mg/kg	<2	<2		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
2,4,6-Trichlorophenol	mg/kg	<2	<2		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
4-Chloro-3-methylphenol	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
4-Methylphenol	mg/kg																										
4-Nitrophenol	mg/kg	<5	<5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Pentachlorophenol	mg/kg	<5	<5																								
Phenol	mg/kg	<2	<2		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
2,4-Dinitrophenol	mg/kg	<1	<1		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
3- & 4-Methylphenol	mg/kg	<2	<2		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
4,6-Dinitro-2-methylphenol	mg/kg	<5	<5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
4-Chlorophenol *	mg/kg	<2	<2																								
PAHs																											
2-Chloronaphthalene	mg/kg	<0.2	<0.2		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
1-Methylnaphthalene	mg/kg	<0.2	<0.2																								
2-Methylnaphthalene	mg/kg	<0.2	<0.2		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Acenaphthene	mg/kg	<0.2	<0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.6	0.3	<0.3	<0.3	<0.3	<0.3	0.4									
Acenaphthylene	mg/kg	<0.2	<0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	<0.3	<0.3	<0.3	<0.3	<0.3									
Anthracene	mg/kg	<0.2	<0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.5	<0.3	0.5	<0.3	<0.3	<0.3									
Benzo(a)anthracene	mg/kg	<0.2	<0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.5	2.7	<0.3	2.2	<0.3	<0.3	0.3									
Benzo(a)pyrene	mg/kg	<0.2	0.2		<0.3	0.4	<0.3	0.4	<0.3	<0.3	<0.3	0.5	2.6	0.3	2.2	<0.3	<0.3	0.5									
Benzo(b)fluoranthene	mg/kg	<0.2	0.2		<0.3	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.4	2.5	0.4	2.1	<0.3	<0.3	0.4									
Benzo(g,h,i)perylene	mg/kg	<0.2	<0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	1.6	<0.3	1.3	<0.3	<0.3	<0.3									
Benzo(k)fluoranthene	mg/kg	<0.2	<0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3	1.8	<0.3	1.5	<0.3	<0.3	<0.3									
Chrysene	mg/kg	<0.2	0.4		1	1.4	5.4	4.3	<0.3	<0.3	<0.3	0.6	2.4	0.5	2.2	<0.3	<0.3	0.5									
Dibenzo(ah)anthracene	mg/kg	<0.2	<0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.7	<0.3	0.6	<0.3	<0.3	<0.3									
Fluoranthene	mg/kg	<0.2	0.3		<0.3	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.7	4.1	0.4	3.6	0.4	<0.3	0.6									
Fluorene	mg/kg	<0.2	<0.2		<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.4	<0.3	<0.3	<0.3									
Indeno(1,2,3-cd)pyrene	mg/kg	<0.2	0.2		<0.3	0.4	<0.3	<0.3	<0.3	<0.3	<0.3	0.5	2.2	0.3	1.8	<0.3	<0.3	0.4									
Naphthalene	mg/kg	<0.2	<0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.9	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3									
Phenanthrene	mg/kg	<0.2	<0.2		<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3	0.4	2.1	<0.3	2.4	<0.3	<0.3	0.5									
Pyrene	mg/kg	<0.2	0.2		<0.3	0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.6	3.3	0.3	2.5	0.3	<0.3	0.5									
Pthalates																											
bis(2-Ethylhexyl)phthalate	mg/kg	8.1	0.7		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Butylbenzyl phthalate	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Di-n-butyl phthalate	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Diethyl phthalate	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Dimethyl phthalate	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Di-N-Octyl Phthalate	mg/kg																										
Other Semi-Volatiles																											
1,2-Dichlorobenzene	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
1,2,4-Trichlorobenzene	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
1,3-Dichlorobenzene	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
1,4-Dichlorobenzene	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
2-Nitroaniline	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
2,4-Dinitrotoluene	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
2,6-Dinitrotoluene	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
3-Nitroaniline	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
4-Bromophenylphenylether	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

e area). Depths unknown

Sample Reference	Units	T1/10	T1/11	T1/12	T1/13	T1/14	T1/15	T2/1	T2/2	T2/3	T2/4	T2/5	T2/6	T2/7	T2/8	T2/9	T2/10	T2/11	T2/12	T2/13	T2/14	T2/15	T2/16	T2/17	T2/18	BHM4CAN029	BHM4CANA022
Specimen Depth (m)																										1-1.6	0-0.2
OD level (m)																										5.84-5.24	6.82-6.62
Geology Code																										MG	MG
Investigation Date																										2016 GI	2016 GI
Sum of detected WHO 12 PCBs	mg/kg																									0.517	1.42
SVOCs																											
Phenols																											
2-Chlorophenol	mg/kg																										
2-Methylphenol	mg/kg																										
2-Nitrophenol	mg/kg																										
2,4-Dichlorophenol	mg/kg																										
2,4-Dimethylphenol	mg/kg																										
2,4,5-Trichlorophenol	mg/kg																										
2,4,6-Trichlorophenol	mg/kg																										
4-Chloro-3-methylphenol	mg/kg																										
4-Methylphenol	mg/kg																										
4-Nitrophenol	mg/kg																										
Pentachlorophenol	mg/kg																										
Phenol	mg/kg																										
2,4-Dinitrophenol	mg/kg																										
3- & 4-Methylphenol	mg/kg																										
4,6-Dinitro-2-methylphenol	mg/kg																										
4-Chlorophenol *	mg/kg																										
PAHs																											
2-Chloronaphthalene	mg/kg																										
1-Methylnaphthalene	mg/kg																										
2-Methylnaphthalene	mg/kg																										
Acenaphthene	mg/kg																										
Acenaphthylene	mg/kg																										
Anthracene	mg/kg																										
Benzo(a)anthracene	mg/kg																										
Benzo(a)pyrene	mg/kg																										
Benzo(b)fluoranthene	mg/kg																										
Benzo(g,h,i)perylene	mg/kg																										
Benzo(k)fluoranthene	mg/kg																										
Chrysene	mg/kg																										
Dibenzo(ah)anthracene	mg/kg																										
Fluoranthene	mg/kg																										
Fluorene	mg/kg																										
Indeno(1,2,3-cd)pyrene	mg/kg																										
Naphthalene	mg/kg																										
Phenanthrene	mg/kg																										
Pyrene	mg/kg																										
Pthalates																											
bis(2-Ethylhexyl)phthalate	mg/kg																										
Butylbenzyl phthalate	mg/kg																										
Di-n-butyl phthalate	mg/kg																										
Diethyl phthalate	mg/kg																										
Dimethyl phthalate	mg/kg																										
Di-N-Octyl Phthalate	mg/kg																										
Other Semi-Volatiles																											
1,2-Dichlorobenzene	mg/kg																										
1,2,4-Trichlorobenzene	mg/kg																										
1,3-Dichlorobenzene	mg/kg																										
1,4-Dichlorobenzene	mg/kg																										
2-Nitroaniline	mg/kg																										
2,4-Dinitrotoluene	mg/kg																										
2,6-Dinitrotoluene	mg/kg																										
3-Nitroaniline	mg/kg																										
4-Bromophenylphenylether	mg/kg																										

M4CAN	Screening Values and Assessment		Notes
Soil (MG) Sample Analysis & Screening Assessment		Exceeds S4ULs criteria	N/C No Comment (assbestos analyst comments)
CL-17	X	Laboratory detection level higher than screening criterion	NFD No Fibres Detected
27/06/2016		Asbestos Detected	Chromium VI and elemental mercury criteria used
	Geological Formation legend		Screening criteria for Pb is C4SL in the absence of S4UL
	MG	Made Ground	Conservative 1% SOM has been used

Sample Reference	Units	WSM4CAN008	WSM4CAN009	WSM4CAN010	WSM4CAN011	WSM4CAN012	WSM4CAN014	HPM4CAN001	HPM4CAN002	HPM4CAN003
Specimen Depth (m)		0.2-0.6	0.5	1	0.5	0.5	0.5	GL	GL	GL
OD level (m)		7.16-6.76	6.68	7.03	6.66	6.7	7.2			
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG
Investigation Date		2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI
Sum of detected WHO 12 PCBs	mg/kg	0.0572	2.85	<0.036	<0.036	1.02	14.1	0.828	0.616	0.305
SVOCs										
Phenols										
2-Chlorophenol	mg/kg	<0.01	<0.01			<0.01				
2-Methylphenol	mg/kg	<0.01	<0.01			<0.01				
2-Nitrophenol	mg/kg	<0.01	<0.01			<0.01				
2,4-Dichlorophenol	mg/kg	<0.01	<0.01			<0.01				
2,4-Dimethylphenol	mg/kg	<0.01	<0.01			<0.01				
2,4,5-Trichlorophenol	mg/kg	<0.01	<0.01			<0.01				
2,4,6-Trichlorophenol	mg/kg	<0.01	<0.01			<0.01				
4-Chloro-3-methylphenol	mg/kg	<0.01	<0.01			<0.01				
4-Methylphenol	mg/kg	<0.01	<0.01			<0.01				
4-Nitrophenol	mg/kg	<0.01	<0.01			<0.01				
Pentachlorophenol	mg/kg	<0.01	<0.01			0.593				
Phenol	mg/kg	<0.01	<0.01			<0.01				
2,4-Dinitrophenol	mg/kg									
3- & 4-Methylphenol	mg/kg									
4,6-Dinitro-2-methylphenol	mg/kg									
4-Chlorophenol *	mg/kg									
PAHs										
2-Chloronaphthalene	mg/kg	<0.1	<0.1			<0.1				
1-Methylnaphthalene	mg/kg									
2-Methylnaphthalene	mg/kg	<0.1	<0.1			<0.1				
Acenaphthene	mg/kg	<0.1	<0.1			<0.1				
Acenaphthylene	mg/kg	<0.1	<0.1			<0.1				
Anthracene	mg/kg	<0.1	<0.1			<0.1				
Benzo(a)anthracene	mg/kg	<0.1	<0.1			0.143				
Benzo(a)pyrene	mg/kg	<0.1	<0.1			0.198				
Benzo(b)fluoranthene	mg/kg	<0.1	<0.1			0.195				
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1			0.185				
Benzo(k)fluoranthene	mg/kg	<0.1	<0.1			0.173				
Chrysene	mg/kg	<0.1	<0.1			0.249				
Dibenzo(ah)anthracene	mg/kg	<0.1	<0.1			<0.1				
Fluoranthene	mg/kg	<0.1	<0.1			0.253				
Fluorene	mg/kg	<0.1	<0.1			<0.1				
Indeno(1,2,3-cd)pyrene	mg/kg	<0.1	<0.1			0.188				
Naphthalene	mg/kg	<0.1	<0.1			<0.1				
Phenanthrene	mg/kg	<0.1	<0.1			0.168				
Pyrene	mg/kg	<0.1	<0.1			0.233				
Pthalates										
bis(2-Ethylhexyl)phthalate	mg/kg	<0.01	<0.01			0.363				
Butylbenzyl phthalate	mg/kg	<0.01	<0.01			<0.01				
Di-n-butyl phthalate	mg/kg	<0.01	<0.01			<0.01				
Diethyl phthalate	mg/kg	<0.01	<0.01			<0.01				
Dimethyl phthalate	mg/kg	<0.01	<0.01			<0.01				
Di-N-Octyl Phthalate	mg/kg	<0.01	<0.01			<0.01				
Other Semi-Volatiles										
1,2-Dichlorobenzene	mg/kg	<0.1	<0.1			<0.1				
1,2,4-Trichlorobenzene	mg/kg	<0.1	0.145			2.35				
1,3-Dichlorobenzene	mg/kg	<0.1	<0.1			<0.1				
1,4-Dichlorobenzene	mg/kg	<0.1	<0.1			<0.1				
2-Nitroaniline	mg/kg	<0.1	<0.1			<0.1				
2,4-Dinitrotoluene	mg/kg	<0.1	<0.1			<0.1				
2,6-Dinitrotoluene	mg/kg	<0.1	<0.1			<0.1				
3-Nitroaniline	mg/kg	<0.1	<0.1			<0.1				
4-Bromophenylphenylether	mg/kg	<0.1	<0.1			<0.1				

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	BHG6	BHH1	BHH1	BHH1	CH33	CH34	CH34	CH35	CH35	CH35	CH36	CH37	CH38	CH39	CH39	CH40	CH40	CH41	CH41	CH42	CH42	CH43	CH44	CH44	CH45	CH46	CH47
Specimen Depth (m)		0.3	0.2	0.9	1.85	0.2	0.15	1.4	0	0.5	0.8	0.1	0	0.1	0	1	0	0.5	0.05	1.4	0.2	1.2	0.2	0.3	1	0.2	0.5	0.1
OD level (m)																												
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Investigation Date		1997 GI	1997 GI	1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI
4-Chloroaniline	mg/kg					<0.5	<0.5	<0.5	<0.5	19.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-Chlorophenylphenylether	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-Nitroaniline	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Azobenzene	mg/kg																											
Bis(2-chloroethoxy)methane	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
bis(2-Chloroethyl)ether	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzofuran	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorobutadiene	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachlorocyclopentadiene	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexachloroethane	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Isophorone	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
N-Nitroso-di-npropylamine	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrobenzene	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
3,3'-Dichlorobenzidine	mg/kg					<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
bis(2-Chloroisopropyl)ether	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzoic Acid	mg/kg					<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzyl alcohol	mg/kg					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Biphenyl *	mg/kg					<0.2	<0.2	<0.2	0.5	<0.2	<0.2	<0.2	0.5	3.4	0.3	0.6	<0.2	<0.2	<0.2	<0.2	0.2	0.6	9.6	4.8	7.8	<0.2	50.7	0.5
Diphenyl ether *	mg/kg					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
VOCs																												
Naphthalene	ug/kg								<25	<25	<25									<25	<25						<25	
Hexachlorobutadiene	ug/kg								<25	<25	<25									<25	<25						<25	
1,2,4-Trichlorobenzene	ug/kg								<25	64	25									72	<25						<25	
1,2-Dichlorobenzene	ug/kg								<5	174	36									5	<5						<5	
1,3-Dichlorobenzene	ug/kg								<5	39	6									6	<5						<5	
1,4-Dichlorobenzene	ug/kg								<5	594	165									46	<5						<5	
1.1.1.2-Tetrachloroethane	ug/kg								<5	<5	<5									<5	<5						<5	
1.1.1-Trichloroethane	ug/kg								<5	<5	<5									<5	<5						<5	
1.1.2.2-Tetrachloroethane	ug/kg								<5	<5	<5									<5	<5						<5	
1.1.2-Trichloroethane	ug/kg								<5	<5	<5									<5	<5						<5	
1.1-Dichloropropene	ug/kg								<5	<5	<5									<5	<5						<5	
1.1-Dichloroethane	ug/kg								<5	<5	<5									<5	<5						<5	
1.1-Dichloroethene	ug/kg								<5	<5	<5									<5	<5						<5	
1.2.3-Trichlorobenzene	ug/kg								<25	<25	<25									<25	<25						<25	
1,2,3-Trichloropropane	ug/kg																											
1.2.4-Trimethylbenzene	ug/kg								<5	<5	<5									<5	<5						<5	
1.2-Dibromo-3-chloropropane	ug/kg								<25	<25	<25									<25	<25						<25	
1,2-Dichlorobenzene	ug/kg																											
1.2-Dichloroethane	ug/kg								<5	<5	<5									<5	<5						<5	
1,2-Dichloropropane	ug/kg																											
cis-1-2-Dichloroethene	ug/kg								<5	<5	<5									<5	<5						<5	
1.2-Dibromoethane	ug/kg								<5	<5	<5									<5	<5						<5	
1.2-Dichloropropane	ug/kg								<5	<5	<5									<5	<5						<5	
1.3.5-Trimethylbenzene	ug/kg								<5	<5	<5									<5	<5						<5	
1.3.5-Trichlorobenzene	ug/kg																											
cis-1-3-Dichloropropene	ug/kg								<5	<5	<5									<5	<5						<5	
1.3-Dichloropropane	ug/kg								<5	<5	<5									<5	<5						<5	
2.2-Dichloropropane	ug/kg								<5	<5	<5									<5	<5						<5	
2-Chlorotoluene	ug/kg								<5	<5	<5									<5	<5						<5	
4-Chlorotoluene	ug/kg								<5	<5	<5									<5	<5						<5	
4-Isopropyltoluene	ug/kg																											
Benzene	ug/kg																											
Bromobenzene	ug/kg								<5	<5	<5									<5	<5						<5	
Bromochloromethane	ug/kg								<5	<5	<5									<5	<5						<5	
Bromoform	ug/kg								<5	<5	<5									<5	<5						<5	

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

																		2008 WSP Investigation. Locations unknown - though to be in the south of the site (wind turbine								
Sample Reference	**Units**	**CH47**	**CH47A**	**CH48**	**CP/RH01**	**CP/RH02**	**TP03**	**TP04**	**TP04**	**TP04**	**TP05**	**TP05**	**TP06**	**TP07**	**TP08**	**TP09**	**TP10**	**TP11**	**T1/1**	**T1/2**	**T1/3**	**T1/4**	**T1/5**	**T1/6**	**T1/7**	**T1/8**	**T1/9**
Specimen Depth (m)		1.1	0.2	0.05	0.2-0.25	0.2-0.5	0.1-0.2	0.3-0.4	0.7-0.8	0.8-0.9	0.2-0.5	0.6-0.7	0.1-0.3	0.2-0.5	0.1-0.3	0.2-0.5	0.1-0.2	0.2-0.3									
OD level (m)																										
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG									
Investigation Date		2000 GI	2000 GI	2000 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI									
4-Chloroaniline	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
4-Chlorophenylphenylether	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
4-Nitroaniline	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Azobenzene	mg/kg																										
Bis(2-chloroethoxy)methane	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
bis(2-Chloroethyl)ether	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Dibenzofuran	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Hexachlorobenzene	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Hexachlorobutadiene	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Hexachlorocyclopentadiene	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Hexachloroethane	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Isophorone	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
N-Nitroso-di-npropylamine	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Nitrobenzene	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
3,3'-Dichlorobenzidine	mg/kg	<2	<2		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
bis(2-Chloroisopropyl)ether	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Benzoic Acid	mg/kg	<10	<10		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Benzyl alcohol	mg/kg	<0.5	<0.5		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Biphenyl *	mg/kg	<0.2	0.4		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
Diphenyl ether *	mg/kg	<0.2	<0.2		<1.3		<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3		<1.3	<1.3	<1.3										
VOCs																											
Naphthalene	ug/kg				<300	<300	<300	<300	<300	<300	<300	900	<300	<300	<300	<300	<300	<300									
Hexachlorobutadiene	ug/kg				<1300		<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300	<1300									
1,2,4-Trichlorobenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1,2-Dichlorobenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1,3-Dichlorobenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1,4-Dichlorobenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		30	<10	<10										
1.1.1.2-Tetrachloroethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.1.1-Trichloroethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.1.2.2-Tetrachloroethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.1.2-Trichloroethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.1-Dichloropropene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.1-Dichloroethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.1-Dichloroethene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.2.3-Trichlorobenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1,2,3-Trichloropropane	ug/kg																										
1.2.4-Trimethylbenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.2-Dibromo-3-chloropropane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1,2-Dichlorobenzene	ug/kg																										
1.2-Dichloroethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1,2-Dichloropropane	ug/kg																										
cis-1-2-Dichloroethene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.2-Dibromoethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.2-Dichloropropane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.3.5-Trimethylbenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.3.5-Trichlorobenzene	ug/kg																										
cis-1-3-Dichloropropene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
1.3-Dichloropropane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
2.2-Dichloropropane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
2-Chlorotoluene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
4-Chlorotoluene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
4-Isopropyltoluene	ug/kg																										
Benzene	ug/kg																										
Bromobenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Bromochloromethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Bromoform	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

e area). Depths unknown

Sample Reference	Units	T1/10	T1/11	T1/12	T1/13	T1/14	T1/15	T2/1	T2/2	T2/3	T2/4	T2/5	T2/6	T2/7	T2/8	T2/9	T2/10	T2/11	T2/12	T2/13	T2/14	T2/15	T2/16	T2/17	T2/18	BHM4CAN029	BHM4CANA022
Specimen Depth (m)																										1-1.6	0-0.2
OD level (m)																										5.84-5.24	6.82-6.62
Geology Code																										MG	MG
Investigation Date																										2016 GI	2016 GI
4-Chloroaniline	mg/kg																										
4-Chlorophenylphenylether	mg/kg																										
4-Nitroaniline	mg/kg																										
Azobenzene	mg/kg																										
Bis(2-chloroethoxy)methane	mg/kg																										
bis(2-Chloroethyl)ether	mg/kg																										
Dibenzofuran	mg/kg																										
Hexachlorobenzene	mg/kg																										
Hexachlorobutadiene	mg/kg																										
Hexachlorocyclopentadiene	mg/kg																										
Hexachloroethane	mg/kg																										
Isophorone	mg/kg																										
N-Nitroso-di-npropylamine	mg/kg																										
Nitrobenzene	mg/kg																										
3,3'-Dichlorobenzidine	mg/kg																										
bis(2-Chloroisopropyl)ether	mg/kg																										
Benzoic Acid	mg/kg																										
Benzyl alcohol	mg/kg																										
Biphenyl *	mg/kg																										
Diphenyl ether *	mg/kg																										
VOCs																											
Naphthalene	ug/kg																										
Hexachlorobutadiene	ug/kg																										
1,2,4-Trichlorobenzene	ug/kg																										
1,2-Dichlorobenzene	ug/kg																										
1,3-Dichlorobenzene	ug/kg																										
1,4-Dichlorobenzene	ug/kg																										
1.1.1.2-Tetrachloroethane	ug/kg																										
1.1.1-Trichloroethane	ug/kg																										
1.1.2.2-Tetrachloroethane	ug/kg																										
1.1.2-Trichloroethane	ug/kg																										
1.1-Dichloropropene	ug/kg																										
1.1-Dichloroethane	ug/kg																										
1.1-Dichloroethene	ug/kg																										
1.2.3-Trichlorobenzene	ug/kg																										
1,2,3-Trichloropropane	ug/kg																										
1.2.4-Trimethylbenzene	ug/kg																										
1.2-Dibromo-3-chloropropane	ug/kg																										
1,2-Dichlorobenzene	ug/kg																										
1.2-Dichloroethane	ug/kg																										
1,2-Dichloropropane	ug/kg																										
cis-1-2-Dichloroethene	ug/kg																										
1.2-Dibromoethane	ug/kg																										
1.2-Dichloropropane	ug/kg																										
1.3.5-Trimethylbenzene	ug/kg																										
1.3.5-Trichlorobenzene	ug/kg																										
cis-1-3-Dichloropropene	ug/kg																										
1.3-Dichloropropane	ug/kg																										
2.2-Dichloropropane	ug/kg																										
2-Chlorotoluene	ug/kg																										
4-Chlorotoluene	ug/kg																										
4-Isopropyltoluene	ug/kg																										
Benzene	ug/kg																										
Bromobenzene	ug/kg																										
Bromochloromethane	ug/kg																										
Bromoform	ug/kg																										

M4CAN Soil (MG) Sample Analysis & Screening Assessment CL-17 27/06/2016	Screening Values and Assessment	
		Exceeds S4ULs criteria
	X	Laboratory detection level higher than screening criterion
		Asbestos Detected
	Geological Formation legend	
	MG	Made Ground

Notes
N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	WSM4CAN008	WSM4CAN009	WSM4CAN010	WSM4CAN011	WSM4CAN012	WSM4CAN014	HPM4CAN001	HPM4CAN002	HPM4CAN003
Specimen Depth (m)		0.2-0.6	0.5	1	0.5	0.5	0.5	GL	GL	GL
OD level (m)		7.16-6.76	6.68	7.03	6.66	6.7	7.2			
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG
Investigation Date		2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI
4-Chloroaniline	mg/kg	<0.1	<0.1			<0.1				
4-Chlorophenylphenylether	mg/kg	<0.1	<0.1			<0.1				
4-Nitroaniline	mg/kg	<0.1	<0.1			<0.1				
Azobenzene	mg/kg	<0.1	<0.1			<0.1				
Bis(2-chloroethoxy)methane	mg/kg	<0.1	<0.1			<0.1				
bis(2-Chloroethyl)ether	mg/kg	<0.1	<0.1			<0.1				
Dibenzofuran	mg/kg	<0.1	<0.1			<0.1				
Hexachlorobenzene	mg/kg	<0.1	<0.1			0.223				
Hexachlorobutadiene	mg/kg	<0.1	<0.1			<0.1				
Hexachlorocyclopentadiene	mg/kg	<0.1	<0.1			<0.1				
Hexachloroethane	mg/kg	<0.1	<0.1			<0.1				
Isophorone	mg/kg	<0.1	<0.1			<0.1				
N-Nitroso-di-npropylamine	mg/kg	<0.1	<0.1			<0.1				
Nitrobenzene	mg/kg	<0.1	<0.1			<0.1				
3,3'-Dichlorobenzidine	mg/kg									
bis(2-Chloroisopropyl)ether	mg/kg									
Benzoic Acid	mg/kg									
Benzyl alcohol	mg/kg									
Biphenyl *	mg/kg									
Diphenyl ether *	mg/kg									
VOCs										
Naphthalene	ug/kg	<13	<13			<13				
Hexachlorobutadiene	ug/kg	<20	<20			<20				
1,2,4-Trichlorobenzene	ug/kg	<20	<20			<20				
1,2-Dichlorobenzene	ug/kg	<10	<10			<10				
1,3-Dichlorobenzene	ug/kg	<8	<8			<8				
1,4-Dichlorobenzene	ug/kg	<5	<5			<5				
1.1.1.2-Tetrachloroethane	ug/kg	<10	<10			<10				
1.1.1-Trichloroethane	ug/kg	<7	<7			<7				
1.1.2.2-Tetrachloroethane	ug/kg	<10	<10			<10				
1.1.2-Trichloroethane	ug/kg	<10	<10			<10				
1.1-Dichloropropene	ug/kg	<10	<10			<10				
1.1-Dichloroethane	ug/kg	<8	<8			<8				
1.1-Dichloroethene	ug/kg	<10	<10			<10				
1.2.3-Trichlorobenzene	ug/kg	<20	<20			<20				
1,2,3-Trichloropropane	ug/kg	<16	<16			<16				
1.2.4-Trimethylbenzene	ug/kg	<9	<9			<9				
1.2-Dibromo-3-chloropropane	ug/kg	<14	<14			<14				
1,2-Dichlorobenzene	ug/kg	<10	<10			<10				
1.2-Dichloroethane	ug/kg	<5	<5			<5				
1,2-Dichloropropane	ug/kg	<10	<10			<10				
cis-1-2-Dichloroethene	ug/kg	<6	<6			<6				
1.2-Dibromoethane	ug/kg	<10	<10			<10				
1.2-Dichloropropane	ug/kg	<10	<10			<10				
1.3.5-Trimethylbenzene	ug/kg	<8	<8			<8				
1.3.5-Trichlorobenzene	ug/kg									
cis-1-3-Dichloropropene	ug/kg	<10	<10			<10				
1.3-Dichloropropane	ug/kg	<7	<7			<7				
2.2-Dichloropropane	ug/kg	<10	<10			<10				
2-Chlorotoluene	ug/kg	<9	<9			<9				
4-Chlorotoluene	ug/kg	<10	<10			<10				
4-Isopropyltoluene	ug/kg	<10	<10			<10				
Benzene	ug/kg	<9	<9			<9				
Bromobenzene	ug/kg	<10	<10			<10				
Bromochloromethane	ug/kg	<10	<10			<10				
Bromoform	ug/kg	<10	<10			<10				

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	BHG6	BHH1	BHH1	BHH1	CH33	CH34	CH34	CH35	CH35	CH35	CH36	CH37	CH38	CH39	CH39	CH40	CH40	CH41	CH41	CH42	CH42	CH43	CH44	CH44	CH45	CH46	CH47
Specimen Depth (m)		0.3	0.2	0.9	1.85	0.2	0.15	1.4	0	0.5	0.8	0.1	0	0.1	0	1	0	0.5	0.05	1.4	0.2	1.2	0.2	0.3	1	0.2	0.5	0.1
OD level (m)																												
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG
Investigation Date		1997 GI	1997 GI	1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI
Bromomethane	ug/kg								<5	<5	<5									<5	<5						<5	
Bromodichloromethane	ug/kg								<5	<5	<5									<5	<5						<5	
Carbon Disulphide	ug/kg																											
Chlorobenzene	ug/kg								<5	56	17									<5	<5						<5	
Chloroethane	ug/kg								<5	<5	<5									<5	<5						<5	
Chloroform	ug/kg								<5	<5	<5									<5	<5						<5	
Chloromethane	ug/kg								<5000	<5000	<5000									<5000	<5000						<5000	
Carbontetrachloride	ug/kg								<5	<5	<5									<5	<5						<5	
Dichlorodifluoromethane	ug/kg								<5000	<5000	<5000									<5000	<5000						<5000	
Dibromochloromethane	ug/kg								<5	<5	<5									<5	<5						<5	
Dibromomethane	ug/kg								<5	<5	<5									<5	<5						<5	
Dichloromethane	ug/kg																											
Ethylbenzene	ug/kg																											
Isopropylbenzene	ug/kg								<5	<5	<5									<5	<5						<5	
Methyl Tertiary Butyl Ether	ug/kg																											
n-Butylbenzene	ug/kg								<5	<5	<5									<5	<5						<5	
o-Xylene	ug/kg																											
p/m-Xylene	ug/kg																											
Propylbenzene	ug/kg								<5	<5	<5									<5	<5						<5	
p-Isopropyltoluene	ug/kg								<5	<5	<5									<5	<5						<5	
sec-Butylbenzene	ug/kg								<5	<5	<5									<5	<5						<5	
Styrene	ug/kg								<5	<5	<5									20	<5						<5	
trans-1-2-Dichloroethene	ug/kg								<5	<5	<5									<5	<5						<5	
trans-1-3-Dichloropropene	ug/kg								<5	<5	<5									<5	<5						<5	
Trichlorofluoromethane	ug/kg								<5	<5	<5									<5	<5						<5	
tert-amyl methyl ether	ug/kg																											
tert-Butylbenzene	ug/kg								<5	<5	<5									<5	<5						<5	
Tetrachloroethene	ug/kg								<5	<5	<5									<5	<5						<5	
Toluene	ug/kg																											
Trichloroethene	ug/kg								<7	<7	<7									<7	<7						<7	
Vinyl Chloride	ug/kg								<5000	<5000	<5000									<5000	<5000						<5000	

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

																		2008 WSP Investigation. Locations unknown - though to be in the south of the site (wind turbine								
Sample Reference	**Units**	**CH47**	**CH47A**	**CH48**	**CP/RH01**	**CP/RH02**	**TP03**	**TP04**	**TP04**	**TP04**	**TP05**	**TP05**	**TP06**	**TP07**	**TP08**	**TP09**	**TP10**	**TP11**	**T1/1**	**T1/2**	**T1/3**	**T1/4**	**T1/5**	**T1/6**	**T1/7**	**T1/8**	**T1/9**
Specimen Depth (m)		1.1	0.2	0.05	0.2-0.25	0.2-0.5	0.1-0.2	0.3-0.4	0.7-0.8	0.8-0.9	0.2-0.5	0.6-0.7	0.1-0.3	0.2-0.5	0.1-0.3	0.2-0.5	0.1-0.2	0.2-0.3									
OD level (m)																										
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG	MG									
Investigation Date		2000 GI	2000 GI	2000 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI									
Bromomethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Bromodichloromethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Carbon Disulphide	ug/kg																										
Chlorobenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Chloroethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Chloroform	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Chloromethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Carbontetrachloride	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Dichlorodifluoromethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Dibromochloromethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Dibromomethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Dichloromethane	ug/kg																										
Ethylbenzene	ug/kg																										
Isopropylbenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Methyl Tertiary Butyl Ether	ug/kg																										
n-Butylbenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
o-Xylene	ug/kg																										
p/m-Xylene	ug/kg																										
Propylbenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
p-Isopropyltoluene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		20	<10	<10										
sec-Butylbenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Styrene	ug/kg				<10		<10	<10	<10	<10	<10	400	300		<10	<10	<10										
trans-1-2-Dichloroethene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
trans-1-3-Dichloropropene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Trichlorofluoromethane	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
tert-amyl methyl ether	ug/kg																										
tert-Butylbenzene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Tetrachloroethene	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										
Toluene	ug/kg																										
Trichloroethene	ug/kg				<10		<10	<10	<10	<10	<10	<10	20		<10	<10	<10										
Vinyl Chloride	ug/kg				<10		<10	<10	<10	<10	<10	<10	<10		<10	<10	<10										

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend

MG	Made Ground

Notes

N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

e area). Depths unknown

Sample Reference	Units	T1/10	T1/11	T1/12	T1/13	T1/14	T1/15	T2/1	T2/2	T2/3	T2/4	T2/5	T2/6	T2/7	T2/8	T2/9	T2/10	T2/11	T2/12	T2/13	T2/14	T2/15	T2/16	T2/17	T2/18	BHM4CAN029	BHM4CANA022
Specimen Depth (m)																										1-1.6	0-0.2
OD level (m)																										5.84-5.24	6.82-6.62
Geology Code																										MG	MG
Investigation Date																										2016 GI	2016 GI
Bromomethane	ug/kg																										
Bromodichloromethane	ug/kg																										
Carbon Disulphide	ug/kg																										
Chlorobenzene	ug/kg																										
Chloroethane	ug/kg																										
Chloroform	ug/kg																										
Chloromethane	ug/kg																										
Carbontetrachloride	ug/kg																										
Dichlorodifluoromethane	ug/kg																										
Dibromochloromethane	ug/kg																										
Dibromomethane	ug/kg																										
Dichloromethane	ug/kg																										
Ethylbenzene	ug/kg																										
Isopropylbenzene	ug/kg																										
Methyl Tertiary Butyl Ether	ug/kg																										
n-Butylbenzene	ug/kg																										
o-Xylene	ug/kg																										
p/m-Xylene	ug/kg																										
Propylbenzene	ug/kg																										
p-Isopropyltoluene	ug/kg																										
sec-Butylbenzene	ug/kg																										
Styrene	ug/kg																										
trans-1-2-Dichloroethene	ug/kg																										
trans-1-3-Dichloropropene	ug/kg																										
Trichlorofluoromethane	ug/kg																										
tert-amyl methyl ether	ug/kg																										
tert-Butylbenzene	ug/kg																										
Tetrachloroethene	ug/kg																										
Toluene	ug/kg																										
Trichloroethene	ug/kg																										
Vinyl Chloride	ug/kg																										

M4CAN
Soil (MG) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment	
	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion
	Asbestos Detected

Geological Formation legend	
MG	Made Ground

Notes
N/C No Comment (assbestos analyst comments)
NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	WSM4CAN008	WSM4CAN009	WSM4CAN010	WSM4CAN011	WSM4CAN012	WSM4CAN014	HPM4CAN001	HPM4CAN002	HPM4CAN003
Specimen Depth (m)		0.2-0.6	0.5	1	0.5	0.5	0.5	GL	GL	GL
OD level (m)		7.16-6.76	6.68	7.03	6.66	6.7	7.2			
Geology Code		MG	MG	MG	MG	MG	MG	MG	MG	MG
Investigation Date		2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI
Bromomethane	ug/kg	<10	<10			<10				
Bromodichloromethane	ug/kg	<7	<7			<7				
Carbon Disulphide	ug/kg	<7	<7			<7				
Chlorobenzene	ug/kg	<5	<5			<5				
Chloroethane	ug/kg	<10	<10			<10				
Chloroform	ug/kg	<8	<8			<8				
Chloromethane	ug/kg	<7	<7			<7				
Carbontetrachloride	ug/kg	<10	<10			<10				
Dichlorodifluoromethane	ug/kg	<6	<6			<6				
Dibromochloromethane	ug/kg	<10	<10			<10				
Dibromomethane	ug/kg	<9	<9			<9				
Dichloromethane	ug/kg	<10	<10			<10				
Ethylbenzene	ug/kg	<4	<4			<4				
Isopropylbenzene	ug/kg	<5	<5			<5				
Methyl Tertiary Butyl Ether	ug/kg	<10	<10			<10				
n-Butylbenzene	ug/kg	<11	<11			<11				
o-Xylene	ug/kg	<10	<10			<10				
p/m-Xylene	ug/kg	<10	<10			<10				
Propylbenzene	ug/kg	<10	<10			<10				
p-Isopropyltoluene	ug/kg									
sec-Butylbenzene	ug/kg	<10	<10			<10				
Styrene	ug/kg	<10	<10			<10				
trans-1-2-Dichloroethene	ug/kg	<10	<10			<10				
trans-1-3-Dichloropropene	ug/kg	<10	<10			<10				
Trichlorofluoromethane	ug/kg	<6	<6			<6				
tert-amyl methyl ether	ug/kg	<10	<10			<10				
tert-Butylbenzene	ug/kg	<14	<14			<14				
Tetrachloroethene	ug/kg	<5	<5			13.3				
Toluene	ug/kg	<7	<7			<7				
Trichloroethene	ug/kg	<9	<9			<9				
Vinyl Chloride	ug/kg	<6	<6			<6				

M4CAN
Soil (Nat) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference / Specimen Depth (m) / OD Level (m) / Geology Code / Investigation Date	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
Metals								
Arsenic	mg/kg	26	26	370	3.9	TP03 @ 0.8-0.9mbGL	170	7
Boron	mg/kg	14	13	3.9	0	BHG6 @ 17.1mbGL	46000	0
Cadmium	mg/kg	26	22	3.9	0.07	BHG6 @ 17.1mbGL	190	0
Chromium	mg/kg	26	26	250	0.101	TP03 @ 0.8-0.9mbGL	33	22
Copper	mg/kg	26	25	42.2	0.03	BHG6 @ 17.1mbGL	44000	0
Lead	mg/kg	26	26	131	15.7	CH46 @ 1.2mbGL	1300	0
Mercury	mg/kg	26	12	2.84	0.08	CH46 @ 1.2mbGL	30	0
Nickel	mg/kg	26	26	44	16	CH46 @ 1.2mbGL	980	0
Selenium	mg/kg	26	10	1.24	0.1	CH46 @ 1.2mbGL	1800	0
Vanadium		5	5	60.1	50.6	WSM4CAN014 @ 2mbGL	5000	0
Zinc	mg/kg	26	26	280	33.2	TP03 @ 0.8-0.9mbGL	170000	0
Non-Metal Inorganics								
Cyanide (total)	mg/kg	20	0	None > LOD	None > LOD			
Cyanide (free)	mg/kg	17	0	None > LOD	None > LOD			
Thiocyanate	mg/kg	10	1	2	2	CH37 @ 1.2mbGL		
Ferro/ferricyanide	mg/kg	7	0	None > LOD	None > LOD			
Acid Soluble Sulphate	mg/kg	1	1	668	668	CH48 @ 1mbGL		
Sulphate (total)	mg/kg	7	7	731	317	BHG5 @ 2.85mbGL		
Sulphide	mg/kg	13	7	17	2.1	CH33 @ 1.5mbGL		
Asbestos Screen	None							
Other								
pH Value	pH Units	25	25	11	7.48	CP/RH02 @ 2.4-2.5mbGL	6-9	3
BTEX								
GRO (C4-C12)	mg/kg	5	0	None > LOD	None > LOD			
MTBE	mg/kg	5	1	0.00524	0.00524	BHM4CANA022 @ 1.2mbGL		
Benzene	mg/kg	12	2	0.46	0.282	TP03 @ 0.8-0.9mbGL	27	0
Toluene	mg/kg	12	1	0.01	0.01	TP03 @ 0.8-0.9mbGL	56000	0
Ethyl benzene	mg/kg	12	1	0.06	0.06	TP03 @ 0.8-0.9mbGL	5700	0
m & p Xylene	mg/kg	12	1	0.59	0.59	TP03 @ 0.8-0.9mbGL	5900	0
o Xylene	mg/kg	12	1	0.15	0.15	TP03 @ 0.8-0.9mbGL	6600	0
Sum of Detected BTEX	mg/kg	5	0	None > LOD	None > LOD			
Sum of Detected Xylenes	mg/kg	5	0	None > LOD	None > LOD			
Organics								
PAH (Screening)	mg/kg	14	7	2400	1.7	CH46 @ 1.2mbGL	1.1	7
VOC (screen)	ug/kg	13	0	None > LOD	None > LOD			
Mineral Oil	mg/kg	13	0	None > LOD	None > LOD			
TPH FTIR (AR)	mg/kg	6	6	1870	22	CH37 @ 1.2mbGL	2000	0
OIL FTIR	mg/kg	13	6	780	67	CH46 @ 1.2mbGL		
TPH								
Aliphatics C5-C6	mg/kg	12	0	None > LOD	None > LOD		3200	0
Aliphatics >C6-C8	mg/kg	12	2	0.3	0.0116	TP03 @ 0.8-0.9mbGL	7800	0
Aliphatics >C8-C10	mg/kg	12	3	3.2	0.0105	TP03 @ 0.8-0.9mbGL	2000	0
Aliphatics >C10-C12	mg/kg	12	6	93	0.0627	CP/RH02 @ 2.4-2.5mbGL	9700	0
Aliphatics >C12-C16	mg/kg	12	2	66	0.179	TP03 @ 0.8-0.9mbGL	25000	0
Aliphatics >C16-C21	mg/kg	12	1	0.613	0.613	BHM4CANA022 @ 1.2mbGL	450000	0
Aliphatics >C21-C35	mg/kg	12	3	3.3	0.443	BHM4CANA022 @ 1.2mbGL	450000	0
Aliphatics >C35-C40	mg/kg	7	0	None > LOD	None > LOD		450000	0
Aliphatics >C35-C44	mg/kg	5	0	None > LOD	None > LOD		450000	0
Aliphatics >C40-C44	mg/kg	7	0	None > LOD	None > LOD		450000	0
Total Aliphatics >C12-C44	mg/kg	5	3	4.09	0.443	BHM4CANA022 @ 1.2mbGL	25000	0
Aromatics >C5-7	mg/kg	5	0	None > LOD	None > LOD		26000	0
Aromatics >C6-C7	mg/kg	7	1	0.46	0.46	TP03 @ 0.8-0.9mbGL	26000	0
Aromatics >C7-C8	mg/kg	12	1	0.01	0.01	TP03 @ 0.8-0.9mbGL	56000	0
Aromatics >EC8-EC10	mg/kg	12	3	0.89	0.0118	TP03 @ 0.8-0.9mbGL	3500	0
Aromatics >EC10-EC12	mg/kg	12	6	78	0.0413	CP/RH01 @ 0.7-0.8mbGL	9200	0
Aromatics >EC12-EC16	mg/kg	12	2	0.242	0.227	BHM4CANA022 @ 1.2mbGL	10000	0
Aromatics >EC16-EC21	mg/kg	12	1	0.974	0.974	WSM4CAN014 @ 2mbGL	7600	0
Aromatics >EC21-EC35	mg/kg	12	3	22.3	1.26	WSM4CAN014 @ 2mbGL	7800	0
Aromatics >EC35-EC40	mg/kg	7	0	None > LOD	None > LOD		7800	0
Aromatics >C35-C44	mg/kg	5	2	1.8	0.638	WSM4CAN014 @ 2mbGL	7800	0
Aromatics >EC40-EC44	mg/kg	12	1	0.199	0.199	WSM4CAN014 @ 2mbGL	7800	0
Total Aromatics >EC12-EC44	mg/kg	5	3	25.3	1.26	WSM4CAN014 @ 2mbGL	7600	0
Total Aliphatics & Aromatics >C5-C44	mg/kg	5	5	25.3	0.281	WSM4CAN014 @ 2mbGL	2000	0
PAHs								
Acenaphthene	mg/kg	5	0	None > LOD	None > LOD		29000	0
Acenaphthylene	mg/kg	5	0	None > LOD	None > LOD		29000	0
Anthracene	mg/kg	5	0	None > LOD	None > LOD		150000	0
Benzo(a)anthracene	mg/kg	5	2	0.0464	0.0293	WSM4CAN014 @ 2mbGL	49	0
Benzo(a)pyrene	mg/kg	5	2	0.0679	0.0202	WSM4CAN014 @ 2mbGL	11	0
Benzo(b)fluoranthene	mg/kg	5	2	0.124	0.0507	WSM4CAN014 @ 2mbGL	13	0
Benzo(g,h,i)perylene	mg/kg	5	1	0.0551	0.0551	WSM4CAN014 @ 2mbGL	1400	0
Benzo(k)fluoranthene	mg/kg	5	1	0.0415	0.0415	WSM4CAN014 @ 2mbGL	370	0
Chrysene	mg/kg	5	2	0.0773	0.0237	WSM4CAN014 @ 2mbGL	93	0
Dibenzo(ah)anthracene	mg/kg	5	0	None > LOD	None > LOD		1.1	0
Fluoranthene	mg/kg	5	2	0.117	0.0525	WSM4CAN014 @ 2mbGL	6300	0
Fluorene	mg/kg	5	0	None > LOD	None > LOD		20000	0
Indeno(1,2,3-cd)pyrene	mg/kg	5	1	0.0461	0.0461	WSM4CAN014 @ 2mbGL		
Naphthalene	mg/kg	5	2	0.0391	0.0123	WSM4CAN014 @ 2mbGL	190	0
Phenanthrene	mg/kg	5	2	0.0943	0.0364	WSM4CAN014 @ 2mbGL	6200	0
Pyrene	mg/kg	5	2	0.083	0.0361	WSM4CAN014 @ 2mbGL	15000	0
PAH, Total Detected USEPA 16	mg/kg	5	2	0.792	0.261	WSM4CAN014 @ 2mbGL		
PCB								
PCB - ARO	mg/kg	13	6	44	1.5	CH46 @ 1.2mbGL	0.24	6

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Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference / Specimen Depth (m) / OD Level (m) / Geology Code / Investigation Date	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
Pcb-28 2,4,4' - Trichlororbiphenyl	mg/kg	3	2	0.33	0.0033	TP03 @ 0.8-0.9mbGL	0.24	1
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	mg/kg	3	3	0.27	0.0025	TP03 @ 0.8-0.9mbGL	0.24	1
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg	4	0	None > LOD	None > LOD		0.24	0
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg	4	0	None > LOD	None > LOD		0.24	0
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	mg/kg	3	3	0.17	0.0021	TP03 @ 0.8-0.9mbGL	0.24	0
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg	4	1	0.00357	0.00357	WSM4CAN014 @ 2mbGL	0.24	0
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg	4	0	None > LOD	None > LOD		0.24	0
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg	7	4	0.2	0.0019	TP03 @ 0.8-0.9mbGL	0.24	0
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg	4	0	None > LOD	None > LOD		0.24	0
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg	4	0	None > LOD	None > LOD		0.24	0
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	mg/kg	3	3	0.13	0.0018	TP03 @ 0.8-0.9mbGL	0.24	0
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	mg/kg	3	3	0.15	0.0029	TP03 @ 0.8-0.9mbGL	0.24	0
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg	4	0	None > LOD	None > LOD		0.24	0
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg	4	0	None > LOD	None > LOD		0.24	0
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg	4	0	None > LOD	None > LOD		0.24	0
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg	4	0	None > LOD	None > LOD		0.24	0
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	mg/kg	3	3	0.092	0.0015	TP03 @ 0.8-0.9mbGL	0.24	0
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	mg/kg	4	0	None > LOD	None > LOD		0.24	0
Total PCB Congeners	mg/kg	3	3	1.3	0.015	TP03 @ 0.8-0.9mbGL	0.24	1
Sum of detected WHO 12 PCBs	mg/kg	4	0	None > LOD	None > LOD		0.24	0
Phenols								
Cresols		5	0	None > LOD	None > LOD			
Phenol Index	mg/kg	7	2	0.6	0.5	CH46 @ 1.2mbGL	440	0
Phenols Monohydric	mg/kg	19	3	0.021	0.0027	TP03 @ 0.8-0.9mbGL	440	0
Phenols (total)	mg/kg	12	0	None > LOD	None > LOD		440	0
Xylenols		5	0	None > LOD	None > LOD			
SVOCs								
Phenols								
2-Chlorophenol	mg/kg	20	0	None > LOD	None > LOD			
2-Methylphenol	mg/kg	20	0	None > LOD	None > LOD			
2-Nitrophenol	mg/kg	20	0	None > LOD	None > LOD			
2,4-Dichlorophenol	mg/kg	20	0	None > LOD	None > LOD			
2,4-Dimethylphenol	mg/kg	20	0	None > LOD	None > LOD			
2,4,5-Trichlorophenol	mg/kg	20	0	None > LOD	None > LOD			
2,4,6-Trichlorophenol	mg/kg	20	0	None > LOD	None > LOD			
4-Chloro-3-methylphenol	mg/kg	20	0	None > LOD	None > LOD			
4-Methylphenol	mg/kg	1	0	None > LOD	None > LOD			
4-Nitrophenol	mg/kg	20	0	None > LOD	None > LOD			
Pentachlorophenol	mg/kg	20	0	None > LOD	None > LOD			
Phenol	mg/kg	10	0	None > LOD	None > LOD		440	0
2,4-Dinitrophenol	mg/kg	19	0	None > LOD	None > LOD			
3- & 4-Methylphenol	mg/kg	19	0	None > LOD	None > LOD			
4,6-Dinitro-2-methylphenol	mg/kg	19	0	None > LOD	None > LOD			
4-Chlorophenol *	mg/kg	19	0	None > LOD	None > LOD			
PAHs								
2-Chloronaphthalene	mg/kg	15	0	None > LOD	None > LOD			
1-Methyl naphthalene *	mg/kg	14	0	None > LOD	None > LOD			
2-Methylnaphthalene	mg/kg	14	0	None > LOD	None > LOD			
Acenaphthene	mg/kg	14	0	None > LOD	None > LOD		29000	0
Acenaphthylene	mg/kg	14	0	None > LOD	None > LOD		29000	0
Anthracene	mg/kg	14	0	None > LOD	None > LOD		150000	0
Benzo(a)anthracene	mg/kg	14	1	0.3	0.3	CH46 @ 1.2mbGL	49	0
Benzo(a)pyrene	mg/kg	14	1	0.3	0.3	CH46 @ 1.2mbGL	11	0
Benzo(b)fluoranthene	mg/kg	14	2	0.4	0.3	TP03 @ 0.8-0.9mbGL	13	0
Benzo(g,h,i)perylene	mg/kg	14	1	0.2	0.2	CH46 @ 1.2mbGL	1400	0
Benzo(k)fluoranthene	mg/kg	14	2	0.4	0.3	CH46 @ 1.2mbGL	370	0
Chrysene	mg/kg	14	3	5.3	0.3	TP03 @ 0.8-0.9mbGL	93	0
Dibenzo(ah)anthracene	mg/kg	14	0	None > LOD	None > LOD		1.1	0
Fluoranthene	mg/kg	14	2	0.6	0.4	CH46 @ 1.2mbGL	6300	0
Fluorene	mg/kg	14	2	0.7	0.3	TP03 @ 0.8-0.9mbGL	20000	0
Indeno(1,2,3-cd)pyrene	mg/kg	14	1	0.2	0.2	CH46 @ 1.2mbGL		
Naphthalene	mg/kg	14	1	0.3	0.3	TP03 @ 0.8-0.9mbGL	190	0
Phenanthrene	mg/kg	14	2	0.5	0.5	CH46 @ 1.2mbGL	6200	0
Pyrene	mg/kg	14	2	0.5	0.3	CH46 @ 1.2mbGL	15000	0
Pthalates								
bis(2-Ethylhexyl)phthalate	mg/kg	13	4	5.6	2.1	CH43 @ 1.3mbGL		
Butylbenzyl phthalate	mg/kg	13	0	None > LOD	None > LOD			
Di-n-butyl phthalate	mg/kg	13	0	None > LOD	None > LOD			
Diethyl phthalate	mg/kg	13	0	None > LOD	None > LOD			
Dimethyl phthalate	mg/kg	13	0	None > LOD	None > LOD			
Di-N-Octyl Phthalate	mg/kg	1	0	None > LOD	None > LOD			
Other Semi-Volatiles								
1,2-Dichlorobenzene	mg/kg	10	0	None > LOD	None > LOD			
1,2,4-Trichlorobenzene	mg/kg	10	0	None > LOD	None > LOD		220	0
1,3-Dichlorobenzene	mg/kg	10	0	None > LOD	None > LOD			
1,4-Dichlorobenzene	mg/kg	10	0	None > LOD	None > LOD			
2-Nitroaniline	mg/kg	10	0	None > LOD	None > LOD			
2,4-Dinitrotoluene	mg/kg	10	0	None > LOD	None > LOD			
2,6-Dinitrotoluene	mg/kg	10	0	None > LOD	None > LOD			
3-Nitroaniline	mg/kg	10	0	None > LOD	None > LOD			
4-Bromophenylphenylether	mg/kg	10	0	None > LOD	None > LOD			
4-Chloroaniline	mg/kg	10	0	None > LOD	None > LOD			
4-Chlorophenylphenylether	mg/kg	10	0	None > LOD	None > LOD			
4-Nitroaniline	mg/kg	10	0	None > LOD	None > LOD			
Azobenzene	mg/kg	1	0	None > LOD	None > LOD			

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Screening Values and Assessment

	Exceeds S4ULs criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference Specimen Depth (m) OD Level (m) Geology Code Investigation Date	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
Bis(2-chloroethoxy)methane	mg/kg	10	0	None > LOD	None > LOD			
bis(2-Chloroethyl)ether	mg/kg	10	0	None > LOD	None > LOD			
Dibenzofuran	mg/kg	10	0	None > LOD	None > LOD			
Hexachlorobenzene	mg/kg	10	0	None > LOD	None > LOD		30	0
Hexachlorobutadiene	mg/kg	10	0	None > LOD	None > LOD		31	0
Hexachlorocyclopentadiene	mg/kg	10	0	None > LOD	None > LOD			
Hexachloroethane	mg/kg	10	0	None > LOD	None > LOD			
Isophorone	mg/kg	13	0	None > LOD	None > LOD			
N-Nitroso-di-npropylamine	mg/kg	13	0	None > LOD	None > LOD			
Nitrobenzene	mg/kg	13	0	None > LOD	None > LOD			
3,3'-Dichlorobenzidine	mg/kg	12	0	None > LOD	None > LOD			
bis(2-Chloroisopropyl)ether	mg/kg	13	0	None > LOD	None > LOD			
Benzoic Acid	mg/kg	12	0	None > LOD	None > LOD			
Benzyl alcohol	mg/kg	12	0	None > LOD	None > LOD			
Biphenyl *	mg/kg	12	1	1.4	1.4	CH46 @ 1.2mbGL		
Diphenyl ether *	mg/kg	12	0	None > LOD	None > LOD			
VOCs								
Naphthalene	ug/kg	1	0	None > LOD	None > LOD		190000	0
Hexachlorobutadiene	ug/kg	4	0	None > LOD	None > LOD		31000	0
1,2,4-Trichlorobenzene	ug/kg	4	0	None > LOD	None > LOD		220000	0
1,2-Dichlorobenzene	ug/kg	4	0	None > LOD	None > LOD			
1,3-Dichlorobenzene	ug/kg	4	0	None > LOD	None > LOD			
1,4-Dichlorobenzene	ug/kg	4	0	None > LOD	None > LOD			
1.1.1.2-Tetrachloroethane	ug/kg	4	0	None > LOD	None > LOD			
1.1.1-Trichloroethane	ug/kg	4	0	None > LOD	None > LOD			
1.1.2.2-Tetrachloroethane	ug/kg	4	0	None > LOD	None > LOD			
1.1.2-Trichloroethane	ug/kg	4	0	None > LOD	None > LOD			
1.1-Dichloropropene	ug/kg	4	0	None > LOD	None > LOD			
1.1-Dichloroethane	ug/kg	4	0	None > LOD	None > LOD			
1.1-Dichloroethene	ug/kg	4	0	None > LOD	None > LOD			
1.2.3-Trichlorobenzene	ug/kg	4	0	None > LOD	None > LOD		102000	0
1.2.3-Trichloropropane	ug/kg	1	0	None > LOD	None > LOD			
1.2.4-Trichlorobenzene	ug/kg	1	0	None > LOD	None > LOD		220000	0
1.2.4-Trimethylbenzene	ug/kg	4	0	None > LOD	None > LOD			
1.2-Dibromo-3-chloropropane	ug/kg	4	0	None > LOD	None > LOD			
1.2-Dichloroethane	ug/kg	4	0	None > LOD	None > LOD			
cis-1-2-Dichloroethene	ug/kg	4	0	None > LOD	None > LOD			
1.2-Dibromoethane	ug/kg	4	0	None > LOD	None > LOD			
1.2-Dichloropropane	ug/kg	4	0	None > LOD	None > LOD			
1.3.5-Trimethylbenzene	ug/kg	4	0	None > LOD	None > LOD			
cis-1-3-Dichloropropene	ug/kg	4	0	None > LOD	None > LOD			
1.3-Dichloropropane	ug/kg	4	0	None > LOD	None > LOD			
2.2-Dichloropropane	ug/kg	4	0	None > LOD	None > LOD			
2-Chlorotoluene	ug/kg	4	0	None > LOD	None > LOD			
4-Chlorotoluene	ug/kg	4	0	None > LOD	None > LOD			
4-Isopropyltoluene	ug/kg	1	0	None > LOD	None > LOD			
Benzene	ug/kg	1	0	None > LOD	None > LOD		27000	0
Bromobenzene	ug/kg	4	0	None > LOD	None > LOD			
Bromochloromethane	ug/kg	4	0	None > LOD	None > LOD			
Bromoform	ug/kg	4	0	None > LOD	None > LOD			
Bromomethane	ug/kg	4	0	None > LOD	None > LOD			
Bromodichloromethane	ug/kg	4	0	None > LOD	None > LOD			
Carbon Disulphide		1	0	None > LOD	None > LOD		11000	0
Chlorobenzene	ug/kg	4	0	None > LOD	None > LOD		56000	0
Chloroethane	ug/kg	4	0	None > LOD	None > LOD			
Chloroform	ug/kg	4	0	None > LOD	None > LOD		99000	0
Chloromethane	ug/kg	4	0	None > LOD	None > LOD			
Carbontetrachloride	ug/kg	4	0	None > LOD	None > LOD			
Dichlorodifluoromethane	ug/kg	4	0	None > LOD	None > LOD			
Dibromochloromethane	ug/kg	4	0	None > LOD	None > LOD			
Dibromomethane	ug/kg	4	0	None > LOD	None > LOD			
Dichloromethane		1	0	None > LOD	None > LOD			
Ethylbenzene		1	0	None > LOD	None > LOD		5700000	0
Isopropylbenzene	ug/kg	4	0	None > LOD	None > LOD			
Methyl Tertiary Butyl Ether		1	0	None > LOD	None > LOD			
n-Butylbenzene	ug/kg	4	1	30	30	TP03 @ 0.8-0.9mbGL		
o-Xylene		1	0	None > LOD	None > LOD		6600000	0
p/m-Xylene		1	0	None > LOD	None > LOD			
Propylbenzene	ug/kg	4	0	None > LOD	None > LOD			
p-Isopropyltoluene	ug/kg	3	1	20	20	TP03 @ 0.8-0.9mbGL		
sec-Butylbenzene	ug/kg	4	0	None > LOD	None > LOD			
Styrene	ug/kg	4	0	None > LOD	None > LOD			
trans-1-2-Dichloroethene	ug/kg	4	0	None > LOD	None > LOD			
trans-1-3-Dichloropropene	ug/kg	4	0	None > LOD	None > LOD			
Trichlorofluoromethane	ug/kg	4	0	None > LOD	None > LOD			
tert-amyl methyl ether		1	0	None > LOD	None > LOD			
tert-Butylbenzene	ug/kg	4	0	None > LOD	None > LOD			
Tetrachloroethene	ug/kg	4	0	None > LOD	None > LOD		19000	0
Toluene		1	0	None > LOD	None > LOD		56000000	0
Trichloroethene	ug/kg	4	0	None > LOD	None > LOD		1200	0
Vinyl Chloride	ug/kg	4	0	None > LOD	None > LOD		59	0

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Soil (Nat) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD
Mercia Mudstone Group	MMG

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criterion	X

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	BHG5	BHG5	BHG5	BHG5	BHG6	BHG6	BHG6	CH33	CH36	CH37	CH38
Specimen Depth (m)		0.4	2.85	12.7	17.2	0.6	12.5	17.1	1.5	0.7	1.2	1.3
OD Level (m)												
Geology Code		TFD	TFD	GFD	MMG	TFD	GFD	MMG	TFD	TFD	TFD	TFD
Investigation Date		1997 GI	1997 GI	1997 GI	1997 GI	1997 GI	1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI
Metals												
Arsenic	mg/kg	21.9	8.1	4.2	3.9	18.5	5.4	7.8	7.68	8.9	11	13
Boron	mg/kg	3.3	1.4	2.1	1.4	1.5	1.5	3.9	2	1.5	2.4	2.5
Cadmium	mg/kg	0.3	<0.2	<0.2	<0.2	1.5	1.5	3.9	0.54	0.09	0.11	0.08
Chromium	mg/kg	93.7	54.1	28.7	34	65.2	35.7	43.6	30	33	37	37
Copper	mg/kg	27.3	13.4	7.7	29.2	15.7	26.9	42.2	19	10	12	11
Lead	mg/kg	60.6	41.3	15.7	19.5	47.2	21.4	31.1	52	37	42	44
Mercury	mg/kg	<0.1	0.4	0.2	<0.1	<0.1	<0.1	0.1	2.14	0.08	0.14	0.16
Nickel	mg/kg	40.1	35.9	16	21.1	35.9	23.3	31.6	21	29	32	34
Selenium	mg/kg	0.3	0.3	0.2	0.3	0.3	0.1	<0.1	0.94	<0.5	<0.5	<0.5
Vanadium												
Zinc	mg/kg	136.6	95.1	33.2	68.3	146.7	45.4	112.6	121	80	98	91
Non-Metal Inorganics												
Cyanide (total)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1	<1
Cyanide (free)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<1	<1	<1
Thiocyanate	mg/kg	<1	<1	<1	<1	<1	<1	<1		<2	2	<2
Ferro/ferricyanide	mg/kg	<10	<10	<10	<10	<10	<10	<10				
Acid Soluble Sulphate	mg/kg											
Sulphate (total)	mg/kg	603	731	317	557	490	706	649				
Sulphide	mg/kg	<2	3.4	12.9	2.1	3.4	15.7	<2	17	<1	<1	<1
Asbestos Screen	None											
Other												
pH Value	pH Units	8.1	8.3	9.3	8.8	7.8	8.3	8.6	8	8.2	8.5	8.6
BTEX												
GRO (C4-C12)	mg/kg											
MTBE	mg/kg											
Benzene	mg/kg											
Toluene	mg/kg											
Ethyl benzene	mg/kg											
m & p Xylene	mg/kg											
o Xylene	mg/kg											
Sum of Detected BTEX	mg/kg											
Sum of Detected Xylenes	mg/kg											
Organics												
PAH (Screening)	mg/kg	1.7	17.6	<0.1	<0.1	9.5	<0.1	<0.1	38	<10	953	<10
VOC (screen)	ug/kg	<100	<100	<100	<100	<100	<100	<100				
Mineral Oil	mg/kg	<1	<1	<1	<1	<1	<1	<1				
TPH FTIR (AR)	mg/kg								22	195	1870	31
OIL FTIR	mg/kg								234	67	74	77
TPH												
Aliphatics C5-C6	mg/kg											
Aliphatics >C6-C8	mg/kg											
Aliphatics >C8-C10	mg/kg											
Aliphatics >C10-C12	mg/kg											
Aliphatics >C12-C16	mg/kg											
Aliphatics >C16-C21	mg/kg											
Aliphatics >C21-C35	mg/kg											
Aliphatics >C35-C40	mg/kg											
Aliphatics >C35-C44	mg/kg											
Aliphatics >C40-C44	mg/kg											
Total Aliphatics >C12-C44	mg/kg											
Aromatics >C5-7	mg/kg											
Aromatics >C6-C7	mg/kg											
Aromatics >C7-C8	mg/kg											
Aromatics >EC8-EC10	mg/kg											
Aromatics >EC10-EC12	mg/kg											
Aromatics >EC12-EC16	mg/kg											
Aromatics >EC16-EC21	mg/kg											
Aromatics >EC21-EC35	mg/kg											
Aromatics >EC35-EC40	mg/kg											
Aromatics >C35-C44	mg/kg											
Aromatics >EC40-EC44	mg/kg											
Total Aromatics >EC12-EC44	mg/kg											
Total Aliphatics & Aromatics >C5-C44	mg/kg											
PAHs												
Acenaphthene	mg/kg											
Acenaphthylene	mg/kg											
Anthracene	mg/kg											
Benzo(a)anthracene	mg/kg											
Benzo(a)pyrene	mg/kg											
Benzo(b)fluoranthene	mg/kg											
Benzo(g,h,i)perylene	mg/kg											
Benzo(k)fluoranthene	mg/kg											
Chrysene	mg/kg											
Dibenzo(ah)anthracene	mg/kg											
Fluoranthene	mg/kg											
Fluorene	mg/kg											
Indeno(1,2,3-cd)pyrene	mg/kg											
Naphthalene	mg/kg											
Phenanthrene	mg/kg											
Pyrene	mg/kg											
PAH, Total Detected USEPA 16	mg/kg											
PCB												
PCB - ARO	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.9	1.5	41	2.1
Pcb-28 2,4,4' - Trichlororbiphenyl	mg/kg											
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	mg/kg											
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg											
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg											
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	mg/kg											
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg											
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg											
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg											
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg											
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg											
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	mg/kg											
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	mg/kg											
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg											
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg											
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg											
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg											
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	mg/kg											
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	mg/kg											
Total PCB Congeners	mg/kg											
Sum of detected WHO 12 PCBs	mg/kg											
Phenols												
Cresols												

M4CAN
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Exceeds S4ULs criteria	
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NFD No Fibres Detected
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Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	CH43	CH46	CH48	CP/RH01	CP/RH02	TP03	TP03	TP04	TP05	TP06	BHM4CAN029	BHM4CAN030	BHM4CANA022	WSM4CAN011	WSM4CAN014
Specimen Depth (m)		1.3	1.2	1	0.7-0.8	2.4-2.5	0.8-0.9	1-1.1	1.4-1.5	1.6-1.7	1.3-1.5	5.0-6.0	1-1.2	1.2	0.8	2
OD Level (m)												1.84-0.84	5.69-5.49	5.62	6.36	5.7
Geology Code		TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD
Investigation Date		2000 GI	2000 GI	2000 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI
Metals																
Arsenic	mg/kg	12.3	8.18	17	240	240	370	270	240	300	280	13.4	13.7	18.7	15.3	14.3
Boron	mg/kg	2.2	<0.5	0												
Cadmium	mg/kg	0.07	0.72	0.2	0.92	1	1.4	0.95	0.84	0.55	0.53	0.243	0.293	0.327	<0.02	0.427
Chromium	mg/kg	36	0.101	42	41	83	250	52	39	61	46	36.6	37.4	37.7	37.6	41.7
Copper	mg/kg	11	0.03	11	13	7.2	33	6.4	4.4	7.6	9.5	11	9.56	15.7	<1.4	13
Lead	mg/kg	41	131	44	33	21	52	28	21	27	31	23	25.1	23.8	25.8	42.4
Mercury	mg/kg	0.24	2.84	<0.01	0.2	<0.2	<0.2	0.9	<0.2	<0.2	0.2	<0.14	<0.14	<0.14	<0.14	<0.14
Nickel	mg/kg	33	44	32	35	24	42	37	34	37	34	33	35.1	35	38.3	30.9
Selenium	mg/kg	<0.5	1.24	0.42	<0.3	<0.3	0.8	<0.3	<0.3	<0.3	<0.3	<1	<1	<1	<1	<1
Vanadium												52.1	50.6	54.4	53.7	60.1
Zinc	mg/kg	82	143	116	110	78	280	100	86	110	110	109	113	112	121	123
Non-Metal Inorganics																
Cyanide (total)	mg/kg	<1	<0.001		<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0					
Cyanide (free)	mg/kg	<1	<1									<1		<1	<1	<1
Thiocyanate	mg/kg															
Ferro/ferricyanide	mg/kg															
Acid Soluble Sulphate	mg/kg			668												
Sulphate (total)	mg/kg															
Sulphide	mg/kg	<1	7													
Asbestos Screen	None											NFD	NFD		NFD	NFD
Other																
pH Value	pH Units	8	8.8	8.6	7.6	11	10	7.9	8.5	8	8.1	8.36	8.54		7.85	7.48
BTEX																
GRO (C4-C12)	mg/kg											<0.01	<0.01	<0.01	<0.01	<0.01
MTBE	mg/kg											<0.003	<0.003	0.00524	<0.003	<0.003
Benzene	mg/kg				<0.01	<0.01	0.46	<0.01	<0.01	<0.01	<0.01	0.282	<0.044	<0.044	<0.044	<0.044
Toluene	mg/kg				<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.006	<0.006	<0.006	<0.006	<0.006
Ethyl benzene	mg/kg				<0.01	<0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005
m & p Xylene	mg/kg				<0.01	<0.01	0.59	<0.01	<0.01	<0.01	<0.01	<0.003	<0.003	<0.003	<0.003	<0.003
o Xylene	mg/kg				<0.01	<0.01	0.15	<0.01	<0.01	<0.01	<0.01	<0.024	<0.024	<0.024	<0.024	<0.024
Sum of Detected BTEX	mg/kg											<0.009	<0.009	<0.009	<0.009	<0.009
Sum of Detected Xylenes	mg/kg											<0.002	<0.002	<0.002	<0.002	<0.002
Organics																
PAH (Screening)	mg/kg	60	2400	<10												
VOC (screen)	ug/kg															
Mineral Oil	mg/kg															
TPH FTIR (AR)	mg/kg	60	58													
OIL FTIR	mg/kg	72	780													
TPH																
Aliphatics C5-C6	mg/kg				<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.01	<0.01	<0.01	<0.01	<0.01
Aliphatics >C6-C8	mg/kg				<0.2	<0.2	0.3	<0.2	<0.2	<0.2	<0.2	0.0116	<0.01	<0.01	<0.01	<0.01
Aliphatics >C8-C10	mg/kg				<0.2	<0.2	3.2	<0.2	<0.2	<0.2	<0.2	0.0974	<0.01	0.0105	<0.01	<0.01
Aliphatics >C10-C12	mg/kg				84	93	69	71	70	<35	<35	0.0627	<0.01	<0.01	<0.01	<0.01
Aliphatics >C12-C16	mg/kg				<50	<50	66	<50	<50	<50	<50	<0.1	<0.1	0.179	<0.1	<0.1
Aliphatics >C16-C21	mg/kg				<100	<100	<100	<100	<100	<100	<100	<0.1	<0.1	0.613	<0.1	<0.1
Aliphatics >C21-C35	mg/kg				<100	<100	<100	<100	<100	<100	<100	<0.1	0.495	3.3	0.443	<0.1
Aliphatics >C35-C40	mg/kg				<100	<100	<100	<100	<100	<100	<100					
Aliphatics >C35-C44	mg/kg											<0.1	<0.1	<0.1	<0.1	<0.1
Aliphatics >C40-C44	mg/kg				<100	<100	<100	<100	<100	<100	<100					
Total Aliphatics >C12-C44	mg/kg											<0.1	0.495	4.09	0.443	<0.1
Aromatics >C5-7	mg/kg											<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >C6-C7	mg/kg				<0.01	<0.01	0.46	<0.01	<0.01	<0.01	<0.01					
Aromatics >C7-C8	mg/kg				<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aromatics >EC8-EC10	mg/kg				<0.01	<0.01	0.89	<0.01	<0.01	<0.01	<0.01	0.0644	<0.01	0.0118	<0.01	<0.01
Aromatics >EC10-EC12	mg/kg				78	45	38	52	37	<35	<35	0.0413	<0.01	<0.01	<0.01	<0.01
Aromatics >EC12-EC16	mg/kg				<50	<50	<50	<50	<50	<50	<50	<0.1	<0.1	0.242	<0.1	0.227
Aromatics >EC16-EC21	mg/kg				<100	<100	<100	<100	<100	<100	<100	<0.1	<0.1	<0.1	<0.1	0.974
Aromatics >EC21-EC35	mg/kg				<100	<100	<100	<100	<100	<100	<100	<0.1	<0.1	4.34	1.26	22.3
Aromatics >EC35-EC40	mg/kg				<100	<100	<100	<100	<100	<100	<100					
Aromatics >C35-C44	mg/kg											<0.1	<0.1	0.638	<0.1	1.8
Aromatics >EC40-EC44	mg/kg				<100	<100	<100	<100	<100	<100	<100	<0.1	<0.1	<0.1	<0.1	0.199
Total Aromatics >EC12-EC44	mg/kg											<0.1	<0.1	5.22	1.26	25.3
Total Aliphatics & Aromatics >C5-C44	mg/kg											0.281	0.495	9.34	1.7	25.3
PAHs																
Acenaphthene	mg/kg											<0.008	<0.008	<0.008	<0.008	<0.008
Acenaphthylene	mg/kg											<0.012	<0.012	<0.012	<0.012	<0.012
Anthracene	mg/kg											<0.016	<0.016	<0.016	<0.016	<0.016
Benzo(a)anthracene	mg/kg											<0.014	<0.014	0.0293	<0.014	0.0464
Benzo(a)pyrene	mg/kg											<0.015	<0.015	0.0202	<0.015	0.0679
Benzo(b)fluoranthene	mg/kg											<0.015	<0.015	0.0507	<0.015	0.124
Benzo(g,h,i)perylene	mg/kg											<0.024	<0.024	<0.024	<0.024	0.0551
Benzo(k)fluoranthene	mg/kg											<0.014	<0.014	<0.014	<0.014	0.0415
Chrysene	mg/kg											<0.01	<0.01	0.0237	<0.01	0.0773
Dibenzo(ah)anthracene	mg/kg											<0.023	<0.023	<0.023	<0.023	<0.023
Fluoranthene	mg/kg											<0.017	<0.017	0.0525	<0.017	0.117
Fluorene	mg/kg											<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	mg/kg											<0.018	<0.018	<0.018	<0.018	0.0461
Naphthalene	mg/kg											<0.09	<0.09	0.0123	<0.09	0.0391
Phenanthrene	mg/kg											<0.015	<0.015	0.0364	<0.015	0.0943
Pyrene	mg/kg											<0.015	<0.015	0.0361	<0.015	0.083
PAH, Total Detected USEPA 16	mg/kg											<0.118	<0.118	0.261	<0.118	0.792
PCB																
PCB - ARO	mg/kg	1.8	44													
Pcb-28 2,4,4' - Trichlororbiphenyl	mg/kg						0.33	0.0033	<0.001							
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	mg/kg						0.27	0.0027	0.0025							
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	mg/kg											<0.003	<0.003		<0.003	<0.003
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	mg/kg											<0.003	<0.003		<0.003	<0.003
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	mg/kg						0.17	0.0021	0.0022							
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	mg/kg											<0.003	<0.003		<0.003	0.00357
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	mg/kg											<0.003	<0.003		<0.003	<0.003
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg						0.2	0.0019	0.0027			<0.003	<0.003		<0.003	0.00733
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	mg/kg											<0.003	<0.003		<0.003	<0.003
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	mg/kg											<0.003	<0.003		<0.003	<0.003
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	mg/kg						0.13	0.0018	0.0023							
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	mg/kg						0.15	0.0029	0.0031							
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg											<0.003	<0.003		<0.003	<0.003
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	mg/kg											<0.003	<0.003		<0.003	<0.003
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg											<0.003	<0.003		<0.003	<0.003
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	mg/kg											<0.003	<0.003		<0.003	<0.003
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	mg/kg						0.092	0.0015	0.0015							
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	mg/kg											<0.003	<0.003		<0.003	<0.003
Total PCB Congeners	mg/kg						1.3	0.016	0.015							
Sum of detected WHO 12 PCBs	mg/kg											<0.036	<0.036		<0.036	<0.036
Phenols																
Cresols												<0.01	<0.01	<0.01	<0.01	<0.01

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Conservative 1% SOM has been used

Sample Reference	Units	BHG5	BHG5	BHG5	BHG5	BHG6	BHG6	BHG6	CH33	CH36	CH37	CH38
Specimen Depth (m)		0.4	2.85	12.7	17.2	0.6	12.5	17.1	1.5	0.7	1.2	1.3
OD Level (m)												
Geology Code		TFD	TFD	GFD	MMG	TFD	GFD	MMG	TFD	TFD	TFD	TFD
Investigation Date		1997 GI	1997 GI	1997 GI	1997 GI	1997 GI	1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI
Phenol Index	mg/kg								0.5	<0.5	<0.5	<0.5
Phenols Monohydric	mg/kg	<1	<1	<1	<1	<1	<1	<1				
Phenols (total)	mg/kg	<1	<1	<1	<1	<1	<1	<1				
Xylenols												
SVOCs												
Phenols												
2-Chlorophenol	mg/kg								<2	<2	<2	<2
2-Methylphenol	mg/kg								<0.5	<0.5	<0.5	<0.5
2-Nitrophenol	mg/kg								<0.2	<0.2	<0.2	<0.2
2,4-Dichlorophenol	mg/kg								<2	<2	<2	<2
2,4-Dimethylphenol	mg/kg								<2	<2	<2	<2
2,4,5-Trichlorophenol	mg/kg								<2	<2	<2	<2
2,4,6-Trichlorophenol	mg/kg								<2	<2	<2	<2
4-Chloro-3-methylphenol	mg/kg								<0.5	<0.5	<0.5	<0.5
4-Methylphenol	mg/kg											
4-Nitrophenol	mg/kg								<5	<5	<5	<5
Pentachlorophenol	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<5	<5	<5	<5
Phenol	mg/kg								<2	<2	<2	<2
2,4-Dinitrophenol	mg/kg								<1	<1	<1	<1
3- & 4-Methylphenol	mg/kg								<2	<2	<2	<2
4,6-Dinitro-2-methylphenol	mg/kg								<5	<5	<5	<5
4-Chlorophenol *	mg/kg								<2	<2	<2	<2
PAHs												
2-Chloronaphthalene	mg/kg								<0.2	<0.2	<0.2	<0.2
1-Methyl naphthalene *	mg/kg								<0.2	<0.2	<0.2	<0.2
2-Methylnaphthalene	mg/kg								<0.2	<0.2	<0.2	<0.2
Acenaphthene	mg/kg								<0.2	<0.2	<0.2	<0.2
Acenaphthylene	mg/kg								<0.2	<0.2	<0.2	<0.2
Anthracene	mg/kg								<0.2	<0.2	<0.2	<0.2
Benzo(a)anthracene	mg/kg								<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg								<0.2	<0.2	<0.2	<0.2
Benzo(b)fluoranthene	mg/kg								<0.2	<0.2	<0.2	<0.2
Benzo(g,h,i)perylene	mg/kg								<0.2	<0.2	<0.2	<0.2
Benzo(k)fluoranthene	mg/kg								<0.2	<0.2	<0.2	<0.2
Chrysene	mg/kg								<0.2	<0.2	<0.2	<0.2
Dibenzo(ah)anthracene	mg/kg								<0.2	<0.2	<0.2	<0.2
Fluoranthene	mg/kg								<0.2	<0.2	<0.2	<0.2
Fluorene	mg/kg								<0.2	<0.2	<0.2	<0.2
Indeno(1,2,3-cd)pyrene	mg/kg								<0.2	<0.2	<0.2	<0.2
Naphthalene	mg/kg								<0.2	<0.2	<0.2	<0.2
Phenanthrene	mg/kg								<0.2	<0.2	<0.2	<0.2
Pyrene	mg/kg								<0.2	<0.2	<0.2	<0.2
Pthalates												
bis(2-Ethylhexyl)phthalate	mg/kg								<0.5	2.6	2.1	2.2
Butylbenzyl phthalate	mg/kg								<0.5	<0.5	<0.5	<0.5
Di-n-butyl phthalate	mg/kg								<0.5	<0.5	<0.5	<0.5
Diethyl phthalate	mg/kg								<0.5	<0.5	<0.5	<0.5
Dimethyl phthalate	mg/kg								<0.5	<0.5	<0.5	<0.5
Di-N-Octyl Phthalate	mg/kg											
Other Semi-Volatiles												
1,2-Dichlorobenzene	mg/kg								<0.5	<0.5	<0.5	<0.5
1,2,4-Trichlorobenzene	mg/kg								<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	mg/kg								<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	mg/kg								<0.5	<0.5	<0.5	<0.5
2-Nitroaniline	mg/kg								<0.5	<0.5	<0.5	<0.5
2,4-Dinitrotoluene	mg/kg								<0.5	<0.5	<0.5	<0.5
2,6-Dinitrotoluene	mg/kg								<0.5	<0.5	<0.5	<0.5
3-Nitroaniline	mg/kg								<0.5	<0.5	<0.5	<0.5
4-Bromophenylphenylether	mg/kg								<0.5	<0.5	<0.5	<0.5
4-Chloroaniline	mg/kg								<0.5	<0.5	<0.5	<0.5
4-Chlorophenylphenylether	mg/kg								<0.5	<0.5	<0.5	<0.5
4-Nitroaniline	mg/kg								<0.5	<0.5	<0.5	<0.5
Azobenzene	mg/kg											
Bis(2-chloroethoxy)methane	mg/kg								<0.5	<0.5	<0.5	<0.5
bis(2-Chloroethyl)ether	mg/kg								<0.5	<0.5	<0.5	<0.5
Dibenzofuran	mg/kg								<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene	mg/kg								<0.5	<0.5	<0.5	<0.5
Hexachlorobutadiene	mg/kg								<0.5	<0.5	<0.5	<0.5
Hexachlorocyclopentadiene	mg/kg								<0.5	<0.5	<0.5	<0.5
Hexachloroethane	mg/kg								<0.5	<0.5	<0.5	<0.5
Isophorone	mg/kg								<0.5	<0.5	<0.5	<0.5
N-Nitroso-di-npropylamine	mg/kg								<0.5	<0.5	<0.5	<0.5
Nitrobenzene	mg/kg								<0.5	<0.5	<0.5	<0.5
3,3'-Dichlorobenzidine	mg/kg								<2	<2	<2	<2
bis(2-Chloroisopropyl)ether	mg/kg								<0.5	<0.5	<0.5	<0.5
Benzoic Acid	mg/kg								<10	<10	<10	<10
Benzyl alcohol	mg/kg								<0.5	<0.5	<0.5	<0.5
Biphenyl *	mg/kg								<0.2	<0.2	<0.2	<0.2
Diphenyl ether *	mg/kg								<0.2	<0.2	<0.2	<0.2
VOCs												
Naphthalene	ug/kg											
Hexachlorobutadiene	ug/kg											
1,2,4-Trichlorobenzene	ug/kg											
1,2-Dichlorobenzene	ug/kg											
1,3-Dichlorobenzene	ug/kg											
1,4-Dichlorobenzene	ug/kg											
1.1.1.2-Tetrachloroethane	ug/kg											
1.1.1-Trichloroethane	ug/kg											
1.1.2.2-Tetrachloroethane	ug/kg											
1.1.2-Trichloroethane	ug/kg											
1.1-Dichloropropene	ug/kg											
1.1-Dichloroethane	ug/kg											
1.1-Dichloroethene	ug/kg											
1.2.3-Trichlorobenzene	ug/kg											
1.2.3-Trichloropropane	ug/kg											
1.2.4-Trichlorobenzene	ug/kg											
1.2.4-Trimethylbenzene	ug/kg											
1.2-Dibromo-3-chloropropane	ug/kg											
1.2-Dichloroethane	ug/kg											
cis-1-2-Dichloroethene	ug/kg											
1.2-Dibromoethane	ug/kg											
1.2-Dichloropropane	ug/kg											
1.3.5-Trimethylbenzene	ug/kg											
cis-1-3-Dichloropropene	ug/kg											
1.3-Dichloropropane	ug/kg											
2.2-Dichloropropane	ug/kg											

M4CAN
Soil (Nat) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD
Mercia Mudstone Group	MMG

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criterion	X

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	CH43	CH46	CH48	CP/RH01	CP/RH02	TP03	TP03	TP04	TP05	TP06	BHM4CAN029	BHM4CAN030	BHM4CANA022	WSM4CAN011	WSM4CAN014
Specimen Depth (m)		1.3	1.2	1	0.7-0.8	2.4-2.5	0.8-0.9	1-1.1	1.4-1.5	1.6-1.7	1.3-1.5	5.0-6.0	1-1.2	1.2	0.8	2
OD Level (m)												1.84-0.84	5.69-5.49	5.62	6.36	5.7
Geology Code		TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD
Investigation Date		2000 GI	2000 GI	2000 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI
Phenol Index	mg/kg	<0.5	0.6	<0.5												
Phenols Monohydric	mg/kg				0.0027	<0.0025	0.021	<0.0025	<0.0025	0.0032	<0.0025	<0.035	<0.035	<0.035	<0.035	<0.035
Phenols (total)	mg/kg											<0.01	<0.01	<0.01	<0.01	<0.01
Xylenols												<0.015	<0.015	<0.015	<0.015	<0.015
SVOCs																
Phenols																
2-Chlorophenol	mg/kg	<2	<2				<1.3	<1.3	<1.3							<0.01
2-Methylphenol	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.01
2-Nitrophenol	mg/kg	<0.2	<0.2				<1.3	<1.3	<1.3							<0.01
2,4-Dichlorophenol	mg/kg	<2	<2				<1.3	<1.3	<1.3							<0.01
2,4-Dimethylphenol	mg/kg	<2	<2				<1.3	<1.3	<1.3							<0.01
2,4,5-Trichlorophenol	mg/kg	<2	<2				<1.3	<1.3	<1.3							<0.01
2,4,6-Trichlorophenol	mg/kg	<2	<2				<1.3	<1.3	<1.3							<0.01
4-Chloro-3-methylphenol	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.01
4-Methylphenol	mg/kg															<0.01
4-Nitrophenol	mg/kg	<5	<5				<1.3	<1.3	<1.3							<0.01
Pentachlorophenol	mg/kg	<5	<5													<0.01
Phenol	mg/kg	<2	<2				<1.3	<1.3	<1.3							<0.01
2,4-Dinitrophenol	mg/kg	<1	<1				<1.3	<1.3	<1.3							
3- & 4-Methylphenol	mg/kg	<2	<2				<1.3	<1.3	<1.3							
4,6-Dinitro-2-methylphenol	mg/kg	<5	<5				<1.3	<1.3	<1.3							
4-Chlorophenol *	mg/kg	<2	<2													
PAHs																
2-Chloronaphthalene	mg/kg	<0.2	<0.2				<1.3	<1.3	<1.3							<0.1
1-Methyl naphthalene *	mg/kg	<0.2	<0.2													
2-Methylnaphthalene	mg/kg	<0.2	<0.2				<1.3	<1.3	<1.3							<0.1
Acenaphthene	mg/kg	<0.2	<0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3					<0.1
Acenaphthylene	mg/kg	<0.2	<0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3					<0.1
Anthracene	mg/kg	<0.2	<0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3					<0.1
Benzo(a)anthracene	mg/kg	<0.2	0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3					<0.1
Benzo(a)pyrene	mg/kg	<0.2	0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3					<0.1
Benzo(b)fluoranthene	mg/kg	<0.2	0.3		<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3					<0.1
Benzo(g,h,i)perylene	mg/kg	<0.2	0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3					<0.1
Benzo(k)fluoranthene	mg/kg	<0.2	0.4		<0.3	<0.3	0.3	<0.3	<0.3	<0.3	<0.3					<0.1
Chrysene	mg/kg	<0.2	2.9		<0.3	<0.3	5.3	0.3	<0.3	<0.3	<0.3					<0.1
Dibenzo(ah)anthracene	mg/kg	<0.2	<0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3					<0.1
Fluoranthene	mg/kg	<0.2	0.6		<0.3	<0.3	0.4	<0.3	<0.3	<0.3	<0.3					<0.1
Fluorene	mg/kg	<0.2	0.3		<0.3	<0.3	0.7	<0.3	<0.3	<0.3	<0.3					<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	<0.2	0.2		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3					<0.1
Naphthalene	mg/kg	<0.2	<0.2		<0.3	<0.3	0.3	<0.3	<0.3	<0.3	<0.3					<0.1
Phenanthrene	mg/kg	<0.2	0.5		<0.3	<0.3	0.5	<0.3	<0.3	<0.3	<0.3					<0.1
Pyrene	mg/kg	<0.2	0.5		<0.3	<0.3	0.3	<0.3	<0.3	<0.3	<0.3					<0.1
Pthalates																
bis(2-Ethylhexyl)phthalate	mg/kg	5.6	<0.5				<1.3	<1.3	<1.3							<0.1
Butylbenzyl phthalate	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Di-n-butyl phthalate	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Diethyl phthalate	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Dimethyl phthalate	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Di-N-Octyl Phthalate	mg/kg															<0.1
Other Semi-Volatiles																
1,2-Dichlorobenzene	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
1,2,4-Trichlorobenzene	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
1,3-Dichlorobenzene	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
1,4-Dichlorobenzene	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
2-Nitroaniline	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
2,4-Dinitrotoluene	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
2,6-Dinitrotoluene	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
3-Nitroaniline	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
4-Bromophenylphenylether	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
4-Chloroaniline	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
4-Chlorophenylphenylether	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
4-Nitroaniline	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Azobenzene	mg/kg															<0.1
Bis(2-chloroethoxy)methane	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
bis(2-Chloroethyl)ether	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Dibenzofuran	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Hexachlorobenzene	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Hexachlorobutadiene	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Hexachlorocyclopentadiene	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Hexachloroethane	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Isophorone	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
N-Nitroso-di-npropylamine	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Nitrobenzene	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
3,3'-Dichlorobenzidine	mg/kg	<2	<2				<1.3	<1.3	<1.3							
bis(2-Chloroisopropyl)ether	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							<0.1
Benzoic Acid	mg/kg	<10	<10				<1.3	<1.3	<1.3							
Benzyl alcohol	mg/kg	<0.5	<0.5				<1.3	<1.3	<1.3							
Biphenyl *	mg/kg	<0.2	1.4				<1.3	<1.3	<1.3							
Diphenyl ether *	mg/kg	<0.2	<0.2				<1.3	<1.3	<1.3							
VOCs																
Naphthalene	ug/kg															<13
Hexachlorobutadiene	ug/kg						<10	<10	<10							<20
1,2,4-Trichlorobenzene	ug/kg						<10	<10	<10							<20
1,2-Dichlorobenzene	ug/kg						<10	<10	<10							<10
1,3-Dichlorobenzene	ug/kg						<10	<10	<10							<8
1,4-Dichlorobenzene	ug/kg						<10	<10	<10							<5
1.1.1.2-Tetrachloroethane	ug/kg						<10	<10	<10							<10
1.1.1-Trichloroethane	ug/kg						<10	<10	<10							<7
1.1.2.2-Tetrachloroethane	ug/kg						<10	<10	<10							<10
1.1.2-Trichloroethane	ug/kg						<10	<10	<10							<10
1.1-Dichloropropene	ug/kg						<10	<10	<10							<10
1.1-Dichloroethane	ug/kg						<10	<10	<10							<8
1.1-Dichloroethene	ug/kg						<10	<10	<10							<10
1.2.3-Trichlorobenzene	ug/kg						<10	<10	<10							<20
1.2.3-Trichloropropane	ug/kg															<16
1.2.4-Trichlorobenzene	ug/kg															<20
1.2.4-Trimethylbenzene	ug/kg						<10	<10	<10							<9
1.2-Dibromo-3-chloropropane	ug/kg						<10	<10	<10							<14
1.2-Dichloroethane	ug/kg						<10	<10	<10							<5
cis-1-2-Dichloroethene	ug/kg						<10	<10	<10							<6
1.2-Dibromoethane	ug/kg						<10	<10	<10							<10
1.2-Dichloropropane	ug/kg						<10	<10	<10							<10
1.3.5-Trimethylbenzene	ug/kg						<10	<10	<10							<8
cis-1-3-Dichloropropene	ug/kg						<10	<10	<10							<10
1.3-Dichloropropane	ug/kg						<10	<10	<10							<7
2.2-Dichloropropane	ug/kg						<10	<10	<10							<10

M4CAN
Soil (Nat) Sample Analysis & Screening Assessment
CL-17
27/06/2016

Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD
Mercia Mudstone Group	MMG

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criterion	X

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	BHG5	BHG5	BHG5	BHG5	BHG6	BHG6	BHG6	CH33	CH36	CH37	CH38
Specimen Depth (m)		0.4	2.85	12.7	17.2	0.6	12.5	17.1	1.5	0.7	1.2	1.3
OD Level (m)												
Geology Code		TFD	TFD	GFD	MMG	TFD	GFD	MMG	TFD	TFD	TFD	TFD
Investigation Date		1997 GI	1997 GI	1997 GI	1997 GI	1997 GI	1997 GI	1997 GI	2000 GI	2000 GI	2000 GI	2000 GI
2-Chlorotoluene	ug/kg											
4-Chlorotoluene	ug/kg											
4-Isopropyltoluene	ug/kg											
Benzene	ug/kg											
Bromobenzene	ug/kg											
Bromochloromethane	ug/kg											
Bromoform	ug/kg											
Bromomethane	ug/kg											
Bromodichloromethane	ug/kg											
Carbon Disulphide												
Chlorobenzene	ug/kg											
Chloroethane	ug/kg											
Chloroform	ug/kg											
Chloromethane	ug/kg											
Carbontetrachloride	ug/kg											
Dichlorodifluoromethane	ug/kg											
Dibromochloromethane	ug/kg											
Dibromomethane	ug/kg											
Dichloromethane												
Ethylbenzene												
Isopropylbenzene	ug/kg											
Methyl Tertiary Butyl Ether												
n-Butylbenzene	ug/kg											
o-Xylene												
p/m-Xylene												
Propylbenzene	ug/kg											
p-Isopropyltoluene	ug/kg											
sec-Butylbenzene	ug/kg											
Styrene	ug/kg											
trans-1-2-Dichloroethene	ug/kg											
trans-1-3-Dichloropropene	ug/kg											
Trichlorofluoromethane	ug/kg											
tert-amyl methyl ether												
tert-Butylbenzene	ug/kg											
Tetrachloroethene	ug/kg											
Toluene												
Trichloroethene	ug/kg											
Vinyl Chloride	ug/kg											

M4CAN
Soil (Nat) Sample Analysis & Screening Assessment
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Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD
Mercia Mudstone Group	MMG

Screening Values and Assessment

Exceeds S4ULs criteria	
Laboratory detection level higher than screening criterion	X

Notes

NFD No Fibres Detected
Chromium VI and elemental mercury criteria used
Screening criteria for Pb is C4SL in the absence of S4UL
Conservative 1% SOM has been used

Sample Reference	Units	CH43	CH46	CH48	CP/RH01	CP/RH02	TP03	TP03	TP04	TP05	TP06	BHM4CAN029	BHM4CAN030	BHM4CANA022	WSM4CAN011	WSM4CAN014
Specimen Depth (m)		1.3	1.2	1	0.7-0.8	2.4-2.5	0.8-0.9	1-1.1	1.4-1.5	1.6-1.7	1.3-1.5	5.0-6.0	1-1.2	1.2	0.8	2
OD Level (m)												1.84-0.84	5.69-5.49	5.62	6.36	5.7
Geology Code		TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD
Investigation Date		2000 GI	2000 GI	2000 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2008 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI
2-Chlorotoluene	ug/kg						<10	<10	<10							<9
4-Chlorotoluene	ug/kg						<10	<10	<10							<10
4-Isopropyltoluene	ug/kg															<10
Benzene	ug/kg															<9
Bromobenzene	ug/kg						<10	<10	<10							<10
Bromochloromethane	ug/kg						<10	<10	<10							<10
Bromoform	ug/kg						<10	<10	<10							<10
Bromomethane	ug/kg						<10	<10	<10							<10
Bromodichloromethane	ug/kg						<10	<10	<10							<7
Carbon Disulphide																<7
Chlorobenzene	ug/kg						<10	<10	<10							<5
Chloroethane	ug/kg						<10	<10	<10							<10
Chloroform	ug/kg						<10	<10	<10							<8
Chloromethane	ug/kg						<10	<10	<10							<7
Carbontetrachloride	ug/kg						<10	<10	<10							<10
Dichlorodifluoromethane	ug/kg						<10	<10	<10							<6
Dibromochloromethane	ug/kg						<10	<10	<10							<10
Dibromomethane	ug/kg						<10	<10	<10							<9
Dichloromethane																<10
Ethylbenzene																<4
Isopropylbenzene	ug/kg						<10	<10	<10							<5
Methyl Tertiary Butyl Ether																<10
n-Butylbenzene	ug/kg						30	<10	<10							<11
o-Xylene																<10
p/m-Xylene																<10
Propylbenzene	ug/kg						<10	<10	<10							<10
p-Isopropyltoluene	ug/kg						20	<10	<10							
sec-Butylbenzene	ug/kg						<10	<10	<10							<10
Styrene	ug/kg						<10	<10	<10							<10
trans-1-2-Dichloroethene	ug/kg						<10	<10	<10							<10
trans-1-3-Dichloropropene	ug/kg						<10	<10	<10							<10
Trichlorofluoromethane	ug/kg						<10	<10	<10							<6
tert-amyl methyl ether																<10
tert-Butylbenzene	ug/kg						<10	<10	<10							<14
Tetrachloroethene	ug/kg						<10	<10	<10							<5
Toluene																<7
Trichloroethene	ug/kg						<10	<10	<10							<9
Vinyl Chloride	ug/kg						<10	<10	<10							<6

Appendix 4

Tabulated Groundwater Laboratory Data

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Groundwater Sample Analysis & Screening Assessment
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Screening Values & Assessment

EQS	Environmental Quality Standards
DWS	Drinking Water Standard
	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: chromium, copper, lead, nickel and zinc

Sample Reference	Units	Screening Criteria	
Round			
Location Type		EQS	DWS
Sample Type			
Sampled Date			
Response Zone (RZ) Details			
Depth (m)			
Installation Details			
Metals			
Arsenic Dissolved	ug/l	50	10
Cadmium Dissolved	ug/l	0.15	5
Chromium Dissolved	ug/l		50
Copper Dissolved	ug/l	10	2000
Lead Dissolved	ug/l	1.2	10
Nickel Dissolved	ug/l	4	20
Selenium Dissolved	ug/l		10
Vanadium Dissolved	ug/l		
Zinc Dissolved	ug/l	75	
Mercury Dissolved	ug/l	0.07	1
Non-Metal Inorganics			
Total Alkalinity as CaCO3	mg/l		
BOD	mg/l	5	
COD	mg/l		
Hardness	mg/l		
Total Diss Sulphur	mg/l		
Chloride	mg/l	250	250
Ammoniacal Nitrogen as N	mg/l	0.6	
Nitrate as NO3	mg/l		50
Nitrite as NO2	mg/l		0.5
Unionised Ammonia	mg/l		
Thiocyanate	mg/l		
Total Cyanide	mg/l	0.001	0.05
Free Cyanide	mg/l		
Complex Cyanide	mg/l		
pH Value	pH units	6-9	6.5-10
Conductivity uS/cm @25C	uS/cm		
Organics			
TPH FTIR	ug/l		
TPH GC	ug/l		
PCB- ARO	ug/l		
BTEX			
GRO (C4-C12)	ug/l		
MTBE	ug/l		
Benzene	ug/l	10	1
Toluene	ug/l	50	
Ethyl benzene	ug/l	20	
m & p Xylene	ug/l	30	
o Xylene	ug/l	30	
Phenols			
Phenols Monohydric	mg/l		
Cresols	ug/l		
Dimethylphenols	ug/l		
Trimethylphenols	ug/l		
Pentachlorophenol	ug/l	0.4	
Phenol	ug/l	7.7	
TPH			
Aliphatics C5-C6	ug/l		
Aliphatics >C6-C8	ug/l		
Aliphatics >C8-C10	ug/l		
Aliphatics >C10-C12	ug/l		
Aliphatics >C12-C16 Aqueous	ug/l		
Aliphatics >C16-C21 Aqueous	ug/l		
Aliphatics >C21-C35 Aqueous	ug/l		
Aromatics >C5-C7	ug/l		
Aromatics >C7-C8	ug/l		
Aromatics >EC8-EC10	ug/l		
Aromatics >EC10-EC12	ug/l		
Aromatics >EC12-EC16 Aqueous	ug/l		
Aromatics >EC16-EC21 Aqueous	ug/l		
Aromatics >EC21-EC35 Aqueous	ug/l		
Total Aliphatic TPH	ug/l		
Total Aromatic TPH	ug/l		
Total petroleum hydrocarbons	ug/l		
PAHs			
Acenaphthene	ug/l		
Acenaphthylene	ug/l		
Anthracene	ug/l	0.1	
Benzo(a)anthracene	ug/l		
Benzo(a)pyrene	ug/l	0.00017	0.01
Benzo(b)fluoranthene	ug/l	0.017	0.1
Benzo(k)fluoranthene	ug/l	0.017	0.1
Benzo(ghi)perylene	ug/l	0.0082	0.1
Indeno(1,2,3-cd)pyrene	ug/l		0.1
Chrysene	ug/l		
Dibenzo(a,h)anthracene	ug/l		
Fluoranthene	ug/l	0.0063	
Fluorene	ug/l		
Naphthalene	ug/l	2	
Phenanthrene	ug/l		
Pyrene	ug/l		
Total PAHs (USEPA 16)	ug/l		
PCBs			
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	ug/l	0	0
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	ug/l	0	0
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	ug/l	0	0
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	ug/l	0	0
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	ug/l	0	0
Pcb-156 2,3,3',4,4',5-Hexachlorobiphenyl	ug/l	0	0
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	ug/l	0	0
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0

No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	No. Data Exceeding EQS	No. Data Exceeding DWS
27	27	206	2.34	BHM4CAN030 @ Single	3	16
27	11	1.97	0.117	BHM4CANA022 @ Single	10	0
27	25	30.1	2	BHM4CAN030 @ Single		0
27	15	10	0.89	CH 40 @	0	0
27	19	2.64	0.028	WSM4CAN011 @ Single	5	0
27	27	12.9	1.36	WSM4CAN011 @ Single	12	0
27	22	34.3	1.62	BHM4CAN029 @ Deep		15
21	21	15.1	0.733	WSM4CAN010 @ Single		
27	25	34	0.883	CH 41 @	0	
27	1	0.0107	0.0107	WSM4CAN012 @ Single	0	0
21	21	2060	430	BHM4CANA022 @ Single		
4	4	17	2	CH 35 @	1	
1	1	33	33	CH 45 @		
2	2	500	260	BH1 @		
4	4	91.4	4.07	CH 35 @		
24	24	3250	17	BHM4CAN029 @ Deep	12	12
27	22	22.1	0.221	BHM4CAN029 @ Deep	20	
21	4	1.68	0.381	WSM4CAN009 @ Single		0
21	5	0.223	0.08	WSM4CAN011 @ Single		0
4	4	0.196964405	0.000928984	CH 35 @		
4	2	9.2	0.6	CH 41 @		
4	2	0.05	0.05	CH 35 @	2	0
4	0	None > LOD	None > LOD			
4	2	0.05	0.05	CH 35 @		
27	27	8.9	7.4	CH 40 @	0	0
21	21	8530	779	BHM4CAN029 @ Deep		
4	4	660	170	CH 41 @		
4	4	10000	800	CH 35 @		
4	4	66	2.3	CH 35 @		
21	3	105	57	BHM4CANA022 @ Single		
21	0	None > LOD	None > LOD			
27	1	130	130	CH 35 @	1	1
27	1	18	18	CH 35 @	0	
27	1	255	255	CH 35 @	1	
27	1	872	872	CH 35 @	1	
27	0	None > LOD	None > LOD		0	
4	1	1.06	1.06	CH 35 @		
4	3	4140	2.4	CH 35 @		
4	2	50	18.6	CH 35 @		
4	1	978	978	CH 35 @		
4	2	4.275	0.063	CH 35 @	1	
4	3	1.083	0.0006	CH 35 @	0	
21	0	None > LOD	None > LOD			
21	0	None > LOD	None > LOD			
21	4	34	12	BHM4CANA022 @ Single		
21	3	25	17	BHM4CANA022 @ Single		
21	0	None > LOD	None > LOD			
21	4	21	10	WSM4CAN009 @ Single		
21	11	214	16	WSM4CAN009 @ Single		
21	0	None > LOD	None > LOD			
21	0	None > LOD	None > LOD			
21	2	23	13	BHM4CANA022 @ Single		
21	3	16	11	BHM4CANA022 @ Single		
21	0	None > LOD	None > LOD			
21	1	16	16	WSM4CAN009 @ Single		
21	6	97	11	BHM4CANA022 @ Single		
21	11	235	16	WSM4CAN009 @ Single		
21	6	97	11	BHM4CANA022 @ Single		
21	13	392	12	BHM4CANA022 @ Single		
27	4	0.54	0.0173	CH 35 @		
27	0	None > LOD	None > LOD			
27	3	0.64	0.0247	CH 35 @	1	
27	8	0.5	0.0186	CH 41 @		
27	8	0.617	0.0283	WSM4CAN009 @ Single	8	8
27	8	0.82	0.0489	WSM4CAN009 @ Single	8	5
27	5	0.288	0.0596	WSM4CAN009 @ Single	5	1
27	8	0.728	0.0247	WSM4CAN009 @ Single	8	3
27	8	0.631	0.0176	WSM4CAN009 @ Single		3
27	8	0.56	0.0197	CH 41 @		
27	4	0.131	0.0211	WSM4CAN009 @ Single		
27	8	0.402	0.0275	WSM4CAN009 @ Single	8	
27	5	1.07	0.0172	CH 35 @		
27	1	0.268	0.268	WSM4CAN009 @ Single	0	
27	6	0.17	0.0244	CH 41 @		
27	8	0.465	0.0159	WSM4CAN009 @ Single		
25	4	5.17	0.789	WSM4CAN009 @ Single		
21	3	0.153	0.0186	WSM4CAN009 @ Single	3	3
21	0	None > LOD	None > LOD		0	0
21	6	0.341	0.0159	WSM4CAN009 @ Single	6	6
21	0	None > LOD	None > LOD		0	0
21	1	0.0582	0.0582	WSM4CAN009 @ Single	1	1
21	2	0.0623	0.02	WSM4CAN009 @ Single	2	2
21	0	None > LOD	None > LOD		0	0
21	1	0.0869	0.0869	WSM4CAN009 @ Single	1	1
21	0	None > LOD	None > LOD		0	0

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Screening Values & Assessment

EQS	Environmental Quality Standards
DWS	Drinking Water Standard
	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: chromium, copper, lead, nickel and zinc

Sample Reference	Units	Screening Criteria	
Round			
Location Type		EQS	DWS
Sample Type			
Sampled Date			
Response Zone (RZ) Details			
Depth (m)			
Installation Details			

Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	ug/l	0	0	21	0	None > LOD	None > LOD		0	0
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	ug/l	0	0	21	1	0.02	0.02	WSM4CAN009 @ Single	1	1
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	ug/l	0	0	21	0	None > LOD	None > LOD		0	0
SVOCs										
Phenols										
2,4,5-Trichlorophenol	ug/l			21	0	None > LOD	None > LOD			
2,4,6-Trichlorophenol	ug/l			21	0	None > LOD	None > LOD			
2,4-Dichlorophenol	ug/l	20		21	0	None > LOD	None > LOD		0	
2,4-Dimethylphenol	ug/l			21	0	None > LOD	None > LOD			
2-Chlorophenol	ug/l	50		21	0	None > LOD	None > LOD		0	
2-Methylphenol	ug/l	100		21	0	None > LOD	None > LOD		0	
2-Nitrophenol	ug/l			18	0	None > LOD	None > LOD			
4-Chloro-3-Methylphenol	ug/l	40		21	0	None > LOD	None > LOD		0	
4-Methylphenol	ug/l	100		21	0	None > LOD	None > LOD		0	
4-Nitrophenol	ug/l			21	0	None > LOD	None > LOD			
Pentachlorophenol (PCP)	ug/l	0.4		21	0	None > LOD	None > LOD		0	
Phenol	ug/l	7.7		21	0	None > LOD	None > LOD		0	
PAHs										
2-Chloronaphthalene	ug/l			21	0	None > LOD	None > LOD			
2-Methylnaphthalene	ug/l			21	0	None > LOD	None > LOD			
Acenaphthene	ug/l			14	0	None > LOD	None > LOD			
Acenaphthylene	ug/l			14	0	None > LOD	None > LOD			
Anthracene	ug/l	0.1		14	0	None > LOD	None > LOD		0	
Benzo(a)anthracene	ug/l			14	0	None > LOD	None > LOD			
Benzo(a)pyrene	ug/l	0.00017	0.01	14	0	None > LOD	None > LOD		0	0
Benzo(b)fluoranthene	ug/l	0.017	0.1	14	0	None > LOD	None > LOD		0	0
Benzo(ghi)perylene	ug/l	0.0082	0.1	14	0	None > LOD	None > LOD		0	0
Benzo(k)fluoranthene	ug/l	0.017	0.1	14	0	None > LOD	None > LOD		0	0
Chrysene	ug/l			14	0	None > LOD	None > LOD			
Chrysene	ug/l			14	0	None > LOD	None > LOD			
Dibenzo(ah)anthracene	ug/l			14	0	None > LOD	None > LOD			
Fluoranthene	ug/l	0.0063		14	0	None > LOD	None > LOD		0	
Fluorene	ug/l			14	0	None > LOD	None > LOD			
Indeno(123cd)pyrene	ug/l	N/A	0.1	14	0	None > LOD	None > LOD		0	0
Phenanthrene	ug/l			14	0	None > LOD	None > LOD			
Pyrene	ug/l			14	0	None > LOD	None > LOD			
Phthalates										
Bis(2-ethylhexyl)phthalate	ug/l	1.3		21	3	96.2	4.4	BHM4CANA022 @ Single	3	
Butylbenzylphthalate	ug/l	20		21	0	None > LOD	None > LOD		0	
Diethylphthalate	ug/l	200		21	1	1.17	1.17	WSM4CAN012 @ Single	0	
Dimethylphthalate	ug/l	800		21	0	None > LOD	None > LOD		0	
Di-N-Butyl Phthalate	ug/l	8		21	1	1.42	1.42	WSM4CAN012 @ Single	0	
Di-N-Octyl Phthalate	ug/l	20		21	0	None > LOD	None > LOD		0	
Other SVOCs										
1,3-Dichlorobenzene	ug/l	20		21	0	None > LOD	None > LOD		0	
1,4-Dichlorobenzene	ug/l	20		21	0	None > LOD	None > LOD		0	
1,2,4-Trichlorobenzene	ug/l	0.4		21	0	None > LOD	None > LOD		0	
1,2-Dichlorobenzene	ug/l	20		21	0	None > LOD	None > LOD		0	
2,4-Dinitrotoluene	ug/l			21	0	None > LOD	None > LOD			
2,6-Dinitrotoluene	ug/l			21	0	None > LOD	None > LOD			
2-Nitroaniline	ug/l			21	0	None > LOD	None > LOD			
3-Nitroaniline	ug/l			21	0	None > LOD	None > LOD			
4-Bromophenyl Phenyl Ether	ug/l			21	0	None > LOD	None > LOD			
4-Chloroaniline	ug/l			21	0	None > LOD	None > LOD			
4-Chlorophenyl Phenyl Ether	ug/l			21	0	None > LOD	None > LOD			
4-Nitroaniline	ug/l			21	0	None > LOD	None > LOD			
Azobenzene	ug/l			21	0	None > LOD	None > LOD			
Bis(2-chloroethoxy)methane	ug/l			21	0	None > LOD	None > LOD			
Bis(2-chloroethyl)ether	ug/l			21	0	None > LOD	None > LOD			
Carbazole	ug/l			21	0	None > LOD	None > LOD			
Dibenzofuran	ug/l			21	0	None > LOD	None > LOD			
Hexachlorobenzene (HCB)	ug/l	0.05		21	0	None > LOD	None > LOD		0	
Hexachlorobutadiene	ug/l	0.6		21	0	None > LOD	None > LOD		0	
Hexachlorocyclopentadiene	ug/l			21	0	None > LOD	None > LOD			
Hexachloroethane	ug/l			21	0	None > LOD	None > LOD			
Isophorone	ug/l			21	0	None > LOD	None > LOD			
Nitrobenzene	ug/l			21	0	None > LOD	None > LOD			
N-Nitroso-Di-N-Propylamine	ug/l			21	0	None > LOD	None > LOD			
VOCs										
1,1,1,2-Tetrachloroethane	ug/l			21	0	None > LOD	None > LOD			0
1,2-Dichloropropane	ug/l			21	0	None > LOD	None > LOD			0
1,3,5-Trichlorobenzene	ug/l			21	0	None > LOD	None > LOD			0
Carbon Disulphide	ug/l			21	1	2.17	2.17	BHM4CANA022 @ Single		0
Dichloromethane	ug/l			21	0	None > LOD	None > LOD			0
Methyl Tertiary butyl ether MTBE	ug/l			21	0	None > LOD	None > LOD			0
tert-Amyl methyl ether (TAME)	ug/l			21	0	None > LOD	None > LOD			0
Dichlorodifluoromethane	ug/l			27	0	None > LOD	None > LOD			
Chloromethane	ug/l			27	0	None > LOD	None > LOD			
Vinyl Chloride	ug/l	0	0.5	27	0	None > LOD	None > LOD		0	0
Bromomethane	ug/l			27	0	None > LOD	None > LOD			
Chloroethane	ug/l			27	0	None > LOD	None > LOD			
Trichlorofluoromethane	ug/l			27	0	None > LOD	None > LOD			
trans-1-2-Dichloroethene	ug/l			27	0	None > LOD	None > LOD			
1.1-Dichloroethene	ug/l			27	0	None > LOD	None > LOD			
1.1-Dichloroethane	ug/l			27	0	None > LOD	None > LOD			
cis-1-2-Dichloroethene	ug/l			27	0	None > LOD	None > LOD			
Bromochloromethane	ug/l		100	27	0	None > LOD	None > LOD			0
Chloroform	ug/l	2.5	100	27	0	None > LOD	None > LOD		0	0
2.2-Dichloropropane	ug/l			27	0	None > LOD	None > LOD			
1.2-Dichloroethane	ug/l	10	3	27	0	None > LOD	None > LOD		0	0
1.1.1-Trichloroethane	ug/l	100		27	0	None > LOD	None > LOD		0	
1.1-Dichloropropene	ug/l			27	0	None > LOD	None > LOD			
Benzene	ug/l	10	1	27	1	130	130	CH 35 @	1	1

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Screening Values & Assessment

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X	Laboratory detection level higher than screening criterion

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: chromium, copper, lead, nickel and zinc

Sample Reference	Units	Screening Criteria	
Round			
Location Type		EQS	DWS
Sample Type			
Sampled Date			
Response Zone (RZ) Details			
Depth (m)			
Installation Details			
Carbontetrachloride	ug/l	12	3
Dibromomethane	ug/l		
Bromodichloromethane	ug/l		
Trichloroethene	ug/l	10	10
cis-1-3-Dichloropropene	ug/l		
trans-1-3-Dichloropropene	ug/l		
1.1.2-Trichloroethane	ug/l	400	
Toluene	ug/l	50	
1.3-Dichloropropane	ug/l		
Dibromochloromethane	ug/l		100
1.2-Dibromoethane	ug/l		
Tetrachloroethene	ug/l	10	10
Chlorobenzene	ug/l		
Ethylbenzene	ug/l	20	
p/m-Xylene	ug/l	30	
Bromoform	ug/l		
Styrene	ug/l	50	
1.1.2.2-Tetrachloroethane	ug/l		
o-Xylene	ug/l	30	
1.2.3-Trichloropropane	ug/l		
Isopropylbenzene	ug/l		
Bromobenzene	ug/l		
2-Chlorotoluene	ug/l		
Propylbenzene	ug/l		
4-Chlorotoluene	ug/l		
1.2.4-Trimethylbenzene	ug/l		
4-Isopropyltoluene	ug/l		
1.3.5-Trimethylbenzene	ug/l		
1.2-Dichlorobenzene	ug/l	20	
1.4-Dichlorobenzene	ug/l	20	
sec-Butylbenzene	ug/l		
tert-Butylbenzene	ug/l		
1.3-Dichlorobenzene	ug/l	20	
n-Butylbenzene	ug/l		
1.2-Dibromo-3-chloropropane	ug/l		
1.2.4-Trichlorobenzene	ug/l	0.4	
Naphthalene	ug/l	2	
1.2.3-Trichlorobenzene	ug/l	0.4	
Hexachlorobutadiene	ug/l	0.6	

No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	No. Data Exceeding EQS	No. Data Exceeding DWS
27	0	None > LOD	None > LOD		0	0
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD		0	0
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD		0	
27	1	18	18	CH 35 @	0	
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD			0
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD		0	0
27	1	6	6	CH 35 @		
27	1	255	255	CH 35 @	1	
27	1	872	872	CH 35 @	1	
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD		0	
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD		0	
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD		0	
27	0	None > LOD	None > LOD		0	
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD		0	
27	0	None > LOD	None > LOD			
27	0	None > LOD	None > LOD			
27	1	204	204	CH 35 @	1	
27	0	None > LOD	None > LOD		0	
27	0	None > LOD	None > LOD		0	
27	0	None > LOD	None > LOD		0	

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Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD

Sample Reference	Units	Screening Criteria		CH 35	CH 40	CH 41	CH 45	BH1	BH2	BHM4CAN029	BHM4CAN029	BHM4CAN029	BHM4CAN030	BHM4CAN030
Round										Round 1	Round 2	Round 3	Round 1	Round 2
Location Type		EQS	DWS	TP	TP	TP	TP			BH				BH
Sample Type										W				W
Sampled Date				2000	2000	2000	2000	2008 GI	2008 GI	28/04/2016	24/05/2016	02/06/2016	28/04/2016	24/05/2016
Response Zone (RZ) Details				MG	MG	MG	MG	MG	MG	GFD	GFD	GFD	GFD	GFD
Depth (m)				0.8	1.1	1.1	1.3							
Installation Details										Deep	Deep	Deep	Single	Single
Metals														
Arsenic Dissolved	ug/l	50	10	9	7	12	9	13	21	20.6	26.1	47.1	141	206
Cadmium Dissolved	ug/l	0.15	5	<0.1	<0.1	<0.1	<0.1	0.5	<0.5	1.95	0.387	0.906	1.71	0.179
Chromium Dissolved	ug/l		50	2	3	4	18	<10	<10	25.8	24.7	24.5	27.6	28.7
Copper Dissolved	ug/l	10	2000	4	10	3	9	<25	<25	<0.85	<0.85	<0.85	<0.85	<0.85
Lead Dissolved	ug/l	1.2	10	<1	<1	<1	<1	<10	<10	1.78	0.462	1.01	1.62	0.402
Nickel Dissolved	ug/l	4	20	7	6	10	4	9.8	5.1	6.02	3.83	4.31	4.55	2.87
Selenium Dissolved	ug/l		10	2	<1	<1	<1	<5.0	<5.0	34.3	29.2	29.5	24.8	18.2
Vanadium Dissolved	ug/l									9.85	8.76	9.86	11.1	10.7
Zinc Dissolved	ug/l	75		30	16	34	9	<10	<10	6.27	3.13	2	5.62	5.63
Mercury Dissolved	ug/l	0.07	1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.01	<0.01	<0.01	<0.01	<0.01
Non-Metal Inorganics														
Total Alkalinity as CaCO3	mg/l									1370	1300	1370	1440	1400
BOD	mg/l	5		17	4	2	3							
COD	mg/l						33							
Hardness	mg/l							500	260					
Total Diss Sulphur	mg/l			91.4	41.1	23.3	4.07							
Chloride	mg/l	250	250	75	21	17				3140	3030	3250	2230	2060
Ammoniacal Nitrogen as N	mg/l	0.6		17	<0.2	<0.2	<0.2	8.3	1	22.1	19.2	18.8	11.6	13.3
Nitrate as NO3	mg/l		50							<0.3	<0.3	<0.3	<0.3	<0.3
Nitrite as NO2	mg/l		0.5							<0.05	<0.05	0.198	<0.05	<0.05
Unionised Ammonia	mg/l			0.196964	0.025719	0.000929	0.013773							
Thiocyanate	mg/l			0.6	<0.2	9.2	<0.2							
Total Cyanide	mg/l	0.001	0.05	0.05	0.05	<0.025	<0.025							
Free Cyanide	mg/l			<0.025	<0.025	<0.025	<0.025							
Complex Cyanide	mg/l			0.05	0.05	<0.025	<0.025							
pH Value	pH units	6-9	6.5-10	7.8	8.9	7.4	8.6	7.8	7.8	7.99	8.33	7.7	7.76	7.8
Conductivity uS/cm @25C	uS/cm									8400	8530	7970	6650	6450
Organics														
TPH FTIR	ug/l			170	180	660	410							
TPH GC	ug/l			10000	800	8000	5700							
PCB- ARO	ug/l			66	48	22	2.3							
BTEX														
GRO (C4-C12)	ug/l									<50	<50	<50	57	<50
MTBE	ug/l									<3	<3	<3	<3	<3
Benzene	ug/l	10	1	130	<1	<1	<1	<3.0	<3.0	<7	<7	<7	<7	<7
Toluene	ug/l	50		18	<1	<1	<1	<3.0	<3.0	<4	<4	<4	<4	<4
Ethyl benzene	ug/l	20		255	<1	<1	<1	<3.0	<3.0	<5	<5	<5	<5	<5
m & p Xylene	ug/l	30		872	<1	<1	<1	<3.0	<3.0	<8	<8	<8	<8	<8
o Xylene	ug/l	30		<5	<1	<1	<1	<3.0	<3.0	<3	<3	<3	<3	<3
Phenols														
Phenols Monohydric	mg/l			1.06	<0.05	<0.05	<0.05							
Cresols	ug/l			4140	<0.5	2.4	40.1							
Dimethylphenols	ug/l			50	<0.5	<0.5	18.6							
Trimethylphenols	ug/l			978	<0.5	<0.5	<0.5							
Pentachlorophenol	ug/l	0.4		4.275	<0.05	0.063	<0.05							
Phenol	ug/l	7.7		1.083	<0.0005	0.0006	0.0204							
TPH														
Aliphatics C5-C6	ug/l									<10	<10	<10	<10	<10
Aliphatics >C6-C8	ug/l									<10	<10	<10	<10	<10
Aliphatics >C8-C10	ug/l									<10	<10	<10	14	<10
Aliphatics >C10-C12	ug/l									<10	<10	<10	17	<10
Aliphatics >C12-C16 Aqueous	ug/l									<10	<10	<10	<10	<10
Aliphatics >C16-C21 Aqueous	ug/l									<10	<10	<10	<10	<10
Aliphatics >C21-C35 Aqueous	ug/l									16	<10	<10	48	<10
Aromatics >C5-C7	ug/l									<10	<10	<10	<10	<10
Aromatics >C7-C8	ug/l									<10	<10	<10	<10	<10
Aromatics >EC8-EC10	ug/l									<10	<10	<10	<10	<10
Aromatics >EC10-EC12	ug/l									<10	<10	<10	11	<10
Aromatics >EC12-EC16 Aqueous	ug/l									<10	<10	<10	<10	<10
Aromatics >EC16-EC21 Aqueous	ug/l									<10	<10	<10	<10	<10
Aromatics >EC21-EC35 Aqueous	ug/l									<10	<10	<10	<10	<10
Total Aliphatic TPH	ug/l									16	<10	<10	48	<10
Total Aromatic TPH	ug/l									<10	<10	<10	<10	<10
Total petroleum hydrocarbons	ug/l									27	<10	12	106	<10
PAHs														
Acenaphthene	ug/l			0.54	<0.05	<0.05	<0.05	<1	<1	<0.015	<0.015	<0.015	<0.015	<0.015
Acenaphthylene	ug/l			<1.00	<1.00	<1.00	<1.00	<1	<1	<0.011	<0.011	<0.011	<0.011	<0.011
Anthracene	ug/l	0.1		0.64	<0.05	<0.05	<0.05	<1	<1	<0.015	<0.015	<0.015	<0.015	<0.015
Benzo(a)anthracene	ug/l			<0.50	<0.05	0.5	<0.05	<1	<1	<0.017	<0.017	<0.017	<0.017	<0.017
Benzo(a)pyrene	ug/l	0.00017	0.01	<0.50	<0.05	0.16	<0.05	<1	<1	0.038	<0.009	<0.009	<0.009	<0.009
Benzo(b)fluoranthene	ug/l	0.017	0.1	<0.50	<0.05	0.16	<0.05	<1	<1	0.0693	<0.023	<0.023	<0.023	<0.023
Benzo(k)fluoranthene	ug/l	0.017	0.1	<0.50	<0.05	0.06	<0.05	<1	<1	<0.027	<0.027	<0.027	<0.027	<0.027
Benzo(ghi)perylene	ug/l	0.0082	0.1	<0.50	<0.05	0.07	<0.05	<1	<1	0.0412	<0.016	<0.016	<0.016	<0.016
Indeno(1,2,3-cd)pyrene	ug/l		0.1	<0.50	<0.05	0.07	<0.05	<1	<1	0.0301	<0.014	<0.014	<0.014	<0.014
Chrysene	ug/l			<0.50	<0.05	0.56	<0.05	<1	<1	0.024	<0.013	<0.013	<0.013	<0.013
Dibenzo(a,h)anthracene	ug/l			<0.50	<0.05	<0.05	<0.05	<1	<1	<0.016	<0.016	<0.016	<0.016	<0.016
Fluoranthene	ug/l	0.0063		<0.50	<0.05	0.21	<0.05	<1	<1	0.0275	<0.017	<0.017	<0.017	<0.017
Fluorene	ug/l			1.07	<0.05	0.07	<0.05	<1	<1	<0.014	<0.014	<0.014	<0.014	<0.014
Naphthalene	ug/l	2		<5.00	<0.50	<0.50	<0.50	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	ug/l			<0.50	<0.05	0.17	<0.05	<1	<1	<0.022	<0.022	<0.022	<0.022	<0.022
Pyrene	ug/l			<0.50	<0.05	0.19	<0.05	<1	<1	0.0252	<0.015	<0.015	<0.015	<0.015

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Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD

Sample Reference	Units	Screening Criteria		BHM4CAN030	BHM4CANA022	BHM4CANA022	BHM4CANA022	WSM4CAN009	WSM4CAN009	WSM4CAN009	WSM4CAN010	WSM4CAN010
Round				Round 3	Round 1	Round 2	Round 3	Round 1	Round 2	Round 3	Round 1	Round 2
Location Type		EQS	DWS		BH				WS			WS
Sample Type					W				W			W
Sampled Date				02/06/2016	28/04/2016	24/05/2016	02/06/2016	04/05/2016	19/05/2016	31/05/2016	04/05/2016	19/05/2016
Response Zone (RZ) Details				GFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD
Depth (m)												
Installation Details				Single	Single	Single	Single	Single	Single	Single	Single	Single
Metals												
Arsenic Dissolved	ug/l	50	10	196	15.2	10.6	13	12.1	9.03	8.66	10.4	20.3
Cadmium Dissolved	ug/l	0.15	5	0.737	1.97	1.97	0.884	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium Dissolved	ug/l		50	30.1	21.8	21.8	26.9	26.8	20.8	5.26	16.6	19.1
Copper Dissolved	ug/l	10	2000	<0.85	1.06	1.06	0.965	<0.85	0.89	<0.85	<0.85	2.28
Lead Dissolved	ug/l	1.2	10	0.868	1.71	1.71	0.923	0.367	0.199	0.085	<0.02	0.307
Nickel Dissolved	ug/l	4	20	2.88	2.86	2.86	1.68	2.84	2.64	1.36	9.33	3.99
Selenium Dissolved	ug/l		10	19.5	27.2	27.2	20.8	11.6	11.8	10.7	13.8	15
Vanadium Dissolved	ug/l			10.9	9.92	9.92	12	10.4	7.5	0.733	5.36	15.1
Zinc Dissolved	ug/l	75		4.13	3.96	3.96	1.8	0.883	1.04	2.11	1.84	1.14
Mercury Dissolved	ug/l	0.07	1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Non-Metal Inorganics												
Total Alkalinity as CaCO3	mg/l			1390	1790	2060	1620	1320	1070	1200	865	1060
BOD	mg/l	5										
COD	mg/l											
Hardness	mg/l											
Total Diss Sulphur	mg/l											
Chloride	mg/l	250	250	2180	2250	2310	2360	486	355	465	24.8	61.9
Ammoniacal Nitrogen as N	mg/l	0.6		14.2	4.8	6.93	7.68	2.85	2.99	2.84	2.29	0.903
Nitrate as NO3	mg/l		50	<0.3	<0.3	<0.3	<0.3	<0.3	1.68	0.392	<0.3	0.381
Nitrite as NO2	mg/l		0.5	<0.05	<0.05	<0.05	<0.05	<0.05	0.101	<0.05	0.08	<0.05
Unionised Ammonia	mg/l											
Thiocyanate	mg/l											
Total Cyanide	mg/l	0.001	0.05									
Free Cyanide	mg/l											
Complex Cyanide	mg/l											
pH Value	pH units	6-9	6.5-10	7.62	7.94	8.44	7.69	7.64	7.57	7.58	7.66	7.91
Conductivity uS/cm @25C	uS/cm			6180	7150	7360	6790	2980	2700	2730	1250	1650
Organics												
TPH FTIR	ug/l											
TPH GC	ug/l											
PCB- ARO	ug/l											
BTEX												
GRO (C4-C12)	ug/l			<50	<50	105	77	<50	<50	<50	<50	<50
MTBE	ug/l			<3	<3	<3	<3	<3	<3	<3	<3	<3
Benzene	ug/l	10	1	<7	<7	<7	<7	<7	<7	<7	<7	<7
Toluene	ug/l	50		<4	<4	<4	<4	<4	<4	<4	<4	<4
Ethyl benzene	ug/l	20		<5	<5	<5	<5	<5	<5	<5	<5	<5
m & p Xylene	ug/l	30		<8	<8	<8	<8	<8	<8	<8	<8	<8
o Xylene	ug/l	30		<3	<3	<3	<3	<3	<3	<3	<3	<3
Phenols												
Phenols Monohydric	mg/l											
Cresols	ug/l											
Dimethylphenols	ug/l											
Trimethylphenols	ug/l											
Pentachlorophenol	ug/l	0.4										
Phenol	ug/l	7.7										
TPH												
Aliphatics C5-C6	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C6-C8	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C8-C10	ug/l			<10	12	34	20	<10	<10	<10	<10	<10
Aliphatics >C10-C12	ug/l			<10	<10	25	20	<10	<10	<10	<10	<10
Aliphatics >C12-C16 Aqueous	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10
Aliphatics >C16-C21 Aqueous	ug/l			<10	<10	<10	18	10	21	<10	<10	<10
Aliphatics >C21-C35 Aqueous	ug/l			<10	16	84	200	171	214	<10	72	132
Aromatics >C5-C7	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >C7-C8	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	ug/l			<10	<10	23	13	<10	<10	<10	<10	<10
Aromatics >EC10-EC12	ug/l			<10	<10	16	14	<10	<10	<10	<10	<10
Aromatics >EC12-EC16 Aqueous	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics >EC16-EC21 Aqueous	ug/l			<10	<10	<10	<10	<10	16	<10	<10	<10
Aromatics >EC21-EC35 Aqueous	ug/l			<10	20	39	97	11	61	<10	<10	15
Total Aliphatic TPH	ug/l			<10	16	84	218	181	235	<10	72	132
Total Aromatic TPH	ug/l			<10	20	39	97	11	77	<10	<10	15
Total petroleum hydrocarbons	ug/l			<10	74	228	392	192	314	<10	72	147
PAHs												
Acenaphthene	ug/l			<0.015	<0.015	<0.015	<0.015	0.0238	0.0751	0.0173	<0.015	<0.015
Acenaphthylene	ug/l			<0.011	<0.011	<0.011	<0.011	<0.011	<0.022	<0.011	<0.011	<0.011
Anthracene	ug/l	0.1		<0.015	<0.015	<0.015	<0.015	0.0247	0.07	<0.015	<0.015	<0.015
Benzo(a)anthracene	ug/l			<0.017	0.0186	0.101	0.0539	0.112	0.24	<0.017	<0.017	<0.017
Benzo(a)pyrene	ug/l	0.00017	0.01	<0.009	0.0283	0.142	0.0919	0.267	0.617	<0.009	<0.009	<0.009
Benzo(b)fluoranthene	ug/l	0.017	0.1	<0.023	0.0489	0.244	0.154	0.349	0.82	<0.023	<0.023	<0.023
Benzo(k)fluoranthene	ug/l	0.017	0.1	<0.027	<0.027	0.0814	0.0596	0.1	0.288	<0.027	<0.027	<0.027
Benzo(ghi)perylene	ug/l	0.0082	0.1	<0.016	0.0247	0.121	0.0651	0.309	0.728	<0.016	<0.016	<0.016
Indeno(1,2,3-cd)pyrene	ug/l		0.1	<0.014	0.0176	0.135	0.0721	0.23	0.631	<0.014	<0.014	<0.014
Chrysene	ug/l			<0.013	0.0291	0.065	0.039	0.0879	0.232	<0.013	<0.013	<0.013
Dibenzo(a,h)anthracene	ug/l			<0.016	<0.016	0.0345	0.0211	0.0547	0.131	<0.016	<0.016	<0.016
Fluoranthene	ug/l	0.0063		<0.017	0.0421	0.13	0.087	0.179	0.402	<0.017	<0.017	<0.017
Fluorene	ug/l			<0.014	<0.014	<0.014	0.0172	0.0193	0.0486	<0.014	<0.014	<0.014
Naphthalene	ug/l	2		<0.1	<0.1	<0.1	<0.1	<0.1	0.268	<0.1	<0.1	<0.1
Phenanthrene	ug/l			<0.022	0.0244	0.0557	0.0559	0.0448	0.133	<0.022	<0.022	<0.022
Pyrene	ug/l			<0.015	0.0358	0.113	0.0717	0.192	0.465	<0.015	<0.015	<0.015

M4CAN
Groundwater Sample Analysis & Screening Assessment
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Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD

Sample Reference	Units	Screening Criteria		WSM4CAN010	WSM4CAN011	WSM4CAN011	WSM4CAN011	WSM4CAN012	WSM4CAN012	WSM4CAN012
Round				Round 3	Round 1	Round 2	Round 3	Round 1	Round 2	Round 3
Location Type		EQS	DWS		WS			WS		
Sample Type					W			W		
Sampled Date				31/05/2016	28/04/2016	20/05/2016	02/06/2016	28/04/2016	20/05/2016	02/06/2016
Response Zone (RZ) Details				TFD	TFD	TFD	TFD	TFD	TFD	TFD
Depth (m)										
Installation Details				Single	Single	Single	Single	Single	Single	Single
Metals										
Arsenic Dissolved	ug/l	50	10	13.4	8.57	2.34	7.37	6.43	9.18	9.02
Cadmium Dissolved	ug/l	0.15	5	<0.1	<0.1	<0.1	<0.1	0.117	<0.1	<0.1
Chromium Dissolved	ug/l		50	2.76	5.79	7.48	7.61	10.2	11.9	13.5
Copper Dissolved	ug/l	10	2000	2.17	2.19	2.95	<0.85	1.05	1.76	2.89
Lead Dissolved	ug/l	1.2	10	0.226	2.64	0.062	<0.02	0.352	0.188	0.028
Nickel Dissolved	ug/l	4	20	3.36	12.9	4.89	6.11	3.11	2.51	2.66
Selenium Dissolved	ug/l		10	17.7	1.62	2.09	1.88	7.42	7.04	4.05
Vanadium Dissolved	ug/l			4.93	3.27	2.62	2.9	3.99	6.03	5.21
Zinc Dissolved	ug/l	75		1.72	9.11	4.93	0.997	5.93	3.37	4.49
Mercury Dissolved	ug/l	0.07	1	<0.01	<0.01	<0.01	<0.01	0.0107	<0.01	<0.01
Non-Metal Inorganics										
Total Alkalinity as CaCO3	mg/l			1000	430	540	463	830	920	839
BOD	mg/l	5								
COD	mg/l									
Hardness	mg/l									
Total Diss Sulphur	mg/l									
Chloride	mg/l	250	250	57.5	40.9	47.5	40.6	78.8	93.6	81.3
Ammoniacal Nitrogen as N	mg/l	0.6		2.44	<0.2	0.221	<0.2	0.691	1.1	0.523
Nitrate as NO3	mg/l		50	0.84	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Nitrite as NO2	mg/l		0.5	0.099	<0.05	<0.05	0.223	<0.05	<0.05	<0.05
Unionised Ammonia	mg/l									
Thiocyanate	mg/l									
Total Cyanide	mg/l	0.001	0.05							
Free Cyanide	mg/l									
Complex Cyanide	mg/l									
pH Value	pH units	6-9	6.5-10	7.89	7.5	8.06	7.62	7.96	8.18	8.11
Conductivity uS/cm @25C	uS/cm			1530	779	1030	871	1490	1660	1530
Organics										
TPH FTIR	ug/l									
TPH GC	ug/l									
PCB- ARO	ug/l									
BTEX										
GRO (C4-C12)	ug/l			<50	<50	<50	<50	<50	<50	<50
MTBE	ug/l			<3	<3	<3	<3	<3	<3	<3
Benzene	ug/l	10	1	<7	<7	<7	<7	<7	<7	<7
Toluene	ug/l	50		<4	<4	<4	<4	<4	<4	<4
Ethyl benzene	ug/l	20		<5	<5	<5	<5	<5	<5	<5
m & p Xylene	ug/l	30		<8	<8	<8	<8	<8	<8	<8
o Xylene	ug/l	30		<3	<3	<3	<3	<3	<3	<3
Phenols										
Phenols Monohydric	mg/l									
Cresols	ug/l									
Dimethylphenols	ug/l									
Trimethylphenols	ug/l									
Pentachlorophenol	ug/l	0.4								
Phenol	ug/l	7.7								
TPH										
Aliphatics C5-C6	ug/l			<10	<10	<10	<10	<10	<10	<10
Aliphatics >C6-C8	ug/l			<10	<10	<10	<10	<10	<10	<10
Aliphatics >C8-C10	ug/l			<10	<10	<10	<10	<10	<10	<10
Aliphatics >C10-C12	ug/l			<10	<10	<10	<10	<10	<10	<10
Aliphatics >C12-C16 Aqueous	ug/l			<10	<10	<10	<10	<10	<10	<10
Aliphatics >C16-C21 Aqueous	ug/l			<10	<10	<10	<10	14	<10	<10
Aliphatics >C21-C35 Aqueous	ug/l			19	<10	<10	<10	163	<10	<10
Aromatics >C5-C7	ug/l			<10	<10	<10	<10	<10	<10	<10
Aromatics >C7-C8	ug/l			<10	<10	<10	<10	<10	<10	<10
Aromatics >EC8-EC10	ug/l			<10	<10	<10	<10	<10	<10	<10
Aromatics >EC10-EC12	ug/l			<10	<10	<10	<10	<10	<10	<10
Aromatics >EC12-EC16 Aqueous	ug/l			<10	<10	<10	<10	<10	<10	<10
Aromatics >EC16-EC21 Aqueous	ug/l			<10	<10	<10	<10	<10	<10	<10
Aromatics >EC21-EC35 Aqueous	ug/l			<10	<10	<10	<10	<10	<10	<10
Total Aliphatic TPH	ug/l			19	<10	<10	<10	177	<10	<10
Total Aromatic TPH	ug/l			<10	<10	<10	<10	<10	<10	<10
Total petroleum hydrocarbons	ug/l			19	<10	<10	<10	177	<10	13
PAHs										
Acenaphthene	ug/l			<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Acenaphthylene	ug/l			<0.011	<0.011	<0.011	<0.011	<0.011	<0.011	<0.011
Anthracene	ug/l	0.1		<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Benzo(a)anthracene	ug/l			0.0398	<0.017	<0.017	<0.017	<0.017	<0.017	0.0198
Benzo(a)pyrene	ug/l	0.00017	0.01	0.0313	**<0.009**	**<0.009**	**<0.009**	**<0.009**	**<0.009**	**<0.009**
Benzo(b)fluoranthene	ug/l	0.017	0.1	0.0511	**<0.023**	**<0.023**	**<0.023**	**<0.023**	**<0.023**	**<0.023**
Benzo(k)fluoranthene	ug/l	0.017	0.1	**<0.027**	**<0.027**	**<0.027**	**<0.027**	**<0.027**	**<0.027**	**<0.027**
Benzo(ghi)perylene	ug/l	0.0082	0.1	0.0325	**<0.016**	**<0.016**	**<0.016**	**<0.016**	**<0.016**	**<0.016**
Indeno(1,2,3-cd)pyrene	ug/l		0.1	0.0255	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014
Chrysene	ug/l			0.0197	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013
Dibenzo(a,h)anthracene	ug/l			<0.016	<0.016	<0.016	<0.016	<0.016	<0.016	<0.016
Fluoranthene	ug/l	0.0063		0.0275	**<0.017**	**<0.017**	**<0.017**	**<0.017**	**<0.017**	**<0.017**
Fluorene	ug/l			<0.014	<0.014	<0.014	<0.014	<0.014	<0.014	<0.014
Naphthalene	ug/l	2		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	ug/l			<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022
Pyrene	ug/l			<0.015	<0.015	<0.015	<0.015	0.0159	<0.015	<0.015

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Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD

Sample Reference	Units	Screening Criteria		CH 35	CH 40	CH 41	CH 45	BH1	BH2	BHM4CAN029	BHM4CAN029	BHM4CAN029	BHM4CAN030	BHM4CAN030
Round										Round 1	Round 2	Round 3	Round 1	Round 2
Location Type		EQS	DWS	TP	TP	TP	TP			BH				BH
Sample Type										W				W
Sampled Date				2000	2000	2000	2000	2008 GI	2008 GI	28/04/2016	24/05/2016	02/06/2016	28/04/2016	24/05/2016
Response Zone (RZ) Details				MG	MG	MG	MG	MG	MG	GFD	GFD	GFD	GFD	GFD
Depth (m)				0.8	1.1	1.1	1.3							
Installation Details										Deep	Deep	Deep	Single	Single
Total PAHs (USEPA 16)	ug/l			<13.75	<2.20	<3.87	<2.20			<0.344	<0.344	<0.344	<0.344	<0.344
PCBs														
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	ug/l	0	0							<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	ug/l	0	0							<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	ug/l	0	0							<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	ug/l	0	0							<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	ug/l	0	0							<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-156 2,3,3',4,4',5-Hexachlorobiphenyl	ug/l	0	0							<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	ug/l	0	0							<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0							<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0							<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	ug/l	0	0							<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	ug/l	0	0							<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	ug/l	0	0							<0.015	<0.015	<0.015	<0.015	<0.015
SVOCs														
Phenols														
2,4,5-Trichlorophenol	ug/l									<1	<1	<1	<1	<1
2,4,6-Trichlorophenol	ug/l									<1	<1	<1	<1	<1
2,4-Dichlorophenol	ug/l	20								<1	<1	<1	<1	<1
2,4-Dimethylphenol	ug/l									<1	<1	<1	<1	<1
2-Chlorophenol	ug/l	50								<1	<1	<1	<1	<1
2-Methylphenol	ug/l	100								<1	<1	<1	<1	<1
2-Nitrophenol	ug/l									<1		<1	<1	
4-Chloro-3-Methylphenol	ug/l	40								<1	<1	<1	<1	<1
4-Methylphenol	ug/l	100								<1	<1	<1	<1	<1
4-Nitrophenol	ug/l									<1	<1	<1	<1	<1
Pentachlorophenol (PCP)	ug/l	0.4								<1	<1	<1	<1	<1
Phenol	ug/l	7.7								<1	<1	<1	<1	<1
PAHs														
2-Chloronaphthalene	ug/l									<1	<1	<1	<1	<1
2-Methylnaphthalene	ug/l									<1	<1	<1	<1	<1
Acenaphthene	ug/l									<1	<1		<1	<1
Acenaphthylene	ug/l									<1	<1		<1	<1
Anthracene	ug/l	0.1								<1	<1		<1	<1
Benzo(a)anthracene	ug/l									<1	<1		<1	<1
Benzo(a)pyrene	ug/l	0.00017	0.01							<1	<1		<1	<1
Benzo(b)fluoranthene	ug/l	0.017	0.1							<1	<1		<1	<1
Benzo(ghi)perylene	ug/l	0.0082	0.1							<1	<1		<1	<1
Benzo(k)fluoranthene	ug/l	0.017	0.1							<1	<1		<1	<1
Chrysene	ug/l									<1	<1		<1	<1
Chrysene	ug/l									<1	<1		<1	<1
Dibenzo(ah)anthracene	ug/l									<1	<1		<1	<1
Fluoranthene	ug/l	0.0063								<1	<1		<1	<1
Fluorene	ug/l									<1	<1		<1	<1
Indeno(123cd)pyrene	ug/l	N/A	0.1							<1	<1		<1	<1
Phenanthrene	ug/l									<1	<1		<1	<1
Pyrene	ug/l									<1	<1		<1	<1
Phthalates														
Bis(2-ethylhexyl)phthalate	ug/l	1.3								<2	<2	<2	<2	<2
Butylbenzylphthalate	ug/l	20								<1	<1	<1	<1	<1
Diethylphthalate	ug/l	200								<1	<1	<1	<1	<1
Dimethylphthalate	ug/l	800								<1	<1	<1	<1	<1
Di-N-Butyl Phthalate	ug/l	8								<1	<1	<1	<1	<1
Di-N-Octyl Phthalate	ug/l	20								<5	<5	<5	<5	<5
Other SVOCs														
1,3-Dichlorobenzene	ug/l	20								<1	<1	<1	<1	<1
1,4-Dichlorobenzene	ug/l	20								<1	<1	<1	<1	<1
1,2,4-Trichlorobenzene	ug/l	0.4								<1	<1	<1	<1	<1
1,2-Dichlorobenzene	ug/l	20								<1	<1	<1	<1	<1
2,4-Dinitrotoluene	ug/l									<1	<1	<1	<1	<1
2,6-Dinitrotoluene	ug/l									<1	<1	<1	<1	<1
2-Nitroaniline	ug/l									<1	<1	<1	<1	<1
3-Nitroaniline	ug/l									<1	<1	<1	<1	<1
4-Bromophenyl Phenyl Ether	ug/l									<1	<1	<1	<1	<1
4-Chloroaniline	ug/l									<1	<1	<1	<1	<1
4-Chlorophenyl Phenyl Ether	ug/l									<1	<1	<1	<1	<1
4-Nitroaniline	ug/l									<1	<1	<1	<1	<1
Azobenzene	ug/l									<1	<1	<1	<1	<1
Bis(2-chloroethoxy)methane	ug/l									<1	<1	<1	<1	<1
Bis(2-chloroethyl)ether	ug/l									<1	<1	<1	<1	<1
Carbazole	ug/l									<1	<1	<1	<1	<1
Dibenzofuran	ug/l									<1	<1	<1	<1	<1
Hexachlorobenzene (HCB)	ug/l	0.05								<1	<1	<1	<1	<1
Hexachlorobutadiene	ug/l	0.6								<1	<1	<1	<1	<1
Hexachlorocyclopentadiene	ug/l									<1	<1	<1	<1	<1
Hexachloroethane	ug/l									<1	<1	<1	<1	<1
Isophorone	ug/l									<1	<1	<1	<1	<1
Nitrobenzene	ug/l									<1	<1	<1	<1	<1
N-Nitroso-Di-N-Propylamine	ug/l									<1	<1	<1	<1	<1
VOCs														
1,1,1,2-Tetrachloroethane	ug/l									<1	<1	<1	<1	<1
1,2-Dichloropropane	ug/l									<1	<1	<1	<1	<1

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Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD

Sample Reference	Units	Screening Criteria		BHM4CAN030	BHM4CANA022	BHM4CANA022	BHM4CANA022	WSM4CAN009	WSM4CAN009	WSM4CAN009	WSM4CAN010	WSM4CAN010
Round				Round 3	Round 1	Round 2	Round 3	Round 1	Round 2	Round 3	Round 1	Round 2
Location Type		EQS	DWS		BH				WS			WS
Sample Type					W				W			W
Sampled Date				02/06/2016	28/04/2016	24/05/2016	02/06/2016	04/05/2016	19/05/2016	31/05/2016	04/05/2016	19/05/2016
Response Zone (RZ) Details				GFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD
Depth (m)												
Installation Details				Single	Single	Single	Single	Single	Single	Single	Single	Single
Total PAHs (USEPA 16)	ug/l			<0.344	<0.344	1.22	0.789	1.99	5.17	<0.344	<0.344	<0.344
PCBs												
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	ug/l	0	0	<0.015	<0.015	0.0186	<0.015	0.07	0.153	<0.015	<0.015	<0.015
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	ug/l	0	0	<0.015	0.02	0.041	0.02	0.14	0.341	<0.015	<0.015	0.0159
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	0.0582	<0.015	<0.015	<0.015
Pcb-156 2,3,3',4,4',5-Hexachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	0.02	0.0623	<0.015	<0.015	<0.015
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	0.0869	<0.015	<0.015	<0.015
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	0.02	<0.015	<0.015	<0.015	<0.015
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
SVOCs												
Phenols												
2,4,5-Trichlorophenol	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
2,4,6-Trichlorophenol	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
2,4-Dichlorophenol	ug/l	20		<1	<1	<4	<1	<1	<1	<1	<1	<2
2,4-Dimethylphenol	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
2-Chlorophenol	ug/l	50		<1	<1	<4	<1	<1	<1	<1	<1	<2
2-Methylphenol	ug/l	100		<1	<1	<4	<1	<1	<1	<1	<1	<2
2-Nitrophenol	ug/l			<1	<1		<1	<1	<1	<1	<1	<2
4-Chloro-3-Methylphenol	ug/l	40		<1	<1	<4	<1	<1	<1	<1	<1	<2
4-Methylphenol	ug/l	100		<1	<1	<4	<1	<1	<1	<1	<1	<2
4-Nitrophenol	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
Pentachlorophenol (PCP)	ug/l	0.4		<1	<1	<4	<1	<1	<1	<1	<1	<2
Phenol	ug/l	7.7		<1	<1	<4	<1	<1	<1	<1	<1	<2
PAHs												
2-Chloronaphthalene	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
2-Methylnaphthalene	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
Acenaphthene	ug/l				<1	<4		<1	<1		<1	<2
Acenaphthylene	ug/l				<1	<4		<1	<1		<1	<2
Anthracene	ug/l	0.1			<1	<4		<1	<1		<1	<2
Benzo(a)anthracene	ug/l				<1	<4		<1	<1		<1	<2
Benzo(a)pyrene	ug/l	0.00017	0.01		<1	<4		<1	<1		<1	<2
Benzo(b)fluoranthene	ug/l	0.017	0.1		<1	<4		<1	<1		<1	<2
Benzo(ghi)perylene	ug/l	0.0082	0.1		<1	<4		<1	<1		<1	<2
Benzo(k)fluoranthene	ug/l	0.017	0.1		<1	<4		<1	<1		<1	<2
Chrysene	ug/l				<1	<4		<1	<1		<1	<2
Chrysene	ug/l				<1	<4		<1	<1		<1	<2
Dibenzo(ah)anthracene	ug/l				<1	<4		<1	<1		<1	<2
Fluoranthene	ug/l	0.0063			<1	<4		<1	<1		<1	<2
Fluorene	ug/l				<1	<4		<1	<1		<1	<2
Indeno(123cd)pyrene	ug/l	N/A	0.1		<1	<4		<1	<1		<1	<2
Phenanthrene	ug/l				<1	<4		<1	<1		<1	<2
Pyrene	ug/l				<1	<4		<1	<1		<1	<2
Phthalates												
Bis(2-ethylhexyl)phthalate	ug/l	1.3		<2	4.58	96.2	4.4	<2	<2	<2	<2	<4
Butylbenzylphthalate	ug/l	20		<1	<1	<4	<1	<1	<1	<1	<2	<2
Diethylphthalate	ug/l	200		<1	<1	<4	<1	<1	<1	<1	<2	<2
Dimethylphthalate	ug/l	800		<1	<1	<4	<1	<1	<1	<1	<2	<2
Di-N-Butyl Phthalate	ug/l	8		<1	<1	<4	<1	<1	<1	<1	<2	<2
Di-N-Octyl Phthalate	ug/l	20		<5	<5	<20	<5	<5	<5	<5	<5	<10
Other SVOCs												
1,3-Dichlorobenzene	ug/l	20		<1	<1	<4	<1	<1	<1	<1	<1	<2
1,4-Dichlorobenzene	ug/l	20		<1	<1	<4	<1	<1	<1	<1	<1	<2
1,2,4-Trichlorobenzene	ug/l	0.4		<1	<1	<4	<1	<1	<1	<1	<1	<2
1,2-Dichlorobenzene	ug/l	20		<1	<1	<4	<1	<1	<1	<1	<1	<2
2,4-Dinitrotoluene	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
2,6-Dinitrotoluene	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
2-Nitroaniline	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
3-Nitroaniline	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
4-Bromophenyl Phenyl Ether	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
4-Chloroaniline	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
4-Chlorophenyl Phenyl Ether	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
4-Nitroaniline	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
Azobenzene	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
Bis(2-chloroethoxy)methane	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
Bis(2-chloroethyl)ether	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
Carbazole	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
Dibenzofuran	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
Hexachlorobenzene (HCB)	ug/l	0.05		<1	<1	<4	<1	<1	<1	<1	<1	<2
Hexachlorobutadiene	ug/l	0.6		<1	<1	<4	<1	<1	<1	<1	<1	<2
Hexachlorocyclopentadiene	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
Hexachloroethane	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
Isophorone	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
Nitrobenzene	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
N-Nitroso-Di-N-Propylamine	ug/l			<1	<1	<4	<1	<1	<1	<1	<1	<2
VOCs												
1,1,1,2-Tetrachloroethane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichloropropane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1

M4CAN
Groundwater Sample Analysis & Screening Assessment
CL-17
23/06/2016

Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD

Sample Reference	Units	Screening Criteria		WSM4CAN010	WSM4CAN011	WSM4CAN011	WSM4CAN011	WSM4CAN012	WSM4CAN012	WSM4CAN012
Round				Round 3	Round 1	Round 2	Round 3	Round 1	Round 2	Round 3
Location Type					WS			WS		
Sample Type					W			W		
Sampled Date				31/05/2016	28/04/2016	20/05/2016	02/06/2016	28/04/2016	20/05/2016	02/06/2016
Response Zone (RZ) Details				TFD	TFD	TFD	TFD	TFD	TFD	TFD
Depth (m)										
Installation Details		EQS	DWS	Single	Single	Single	Single	Single	Single	Single
Total PAHs (USEPA 16)	ug/l			<0.344	<0.344	<0.344	<0.344	<0.344	<0.344	<0.344
PCBs										
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-156 2,3,3',4,4',5-Hexachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	ug/l	0	0	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
SVOCs										
Phenols										
2,4,5-Trichlorophenol	ug/l			<8	<1	<1	<1	<1	<1	<1
2,4,6-Trichlorophenol	ug/l			<8	<1	<1	<1	<1	<1	<1
2,4-Dichlorophenol	ug/l	20		<8	<1	<1	<1	<1	<1	<1
2,4-Dimethylphenol	ug/l			<8	<1	<1	<1	<1	<1	<1
2-Chlorophenol	ug/l	50		<8	<1	<1	<1	<1	<1	<1
2-Methylphenol	ug/l	100		<8	<1	<1	<1	<1	<1	<1
2-Nitrophenol	ug/l			<8	<1	<1	<1	<1	<1	<1
4-Chloro-3-Methylphenol	ug/l	40		<8	<1	<1	<1	<1	<1	<1
4-Methylphenol	ug/l	100		<8	<1	<1	<1	<1	<1	<1
4-Nitrophenol	ug/l			<8	<1	<1	<1	<1	<1	<1
Pentachlorophenol (PCP)	ug/l	0.4		<8	<1	<1	<1	<1	<1	<1
Phenol	ug/l	7.7		<8	<1	<1	<1	<1	<1	<1
PAHs										
2-Chloronaphthalene	ug/l			<8	<1	<1	<1	<1	<1	<1
2-Methylnaphthalene	ug/l			<8	<1	<1	<1	<1	<1	<1
Acenaphthene	ug/l				<1	<1		<1	<1	
Acenaphthylene	ug/l				<1	<1		<1	<1	
Anthracene	ug/l	0.1			<1	<1		<1	<1	
Benzo(a)anthracene	ug/l				<1	<1		<1	<1	
Benzo(a)pyrene	ug/l	0.00017	0.01		<1	<1		<1	<1	
Benzo(b)fluoranthene	ug/l	0.017	0.1		<1	<1		<1	<1	
Benzo(ghi)perylene	ug/l	0.0082	0.1		<1	<1		<1	<1	
Benzo(k)fluoranthene	ug/l	0.017	0.1		<1	<1		<1	<1	
Chrysene	ug/l				<1	<1		<1	<1	
Chrysene	ug/l				<1	<1		<1	<1	
Dibenzo(ah)anthracene	ug/l				<1	<1		<1	<1	
Fluoranthene	ug/l	0.0063			<1	<1		<1	<1	
Fluorene	ug/l				<1	<1		<1	<1	
Indeno(123cd)pyrene	ug/l	N/A	0.1		<1	<1		<1	<1	
Phenanthrene	ug/l				<1	<1		<1	<1	
Pyrene	ug/l				<1	<1		<1	<1	
Phthalates										
Bis(2-ethylhexyl)phthalate	ug/l	1.3		<16	<2	<2	<2	<2	<2	<2
Butylbenzylphthalate	ug/l	20		<8	<1	<1	<1	<1	<1	<1
Diethylphthalate	ug/l	200		<8	<1	<1	<1	1.17	<1	<1
Dimethylphthalate	ug/l	800		<8	<1	<1	<1	<1	<1	<1
Di-N-Butyl Phthalate	ug/l	8		<8	<1	<1	<1	1.42	<1	<1
Di-N-Octyl Phthalate	ug/l	20		<40	<5	<5	<5	<5	<5	<5
Other SVOCs										
1,3-Dichlorobenzene	ug/l	20		<8	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	ug/l	20		<8	<1	<1	<1	<1	<1	<1
1,2,4-Trichlorobenzene	ug/l	0.4		<8	<1	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	ug/l	20		<8	<1	<1	<1	<1	<1	<1
2,4-Dinitrotoluene	ug/l			<8	<1	<1	<1	<1	<1	<1
2,6-Dinitrotoluene	ug/l			<8	<1	<1	<1	<1	<1	<1
2-Nitroaniline	ug/l			<8	<1	<1	<1	<1	<1	<1
3-Nitroaniline	ug/l			<8	<1	<1	<1	<1	<1	<1
4-Bromophenyl Phenyl Ether	ug/l			<8	<1	<1	<1	<1	<1	<1
4-Chloroaniline	ug/l			<8	<1	<1	<1	<1	<1	<1
4-Chlorophenyl Phenyl Ether	ug/l			<8	<1	<1	<1	<1	<1	<1
4-Nitroaniline	ug/l			<8	<1	<1	<1	<1	<1	<1
Azobenzene	ug/l			<8	<1	<1	<1	<1	<1	<1
Bis(2-chloroethoxy)methane	ug/l			<8	<1	<1	<1	<1	<1	<1
Bis(2-chloroethyl)ether	ug/l			<8	<1	<1	<1	<1	<1	<1
Carbazole	ug/l			<8	<1	<1	<1	<1	<1	<1
Dibenzofuran	ug/l			<8	<1	<1	<1	<1	<1	<1
Hexachlorobenzene (HCB)	ug/l	0.05		<8	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene	ug/l	0.6		<8	<1	<1	<1	<1	<1	<1
Hexachlorocyclopentadiene	ug/l			<8	<1	<1	<1	<1	<1	<1
Hexachloroethane	ug/l			<8	<1	<1	<1	<1	<1	<1
Isophorone	ug/l			<8	<1	<1	<1	<1	<1	<1
Nitrobenzene	ug/l			<8	<1	<1	<1	<1	<1	<1
N-Nitroso-Di-N-Propylamine	ug/l			<8	<1	<1	<1	<1	<1	<1
VOCs										
1,1,1,2-Tetrachloroethane	ug/l			<1	<1	<1	<1	<1	<1	<1
1,2-Dichloropropane	ug/l			<1	<1	<1	<1	<1	<1	<1

M4CAN
Groundwater Sample Analysis & Screening Assessment
CL-17
23/06/2016

Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD

Sample Reference	Units	Screening Criteria		CH 35	CH 40	CH 41	CH 45	BH1	BH2	BHM4CAN029	BHM4CAN029	BHM4CAN029	BHM4CAN030	BHM4CAN030
Round										Round 1	Round 2	Round 3	Round 1	Round 2
Location Type		EQS	DWS	TP	TP	TP	TP			BH				BH
Sample Type										W				W
Sampled Date				2000	2000	2000	2000	2008 GI	2008 GI	28/04/2016	24/05/2016	02/06/2016	28/04/2016	24/05/2016
Response Zone (RZ) Details				MG	MG	MG	MG	MG	MG	GFD	GFD	GFD	GFD	GFD
Depth (m)				0.8	1.1	1.1	1.3							
Installation Details										Deep	Deep	Deep	Single	Single
1,3,5-Trichlorobenzene	ug/l									<1	<1	<1	<1	<1
Carbon Disulphide	ug/l									<1	<1	<1	<1	<1
Dichloromethane	ug/l									<3	<3	<3	<3	<3
Methyl Tertiary butyl ether MTBE	ug/l									<1	<1	<1	<1	<1
tert-Amyl methyl ether (TAME)	ug/l									<1	<1	<1	<1	<1
Dichlorodifluoromethane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Chloromethane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Vinyl Chloride	ug/l	0	0.5	**<5**	**<1**	**<1**	**<1**	**<3.0**	**<3.0**	**<1**	**<1**	**<1**	**<1**	**<1**
Bromomethane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Chloroethane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Trichlorofluoromethane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
trans-1-2-Dichloroethene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.1-Dichloroethene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.1-Dichloroethane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
cis-1-2-Dichloroethene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Bromochloromethane	ug/l		100	<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Chloroform	ug/l	2.5	100	**<5**	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
2.2-Dichloropropane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.2-Dichloroethane	ug/l	10	3	**<5**	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.1.1-Trichloroethane	ug/l	100		<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.1-Dichloropropene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Benzene	ug/l	10	1	130	<1	<1	<1	**<3.0**	**<3.0**	<1	<1	<1	<1	<1
Carbontetrachloride	ug/l	12	3	<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Dibromomethane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Bromodichloromethane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Trichloroethene	ug/l	10	10	<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
cis-1-3-Dichloropropene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
trans-1-3-Dichloropropene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.1.2-Trichloroethane	ug/l	400		<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Toluene	ug/l	50		18	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.3-Dichloropropane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Dibromochloromethane	ug/l		100	<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.2-Dibromoethane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Tetrachloroethene	ug/l	10	10	<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Chlorobenzene	ug/l			6	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Ethylbenzene	ug/l	20		255	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
p/m-Xylene	ug/l	30		872	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Bromoform	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Styrene	ug/l	50		<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.1.2.2-Tetrachloroethane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
o-Xylene	ug/l	30		<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.2.3-Trichloropropane	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Isopropylbenzene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Bromobenzene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
2-Chlorotoluene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
Propylbenzene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
4-Chlorotoluene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.2.4-Trimethylbenzene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
4-Isopropyltoluene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.3.5-Trimethylbenzene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.2-Dichlorobenzene	ug/l	20		<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.4-Dichlorobenzene	ug/l	20		<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
sec-Butylbenzene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
tert-Butylbenzene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.3-Dichlorobenzene	ug/l	20		<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
n-Butylbenzene	ug/l			<5	<1	<1	<1	<3.0	<3.0	<1	<1	<1	<1	<1
1.2-Dibromo-3-chloropropane	ug/l			<25	<5	<5	<5	<3.0	<3.0	<1	<1	<1	<1	<1
1.2.4-Trichlorobenzene	ug/l	0.4		204	**<5**	**<5**	**<5**	**<3.0**	**<3.0**	**<1**	**<1**	**<1**	**<1**	**<1**
Naphthalene	ug/l	2		**<25**	**<5**	**<5**	**<5**	**<3.0**	**<3.0**	<1	<1	<1	<1	<1
1.2.3-Trichlorobenzene	ug/l	0.4		**<25**	**<5**	**<5**	**<5**	**<3.0**	**<3.0**	**<1**	**<1**	**<1**	**<1**	**<1**
Hexachlorobutadiene	ug/l	0.6		**<25**	**<5**	**<5**	**<5**	**<3.0**	**<3.0**	**<1**	**<1**	**<1**	**<1**	**<1**

M4CAN
Groundwater Sample Analysis & Screening Assessment
CL-17
23/06/2016

Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD

Sample Reference	Units	Screening Criteria		BHM4CAN030	BHM4CANA022	BHM4CANA022	BHM4CANA022	WSM4CAN009	WSM4CAN009	WSM4CAN009	WSM4CAN010	WSM4CAN010
Round				Round 3	Round 1	Round 2	Round 3	Round 1	Round 2	Round 3	Round 1	Round 2
Location Type		EQS	DWS	BH				WS				WS
Sample Type				W				W				W
Sampled Date				02/06/2016	28/04/2016	24/05/2016	02/06/2016	04/05/2016	19/05/2016	31/05/2016	04/05/2016	19/05/2016
Response Zone (RZ) Details				GFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD	TFD
Depth (m)												
Installation Details				Single	Single	Single	Single	Single	Single	Single	Single	Single
1,3,5-Trichlorobenzene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbon Disulphide	ug/l			<1	<1	<1	2.17	<1	<1	<1	<1	<1
Dichloromethane	ug/l			<3	<3	<3	<3	<3	<3	<3	<3	<3
Methyl Tertiary butyl ether MTBE	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
tert-Amyl methyl ether (TAME)	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Dichlorodifluoromethane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloromethane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	ug/l	0	0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromomethane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroethane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichlorofluoromethane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1-2-Dichloroethene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
1.1-Dichloroethene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
1.1-Dichloroethane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1-2-Dichloroethene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromochloromethane	ug/l		100	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroform	ug/l	2.5	100	<1	<1	<1	<1	<1	<1	<1	<1	<1
2.2-Dichloropropane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
1.2-Dichloroethane	ug/l	10	3	<1	<1	<1	<1	<1	<1	<1	<1	<1
1.1.1-Trichloroethane	ug/l	100		<1	<1	<1	<1	<1	<1	<1	<1	<1
1.1-Dichloropropene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzene	ug/l	10	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbontetrachloride	ug/l	12	3	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibromomethane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromodichloromethane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	ug/l	10	10	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1-3-Dichloropropene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
trans-1-3-Dichloropropene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
1.1.2-Trichloroethane	ug/l	400		<1	<1	<1	<1	<1	<1	<1	<1	<1
Toluene	ug/l	50		<1	<1	<1	<1	<1	<1	<1	<1	<1
1.3-Dichloropropane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Dibromochloromethane	ug/l		100	<1	<1	<1	<1	<1	<1	<1	<1	<1
1.2-Dibromoethane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	ug/l	10	10	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorobenzene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	ug/l	20		<1	<1	<1	<1	<1	<1	<1	<1	<1
p/m-Xylene	ug/l	30		<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromoform	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Styrene	ug/l	50		<1	<1	<1	<1	<1	<1	<1	<1	<1
1.1.2.2-Tetrachloroethane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
o-Xylene	ug/l	30		<1	<1	<1	<1	<1	<1	<1	<1	<1
1.2.3-Trichloropropane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Isopropylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Bromobenzene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Chlorotoluene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
Propylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Chlorotoluene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
1.2.4-Trimethylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Isopropyltoluene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
1.3.5-Trimethylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
1.2-Dichlorobenzene	ug/l	20		<1	<1	<1	<1	<1	<1	<1	<1	<1
1.4-Dichlorobenzene	ug/l	20		<1	<1	<1	<1	<1	<1	<1	<1	<1
sec-Butylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
tert-Butylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
1.3-Dichlorobenzene	ug/l	20		<1	<1	<1	<1	<1	<1	<1	<1	<1
n-Butylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
1.2-Dibromo-3-chloropropane	ug/l			<1	<1	<1	<1	<1	<1	<1	<1	<1
1.2.4-Trichlorobenzene	ug/l	0.4		<1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	ug/l	2		<1	<1	<1	<1	<1	<1	<1	<1	<1
1.2.3-Trichlorobenzene	ug/l	0.4		<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene	ug/l	0.6		<1	<1	<1	<1	<1	<1	<1	<1	<1

M4CAN
Groundwater Sample Analysis & Screening Assessment
CL-17
23/06/2016

Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Geological Formation Legend

Tidal Flat Deposits	TFD
Glaciofluvial Deposits	GFD

Sample Reference	Units	Screening Criteria		WSM4CAN010	WSM4CAN011	WSM4CAN011	WSM4CAN011	WSM4CAN012	WSM4CAN012	WSM4CAN012
Round				Round 3	Round 1	Round 2	Round 3	Round 1	Round 2	Round 3
Location Type					WS			WS		
Sample Type					W			W		
Sampled Date		EQS	DWS	31/05/2016	28/04/2016	20/05/2016	02/06/2016	28/04/2016	20/05/2016	02/06/2016
Response Zone (RZ) Details				TFD	TFD	TFD	TFD	TFD	TFD	TFD
Depth (m)										
Installation Details				Single	Single	Single	Single	Single	Single	Single
1,3,5-Trichlorobenzene	ug/l			<1	<1	<1	<1	<1	<1	<1
Carbon Disulphide	ug/l			<1	<1	<1	<1	<1	<1	<1
Dichloromethane	ug/l			<3	<3	<3	<3	<3	<3	<3
Methyl Tertiary butyl ether MTBE	ug/l			<1	<1	<1	<1	<1	<1	<1
tert-Amyl methyl ether (TAME)	ug/l			<1	<1	<1	<1	<1	<1	<1
Dichlorodifluoromethane	ug/l			<1	<1	<1	<1	<1	<1	<1
Chloromethane	ug/l			<1	<1	<1	<1	<1	<1	<1
Vinyl Chloride	ug/l	0	0.5	<1	<1	<1	<1	<1	<1	<1
Bromomethane	ug/l			<1	<1	<1	<1	<1	<1	<1
Chloroethane	ug/l			<1	<1	<1	<1	<1	<1	<1
Trichlorofluoromethane	ug/l			<1	<1	<1	<1	<1	<1	<1
trans-1-2-Dichloroethene	ug/l			<1	<1	<1	<1	<1	<1	<1
1.1-Dichloroethene	ug/l			<1	<1	<1	<1	<1	<1	<1
1.1-Dichloroethane	ug/l			<1	<1	<1	<1	<1	<1	<1
cis-1-2-Dichloroethene	ug/l			<1	<1	<1	<1	<1	<1	<1
Bromochloromethane	ug/l		100	<1	<1	<1	<1	<1	<1	<1
Chloroform	ug/l	2.5	100	<1	<1	<1	<1	<1	<1	<1
2.2-Dichloropropane	ug/l			<1	<1	<1	<1	<1	<1	<1
1.2-Dichloroethane	ug/l	10	3	<1	<1	<1	<1	<1	<1	<1
1.1.1-Trichloroethane	ug/l	100		<1	<1	<1	<1	<1	<1	<1
1.1-Dichloropropene	ug/l			<1	<1	<1	<1	<1	<1	<1
Benzene	ug/l	10	1	<1	<1	<1	<1	<1	<1	<1
Carbontetrachloride	ug/l	12	3	<1	<1	<1	<1	<1	<1	<1
Dibromomethane	ug/l			<1	<1	<1	<1	<1	<1	<1
Bromodichloromethane	ug/l			<1	<1	<1	<1	<1	<1	<1
Trichloroethene	ug/l	10	10	<1	<1	<1	<1	<1	<1	<1
cis-1-3-Dichloropropene	ug/l			<1	<1	<1	<1	<1	<1	<1
trans-1-3-Dichloropropene	ug/l			<1	<1	<1	<1	<1	<1	<1
1.1.2-Trichloroethane	ug/l	400		<1	<1	<1	<1	<1	<1	<1
Toluene	ug/l	50		<1	<1	<1	<1	<1	<1	<1
1.3-Dichloropropane	ug/l			<1	<1	<1	<1	<1	<1	<1
Dibromochloromethane	ug/l		100	<1	<1	<1	<1	<1	<1	<1
1.2-Dibromoethane	ug/l			<1	<1	<1	<1	<1	<1	<1
Tetrachloroethene	ug/l	10	10	<1	<1	<1	<1	<1	<1	<1
Chlorobenzene	ug/l			<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	ug/l	20		<1	<1	<1	<1	<1	<1	<1
p/m-Xylene	ug/l	30		<1	<1	<1	<1	<1	<1	<1
Bromoform	ug/l			<1	<1	<1	<1	<1	<1	<1
Styrene	ug/l	50		<1	<1	<1	<1	<1	<1	<1
1.1.2.2-Tetrachloroethane	ug/l			<1	<1	<1	<1	<1	<1	<1
o-Xylene	ug/l	30		<1	<1	<1	<1	<1	<1	<1
1.2.3-Trichloropropane	ug/l			<1	<1	<1	<1	<1	<1	<1
Isopropylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1
Bromobenzene	ug/l			<1	<1	<1	<1	<1	<1	<1
2-Chlorotoluene	ug/l			<1	<1	<1	<1	<1	<1	<1
Propylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1
4-Chlorotoluene	ug/l			<1	<1	<1	<1	<1	<1	<1
1.2.4-Trimethylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1
4-Isopropyltoluene	ug/l			<1	<1	<1	<1	<1	<1	<1
1.3.5-Trimethylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1
1.2-Dichlorobenzene	ug/l	20		<1	<1	<1	<1	<1	<1	<1
1.4-Dichlorobenzene	ug/l	20		<1	<1	<1	<1	<1	<1	<1
sec-Butylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1
tert-Butylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1
1.3-Dichlorobenzene	ug/l	20		<1	<1	<1	<1	<1	<1	<1
n-Butylbenzene	ug/l			<1	<1	<1	<1	<1	<1	<1
1.2-Dibromo-3-chloropropane	ug/l			<1	<1	<1	<1	<1	<1	<1
1.2.4-Trichlorobenzene	ug/l	0.4		<1	<1	<1	<1	<1	<1	<1
Naphthalene	ug/l	2		<1	<1	<1	<1	<1	<1	<1
1.2.3-Trichlorobenzene	ug/l	0.4		<1	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene	ug/l	0.6		<1	<1	<1	<1	<1	<1	<1

Appendix 5

Tabulated Soil Leachate Data

M4CAN
Leachate Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values & Assessment

EQS	Environmental Quality Standards
DWS	Drinking Water Standard
	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: chromium, copper, lead, nickel and zinc

Sample Reference	Units	Screening Criteria		No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	No. Data Exceeding EQS	No. Data Exceeding DWS
Specimen Depth (m)		EQS	DWS							
OD Level (m)										
Sample Type										
Geology Code										
Cluster Code										
2:1 Results										
Arsenic Dissolved	ug/l	50	10	10	6	12	0.164	BHM4CAN029 @ 1-1.6mbGL	0	1
Cadmium Dissolved	ug/l	0.15	5	10	0	None > LOD	None > LOD		0	0
Chromium Dissolved	ug/l		50	10	6	5.19	0.897	WSM4CAN012 @ 0.5mbGL		0
Copper Dissolved	ug/l	10	2000	15	10	17.4	1.22	WSM4CAN012 @ 0.5mbGL	1	0
Nickel Dissolved	ug/l	4	20	10	6	2.6	0.327	WSM4CAN012 @ 0.5mbGL	0	0
Lead Dissolved	ug/l	1.2	10	10	6	0.66	0.037	BHM4CAN029 @ 1-1.6mbGL	0	0
Mercury Dissolved	ug/l	0.07	1	6	2	3.5	0.0105	WSM4CAN012 @ 0.5mbGL	1	1
Selenium Dissolved	ug/l		10	10	4	1.84	0.716	WSM4CAN008 @ 0.2-0.6mbGL		0
Vanadium Dissolved	ug/l			6	6	140	1.8	WSM4CAN012 @ 0.5mbGL		
Zinc Dissolved	ug/l	75		15	12	23	0.477	CH39 @ 0mbGL	0	
pH	pH units	6-9	6.5-10	14	14	10.4	7.5	WSM4CAN012 @ 0.5mbGL	1	1
Conductivity uS/cm @25C	uS/cm			6	6	162	55.7	WSM4CAN012 @ 0.5mbGL		
Cyanide Free	mg/l			4	0	None > LOD	None > LOD			
Organics										
Pentachlorophenol	ug/l	0.4		5	0	None > LOD	None > LOD		0	
PCB- ARO	ug/l			5	0	None > LOD	None > LOD			
TPH FTIR	ug/l			5	2	4000	500	CH43 @ 0.2mbGL		
TPH GC	ug/l			5	0	None > LOD	None > LOD			
Cresols	ug/l			4	0	None > LOD	None > LOD			
Phenol	ug/l	7.7		4	0	None > LOD	None > LOD		0	
Phenols monohydric	ug/l			4	0	None > LOD	None > LOD			
Xylenols	ug/l			4	0	None > LOD	None > LOD			
PAHs - Speciated										
Acenaphthene	ug/l			6	2	0.0846	0.0419	WSM4CAN014 @ 0.5mbGL		
Acenaphthylene	ug/l			6	0	None > LOD	None > LOD			
Anthracene	ug/l	0.1		6	1	0.0246	0.0246	WSM4CAN014 @ 0.5mbGL	0	
Benzo(a)anthracene	ug/l			6	2	0.0278	0.0246	WSM4CAN014 @ 0.5mbGL		
Benzo(a)pyrene	ug/l	0.00017	0.01	6	2	0.0331	0.0209	WSM4CAN014 @ 0.5mbGL	2	2
Benzo(b)fluoranthene	ug/l	0.017	0.1	6	2	0.0608	0.035	WSM4CAN014 @ 0.5mbGL	2	0
Benzo(ghi)perylene	ug/l	0.0082	0.1	6	2	0.0484	0.0221	WSM4CAN014 @ 0.5mbGL	2	0
Benzo(k)fluoranthene	ug/l	0.017	0.1	6	0	None > LOD	None > LOD		0	0
Chrysene	ug/l			6	2	0.0381	0.027	WSM4CAN014 @ 0.5mbGL		
Dibenzo(ah)anthracene	ug/l			6	0	None > LOD	None > LOD			
Fluoranthene	ug/l	0.0063		6	3	0.171	0.0338	WSM4CAN014 @ 0.5mbGL	3	
Fluorene	ug/l			6	2	0.0329	0.0193	WSM4CAN014 @ 0.5mbGL		
Indeno(123cd)pyrene	ug/l	N/A	0.1	6	2	0.0328	0.0185	WSM4CAN014 @ 0.5mbGL	0	0
Naphthalene	ug/l	2		6	2	0.298	0.149	WSM4CAN014 @ 0.5mbGL	0	
Phenanthrene	ug/l			6	3	0.105	0.0295	WSM4CAN014 @ 0.5mbGL		
Pyrene	ug/l			6	3	0.112	0.0249	WSM4CAN014 @ 0.5mbGL		
PAH 16 Total	ug/l			6	2	1.07	0.36	WSM4CAN014 @ 0.5mbGL		
PCBs										
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	ug/l	0	0	5	2	0.031	0.0166	WSM4CAN014 @ 0.5mbGL	2	2
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	ug/l	0	0	5	0	None > LOD	None > LOD		0	0
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	ug/l	0	0	5	3	0.0693	0.0246	WSM4CAN014 @ 0.5mbGL	3	3
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	ug/l	0	0	5	0	None > LOD	None > LOD		0	0
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	ug/l	0	0	5	0	None > LOD	None > LOD		0	0
Pcb-156 2,3,3',4,4',5-Hexachlorobiphenyl	ug/l	0	0	5	0	None > LOD	None > LOD		0	0
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	ug/l	0	0	5	0	None > LOD	None > LOD		0	0
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0	5	0	None > LOD	None > LOD		0	0
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0	5	0	None > LOD	None > LOD		0	0
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	ug/l	0	0	5	0	None > LOD	None > LOD		0	0
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	ug/l	0	0	5	0	None > LOD	None > LOD		0	0
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	ug/l	0	0	5	0	None > LOD	None > LOD		0	0
SVOCs										
Phenols										
2-Chlorophenol	ug/l	50		2	0	None > LOD	None > LOD		0	
2-Methylphenol	ug/l	100		2	0	None > LOD	None > LOD		0	
2-Nitrophenol	ug/l			2	0	None > LOD	None > LOD			
2,4-Dichlorophenol	ug/l	20		2	0	None > LOD	None > LOD		0	
2,4-Dimethylphenol	ug/l			2	0	None > LOD	None > LOD			
2,4,5-Trichlorophenol	ug/l			2	0	None > LOD	None > LOD			
2,4,6-Trichlorophenol	ug/l			2	0	None > LOD	None > LOD			
4-Chloro-3-methylphenol	ug/l	40		2	0	None > LOD	None > LOD		0	
4-Methylphenol	ug/l	100		2	0	None > LOD	None > LOD		0	
4-Nitrophenol	ug/l			2	0	None > LOD	None > LOD			
Pentachlorophenol	ug/l	0.4		2	1	2.92	2.92	WSM4CAN012 @ 0.5mbGL	1	
Phenol	ug/l	7.7		2	0	None > LOD	None > LOD		0	
PAHs										
2-Chloronaphthalene	ug/l			2	0	None > LOD	None > LOD			
2-Methylnaphthalene	ug/l			2	0	None > LOD	None > LOD			
Acenaphthene	ug/l			2	0	None > LOD	None > LOD			
Acenaphthylene	ug/l			2	0	None > LOD	None > LOD			
Anthracene	ug/l	0.1		2	0	None > LOD	None > LOD		0	
Benzo(a)anthracene	ug/l			2	0	None > LOD	None > LOD			
Benzo(a)pyrene	ug/l	0.00017	0.01	2	0	None > LOD	None > LOD		0	0
Benzo(b)fluoranthene	ug/l	0.017	0.1	2	0	None > LOD	None > LOD		0	0
Benzo(ghi)perylene	ug/l	0.0082	0.1	2	0	None > LOD	None > LOD		0	0
Benzo(k)fluoranthene	ug/l	0.017	0.1	2	0	None > LOD	None > LOD		0	0
Chrysene	ug/l			2	0	None > LOD	None > LOD			
Dibenzo(ah)anthracene	ug/l			2	0	None > LOD	None > LOD			
Fluoranthene	ug/l	0.0063		2	0	None > LOD	None > LOD		0	
Fluorene	ug/l			2	0	None > LOD	None > LOD			
Indeno(1,2,3-cd)pyrene	ug/l		0.1	2	0	None > LOD	None > LOD			0
Naphthalene	ug/l	2		2	0	None > LOD	None > LOD		0	
Phenanthrene	ug/l			2	0	None > LOD	None > LOD			
Pyrene	ug/l			2	0	None > LOD	None > LOD			
Phthalates										
bis(2-Ethylhexyl)phthalate	ug/l	1.3		2	0	None > LOD	None > LOD		0	
Butylbenzyl phthalate	ug/l	20		2	0	None > LOD	None > LOD		0	
Di-n-butyl phthalate	ug/l	8		2	0	None > LOD	None > LOD		0	
Diethyl phthalate	ug/l	200		2	0	None > LOD	None > LOD		0	
Dimethyl phthalate	ug/l	800		2	0	None > LOD	None > LOD		0	

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Screening Values & Assessment

EQS	Environmental Quality Standards
DWS	Drinking Water Standard
	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: chromium, copper, lead, nickel and zinc

Sample Reference Specimen Depth (m) OD Level (m) Sample Type Geology Code Cluster Code	Units	Screening Criteria		No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	No. Data Exceeding EQS	No. Data Exceeding DWS
		EQS	DWS							
Di-N-Octyl Phthalate	ug/l	20		2	0	None > LOD	None > LOD		0	
Other SVOCs										
1,2-Dichlorobenzene	ug/l	20		2	0	None > LOD	None > LOD		0	
1,2,4-Trichlorobenzene	ug/l	0.4		2	0	None > LOD	None > LOD		0	
1,3-Dichlorobenzene	ug/l	20		2	0	None > LOD	None > LOD		0	
1,4-Dichlorobenzene	ug/l	20		2	0	None > LOD	None > LOD		0	
2-Nitroaniline	ug/l			2	0	None > LOD	None > LOD			
2,4-Dinitrotoluene	ug/l			2	0	None > LOD	None > LOD			
2,6-Dinitrotoluene	ug/l			2	0	None > LOD	None > LOD			
3-Nitroaniline	ug/l			2	0	None > LOD	None > LOD			
4-Bromophenylphenylether	ug/l			2	0	None > LOD	None > LOD			
4-Chloroaniline	ug/l			2	0	None > LOD	None > LOD			
4-Chlorophenylphenylether	ug/l			2	0	None > LOD	None > LOD			
4-Nitroaniline	ug/l			2	0	None > LOD	None > LOD			
Azobenzene	ug/l			2	0	None > LOD	None > LOD			
Bis(2-chloroethoxy)methane	ug/l			2	0	None > LOD	None > LOD			
bis(2-Chloroethyl)ether	ug/l			2	0	None > LOD	None > LOD			
Carbazole	ug/l			2	0	None > LOD	None > LOD			
Dibenzofuran	ug/l			2	0	None > LOD	None > LOD			
Hexachlorobenzene	ug/l	0.05		2	0	None > LOD	None > LOD		0	
Hexachlorobutadiene	ug/l	0.6		2	0	None > LOD	None > LOD		0	
Hexachlorocyclopentadiene	ug/l			2	0	None > LOD	None > LOD			
Hexachloroethane	ug/l			2	0	None > LOD	None > LOD			
Isophorone	ug/l			2	0	None > LOD	None > LOD			
N-nitrosodi-n-propylamine	ug/l			2	0	None > LOD	None > LOD			
Nitrobenzene	ug/l			2	0	None > LOD	None > LOD			
VOCs										
1,1,1,2-Tetrachloroethane	ug/l			2	0	None > LOD	None > LOD			
1,1,1-Trichloroethane	ug/l	100		2	0	None > LOD	None > LOD		0	
1,1,2-Trichloroethane	ug/l	400		2	0	None > LOD	None > LOD		0	
1,1-Dichloroethane	ug/l			2	0	None > LOD	None > LOD			
1,1-Dichloroethene	ug/l			2	0	None > LOD	None > LOD			
1,1-Dichloropropene	ug/l			2	0	None > LOD	None > LOD			
1,2,3-Trichlorobenzene	ug/l	0.4		2	0	None > LOD	None > LOD		0	
1,2,3-Trichloropropane	ug/l			2	0	None > LOD	None > LOD			
1,2,4-Trichlorobenzene	ug/l	0.4		2	0	None > LOD	None > LOD		0	
1,2,4-Trimethylbenzene	ug/l			2	0	None > LOD	None > LOD			
1,2-Dibromo-3-Chloropropane	ug/l			2	0	None > LOD	None > LOD			
1,2-Dibromoethane	ug/l			2	0	None > LOD	None > LOD			
1,2-Dichlorobenzene	ug/l	20		2	0	None > LOD	None > LOD		0	
1,2-Dichloroethane	ug/l	10	3	2	0	None > LOD	None > LOD		0	0
1,2-Dichloropropane	ug/l			2	0	None > LOD	None > LOD			
1,3,5-Trichlorobenzene	ug/l	0.4		2	0	None > LOD	None > LOD		0	
1,3,5-Trimethylbenzene	ug/l			2	0	None > LOD	None > LOD			
1,3-Dichlorobenzene	ug/l	20		2	0	None > LOD	None > LOD		0	
1,3-Dichloropropane	ug/l			2	0	None > LOD	None > LOD			
1,4-Dichlorobenzene	ug/l	20		2	0	None > LOD	None > LOD		0	
2-Chlorotoluene	ug/l			2	0	None > LOD	None > LOD			
4-Chlorotoluene	ug/l			2	0	None > LOD	None > LOD			
4-Isopropyltoluene	ug/l			2	0	None > LOD	None > LOD			
Benzene	ug/l	10	1	2	1	1.13	1.13	WSM4CAN012 @ 0.5mbGL	0	1
Bromobenzene	ug/l			2	0	None > LOD	None > LOD			
Bromochloromethane	ug/l		100	2	0	None > LOD	None > LOD			0
Bromodichloromethane	ug/l			2	0	None > LOD	None > LOD			
Bromoform	ug/l			2	0	None > LOD	None > LOD			
Bromomethane	ug/l			2	0	None > LOD	None > LOD			
Carbon Disulphide	ug/l			2	0	None > LOD	None > LOD			
Carbontetrachloride	ug/l	12	3	2	0	None > LOD	None > LOD		0	0
Chlorobenzene	ug/l			2	0	None > LOD	None > LOD			
Chloroethane	ug/l			2	0	None > LOD	None > LOD			
Chloroform	ug/l	2.5	100	2	0	None > LOD	None > LOD		0	0
Chloromethane	ug/l			2	0	None > LOD	None > LOD			
cis-1,2-Dichloroethene	ug/l			2	0	None > LOD	None > LOD			
cis-1,3-Dichloropropene	ug/l			2	0	None > LOD	None > LOD			
Dibromochloromethane	ug/l		100	2	0	None > LOD	None > LOD			0
Dibromomethane	ug/l			2	0	None > LOD	None > LOD			
Dichlorodifluoromethane	ug/l			2	0	None > LOD	None > LOD			
Dichloromethane	ug/l	20		2	0	None > LOD	None > LOD		0	
Ethylbenzene	ug/l	20		2	0	None > LOD	None > LOD		0	
Hexachlorobutadiene (HCBD)	ug/l	0.6		2	0	None > LOD	None > LOD		0	
Isopropylbenzene	ug/l			2	0	None > LOD	None > LOD			
m,p xylenes	ug/l	30		2	0	None > LOD	None > LOD		0	
Methyl tert-butyl ether (MTBE)	ug/l			2	0	None > LOD	None > LOD			
Naphthalene	ug/l	2		2	0	None > LOD	None > LOD		0	
n-Butylbenzene	ug/l			2	0	None > LOD	None > LOD			
O-Xylene	ug/l	30		2	0	None > LOD	None > LOD		0	
Propylbenzene	ug/l			2	0	None > LOD	None > LOD			
Sec-Butylbenzene	ug/l			2	0	None > LOD	None > LOD			
Styrene	ug/l	50		2	0	None > LOD	None > LOD		0	
tert-Amyl methyl ether	ug/l			2	0	None > LOD	None > LOD			
Tert-Butylbenzene	ug/l			2	0	None > LOD	None > LOD			
Tetrachloroethene	ug/l	10	10	2	0	None > LOD	None > LOD		0	0
Toluene	ug/l	50		2	0	None > LOD	None > LOD		0	
trans-1,2-Dichloroethene	ug/l			2	0	None > LOD	None > LOD			
trans-1,3-Dichloropropene	ug/l			2	0	None > LOD	None > LOD			
Trichloroethene	ug/l	10	10	2	0	None > LOD	None > LOD		0	0
Trichlorofluoromethane	ug/l			2	0	None > LOD	None > LOD			
Vinyl Chloride	ug/l	0	0.5	2	0	None > LOD	None > LOD		0	0

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Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Geological Formation Legend

Made Ground	MG

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Sample Reference	Units	Screening Criteria		CH36	CH38	CH39	CH43	CH47	TP03	TP04	TP05	TP06	BHM4CAN029	BHM4CANA022	WSM4CAN008	WSM4CAN011	WSM4CAN012	WSM4CAN014
Specimen Depth (m)				0.1	0.1	0	0.2	0.1	0.1-0.2	0.3-0.4	0.6-0.7	0.1-0.3	1-1.6	0-0.2	0.2-0.6	0.5	0.5	0.5
OD Level (m)				6.92	7.25	7.26	7.29	7.35					5.84-5.24	6.82-6.62	7.16-6.76	6.66	6.7	7.2
Sample Type				D	D	D	D	D					ES	ES	ES	ES	ES	ES
Geology Code				MG	MG	MG	MG	MG					MG	MG	MG	MG	MG	MG
Cluster Code		**EQS**	**DWS**	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2008 GI	2008 GI	2008 GI	2008 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI
2:1 Results																		
Arsenic Dissolved	ug/l	50	10						<10	<10	<10	<10	12	4.4	1.03	0.164	3.71	2.68
Cadmium Dissolved	ug/l	0.15	5						**<0.5**	**<0.5**	**<0.5**	**<0.5**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chromium Dissolved	ug/l		50						<10	<10	<10	<10	0.897	1.28	3.94	1.46	5.19	2.01
Copper Dissolved	ug/l	10	2000	3	3	7	4	3	**<25**	**<25**	**<25**	**<25**	1.61	<0.85	1.22	1.84	17.4	2.52
Nickel Dissolved	ug/l	4	20						**<5**	**<5**	**<5**	**<5**	0.327	0.366	0.606	1.46	2.6	0.768
Lead Dissolved	ug/l	1.2	10						**<10**	**<10**	**<10**	**<10**	0.66	0.06	0.037	0.26	0.26	0.195
Mercury Dissolved	ug/l	0.07	1										<0.01	<0.01	<0.01	0.0105	3.5	<0.01
Selenium Dissolved	ug/l		10						**<5**	**<5**	**<5**	**<5**	<0.39	1.01	1.84	<0.39	0.716	0.982
Vanadium Dissolved	ug/l												12.4	11.9	3.47	1.8	140	5.61
Zinc Dissolved	ug/l	75		8	16	23	6	10	<10	12	<10	<10	1.3	0.477	0.762	3.17	0.942	1.98
pH	pH units	6-9	6.5-10	7.9	7.8	7.9	8.8	8.6	7.8	7.5	7.8	7.9	8.77	8.59	8.1	7.56	10.4	
Conductivity uS/cm @25C	uS/cm												99.4	94.8	124	55.7	162	110
Cyanide Free	mg/l												<0.05		<0.05	<0.05	<0.05	
Organics																		
Pentachlorophenol	ug/l	0.4		**<50**	**<50**	**<50**	**<83**	**<50**										
PCB- ARO	ug/l			<0.8	<0.8	<1	<2	<0.9										
TPH FTIR	ug/l			500	<300	<300	4000	<200										
TPH GC	ug/l			IS	IS	IS	<200	<200										
Cresols	ug/l												<6		<6	<6	<6	
Phenol	ug/l	7.7											<2		<2	<2	<2	
Phenols monohydric	ug/l												<16		<16	<16	<16	
Xylenols	ug/l												<8		<8	<8	<8	
PAHs - Speciated																		
Acenaphthene	ug/l												<0.015	<0.015	<0.015	<0.015	0.0419	0.0846
Acenaphthylene	ug/l												<0.011	<0.011	<0.011	<0.011	<0.011	<0.011
Anthracene	ug/l	0.1											<0.015	<0.015	<0.015	<0.015	<0.015	0.0246
Benzo(a)anthracene	ug/l												<0.017	<0.017	<0.017	0.0246	<0.017	0.0278
Benzo(a)pyrene	ug/l	0.00017	0.01										<0.009	<0.009	<0.009	0.0209	<0.009	0.0331
Benzo(b)fluoranthene	ug/l	0.017	0.1										<0.023	<0.023	<0.023	0.035	<0.023	0.0608
Benzo(ghi)perylene	ug/l	0.0082	0.1										<0.016	<0.016	<0.016	0.0221	<0.016	0.0484
Benzo(k)fluoranthene	ug/l	0.017	0.1										<0.027	<0.027	<0.027	<0.027	<0.027	<0.027
Chrysene	ug/l												<0.013	<0.013	<0.013	0.027	<0.013	0.0381
Dibenzo(ah)anthracene	ug/l												<0.016	<0.016	<0.016	<0.016	<0.016	<0.016
Fluoranthene	ug/l	0.0063											<0.017	<0.017	<0.017	0.0636	0.0338	0.171
Fluorene	ug/l												<0.014	<0.014	<0.014	<0.014	0.0193	0.0329
Indeno(123cd)pyrene	ug/l	N/A	0.1										<0.014	<0.014	<0.014	0.0185	<0.014	0.0328
Naphthalene	ug/l	2											<0.1	<0.1	<0.1	<0.1	0.149	0.298
Phenanthrene	ug/l												<0.022	<0.022	<0.022	0.0295	0.0912	0.105
Pyrene	ug/l												<0.015	<0.015	<0.015	0.0511	0.0249	0.112
PAH 16 Total	ug/l												<0.344	<0.344	<0.344	<0.344	0.36	1.07
PCBs																		
Pcb-105 2,3,3',4,4'-Pentachlorobiphenyl	ug/l	0	0										<0.015	<0.015	<0.015		0.0166	0.031
Pcb-114 2,3,4,4',5-Pentachlorobiphenyl	ug/l	0	0										<0.015	<0.015	<0.015		<0.015	<0.015
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	ug/l	0	0										<0.015	0.0246	<0.015		0.0325	0.0693
Pcb-123 2,3',4,4',5'-Pentachlorobiphenyl	ug/l	0	0										<0.015	<0.015	<0.015		<0.015	<0.015
Pcb-126 3,3',4,4',5-Pentachlorobiphenyl	ug/l	0	0										<0.015	<0.015	<0.015		<0.015	<0.015

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Environmental Quality Standards	EQS
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Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Geological Formation Legend

Made Ground	MG

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Sample Reference	Units	Screening Criteria		CH36	CH38	CH39	CH43	CH47	TP03	TP04	TP05	TP06	BHM4CAN029	BHM4CANA022	WSM4CAN008	WSM4CAN011	WSM4CAN012	WSM4CAN014
Specimen Depth (m)				0.1	0.1	0	0.2	0.1	0.1-0.2	0.3-0.4	0.6-0.7	0.1-0.3	1-1.6	0-0.2	0.2-0.6	0.5	0.5	0.5
OD Level (m)				6.92	7.25	7.26	7.29	7.35					5.84-5.24	6.82-6.62	7.16-6.76	6.66	6.7	7.2
Sample Type				D	D	D	D	D					ES	ES	ES	ES	ES	ES
Geology Code				MG	MG	MG	MG	MG					MG	MG	MG	MG	MG	MG
Cluster Code		**EQS**	**DWS**	2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2008 GI	2008 GI	2008 GI	2008 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI
Pcb-156 2,3,3',4,4',5-Hexachlorobiphenyl	ug/l	0	0										<0.015	<0.015	<0.015		<0.015	<0.015
Pcb-157 2,3,3',4,4',5'-Hexachlorobiphenyl	ug/l	0	0										<0.015	<0.015	<0.015		<0.015	<0.015
Pcb-167 2,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0										<0.015	<0.015	<0.015		<0.015	<0.015
Pcb-169 3,3',4,4',5,5'-Hexachlorobiphenyl	ug/l	0	0										<0.015	<0.015	<0.015		<0.015	<0.015
Pcb-189 2,3,3',4,4',5,5'-Heptachlorobiphenyl	ug/l	0	0										<0.015	<0.015	<0.015		<0.015	<0.015
Pcb-77 3,3',4,4'-Tetrachlorobiphenyl	ug/l	0	0										<0.015	<0.015	<0.015		<0.015	<0.015
Pcb-81 3,4,4',5-Tetrachlorobiphenyl	ug/l	0	0										<0.015	<0.015	<0.015		<0.015	<0.015
SVOCs																		
Phenols																		
2-Chlorophenol	ug/l	50													<1		<1	
2-Methylphenol	ug/l	100													<1		<1	
2-Nitrophenol	ug/l														<1		<1	
2,4-Dichlorophenol	ug/l	20													<1		<1	
2,4-Dimethylphenol	ug/l														<1		<1	
2,4,5-Trichlorophenol	ug/l														<1		<1	
2,4,6-Trichlorophenol	ug/l														<1		<1	
4-Chloro-3-methylphenol	ug/l	40													<1		<1	
4-Methylphenol	ug/l	100													<1		<1	
4-Nitrophenol	ug/l														<1		<1	
Pentachlorophenol	ug/l	0.4													<1		2.92	
Phenol	ug/l	7.7													<1		<1	
PAHs																		
2-Chloronaphthalene	ug/l														<1		<1	
2-Methylnaphthalene	ug/l														<1		<1	
Acenaphthene	ug/l														<1		<1	
Acenaphthylene	ug/l														<1		<1	
Anthracene	ug/l	0.1													<1		<1	
Benzo(a)anthracene	ug/l														<1		<1	
Benzo(a)pyrene	ug/l	0.00017	0.01												<1		<1	
Benzo(b)fluoranthene	ug/l	0.017	0.1												<1		<1	
Benzo(ghi)perylene	ug/l	0.0082	0.1												<1		<1	
Benzo(k)fluoranthene	ug/l	0.017	0.1												<1		<1	
Chrysene	ug/l														<1		<1	
Dibenzo(ah)anthracene	ug/l														<1		<1	
Fluoranthene	ug/l	0.0063													<1		<1	
Fluorene	ug/l														<1		<1	
Indeno(1,2,3-cd)pyrene	ug/l		0.1												<1		<1	
Naphthalene	ug/l	2													<1		<1	
Phenanthrene	ug/l														<1		<1	
Pyrene	ug/l														<1		<1	
Phthalates																		
bis(2-Ethylhexyl)phthalate	ug/l	1.3													<2		<2	
Butylbenzyl phthalate	ug/l	20													<1		<1	
Di-n-butyl phthalate	ug/l	8													<1		<1	
Diethyl phthalate	ug/l	200													<1		<1	
Dimethyl phthalate	ug/l	800													<1		<1	
Di-N-Octyl Phthalate	ug/l	20													<5		<5	

M4CAN
Leachate Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Geological Formation Legend

Made Ground	MG

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Sample Reference	Units	Screening Criteria		CH36	CH38	CH39	CH43	CH47	TP03	TP04	TP05	TP06	BHM4CAN029	BHM4CANA022	WSM4CAN008	WSM4CAN011	WSM4CAN012	WSM4CAN014
Specimen Depth (m)				0.1	0.1	0	0.2	0.1	0.1-0.2	0.3-0.4	0.6-0.7	0.1-0.3	1-1.6	0-0.2	0.2-0.6	0.5	0.5	0.5
OD Level (m)				6.92	7.25	7.26	7.29	7.35					5.84-5.24	6.82-6.62	7.16-6.76	6.66	6.7	7.2
Sample Type				D	D	D	D	D					ES	ES	ES	ES	ES	ES
Geology Code		EQS	DWS	MG	MG	MG	MG	MG					MG	MG	MG	MG	MG	MG
Cluster Code				2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2008 GI	2008 GI	2008 GI	2008 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI
Other SVOCs																		
1,2-Dichlorobenzene	ug/l	20													<1		<1	
1,2,4-Trichlorobenzene	ug/l	0.4													<1		<1	
1,3-Dichlorobenzene	ug/l	20													<1		<1	
1,4-Dichlorobenzene	ug/l	20													<1		<1	
2-Nitroaniline	ug/l														<1		<1	
2,4-Dinitrotoluene	ug/l														<1		<1	
2,6-Dinitrotoluene	ug/l														<1		<1	
3-Nitroaniline	ug/l														<1		<1	
4-Bromophenylphenylether	ug/l														<1		<1	
4-Chloroaniline	ug/l														<1		<1	
4-Chlorophenylphenylether	ug/l														<1		<1	
4-Nitroaniline	ug/l														<1		<1	
Azobenzene	ug/l														<1		<1	
Bis(2-chloroethoxy)methane	ug/l														<1		<1	
bis(2-Chloroethyl)ether	ug/l														<1		<1	
Carbazole	ug/l														<1		<1	
Dibenzofuran	ug/l														<1		<1	
Hexachlorobenzene	ug/l	0.05													<1		<1	
Hexachlorobutadiene	ug/l	0.6													<1		<1	
Hexachlorocyclopentadiene	ug/l														<1		<1	
Hexachloroethane	ug/l														<1		<1	
Isophorone	ug/l														<1		<1	
N-nitrosodi-n-propylamine	ug/l														<1		<1	
Nitrobenzene	ug/l														<1		<1	
VOCs																		
1,1,1,2-Tetrachloroethane	ug/l														<1		<1	
1,1,1-Trichloroethane	ug/l	100													<1		<1	
1,1,2-Trichloroethane	ug/l	400													<1		<1	
1,1-Dichloroethane	ug/l														<1		<1	
1,1-Dichloroethene	ug/l														<1		<1	
1,1-Dichloropropene	ug/l														<1		<1	
1,2,3-Trichlorobenzene	ug/l	0.4													<1		<1	
1,2,3-Trichloropropane	ug/l														<1		<1	
1,2,4-Trichlorobenzene	ug/l	0.4													<1		<1	
1,2,4-Trimethylbenzene	ug/l														<1		<1	
1,2-Dibromo-3-Chloropropane	ug/l														<1		<1	
1,2-Dibromoethane	ug/l														<1		<1	
1,2-Dichlorobenzene	ug/l	20													<1		<1	
1,2-Dichloroethane	ug/l	10	3												<1		<1	
1,2-Dichloropropane	ug/l														<1		<1	
1,3,5-Trichlorobenzene	ug/l	0.4													<1		<1	
1,3,5-Trimethylbenzene	ug/l														<1		<1	
1,3-Dichlorobenzene	ug/l	20													<1		<1	
1,3-Dichloropropane	ug/l														<1		<1	
1,4-Dichlorobenzene	ug/l	20													<1		<1	
2-Chlorotoluene	ug/l														<1		<1	

M4CAN
Leachate Sample Analysis & Screening Assessment
CL-17
27/06/2016

Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Geological Formation Legend

Made Ground	MG

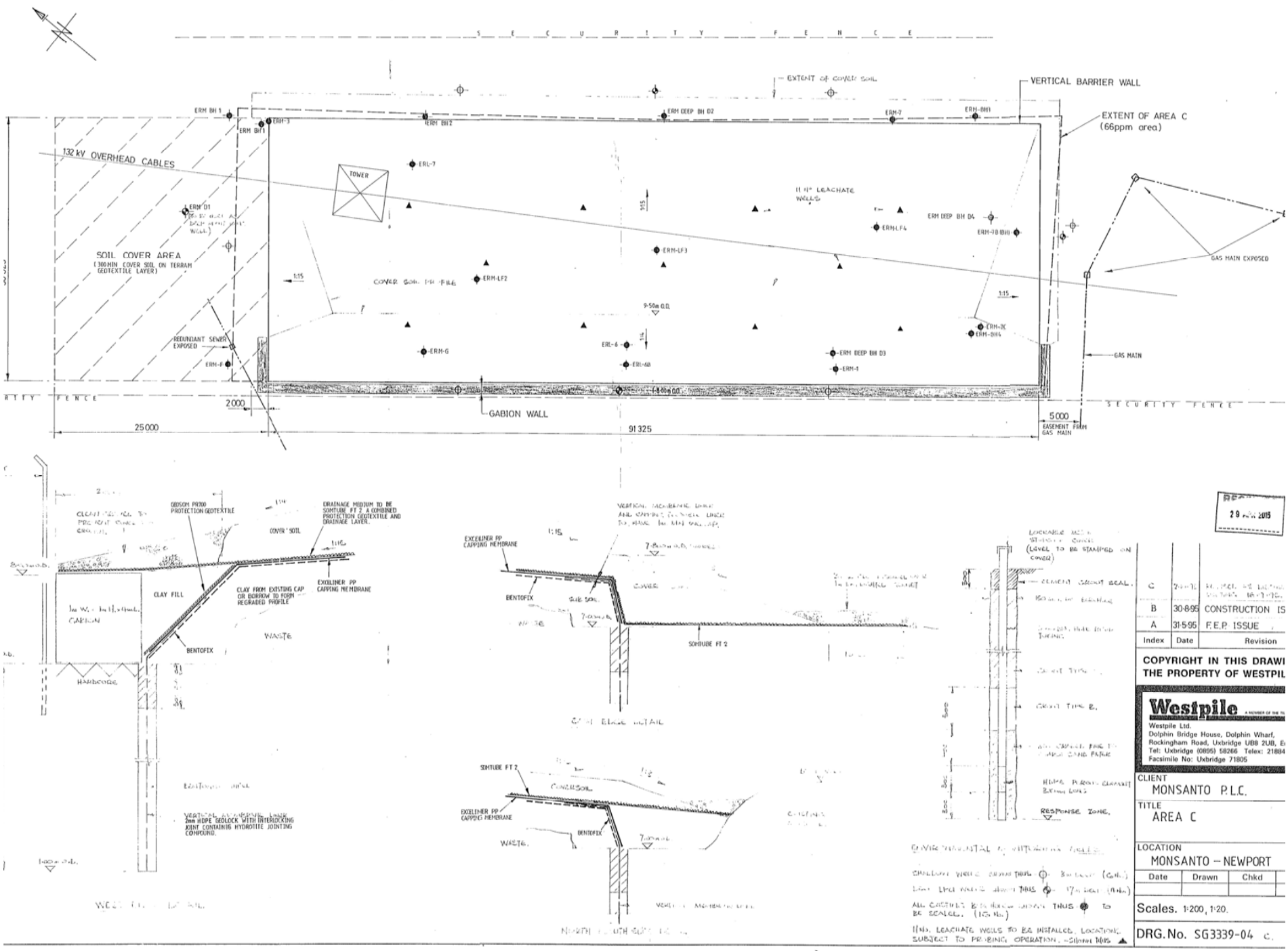
Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: Cr, Cu, Pb, Ni & Zn

Sample Reference	Units	Screening Criteria		CH36	CH38	CH39	CH43	CH47	TP03	TP04	TP05	TP06	BHM4CAN029	BHM4CANA022	WSM4CAN008	WSM4CAN011	WSM4CAN012	WSM4CAN014
Specimen Depth (m)				0.1	0.1	0	0.2	0.1	0.1-0.2	0.3-0.4	0.6-0.7	0.1-0.3	1-1.6	0-0.2	0.2-0.6	0.5	0.5	0.5
OD Level (m)				6.92	7.25	7.26	7.29	7.35					5.84-5.24	6.82-6.62	7.16-6.76	6.66	6.7	7.2
Sample Type				D	D	D	D	D					ES	ES	ES	ES	ES	ES
Geology Code		EQS	DWS	MG	MG	MG	MG	MG					MG	MG	MG	MG	MG	MG
Cluster Code				2000 GI	2000 GI	2000 GI	2000 GI	2000 GI	2008 GI	2008 GI	2008 GI	2008 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI	2016 GI
4-Chlorotoluene	ug/l														<1		<1	
4-Isopropyltoluene	ug/l														<1		<1	
Benzene	ug/l	10	1												<1		1.13	
Bromobenzene	ug/l														<1		<1	
Bromochloromethane	ug/l		100												<1		<1	
Bromodichloromethane	ug/l														<1		<1	
Bromoform	ug/l														<1		<1	
Bromomethane	ug/l														<1		<1	
Carbon Disulphide	ug/l														<1		<1	
Carbontetrachloride	ug/l	12	3												<1		<1	
Chlorobenzene	ug/l														<1		<1	
Chloroethane	ug/l														<1		<1	
Chloroform	ug/l	2.5	100												<1		<1	
Chloromethane	ug/l														<1		<1	
cis-1,2-Dichloroethene	ug/l														<1		<1	
cis-1,3-Dichloropropene	ug/l														<1		<1	
Dibromochloromethane	ug/l		100												<1		<1	
Dibromomethane	ug/l														<1		<1	
Dichlorodifluoromethane	ug/l														<1		<1	
Dichloromethane	ug/l	20													<1		<1	
Ethylbenzene	ug/l	20													<1		<1	
Hexachlorobutadiene (HCBD)	ug/l	0.6													<1		<1	
Isopropylbenzene	ug/l														<1		<1	
m,p xylenes	ug/l	30													<1		<1	
Methyl tert-butyl ether (MTBE)	ug/l														<1		<1	
Naphthalene	ug/l	2													<1		<1	
n-Butylbenzene	ug/l														<1		<1	
O-Xylene	ug/l	30													<1		<1	
Propylbenzene	ug/l														<1		<1	
Sec-Butylbenzene	ug/l														<1		<1	
Styrene	ug/l	50													<1		<1	
tert-Amyl methyl ether	ug/l														<1		<1	
Tert-Butylbenzene	ug/l														<1		<1	
Tetrachloroethene	ug/l	10	10												<1		<1	
Toluene	ug/l	50													<1		<1	
trans-1,2-Dichloroethene	ug/l														<1		<1	
trans-1,3-Dichloropropene	ug/l														<1		<1	
Trichloroethene	ug/l	10	10												<1		<1	
Trichlorofluoromethane	ug/l														<1		<1	
Vinyl Chloride	ug/l	0	0.5												<1		<1	

Appendix 6

Plan and layout of PCB Cell



Index	Date	Revision
C	[illegible]	[illegible]
B	30-8-95	CONSTRUCTION IS
A	31-5-95	F.E.P. ISSUE

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CLIENT
MONSANTO P.L.C.

TITLE
AREA C

LOCATION
MONSANTO – NEWPORT

Date	Drawn	Chkd

Scales. 1:200, 1:20.

DRG.No. SG3339-04 C.

Appendix 7

Site Walkover Photographs

Plate 01: CL17 ï Solutia operational site ï east facing . 27th August 2015.

Plate 02: CL17 ï Solutia operational site ï north facing. 27th August 2015.

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: July 2016

Plate 03: CL17. 27th August 2015.

Plate 04: CL17. 27th August 2015.

Plate 05: CL17 ï Waste storage area (scrap metal) ï south west of the operational site. 27th August 2015.

Plate 06: CL17. 27th August 2015.

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Daleuly 2016

Plate 07: CL17. 27th August 2015.

Plate 08: CL17. 27th August 2015.

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: July 2016

Plate 09: CL17 ï Hydrogen storage. 27th August 2015.

Plate 10: CL17 ï Hydrogen storage. 27th August 2015.

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: July 2016

Plate 11: CL17 ï Waste water treatment . 27th August 2015.

Plate 12: CL17. 27th August 2015.

Plate 13: CL17. 27th August 2015.

Plate 14: CL17 ï Storage area. 27th August 2015.

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: July 2016

Plate 15: CL17 ï PCB Cell ï South west of operational site . 27th August 2015.

Plate 16: CL17 ï PCB Cell. 27th August 2015.

Client:	Welsh Government		
Project:	M4CaN		
Job Ref:	JER6591	Checked By:	Date: July 2016

Plate 17: CL17 ï PCB Cell. 27th August 2015.

Plate 18: CL17 ï PCB Cell. 15th July 2015.

Appendix 8

Relevant Extracts of Additional Environmental Data

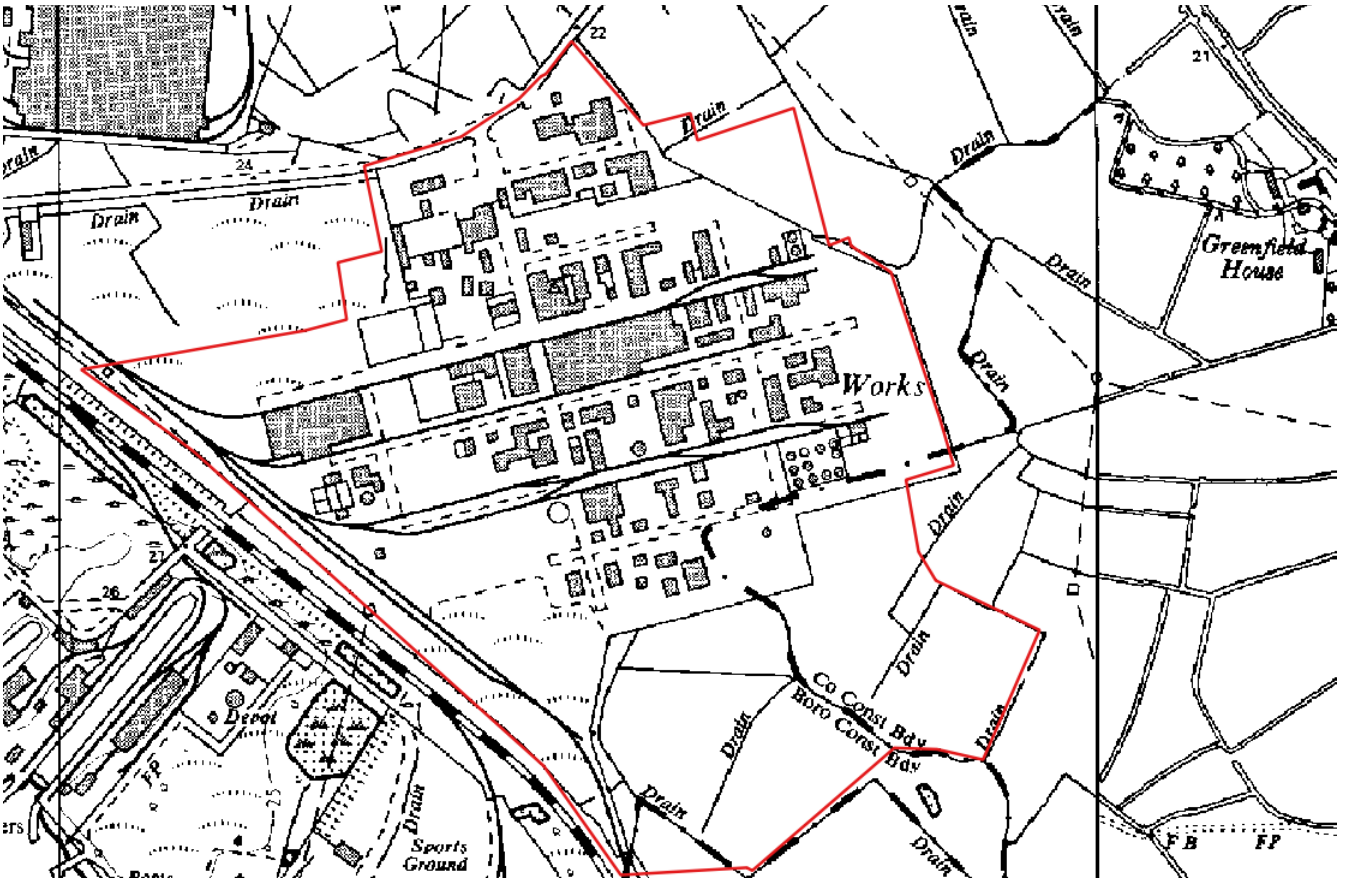
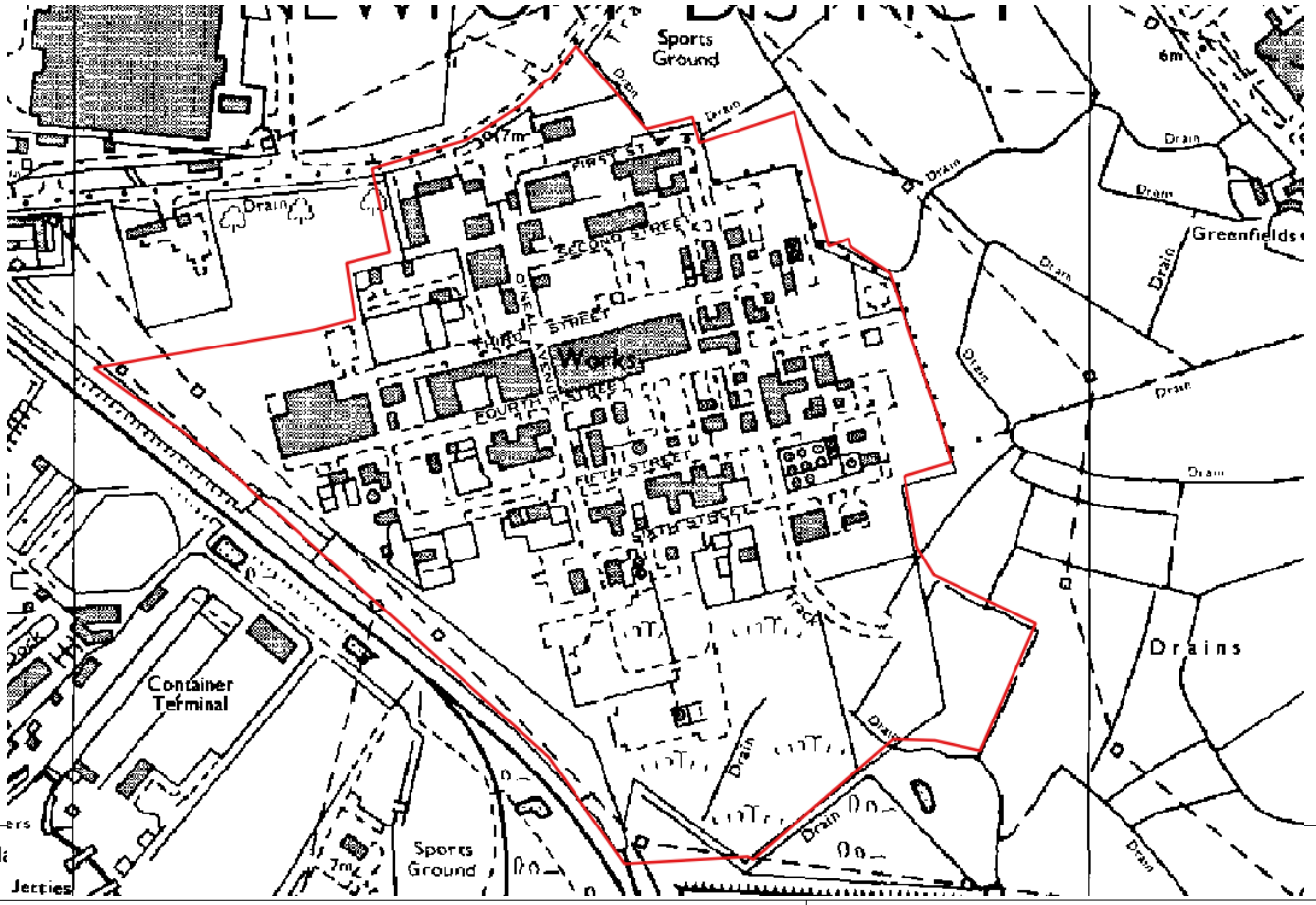


Plate 01: Extract of 1964-65 Ordnance Survey 1:10,560 scale map



Pla

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591
Checked By:	
Date:	Oct 2015

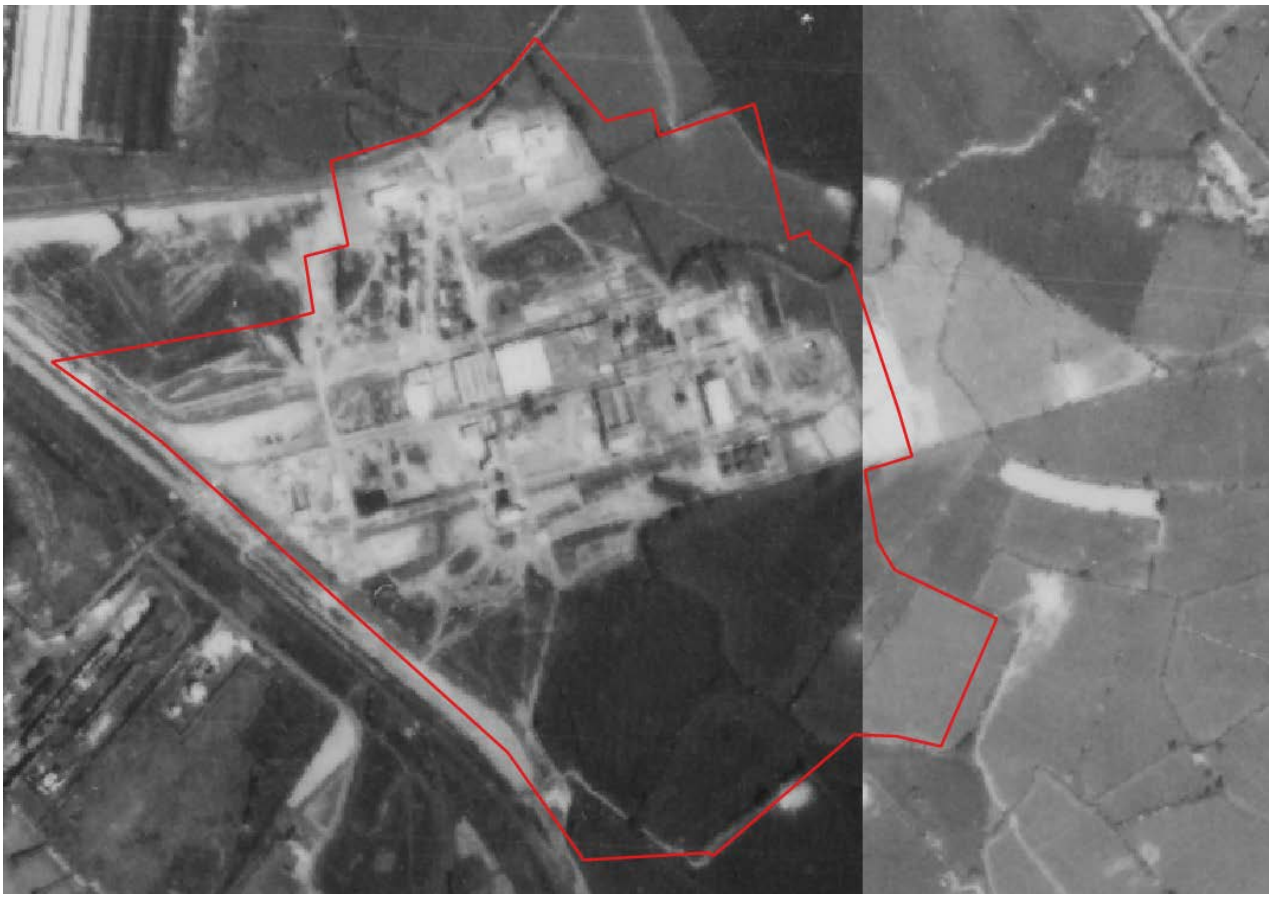


Plate 03: Extract of 1949 Aerial Photograph

Plate 04: Extract of 1971 Aerial Photograph

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: Oct 2015

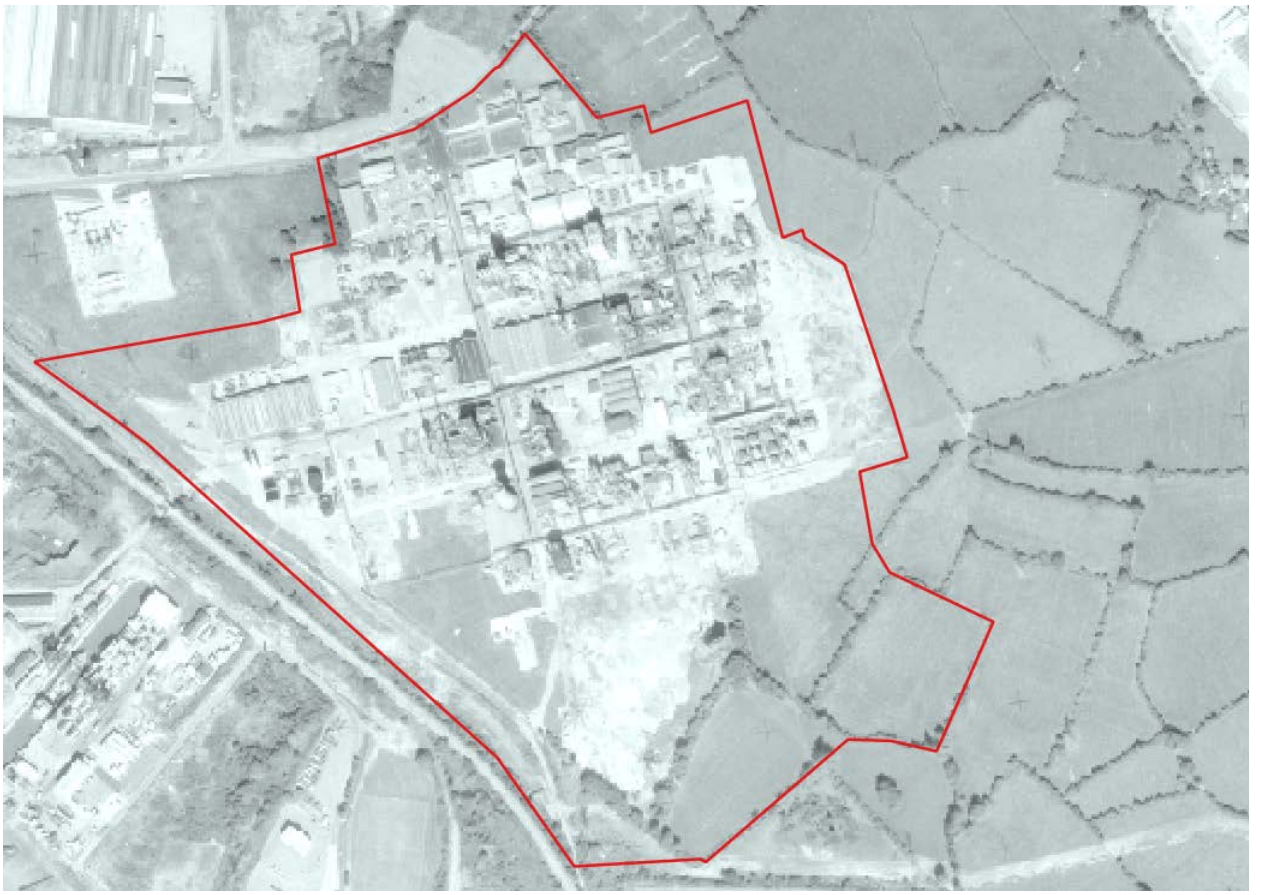


Plate 05: Extract of 1979 Aerial Photograph

Plate 06: Extract of 1991 Aerial Photograph showing the position of a tank in the southern area of the Site.

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: Oct 2015

Plate 07: Extract of 2006 Aerial Photograph showing extension of works area in the south east.

Plate 08: Extract of 2009/10 Aerial Photograph.

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: Oct 2015

Plate 09: Extract of 2014 High Resolution Aerial Photograph

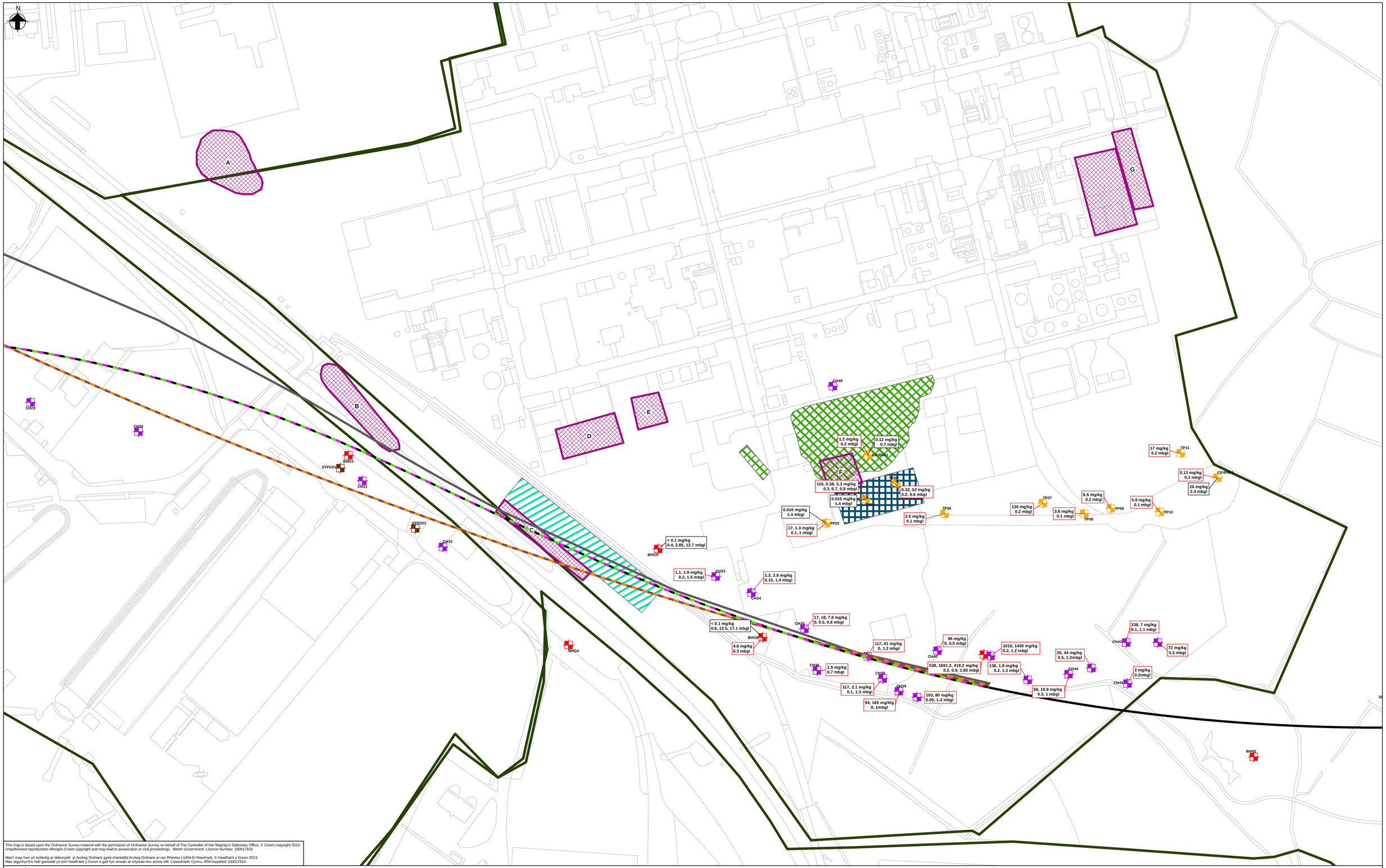
Plate 0:

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: Oct 2015

Appendix 9

PSSR Figure showing Historical Disposal Areas / Infilled Ground

A1



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Legend

- Site Boundary
- Option 1 - Black Route High (without Junction)
- Option 2 - Black Route High
- Option 3 - Black Route Low
- Option 4 - ABP Route High (without Junction)
- Option 5 - ABP Route Low
- Option 6 - Black Route North Shift Low
- On-site Disposal Areas - as per Arup 1996 report figure 2
- Option B1, B2, B3
- Options B4, B5
- Option B6
- Sections A and C

EA Pollution Incidents

- Category 2 (Significant)
- Category 3 (Minor)
- Category 4 (No Impact)

Ground Investigations

- 1997 Norwest Holst
- 2000 (May) Exploration Associates
- 2007 Norwest Holst
- 2008

- PCB results recorded above the 0.24mgkg screening level
- Approximate location of buried disposal cell
- Approximate location of disposal area for hazardous substances
- Approximate location of historic infilled ground WSP

Issue	Date	By	Chkd	Appd
F1	2014-03-21	EB	AL	SH
For Issue				

Client

Llywodraeth Cymru
Welsh Government

Transport
Department for Economy, Science and Transport
Welsh Government
Cathays Park
Cardiff
CF10 3NQ

Trafnidiaeth
Adran Economi, Gwyddoniaeth a Thrafnidiaeth
Llywodraeth Cymru
Parc Cathays
Caerdydd
CF10 3NQ

Job Title

M4 Corridor Around Newport

Coridor yr M4 o amgylch Casnewydd

Metres
0 15 30 60

Scale at A3
1:1,300

ARUP

4 Pierhead Street, Capital Waterside
Cardiff, CF10 4QP
T +44(0)29 20473727 F +44(0)29 20472277
www.arup.com

Drawing Title

Figure 3
Solutia PCB Levels

Job No	Drawing Status
117300-01	**For Issue**

Drawing No	Issue
M4-OA-01-00-DR-Z-XX-0078	**F1**

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\\gbsfs\Arup\pe\Cardiff\Jobs\117000\117300-01\4 Internal Project Data\4-80 GIS\4-84 Map Documents\GEO_Geotechnics\Desk Studies - site plan.mxd

Welsh Government

M4 Corridor around Newport

Environmental Statement Supplement
Land Contamination Assessment Report Annex D
CL-18 River Usk Pier Location

M4CaN-DJV-EGT-ZG_GEN-RP-EN-0016

At Issue | September 2016

CVJV/AAR
3rd Floor
Longross Court,
47 Newport Road,
Cardiff
CF24 0AD

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Figure 2 Conceptual Site Model

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Appendix 1 Exploratory Records
Appendix 2 Gas and Groundwater Monitoring Dataset
Appendix 3 Soil Laboratory Data
Appendix 4 Groundwater Laboratory Data

Appendix 5 Soil Leachate Laboratory Data
Appendix 6 Relevant Extract of Additional Environmental Data

1 Introduction

1.1 Background

1.1.1 This report relates to an area of land potentially affected by contamination (CL-18) known as 'River Usk Pier Location' hereafter referred to as the 'Site'.

1.1.2 The Site is located between chainage 10,200 and 10,550 (shown in Figure 1), upon mudflats within the tidal range of the River Usk on its eastern bank.

1.2 Reporting Context

1.2.1 The Site has been assessed as part of ground investigations and monitoring associated with the wider works for the M4 Corridor around Newport (M4CaN) (hereafter referred to as the 'Scheme') and informs the baseline for the environmental impact assessment (EIA) for the Scheme. The EIA is reported in the M4CaN Environmental Statement (ES) published in March 2016 and the Land Contamination Assessment Reports formed an annex to Appendix 11.1 of the chapter on Geology and Soils.

1.2.2 A subsequent phase of investigation has been undertaken since the publication of the March 2016 ES. The additional data, herein referred to as the 2016 Additional Ground Investigation, have been incorporated into the summary tables, risk assessment, conceptual site model and associated text of this report where relevant. The conclusions and recommendations have also been refined to reflect the improved understanding of status of the site and associated risk. Therefore this report replaces the original CL-18 report published in Appendix 11.1 of the March 2016 ES.

1.2.3 In 2014, a Preliminary Sources Study Report (PSSR) was prepared as an initial land contamination appraisal (Ove Arup & Partners, 2014) as part of Design Manual for Roads and Bridges (DMRB) Stage 2 Assessments for a number of potential route options. This identified a number of individual areas that may have been affected by contamination as a result of historical activities at the Site. In addition, this report draws upon the 2015 Supplementary Ground Investigation report on behalf of the Welsh Government (Geotechnical Engineering, 2015) and the 2016 Additional Ground Investigation. This report relates to the area defined on the Site Plan Figure 1.

1.2.4 The overarching rationale and approach for the assessment of areas of land along the proposed new section of motorway with potential contamination is detailed in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES).

1.3 Objectives

1.3.1 The key objectives of this report are set out below.

- Undertake a risk assessment of the Site and determine whether potential risks to human health or controlled waters could exist based upon the Scheme.

- Identify the need for further assessment and investigation in order to refine potential land contamination risks and inform the need for remediation/mitigation.
- To provide the information required under DMRB HD22/08 (Highways Agency, 2008).

1.4 Report Structure

1.4.1 The subsequent report structure is as follows.

- Section 2: Site Location and Description.
- Section 3: The Scheme – This section details the new section of motorway alignment and associated features at the Site.
- Section 4: Site History – This section summarises the history of the Site based on historical maps and historical land photographs.
- Section 5: Environmental Setting – This section summarises the Site description, published geology, hydrology and hydrogeology and any relevant environmental information presented in the 2014 PSSR.
- Section 6: Scope of Ground Investigation Works – This section describes the previous and supplementary ground investigation data available for the Site.
- Section 7: Ground Conditions – This section describes the main findings of the intrusive site investigation including the ground conditions encountered and any visual or olfactory evidence of contamination identified.
- Section 8: Contamination Assessment – This section describes the findings of the Tier 1 and Tier 2 contamination risk assessment based upon potential contamination sources, potential receptors and potential contaminant linkages and presents the human health and controlled waters assessments.
- Section 9: Refined Conceptual Site Model – This section presents the Conceptual Site Model (CSM) for the Site and identifies potential contaminant linkages, based upon the findings of the data presented within Sections 2 to 7.
- Section 10: Conclusions and Recommendations – This section provides conclusions concerning the likelihood of land contamination associated with the Site affecting the Scheme and requirements for remediation/mitigation.

2 Site Location and Description

2.1.1 The Site comprises the footprint of the proposed bridge pier that will support the new section of motorway crossing of the River Usk. The River Usk is designated as a Special Area of Conservation (SAC).

2.1.2 The Site is located on the mudflats on the eastern bank of the River Usk, centred at National Grid Reference ST 325 854. Newport Docks and Stephenson Street Industrial Estate occupy the western and eastern banks of the river respectively (refer to Land Contamination Assessment Reports CL-14 and CL-15 (Annex D of Appendix 11.1 of the March 2016 ES) for details), in the vicinity of the pier location.

2.1.3 During the 2016 Additional Ground Investigation tidal debris was noted in the area including barrels, cones, branches and miscellaneous plastics indicating that the site is inundated during certain periods of high tide cycles.

2.1.4 The Site layout is shown in Figure 1.

3 The Scheme

3.1.1 The Scheme includes the construction of a new section of motorway, which would cross the River Usk near to Newport Docks at approximate chainage 10,000 to 10,500. This would require a bridge crossing with one pier located on the east bank of the river channel. For this assessment, the boundaries of the Site are determined by the footprint of the piers/foundations of the viaduct that would support the motorway.

3.1.2 The eastern pier would be situated approximately on the High Mean Water mark and approximately 200 m from the centre of the river channel.

3.1.3 The expected construction methodology is likely to involve a cofferdam to 6 m depth and piled foundations in the bedrock. Sheet piling will extend deep into the bedrock and part of the river channel alluvium will be excavated. The necessary piling foundations would be constructed within the rock and then be capped. On completion of works, the sheet piling would be removed.

4 Site History

4.1.1 The 2014 PSSR historical searches were based on Ordnance Survey plans, literature reviews, information provided by British Steel, Natural Resources Wales (NRW) (formerly Environment Agency Wales), Newport City Council and aerial photographic interpretation.

4.1.2 This is supplemented by a review of historical maps obtained in 2015 from the Welsh Government. Relevant extracts are presented in Appendix 6.

4.1.3 A detailed history of the docks on the east and west banks of the River Usk are presented in Land Contamination Assessment Reports for CL-14 and CL-15. A summary of the history in relation to the pier location is presented in Table 1.

Table 1: Site History

Date	Use	Source of Information
1843 - 1893	The site comprises mudflats on the eastern bank of the River Usk. Agricultural fields are to the east. An embankment runs along the eastern side.	1:10,560 Historical Mapping
1891 - 1912	No significant change. A footpath is identified along the embankment.	1:10,560 Historical Mapping
1904 - 1939	Dry docks have been constructed 300 m south on the eastern bank.	1:10,560 Historical Mapping
1964 - 1965	No significant change.	1:10,560 Historical Mapping
1970 - 1973	No significant change. Footpath no longer identified.	1:10,000 Historical Mapping
1979	Works have been built on the land to the east, including a jetty/pier to the River Usk beyond the northern boundary of the Site.	Aerial Photography
1981 - 1989	No significant change.	1:10,000 Historical Mapping
1985 - 1996	No significant change.	1:10,000 Historical Mapping
2006	No significant change.	Aerial Photography
2009 - 2010	No significant change.	Aerial Photography
2014	No significant change.	Aerial Photography

Notes: Potential sources of contamination are underlined.

4.1.4 The sources of information presented above supplement those used in the 2014 PSSR. In particular, the 1979 aerial photograph highlights works adjacent to the Site. Relevant extracts of the photographs are presented in Appendix 6.

4.1.5 Previous ground investigations on the eastern side of the River Usk have identified the Alluvium present to have been impacted by the industrial legacy around the watercourse with notably elevated polychlorinated biphenyl (PCB) concentrations.

4.1.6 Historically there is the potential for the Site to have been bombed during World War II which is discussed in detail within the Explosive Ordnance Threat Assessment Report (Bactec, 2014). There is thus a risk from unexploded ordnance at the Site which is categorised as medium-high risk (Bactec, 2014).

5 Environmental Setting

5.1 Geology

5.1.1 British Geological Survey (BGS) data indicate that the Site is underlain by Tidal Flat Deposits (TFD) overlying bedrock of the Mercia Mudstone Group. The more recent deposition of the Tidal Flat Deposits associated with the River Usk is referred to as Alluvium.

5.2 Hydrology

5.2.1 The Site is located on the River Usk within the mean high tidal range.

5.3 Hydrogeology

5.3.1 NRW classifies the Mercia Mudstone Group as a Secondary B Aquifer. The Tidal Flat Deposits are classified as non-productive (negligibly permeable) strata.

5.3.2 The Site does not lie within a groundwater source protection zone.

5.4 Environmental Information

5.4.1 There are no records of pollution incidents, abstraction licences or discharge consents being located within the Site boundary.

5.4.2 NRW records identify two pollution incidents occurring within 300 m of the Site, which had no impact on water. These incidents were related to unauthorised waste activities.

5.4.3 Three significant pollution incidents are, however, reported by NRW that may potentially have affected the Site.

5.4.4 Two pollution incidents with significant impact on water were recorded in 2010 and 2011 some 20 m north. The 2010 incident involved a release of oil and fuel. No information on the type of released substance in 2011 has been provided. This may potentially have an effect on sediment quality at the pier location.

5.4.5 In June 2002, a significant amount of oils and fuels (details regarding the type and amount of released hydrocarbons are unknown) were released to the River Usk, approximately 600 m downstream. The tidal conditions during the release are unknown and therefore, in the worst case scenario (i.e. incoming high tide during the incident), there could potentially have been transport of the dispersed plume of contamination upstream and the receding tidal waters could have allowed some of the plume to settle on the tidal mudflats. There is therefore the potential for the contamination to have affected the Site.

5.4.6 One discharge outlet is located directly to the east of the Site and is related to the industrial estate. The discharge consent was issued in 1995. No further details are available. This may potentially have an effect on sediments quality at the pier location.

5.4.7 The River Usk itself is classed as a SAC and a Site of Special Scientific Interest (SSSI).

5.4.8 Based on the above, a number of off site pollution incidents that could represent potential contamination sources require due consideration in relation to the new section of motorway.

6 Scope of Ground Investigation Works

6.1 General

6.1.1 Three intrusive ground investigations have been undertaken within the Site boundary. These are summarised below.

6.1.2 For the purpose of meeting the requirements of Volume 4, Section 1, Part 2 of the DMRB HD22/08 – Managing Geotechnical Risk – 2008 (Highways Agency, 2008), the historical data used to support the 2014 PSSR have been differentiated from additional 2015 Supplementary Ground Investigation data (Geotechnical Engineering, 2015) and 2016 Additional Ground Investigation data.

6.1.3 The Site is located adjacent to the Stephenson Street Industrial Estate (CL-15). Summarised information relating to the industrial estate site is discussed in this report. Full details of the scope of works for CL-15, however, including findings, assessment and conclusions, are available within the Land Contamination Assessment Report for CL-15 (Annex D of Appendix 11.1 of the March 2016 ES).

6.2 Scope of Works

6.2.1 Table 2 provides details on the intrusive ground investigations undertaken within the Site area.

Table 2: Site Investigation Summary

Date	Contractor	Site Location	Boreholes	Window Sampler	Trial Pits	Sampling
1997	Norwest Holst	West	BHG1	-	-	None
2015	Geotechnical Engineering	East	BH423	-	TP410	Soil, leachate and groundwater
2016	RPS	Central	BHM4CANA034 BHM4CANA034A	-	-	Soil

6.2.2 The well construction details of all boreholes installed on the Site are summarised in Table 3.

Table 3: Summary of Borehole Construction Details

Borehole ID	Diameter (mm)	Total Drilled Depth (m)	Top of Slotted Well Casing/Gravel Pack (m bGL)	Base of Slotted Well Casing/Gravel Pack (m bGL)	Targeted Geology
BHG1	Unknown	55	30	36.5	Mercia Mudstone Group
BH423	35	60	15	18	Tidal Flat Deposits/River Terrace Deposits
	50		25	40	Mercia Mudstone Group

6.3 Surface Water Quality Monitoring

6.3.1 Surface water quality monitoring was not undertaken during the previous ground investigations of the Site. Further information on surface water monitoring undertaken for the Scheme is provided in Chapter 16 of the ES.

6.4 Field Testing

6.4.1 Monitoring of Volatile Organic Compounds (VOCs) was undertaken on three soil samples from BH423 at 0.2-0.5 m bGL, 0.5-1.0 m bGL and 1.0-1.2 m bGL, and five soil samples from TP410 at 0.0-0.2 m bGL, 0.9-1.0 m bGL, 1.4-1.5 m bGL, 2.5-2.6 m bGL and 3.7-3.8 m bGL

6.5 Groundwater Monitoring

6.5.1 A summary of the groundwater sampling, groundwater/monitoring and ground gas monitoring is shown in Table 4 below.

Table 4: Summary of Monitoring Rounds

Borehole ID	Number of Rounds (Date of Sampling)	Monitoring Details	Notes
BHG1	**4 no**. (27 November 1997, 3 December 1997, 11 December 1997, 17 December 2015)	Groundwater - level	-
BH423	**4 no**. (28 April 2015, 6 May 2015, 11 May 2015, 19 May 2015)	Groundwater - level and sampling ground gas	Gas monitoring in the 35 mm shallow installation only.

6.6 Laboratory Chemical Testing

6.6.1 A summary of all laboratory analysis undertaken on soil, groundwater and leachate is summarised in Table 5 below.

Table 5: Summary of Previous Investigation Sampling

Site Investigation Date	Number of Soil Samples	Number of Leachate Samples	Number of Water Samples	Suites of Testing
1997	0	0	0	-
2015	4	1	6	Metals, PAH, TPH, pH, cyanide, phenols, asbestos, PCBs, BTEX (VOCs & SVOCs)*
2016	2	0	0	Metals, pH, BTEX, PAH, TPH, PCBs, SVOCs, Phenols, VOCs

Notes: ***** Groundwater only

Soil Analysis

6.6.2 The following sections summarise the results of the laboratory analysis for soil samples collected during the various intrusive investigation phases. The available data set has been tabulated and is presented in Appendix 3.

6.6.3 To aid the development of the conceptual site model, the analytical data from the Made Ground have been assessed separately from those of the natural soils (Tidal Flat Deposits).

6.6.4 The available information used in this assessment has been summarised in Table 6.

Table 6: Summary of Analytical Soil Data

Formation Unit	Number of Soil Analyses per Analytical Suite								
	Metals and Inorganics	PCBs	PAH	TPH	Phenol	Asbestos	BTEX	SVOCs	VOCs
2015 Data									
Made Ground	2	1	2	2	2	2	0	0	0
Natural Soils	2	0	2	2	0	0	0	0	0
2016 Data									
Natural Soils	2	2	2	2	0	0	2	2	2
Total Data									
Total	6	3	6	6	2	2	2	2	2

Soil Leaching Analysis

6.6.5 One soil sample from the Made Ground in TP410 was taken for soil leaching analysis. The available information is presented in Appendix 5 and is summarised in Table 7 below.

Table 7: Summary of Soil Leaching Analytical Data

Formation Unit	Number of Soil Leachate Analyses per Analytical Suite - 2015 Data					
	Metals and Inorganics	Total Petroleum Hydrocarbon	Phenols	BTEX	PCBs	PAHs
Made Ground	1	1	1	1	1	1

6.7 Groundwater Results

6.7.1 The following sections summarise the results of laboratory analysis for groundwater samples collected during the various intrusive investigation phases. The available dataset has been tabulated and is presented in Appendix 4.

6.7.2 The available data relate to groundwater samples taken from the wells installed within the groundwater of the River Terrace Deposits and the Mercia Mudstone Group and is summarised in Table 8.

Table 8: Summary of Analytical Groundwater Data

Groundwater Unit	Number of Groundwater Analyses per Analytical Suite (Number of Well Locations)						
	Metals and Inorganics	PAH	TPH	Phenol	BTEX	VOCs	SVOCs
2015 Data							
Perched Groundwater (Tidal Flat Deposits/River Terrace Deposits)	3(1)	3(1)	3(1)	2(1)	3(1)	3(1)	2 (1)
Groundwater Aquifer (Mercia Mudstone Group)	3(1)	3(1)	3(1)	2(1)	3(1)	3(1)	2(1)

Notes: VOC – Volatile Organic Compounds, TPH – Total Petroleum Hydrocarbon, PAH – Polycyclic Aromatic Hydrocarbons, SVOC – Semi-Volatile Organic Compounds.

6.8 Review of Available Data

6.8.1 As part of the 2016 Additional Ground Investigation two boreholes were constructed within the location of the proposed pier (BHM4CANA034 and BHM4CANA034A however due to locational constraints gas monitoring wells were not installed in either hole.

6.8.2 PCB analyses have not been undertaken within the groundwaters.

7 Ground Conditions

7.1 Geology

7.1.1 The geological logs for all available exploratory holes excavated on or in close proximity to the Site are provided in Appendix 1. The observed geological sequence is consistent with that discussed in the 2014 PSSR report and is summarised in the following sections. Information from the Supplementary Ground Investigation (Geotechnical Engineering, 2015) and 2016 Additional Ground Investigation has also been used.

Made Ground

7.1.2 Made Ground was encountered at one location (TP410) from ground level to a depth of 1.8 m. It comprised sandy gravelly silty peaty clay with gravels of brick. In the top 0.2 m there were frequent plastic bottles, steel cans, wood, timber and plastic.

7.1.3 It is thought that the location of TP410 represents the Mean High Water mark and as such incorporates variable detritus from the river within the substrate.

Superficial Deposits

7.1.4 Alluvium was encountered at all locations at ground level with the exception of TP410 where it was encountered beneath the Made Ground.

7.1.5 There are no obvious markers to differentiate the Alluvium from the Tidal Flat Deposits (TFD) and for the purpose of this report, the latter has been assumed to be the upper 2 m.

7.1.6 Beneath the assumed 2 m thick Alluvium, the Tidal Flat Deposits were proven to approximately 16 m bGL. Both the Alluvium and TFD generally comprised soft to very soft organic clay with occasional pockets of peat and organic material. The TFD were found to become sandy and gravelly with depth.

7.1.7 Beneath the TFD, coarser material representing Glaciofluvial Deposits (GFD) was encountered. This generally comprised sand or gravel with occasional cobbles and was generally approximately 2 m in thickness.

Solid Geology

7.1.8 Below the GFD, weathered mudstone of the Mercia Mudstone Group (MMG) was encountered at depths of between 17.85 and 18.5 m bGL, generally becoming weak at approximately 58 m depth.

Geological Sequence Summary

7.1.9 The general geological sequence identified during the previous ground investigations is summarised in Table 9.

Table 9: Summary of Geological Sequence

Unit	Description	Thickness Range (m)	Basal Depth (mbGL)
Made Ground (TP410 Only)	Sandy, gravelly clay including plastic, wood, steel cans and brick fragments	1.8	1.8
Alluvium	Soft organic clay	2 (assumed)	2 - 3.8
Tidal Flat Deposits	Soft organic clay becoming sandy/gravelly with depth	14 - 14.6	16 - 16.6
River Terrace Deposits	Sand/gravel	1.7 - 2.2	17.85 - 18.5
Mercia Mudstone Group	Weathered reddish brown mudstone	>36.8 - >72.55	unproven

7.1.10 The conceptual site model included within the 2014 PSSR report has been revised in light of the 2015 and 2016 information and is presented within Figure 2.

7.1.11 The ground conditions proven in the adjacent Stephenson Street Industrial Estate (CL-15) are similar to the one proven beneath this Site, although Made Ground was found to range between 0.7 and 3.1 m in thickness. It was found to be predominantly coarse with ash, slag, brick and limestone inclusions.

7.2 Visual and Olfactory Evidence of Contamination

7.2.1 A summary of the visual and olfactory evidence of contamination encountered during the previous ground investigations is summarised in Table 10.

Table 10: Visual and Olfactory Evidence of Contamination Summary

Location ID	Depth (m bGL)	Strata	Evidence of Potential Contamination
TP410	0 - 0.2	Made Ground	Plastic bottles, steel cans, wood, timber and plastic
	0.2 - 1.8	Made Ground	Gravel of brick

7.2.2 Photo Ionisation Detector (PID) monitoring was undertaken on three soil samples from BH423 and five soil samples from TP410. The PID meter recorded low levels of VOCs of between zero and 2.6 ppm (maximum within Tidal Flat Deposits).

7.2.3 Full details and observations noted during the drilling and trial pitting are presented on the exploratory logs attached in Appendix 1.

7.3 Gas Monitoring

7.3.1 The gas monitoring data set collected during each of the previous three monitoring rounds is summarised on the field data sheets provided in Appendix 2. The maximum gas concentrations are presented in Table 11 below.

Table 11: Summary of Gas Monitoring Data

Location ID	Flow (l/hr)	VOCs (ppm)	CH_4 (%/vol)	Peak LEL (%)	CO_2 (%/vol)	O_2 (%/vol)	CO (ppm)	H_2S (ppm)
	Max.	Max.	Max.	Max.	Max.	Min.	Max.	Max.
BH423 (35 mm)	0.0	3.3	1.0	24.2	0.3	19.8	0	0

7.4 Groundwater

Groundwater Encountered During Investigation

7.4.1 Groundwater strikes were encountered during the advancement of all 2015 on site locations as detailed on the geological logs provided in Appendix 1. This is summarised in Table 12.

Table 12: Summary of Groundwater Water Level Data

Location	Strike Depth (m bGL)	Geological Formation	Level After 20 Minutes (m bGL)	Comments
BHG1	12.9	Base of TFD	6.3	Dry condition recorded during drilling when borehole taken to 9 m bGL in the TFD
				Water level during drilling recorded at 4.1 - 7.6 m bGL when borehole taken into the MMG
BH432	1.2	TFD	0.54	-
TP410	0.9	Base of Made Ground	NR	Likely to represent surface water ingress

Groundwater Level during Monitoring Rounds

7.4.2 The entire groundwater level data set gathered on site is provided in Appendix 2 and is summarised in Table 13.

Table 13: Summary of Groundwater Level Data

Location	Installation[#1]	Depth of Response Zone (mbGL) and Geological Formation	Number of Measurements	Minimum Depth (m bGL)	Maximum Depth (m bGL)
BHG1	-	30 - 36.5 MMG	4	3.72	6.05
BH423	35 mm (S)	15 - 18 TFD / RTD	4	5.18	7.4

Location	Installation[#1]	Depth of Response Zone (mbGL) and Geological Formation	Number of Measurements	Minimum Depth (m bGL)	Maximum Depth (m bGL)
	50 mm (D)	25 - 40 MMG	4	5.27	6.9

Notes: #1 S denotes a shallow installation and D denotes deep installation.

7.4.3 There are two main groundwater bodies anticipated to be present at the Site. The main deep body is within the Mercia Mudstone at depth which appears to be confined. A shallower body within the Glaciofluvial Deposits was struck during drilling with groundwater observations showing a rise to a resting level at 3.7 to 6.4 m bGL. This implies the groundwater within the Glaciofluvial Deposits is confined by the overlying lower permeability Tidal Flat Deposits. This demonstrates the latter to represent an aquitard to the groundwater flow.

7.4.4 The variation seen between the minimum and maximum depths indicates possible tidal influence.

7.4.5 Discontinuous shallow perched water is observed within the upper Tidal Flat Deposits. This 'groundwater' is regarded as 'pore water' which does not contribute to advective flow within these strata.

7.4.6 Perched water is also identified at the base of the shallow Made Ground and this may represent delayed infiltration rather than a water body, given the granular content of the material.

7.4.7 The groundwater regime described above is similar to the one identified for the adjacent Stephenson Street Industrial Estate (CL-15).

8 Contamination Assessment

8.1 Introduction

8.1.1 The following sections provide details of the assessment of land contamination at the Site.

8.1.2 The outline Conceptual Site Model presented within the 2014 PSSR has been reviewed and updated based on data from the Supplementary Ground Investigation (Geotechnical Engineering, 2015) and the proposed Scheme. The main alterations to the 2104 PSSR model are summarised as follows.

- Inclusion of groundwater quality and level data set.
- Inclusion of gas monitoring data set.
- Identification of Made Ground on Site (not encountered within the proposed pier location).
- Inclusion of Alluvium.
- Consideration of ground and groundwater conditions within the adjacent Stephenson Street Industrial Estate (CL-15).
- Update of the source-pathway-receptor linkages taking account of above and more detailed assessments.

8.2 Preliminary Risk Assessments

Potential Sources

8.2.1 The historical neighbouring site uses are considered a potential source (see CL-15 report for full details). This may have had an effect on groundwater quality within the Glaciofluvial Deposits and Mercia Mudstone Group. Dewatering processes during construction may increase or draw off site contamination into the groundwater within the Site.

8.2.2 The presence of Made Ground was encountered at the High Mean Water level of the River Usk. Made Ground is identified as being absent at the currently proposed pier location at the Site. As such, Made Ground has not been considered as a viable source for the new section of motorway.

8.2.3 The Alluvium may include a number of potential contaminants transported and deposited by the River Usk from the industrial activities that have taken place over the years along its course.

8.2.4 The pier foundations may provide linkage between surface waters, perched groundwater and the deeper aquifer within the Glaciofluvial Deposits and Mercia Mudstone resulting in potential mixing of groundwater bodies. Perched groundwater and aquifer could therefore be regarded as a source of possible contaminants as well as receptors.

8.2.5 The pier construction may include excavation of a deep cofferdam and may involve man entry. Ground gas from soils (Alluvium and peaty Tidal Flat Deposits) and possible hydrocarbons from the groundwaters should be considered.

Potential Receptors

8.2.6 Receptors during the construction and the operational stages of the Scheme have been considered.

During Construction

- Construction workers during site development works.
- Site neighbours (industrial units to the east of the construction works).
- The River Usk.
- Groundwater in the Secondary B Aquifer within the Mercia Mudstone.

During Operation

- The River Usk.
- Groundwater in the Secondary B Aquifer within the bedrock.

Potential Pathways

8.2.7 The construction of the pier will require the removal of shallow soils which are to be replaced by new foundation structure. No viable pathways are identified from the potential sources to maintenance workers, general public end users and neighbouring general public. As such these have not been considered further in the conceptual site model.

8.2.8 Potential pathways include the following.

- Dermal contact, ingestion, inhalation pathways of potentially contaminated soils possible during construction and maintenance works.
- Mobilisation of potentially contaminated Alluvium material into surface water by construction and scouring action by the River Usk.
- Vertical or lateral migration of ground gas associated with Alluvium, Tidal Flat Deposits and possibly impacted groundwaters with hydrocarbon contamination. Dewatering process may draw possible off site contamination into cofferdam.
- Downward vertical migration of potentially contaminated surface water or perched groundwater within the Tidal Flat Deposits into the Glaciofluvial Deposits and Mercia Mudstone aquifer due to piling/cofferdam construction.
- Lateral migration through newly imported Made Ground used to construct working platform.

8.3 Risk Evaluation

8.3.1 Source-pathway-receptor linkages were considered in the 2014 PSSR using the historical data available up to 2008. With review of the other data described herein, the following risk evaluation was reconsidered and included.

- The construction of the pier is anticipated to include the excavation of a cofferdam into the rockhead, from where piles are to be installed. The potentially contaminated shallow sediments of the Alluvium are therefore going to be removed in the process.

- The cofferdam is anticipated to be to 6 m depth and will comprise sheet pile wall. Large scale dewatering is therefore not anticipated.
- The Site lies adjacent to potentially contaminating land uses including a docks and industrial estate.
- Three significant pollution incidents have occurred in the vicinity of the Site, two involving fuel/oils.
- Made Ground has been identified on site, though limited to one location and outside the area of pier construction.
- Large thicknesses (>10 m) of cohesive Tidal Flat Deposits overlie a Secondary B Aquifer within the bedrock.
- The Site lies within the mean tidal range of the River Usk; however the proposed pier and associated construction compounds are set outside the Mean High Water level. As such the River Usk is not considered as a direct source of possible contamination.
- Lateral pathways between off site perched Made Ground (CL-15) and the River Usk/the Site have not been identified but may be altered with the off site construction of temporary working platform.
- Perched groundwater within the Tidal Flat Deposits is not considered a water resource due to its anticipated low vertical hydraulic continuity with the aquifer beneath, low permeability and low storage capacity. Low lateral pathways are also considered to be present with unlikely direct linkages with the River Usk receptor.

8.4 Human Health Risk Assessment

8.4.1 The rationale and approach for the human health (Tier 2) screening assessment is detailed in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES). Soil chemical results and the findings of the Tier 2 generic human health risk assessment are presented in Appendix 3 of this report. Any exceedances have been summarised in Table 14 below.

Table 14: Summary of Human Health Soil Screening Exceedances (Natural Ground)

Determinant	Units	Range	Screening Criteria	No. samples exceeding Screening Criteria (Total number of results)	Locations of exceedances
Chromium	mg/kg	16 - 53.2	33	3 (6)	BH423, BHM4CANA034 a (x 2)

8.4.2 Chromium concentrations are considered to be within the normal background range and therefore are not considered to represent a contaminant of concern. One sample of the Tidal Flat Deposits analyse for hexavalent chromium was reported at <LOD and therefore chromium concentrations at this location are indicated to comprise a lesser toxic form. Further consideration of chromium is also provided in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES).

8.5 Controlled Waters Screening Assessment

8.5.1 The rationale and approach for the controlled waters (Tier 1) screening assessment is detailed in the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES). The groundwater chemical results are presented in Appendix 4 of this report. All exceedances to the relevant generic criteria are summarised in Table 15 for soil leachate.

8.5.2 Where Environmental Quality Standards (EQS) are dependent on water hardness (e.g. some heavy metals), the hardness of the surface water receptor should normally be used. The Baseline Water Environment Report (Appendix 16.2 of the March 2016 ES) indicates surface water to be generally moderately hard with hardness concentrations within a range of 100 to 150 mg/l as calcium carbonate. Therefore EQS within this water hardness range have been used for screening purposes.

Soil Leachate Results

8.5.3 One soil sample was subjected to leachate analysis. The majority of the soil leachate results were all below the applied screening criteria, with the exception of the contaminants shown in Table 15.

Table 15: Controlled Waters Screening Exceedances – Soil Leachate

Determinant	Units	Range	EQS	DWS	No. of Exceeded EQS Screening Criteria (Total Number of Results)	Location (Formation)	No. of Exceeded DWS Screening Criteria (Total Number of Results)	Location
Cadmium	µg/l	2.5	0.15	5	1 (1)	TP410 (MG)	0 (1)	-
Copper	µg/l	25	10	2,000	1 (1)	TP410 (MG)	0 (1)	-
Selenium	µg/l	13	-	10	0 (1)	-	1 (1)	TP410 (MG)

Notes: DWS – Drinking water Standards, EQS – Environmental Quality Standard.

8.5.4 The identified exceedances are considered to be minor and unlikely to pose a risk to controlled waters.

8.5.5 The laboratory detection levels for mercury, cyanide and some polycyclic aromatic hydrocarbons (PAHs) are higher than applied screening criteria. These are considered unlikely to pose a risk to controlled waters.

Groundwater Results

8.5.6 Groundwater analysis results have been assessed from samples collected over three monitoring rounds in borehole BH423 undertaken in 2015. The groundwater samples were taken from the shallow groundwater body within the superficial deposits and the aquifer body within the Mercia Mudstone Bedrock.

8.5.7 A summary of the exceedances of the screening criteria from all available ground results relating to the Site is presented in Table 16 and discussed below.

Table 16: Controlled Waters Screening Exceedances – Groundwater

Determinant	Unit	Range	EQS	DWS	No. of Exceeded Screening Criteria (Total Number of Results) Against EQS	Location	No. of Exceeded Screening Criteria (Total Number of Results) Against DWS	Location
Shallow Groundwater (Superficial Deposits)								
Arsenic	µg/l	19 - 24	50	10	0 (3)	-	3 (3)	BH423
Boron	µg/l	1,500 - 2,900	2,000	1,000	1 (3)	BH423	3 (3)	BH423
Chromium	µg/l	17 - 55	-	50	0 (3)	-	1 (3)	BH423
Copper	µg/l	7.8 - 29	10	2,000	2 (3)	BH423	0 (3)	-
Nickel	µg/l	3.1 - 6.1	4	20	2 (3)	BH423	0 (3)	-
Selenium	µg/l	19 - 34	-	10	-	-	3 (3)	BH423
Chloride	µg/l	5,600 - 6,800	250	250	2 (2)	BH423	2 (2)	BH423
Ammoniacal Nitrogen	µg/l	34 - 45	0.6	-	2(2)	BH423	-	-
Aquifer (Mercia Mudstone)								
Arsenic	µg/l	10 - 31	50	10	0 (3)	-	2(3)	BH423
Boron	µg/l	480 - 1,100	2,000	1,000	0 (3)	-	1 (3)	BH423
Copper	µg/l	3.5 - 16	10	2,000	1 (3)	BH423	0 (3)	-
Nickel	µg/l	<1 - 4.4	4	20	1 (3)	BH423	0 (3)	-
Selenium	µg/l	14 - 18	-	10	-	-	3 (3)	BH423
Chloride	µg/l	3,200 - 3,700	250	250	2 (2)	BH423	2 (2)	BH423
Ammoniacal Nitrogen	µg/l	1.6 - 2.5	0.6	-	2 (2)	BH423	-	-

8.5.8 The review of the groundwater chemical testing results indicated that both the shallow groundwater and deep groundwater beneath the Site have elevated levels of metals (arsenic, boron, copper, nickel and selenium) and inorganics (ammoniacal nitrogen and chloride).

8.5.9 The quality seen in both shallow and deep groundwater bodies is similar in terms of the contaminants in exceedance and their respective concentrations.

8.5.10 Saline intrusion may be inferred in each groundwater body when considering the elevated chloride concentration. The perched groundwater holds a higher concentration in ammoniacal nitrogen than the aquifer.

8.5.11 All phenols, benzene, toluene, ethylbenzene and xylenes (BTEX), PAH, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) results were found to be below the limit of detection in both groundwater bodies. This is considered unlikely to pose a risk to controlled waters.

8.5.12 Further to the exceedances identified above, the analytical data indicate the presence of petroleum hydrocarbons in groundwater aquifer at borehole BH423 during one sampling round (total petroleum hydrocarbon (TPH) value of 3.7 mg/l). However, the concentrations were variable through the monitoring rounds with results below the limit of detection in some instances.

8.5.13 It is noted that the laboratory detection levels for mercury, cyanide, phenols, some PAH compounds, VOCs and SVOCs are higher than applied screening criteria. These are considered unlikely to pose a risk to controlled waters.

8.5.14 Considering the thickness of cohesive superficial deposits beneath the Site (approximately 16 m) and the absence of any obvious soil to groundwater contamination linkage, it is unlikely that the Site is the source of this contamination.

8.6 Ground Gas Risk Assessment

8.6.1 The only ground gas data available relate to borehole BH423 associated with a response zone within the base of the Tidal Flat Deposits and the River Terrace Deposits between depths of 15 to 18 m bGL. No data have been made available from the shallow Tidal Flat Deposits likely to be exposed through the construction of the cofferdam. Of the four monitoring rounds available, the following comments may be made.

- No monitoring was undertaken during a period of low barometric pressure (less than 1000 mb), with the lowest conditions being 1004 mb. As such, worst case atmospheric conditions for potential ground gas generation may have not been monitored.
- Gas flow was generally recorded as absent or negative.
- Methane was recorded at concentrations of up to 1 % v/v on the first monitoring round but was absent in the subsequent three monitoring rounds. The concentrations are at or below the screening criteria of 1 %. A concentration of 24 % of the Lower Explosive Limit (LEL) is noted for the first monitoring round reducing to 0-1 % on the second monitoring round and nil for the following two.
- Carbon dioxide was identified at concentrations of up to 0.3 % in the first monitoring round but was absent in the following three. These concentrations are well below the screening criteria of 5 %.
- Trace Volatile Organic Compounds at concentrations of up to 3.3 ppm were recorded.
- Hydrogen sulphide and carbon monoxide were recorded zero throughout.
- Oxygen was recorded at relatively normal levels (ambient) with concentrations of between 19.9 and 20.4 %.

8.6.2 The available data do not identify abnormal gas concentrations and are consistent with the expected gas regime given the ground conditions.

8.6.3 The gas regime at the Site does not appear to have been influenced by previous historical uses and is instead driven by soil gas within natural soils. A gas risk assessment has been undertaken and is set out within the Land Contamination Assessment Report (Appendix 11.1 of the March 2016 ES).

8.7 Summary

8.7.1 No contaminants included within the analytical suites were recorded at concentrations that are likely to pose a potential risk to human health within the analysed Alluvium and Made Ground samples.

8.7.2 Moderate leachability of the Made Ground has been identified with marginal exceedances of cadmium, copper and selenium.

8.7.3 Both of the groundwater bodies present beneath the Site have elevated levels of metals (arsenic, boron, copper, mercury and selenium) and inorganics (ammoniacal nitrogen and chloride) when compared to Environment Quality Standards or Drinking Water Standards. The lack of available contamination linkage between the soil and groundwater data is noted. This, together with the ground and groundwater conditions encountered at the Site, would indicate that the quality of the aquifer observed may be affected by off site sources.

8.7.4 The groundwater quality identified within the Site is similar to the one proven in the adjacent Stephenson Street Industrial Estate (CL-15). The contaminants of concern seen within the perched water of the Made Ground included lead, pH and organics (PCB, TPH and one compound of PAH). VOCs and SVOCs were all below the limit of detection.

9 Refined Conceptual Site Model

9.1.1 The incorporation of data from the 2015 Supplementary Ground Investigation and 2016 Additional Ground Investigation has enabled the original CSM presented in the 2014 PSSR to be updated. Relevant contaminant (source-pathway-receptor) linkages have been considered within the refined CSM. The assessment was based on the Scheme during construction and operational phases.

9.1.2 A CSM representing the general ground conditions, the overall layout of the new section of motorway and the relevant source-pathway-receptors (each of which has a specific alpha-numerical symbol attached) is presented in Figure 1 and is described in Table 17.

Table 17: Conceptual Site Model

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
	Construction					
Potentially contaminated Alluvium	Construction workers (A)	Direct dermal (1)	Likely	Low	Low	Construction workers will possibly be exposed to potentially contaminated Tidal Flat Deposits during construction works. However, the exposure duration will be short-term only. Prior to construction, a specific risk assessment will be required in line with Construction (Design and Management) (CDM) Regulations 2015 requirements and other relevant health and safety (H&S) guidance. This will enable safe methodology and appropriate levels of Personal Protective Equipment (PPE) to be put in place. As such, all risks will be duly considered and suitably mitigated to protect construction workers. A construction mat will be placed over the area to enable piling as well as general construction. This will break dermal, ingestion and inhalation pathways once placed. Current data set identifies limited exceedances to the selected screening criteria. No obvious gross contamination identified within the shallow sediments/Tidal Flat Deposits. Current contamination status does not indicate abnormal constraints to construction workers health and safety, over and above those typical of a brownfield site. No Made Ground encountered within the proposed pier location.
		Ingestion (3)	Likely	Low	Low	
		Inhalation of soil dust (2)	Likely	Low	Low	
		Inhalation of ground gas or hydrocarbon vapours (2)	Likely	Low	Low	Low levels of VOCs were recorded within soils. No putrescible material identified within the shallow Tidal Flat Deposits. Significant abnormal gas regime not anticipated. Construction of the cofferdam will require specific risk assessment, control measures and PPE.
	Site neighbours (B)	Dermal contact with soil dust (1)	Unlikely	Low	Very low	During construction there is the possibility of inhalation of soil dust during off site transport of the

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
		Ingestion of soil dust (3)	Unlikely	Low	Very low	arising. This would lead to short-term exposure only. Covering of load and other dust mitigation measures are recommended during construction works. A construction mat will be in place to enable piling as well as general construction. This will break dermal, ingestion and inhalation pathways once placed. Construction within the tidal zone of the river and dust emission during excavation to be negligible given that the material will be wet.
		Inhalation of soil dust (2)	Unlikely	Low	Very low	
	The River Usk (D)	Mobilisation of sediments (4)	Likely	Low	Low	Alluvium within the High Water Mark is likely to be mobilised during the cofferdam construction works, although this will be short-term only. Construction works and insertion of the cofferdam, should be undertaken, where possible, during low tide events. No elevated contamination identified at the Site. A foundations works risk assessment is required to confirm the absence of risk to controlled waters. This should provide a method statement to mitigate silt mobilisation.
Tidal Flat Deposits with organic peat material potentially contaminated groundwater with hydrocarbons	Construction workers (A)	Inhalation of ground gas or hydrocarbon vapours (2)	Low	High	Moderate	Low levels of VOCs were recorded within soils. No significant peat bands within the Tidal Flat Deposits. No volatile organic compounds identified within the groundwater. Current gas data identified presence of some abnormal gas conditions including some methane concentration. Construction of the cofferdam will require specific risk assessment, control measures and PPE.
Perched water in Made Ground (off site; CL-15)	Surface waters River Usk (D)	Migration of contaminated surface water	Unlikely	Low	Very low	Newly imported granular material may provide a new pathway from potentially contaminated waters perched within the Made Ground beneath the adjacent Industrial Estate to the River Usk.
Perched groundwater/ groundwater (D) (Secondary B	Construction workers (A)	Dermal contact (1)	Likely	Moderate	Moderate	Both groundwaters identified to have marginal exceedances for some metals and inorganic contaminants when compared against Drinking Water Standards.
		Ingestion (3)	Likely	Moderate	Moderate	
		Inhalation of hydrocarbon vapours (2)	Likely	Low	Low	

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
Aquifer)						Dewatering process may alter migration of potentially contaminated waters from off site sources. Construction workers will possibly be exposed to contaminated waters during Site construction works. However, exposure duration will be short-term only. Prior to construction, a specific risk assessment will be required in line with CDM Regulations 2015 requirements and other relevant H&S guidance. This will enable safe methodology and appropriate levels of PPE to be put in place. As such, all risks will be duly considered and suitably mitigated. VOCs and SVOCs determinants below level of detection within the Site and within adjacent industrial estate (CL-15).
Perched groundwater (Cp)/groundwater (Ca) (Secondary B Aquifer)	Surface water River Usk (D)	Dewatering (4)	Likely	Moderate	Moderate	Both groundwater bodies shown to be of similar quality with marginally elevated metal and inorganic contaminants when compared against EQS. Dewatering process may alter migration of potentially contaminated waters from off site sources. A detailed dewatering risk assessment to determine likely influence on groundwater flow and potential contamination sources (on site/off site) is required. A suitable water management strategy is required to specify required mitigation measures.
Perched groundwater (Cp)	Groundwater (Ca) (Secondary B Aquifer)	Contamination migration along the piles/cofferdam (4)	Likely	Low	Low	Both groundwater bodies shown to be of similar quality with marginally elevated metal and inorganic contaminants. Dewatering process may alter migration of potentially contaminated waters from off site sources. A foundation risk assessment is required to confirm the risks.
	Operation					
Perched water in Made Ground (off site; CL-15)	Surface waters River Usk (D)	Migration of contaminated surface water	Unlikely	Low	Low	Newly imported granular material may provide a new pathway from potentially contaminated waters perched within the Made Ground beneath the adjacent industrial estate to the River Usk. It is likely the construction platform will be removed post-construction of the River Usk crossing.

Potential Source	Potential Receptor	Possible Pathway	Likelihood	Severity	Risk	Comment
						Both groundwater bodies shown to be of similar quality with marginally elevated metal and inorganic contaminants. A foundation risk assessment is required to confirm the risks.
Perched groundwater (Cp)	Groundwater (Ca) (Secondary B Aquifer)	Contamination migration along the piles/cofferdam (4)	Likely	Low	Low	

10 Conclusions and Recommendations

10.1 Conclusions

10.1.1 Ground investigations have been undertaken at the Site to assess risks from land contamination associated with the construction and operation of the Scheme including human health and controlled waters.

10.1.2 The historical and 2015/2016 laboratory testing results confirmed the on site observations and field testing, and showed that the materials encountered within the Site contain contaminant concentrations that are at levels that indicate low to moderate risks to human health and controlled waters.

10.1.3 During construction these risks are likely to be mitigated through appropriate health and safety protocols which are anticipated to be in line with typical brownfield sites. The presence of ground gas has been identified and further monitoring and a gas risk assessment to support safe construction activities should be considered.

10.1.4 Chemical analytical soils data within the location of the proposed pier demonstrated no elevated contaminant concentrations considered to pose risks to human health.

10.1.5 Materials are likely to be suitable for reuse subject to provision of reuse criteria under a Materials Management Plan.

10.1.6 A detailed dewatering risk assessment to determine the likely influence on groundwater flow and potential contamination sources (on site/off site) is required.

10.1.7 A suitable water management strategy is required to specify required mitigation measures.

10.1.8 The deep aquifer and the perched groundwater have been identified to have marginal exceedances to EQS and DWS and the implication to controlled waters and human health should be carefully considered, taking into account the potentiometric level of the aquifer and the possible creation of new pathways from the proposed deep foundations.

10.2 Recommendations

10.2.1 The assessment indicates the site poses a low to moderate risk and that construction can be undertaken in line with normal brownfield development protocols. Specific measures would be identified within a remediation strategy for the Scheme. The strategy is anticipated to include, but may not be limited to, the following.

- Foundation works and piling rsk assessment of cofferdam, piles and associated construction works to mitigate risk to controlled waters.
- Dealing with unexpected contamination.
- Provision of a detailed dewatering risk assessment and suitable water management strategy to protect controlled waters during construction.

- Verification sampling to confirm suitability of soils for reuse.
- Control measures to prevent risks to construction workers and the general public during construction.

10.2.2 The remediation strategy should include a remediation options appraisal, remediation implementation plan and remediation verification plan.

10.2.3 The remediation strategy should be supported by a Scheme wide Materials Management Plan prepared in accordance with CL:AIRE Code of Practice (CL:AIRE 2011).

11 References

Bactec (2014) Explosive Ordnance Threat Assessment in respect of M4 Corridor around Newport for Hyder Consulting (UK) Limited, 5750TA

CL:AIRE (2011) Definition of Waste. Development Industry Code of Practice, Version 2, March 2011, ISBN 978-1-905046-23-2

Geotechnical Engineering Limited (2015) M4 Corridor Around Newport, Factual Report on Ground Investigation, 30238

Highways Agency (2008) Design Manual for Roads and Bridges. Vol. 4. Geotechnics and Drainage. Section 1. Earthworks; Part 2. HD22/08. Managing Geotechnical Risk.

Ove Arup & Partners (2014) M4 Corridor Around Newport, Preliminary Sources Study Report, 14/9197

12 Glossary

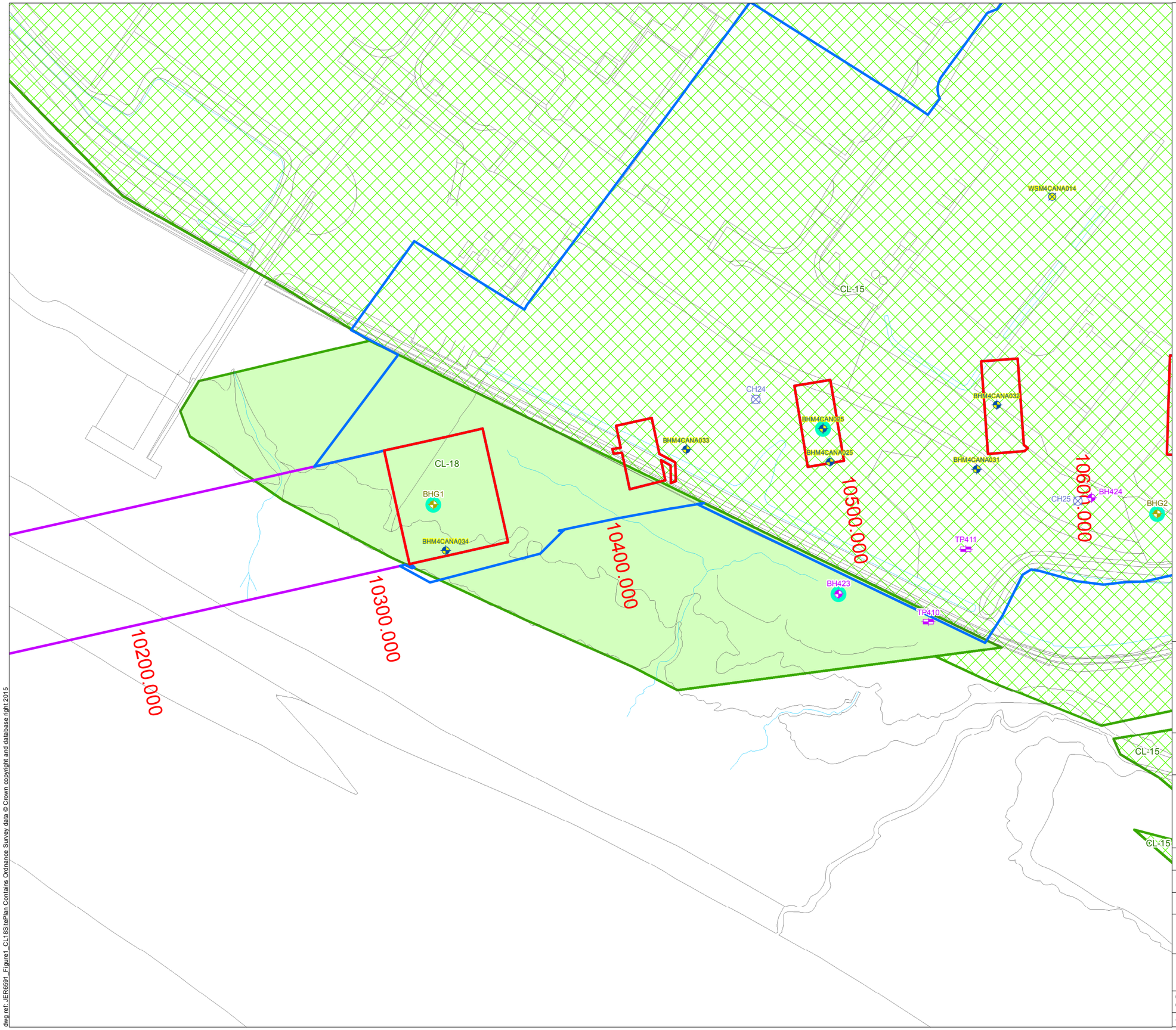
BF	Blast Furnace
BGS	British Geological Survey
BOD	Biochemical Oxygen Demand
BOS	Basic Oxygen Slag
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CAT	Cable Avoidance Tool
CDM	Construction Design Management
CH_4	Methane
CLEA	Contaminated Land Exposure Assessment
CO_2	Carbon Dioxide
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CSM	Conceptual Site Model
DMRB	Design Manual for Roads and Bridges
DO	Dissolved Oxygen
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standard
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
ES	Environmental Statement
ESG	Environmental Scientifics Group
EQS	Environmental Quality Standard
FTIR	Fourier Transform Infrared (spectroscopy)
GAC	Generic Assessment Criteria
GRO	Gasoline Range Organics
LEL	Lower Explosive Limit
LOD	Limit of Detection
mAOD	Metres Above Ordnance Datum
mb	Millibars
mbGL	Metres below Ground Level

MTBE	Methyl Tert-butyl Ether
NRW	Natural Resources Wales
ORP	Oxidation Reduction Potential
O_2	Oxygen
OS	Ordnance Survey
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCSM	Preliminary Conceptual Site Model
PID	Photo Ionisation Detector
PPE	Personnel Protection Equipment
PSSR	Preliminary Sources Study Report
SGVs	Soil Guideline Values
SSAC	Site Specific Assessment Criteria
SSSI	Site of Special Scientific Interest
SVOCs	Semi-Volatile Organic Compounds
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbon
TPH CWG	Total Petroleum Hydrocarbon Criteria Working Group
UKAS	United Kingdom Accreditation Service
VOCs	Volatile Organic Compounds
WFD	Water Framework Directive
UXO	Unexploded Ordnance Survey

Figures

Figure 1

Site Plan



Legend

- Permanent Highway Land within Fenceline (including Water Treatment Areas)
- Temporary Construction Land
- Easement Only
- Potential Area of Land Contamination based on 2014 PSSR
- Revised Potential Area of Land Contamination
- Other Potential Area of Land Contamination

Investigation Locations

2015-2016 (RPS)

- Borehole
- Window Sample

2015 (Geotechnical Engineering)

- Borehole
- Trial Pit

2000 (Exploration Associates)

- Window Sample

1997 (Norwest Holst)

- Borehole
- Monitoring Well Installation

Llywodraeth Cymru
Welsh Government

Appendix R11.1 Annex D CL-18

Site Plan for CL-18

Figure: 1	Revision: 1
Date: September 2016	Status: At Issue
Drawn: RJJ	Checked: FB

Scale: A3 @ 1:1,500
0 25 50 m

N

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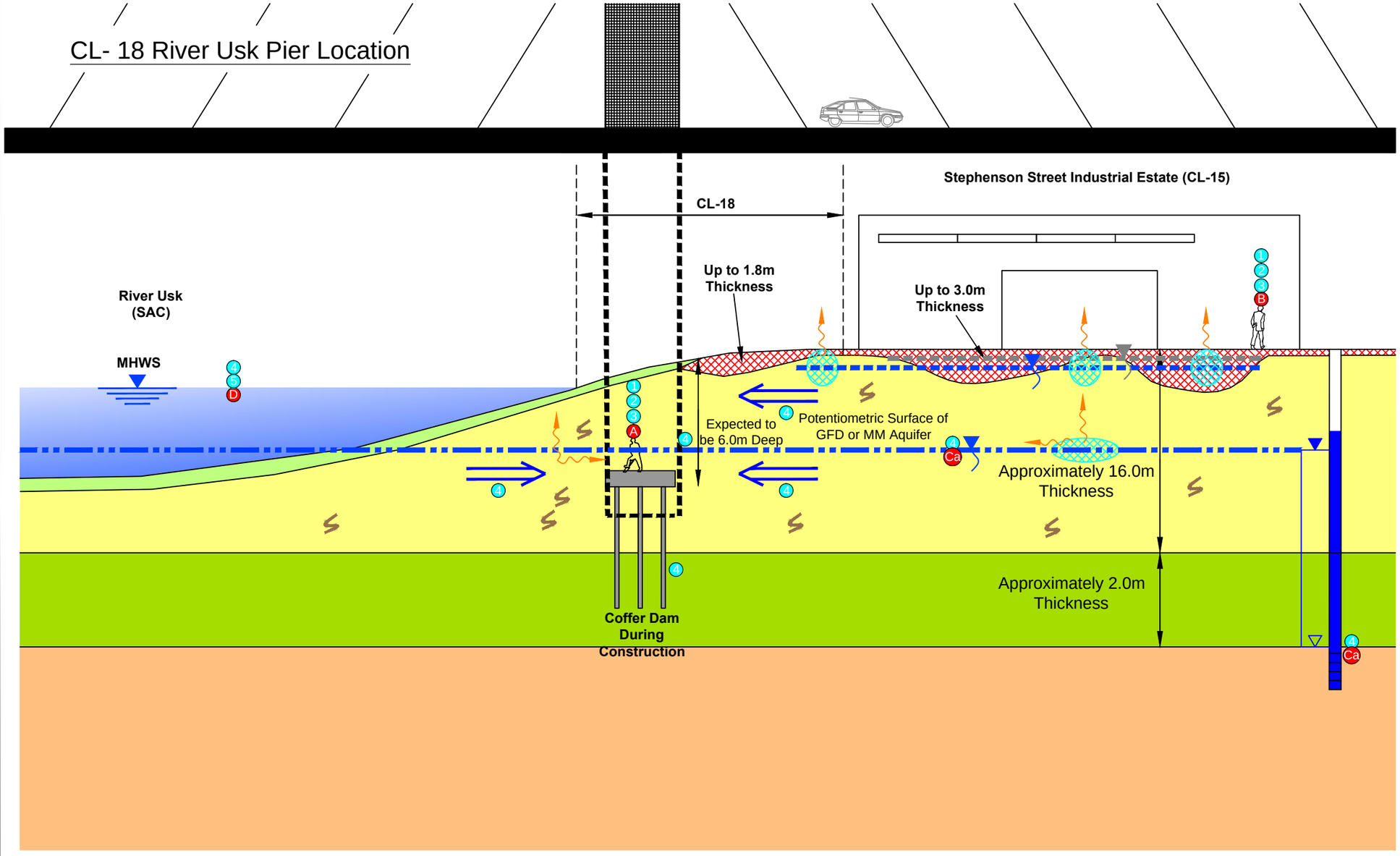
dwg ref: JER6591_Figure1_CL18SitePlan

dwg ref: JER6591_Figure1_CL18SitePlan Contains Ordnance Survey data © Crown copyright and database right 2015

Figure 2

Conceptual Site Model



Legend

- Made Ground
- Potentially Contaminated Waters
- Alluvium
- Tidal Flat Deposits - TFD
- Organic Matter within Tidal Flat Deposits
- Glaciofluvial Deposits (Predominantly Sand & Gravel) - GFD
- Mercia Mudstone - MM
- Perched Water (MG)
- Groundwater (GFD and MM)
- Induced Flow During Temporary Works (Dewatering)
- Water Strike
- Rest Water Level
- Gas Migration Pathway

Potential Receptors

- A Humans On-Site (Construction)
- B Humans Off-Site (Stephenson Street Industrial Estate Staff / Visitors)
- Ca Groundwater (Aquifer)
- D Surface Water

Potential Pathways

- 1 Dermal Contact
- 2 Inhalation
- 3 Ingestion
- 4 Leaching / Migration
- 5 Surface Run Off / Mobilisation

Potential Sources of Contamination

Possible contamination present on site associated with :

- Tidal deposits impacted by local industrial land use
- Surface water (River Usk)
- Groundwater Aquifers (Tidal Flat Deposits or Glaciofluvial Deposits/Mercia Mudstone)
- Organic inclusions within Tidal Flat Deposits

NOTE
Drawing refined from PSSR Drawing Reference
M4-OA-17-00DR-Z-XX-0151 (February 2014)

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Welsh Government

Appendix R11.1 Annex D CL-18

Conceptual Site Model for CL-18

Figure: 2	Revision: -
Date: September 2016	Status: At Issue
Drawn: RJJ	Checked: FB

Not to Scale

dwg ref:JER6591_Figure2_CL18ConceptualSiteModel

dwg ref: JER6591_Figure2_CL18ConceptualSiteModel

Appendices

Appendix 1

Exploratory Records

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Header

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E
Project	M4 Relief Road Magor to Castleton Stage 2				185472.0 N
		Drilling Rig	Pilcon/T30	Ground Level	6.20m AOD
Client	Welsh Office	Drillers	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Chunk		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
11/11/1997	1800	11.00	9.00	Dry	
12/11/1997	0800	11.00	9.00	Dry	
12/11/1997	1800	19.50	19.20	7.60	
16/11/1997	1800	27.35	20.00	10.50	
17/11/1997	0800	27.35	20.00	4.10	
17/11/1997	1800	35.65	20.00	6.80	
18/11/1997	0800	35.65	20.00	6.80	
18/11/1997	1800	47.50	20.00	12.00	
19/11/1997	0800	47.50	20.00	6.50	
19/11/1997	1800	55.00	20.00	12.30	

CABLE PERCUSSION DETAILS

Hard strata from depth	Hard strata to depth	Hours	Remarks
16.50	16.90	1.00	
18.30	18.50	0.50	
19.00	19.50	1.00	

CASING

Hole diameter	Max depth of hole at dia.	Casing diameter	Max depth of casing of dia.
150	19.50	150	19.20
120	55.00	140	20.00

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Flow	Casing depth at strike time	Casing depth to seal flow
12/11/1997	0000	12.90	6.30	20	fast	12.90	0.00

ROTARY DRILLING DETAILS

From depth	To depth	Flush type	Flush return	Core diameter
19.50	20.00	foam	moderate	92
20.00	55.00	air & water	good	92

SPT DETAILS

Depth	Type	Incremental blow count/penetration in mm
1.50	S	N=2 (1,0,1,0,0,1)
3.50	S	1/450mm
5.50	S	1/450mm
7.50	S	1/450mm
10.50	S	1/450mm
13.50	S	N=8 (2,2,2,2,2,2)
16.50	S	30/0mm*
18.00	S	49/150mm
19.00	S	81/150mm
19.50	S	42/75mm*

* Seating blows only.

GENERAL NOTES

NB All depths in metres, all diameters in millimetres, water strike rise time in minutes, hard strata time in hours

Form	COMBINED HEADER
Version	2.00
Revised	26/06/1997

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Sheet 1 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E 185472.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.20 m AOD
Client	Welsh Office	Drillers	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	19/11/1997
		Core Bit	Chunk		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive U100	SPT N & depth	Install-ation
Soft to firm becoming very soft greyish brown thinly laminated slightly micaceous organic CLAY, with occasional rootlets. (Estuarine Alluvium)			U 0.50 - 1.00	(9)		
			D 1.20			
			B 1.50 - 2.00		S2 1.50 1.95	
			D 2.20			
	2.40	3.80				
Very soft dark grey slightly organic CLAY. (Estuarine Alluvium)			D 3.20			
			B 3.50 - 4.00	(2)	S1/450mm 3.50 3.95	
			D 4.20			
			U 4.50 - 5.00	(2)		
			D 5.20			
---from 5.50 to 5.95m slightly micaceous			B 5.50 - 6.00		S1/450mm 5.50 5.95	
			D 6.20			
			U 6.50 - 7.00	(2)		
			D 7.20			
---from 7.50m soft slightly micaceous slightly sandy			B 7.50 - 8.00		S1/450mm 7.50 7.95	
			D 8.20			
			B 9.00 - 9.50 U 9.00 - 9.50	(3)		
			D 9.70			

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Sheet 2 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E 185472.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.20 m AOD
Client	Welsh Office	Drillers	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	19/11/1997
		Core Bit	Chunk		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	Blow count to drive UI 00	SPT N & depth	Install-ation
Very soft dark grey slightly organic CLAY. (Estuarine Alluvium)				B 10.50 - 11.00		S1/450mm 10.50 10.95	
---at 10.50m occasionally mottled brown							
---at 11.50m sandy				D 11.50			
				U 12.00 - 12.50	(5)		
				D 12.70			
---from 12.70m very dark grey		12.90	-6.70				
Soft grey sandy CLAY with occasional sub-rounded siliceous gravel. (Estuarine Alluvium)				B 13.50 - 14.00		S8 13.50 13.95	
		13.80	-7.60				
Firm greyish brown sandy very silty CLAY with occasional fine to medium gravel size pockets of brownish yellow and black, brown woody fibrous peat. (Estuarine Alluvium)				D 14.50			
				U 15.00 - 15.50	(11)		
				D 15.70			
		16.20	-10.00				
Very dense greyish brown slightly sandy sub-angular to sub-rounded siliceous GRAVEL with many cobbles. (Fluvial Alluvium)				B 16.50 - 17.00		S30/0mm* 16.50 16.50	
				B 17.20 - 17.70			
						S49/150mm 18.00 18.30	
		18.20	-12.00				
Reddish brown mottled greyish green thinly laminated moderately to highly weathered slightly calcitic MUDSTONE, weak to moderately weak. (Mercia Mudstone Group)				D 18.80		S81/150mm 19.00 19.15	
---at 19.30m moderately weak to moderately strong		19.50	-13.30	D 19.50		S42/75mm* 19.50 19.58	

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Sheet 3 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E 185472.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.20 m AOD
Client	Welsh Office	Drillers	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core Barrel	P	Date Completed	19/11/1997
		Core Bit	Chunk		

Description of Strata	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	Fl	SPT N & depth	Install-ation
Reddish brown mottled green medium bedded moderately to highly weathered silty MUDSTONE, weak to moderately weak with closely spaced sub-horizontal fractures planar rough tight. (Mercia Mudstone Group)			20.00 - 21.50	99	61	55	NI		
---from 20.40 to 20.50m calcitic							2		
---from 21.50 to 21.60m highly weathered weak completely fractured							NI		
---from 21.90 to 22.30m highly weathered very weak completely fractured			21.50 - 23.00	100	20	0	3		
---from 22.65 to 23.00m highly weathered weak							NI		
---from 23.00 to 23.40m completely fractured weak							NI		
			23.00 - 24.25	92	38	26	8		
---from 24.25 to 26.00m highly weathered very weak completely fractured			24.25 - 25.80	100	0	0	NI		
	26.00	-19.80					NI		
Reddish brown occasionally mottled green medium bedded moderately weathered slightly sandy silty MUDSTONE, moderately weak to moderately strong with medium to widely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)			25.80 - 27.35	100	71	35	6		
---from 27.35 to 27.50m highly weathered very weak completely fractured							NI		
---from 27.95m moderately to highly weathered weak to moderately weak			27.35 - 28.90	98	68	19	10		
---from 28.50 to 28.55m inclined fracture (45°) planar slightly open (15mm calcite infill)							NI		
---from 28.55 to 28.90m highly weathered very weak completely fractured									
---from 28.90m very closely to closely spaced			28.90 - 30.40	100	79	0	15		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	2.00
Revised	19/12/1996

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Sheet 4 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E 185472.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.20 m AOD
Client	Welsh Office	Driller	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Chunk		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green medium bedded moderately weathered slightly sandy silty MUDSTONE, moderately weak to moderately strong with medium to widely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)										
				30.40 - 31.75	100	74	59	3		
---from 30.40 to 31.40m closely to medium spaced sub-horizontal fractures								NI		
---from 31.40 to 31.75m highly weathered weak completely fractured										
				31.75 - 32.95	100	83	30	10		
---from 31.70 to 32.55m moderately to highly weathered weak to moderately weak								2		
---from 32.95 to 33.70m highly weathered very weak completely fractured								NI		
				32.95 - 34.45	100	40	13			
---from 33.70 to 34.45m moderately to highly weathered weak to moderately weak								7		
		34.45	-28.25							
Reddish brown occasionally mottled green thinly to medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)				34.45 - 35.65	100	0	0	NI		
---from 35.65 to 35.95m moderately weathered moderately weak with very closely spaced inclined fractures planar rough tight				35.65 - 35.95	100	50	0	4		
				35.95 - 37.45	97	13	0	NI		
---from 37.05 to 37.25m moderately weathered moderately weak with very closely spaced inclined fractures planar rough tight								4		
								NI		
				37.45 - 38.90	88	0	0	NI		
				38.90 - 40.30	100	0	0	NI		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Sheet 5 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E 185472.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.20 m AOD
Client	Welsh Office	Driller	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Chunk		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green thinly to medium bedded highly weathered silty MUDSTONE, very weak completely fractured. (Mercia Mudstone Group)										
		41.00	-34.80	40.30 - 41.80	100	17	7	NI 3 NI 8		
Reddish brown thinly bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal fractures. (Mercia Mudstone Group)		41.80	-35.60							
Reddish brown thinly to medium bedded highly weathered silty MUDSTONE, weak completely fractured. (Mercia Mudstone Group)		42.60	-36.40	41.80 - 43.30	100	30	0	NI 10		
Reddish brown thinly bedded moderately weathered silty MUDSTONE, moderately weak to moderately strong with very closely to closely spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group)		43.30	-37.10							
Reddish brown occasionally mottled green thinly to medium bedded slightly weathered silty MUDSTONE, moderately strong with closely to medium spaced sub-horizontal to inclined thick laminations to very thin beds of calcite and closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group) ---from 43.75 to 43.85m slightly to moderately weathered moderately weak completely fractured ---from 43.85m moderately weathered moderately weak ---from 44.75 to 44.95m completely fractured ---from 45.20m fresh to slightly weathered ---from 46.65 to 47.15m slightly to moderately weathered ---from 47.40 to 47.80m moderately to highly weathered weak completely fractured				43.30 - 44.75	100	72	30	4 NI 9		
				44.75 - 46.20	100	77	36	NI 11		
				46.20 - 47.50	100	69	39	9 NI		
				47.50 - 48.90	100	69	44	NI 4		
				48.90 - 50.30	100	75	39	8		

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Norwest Holst Soil Engineering Ltd.

BOREHOLE LOG - CABLE & ROTARY

Borehole No. **BHG1** Sheet 6 of 6

Contract No.	F10895	Method	Cable Percussion & Rotary Coring	Coordinates	332490.0 E 185472.0 N
Project	M4 Relief Road Magor to Castleton Stage 2	Drilling Rig	Pilcon/T30	Ground Level	6.20 m AOD
Client	Welsh Office	Driller	I.D/J.M	Orientation	Vertical
		Logged by	C.D/T.R	Date Started	11/11/1997
Consultant	Ove Arup and Partners	Core barrel	P	Date Completed	19/11/1997
		Core bit	Chunk		

Description of Strata	Legend	Depth Below G.L.	O.D. Level	Sampling & coring	TCR	SCR	RQD	FI	SPT N & depth	Install-ation
Reddish brown occasionally mottled green thinly to medium bedded slightly weathered silty MUDSTONE, moderately strong with closely to medium spaced sub-horizontal to inclined thick laminations to very thin beds of calcite and closely to medium spaced sub-horizontal to inclined fractures planar rough tight. (Mercia Mudstone Group) ---from 50.10 to 50.65m highly weathered very weak completely fractured ---from 50.85 to 51.05m highly weathered very weak completely fractured ----from 51.15 to 51.70m sub-vertical (075°) thick laminations of calcite (15mm) ---from 52.40 to 52.85m vertical to sub-vertical (90-75°) thick laminations of calcite (15-20mm)				50.30 - 51.70	93	44	29	NI NI 1 NI 2		
				51.70 - 52.40	86	60	37	3		
				52.40 - 53.35	86	84	53	6		
				53.35 - 54.25	83	78	37	9		
				54.25 - 55.00	89	89	83	6		
		55.00	-48.80							
Borehole complete at 55.00 m.										

NB All depths in metres, all diameters in millimetres.
See header sheet for details of drilling, progress and water strikes. See legend sheet for key to symbols.

Form	NH COMBINED LOG
Version	1.00
Revised	20/09/96

Geotechnical Engineering Limited

BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 1 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
10/03/15 1150hrs	1B	0.20	0.50						Soft dark brownish grey slightly sandy CLAY with frequent roots (up to 20mm diam) and rootlets. (TFD)			
	2D*	0.20	0.50		Vo 0.0							
	3B	0.50	1.00									
	4D*	0.50	1.00		Vo 0.0							
	5B	1.00	1.20									
	6D*	1.00	1.20		Vo 0.0					1.00	6.00	
	UT	1.20	1.65	Nil					Very soft dark grey organic CLAY with rare fragments of fibrous organic material (up to 2mm diam). (TFD)			
	8X	1.20	1.70									
	9D*	1.20	1.40									
	10X	1.70	2.20									
	UT	2.20	2.65	Nil								
	12X	2.20	2.70									
	13D*	2.20	2.40									
10/03/15 1655hrs 0.00m	14X	2.70	3.20	Nil								
	15D*	3.00	3.20									
11/03/15 0930hrs 0.00m	16P	3.20	4.00	3.20		P/S						
	17X	4.00	4.60	3.20								
		4.50		3.20	V 29				4.50m: Low strength.			
	18P	4.60	5.40	4.60		P/S						
	19X	5.40	5.80									
		5.70		4.60	V 1				5.70m: Extremely low strength.			
	20P	5.80	6.60			P/S						
	21X	6.60	7.00									
		6.90		4.60	V 9				6.90m: Extremely low strength.			
	22P	7.00	7.80	7.00		P/S						
	23X	7.80	8.20									
									Continued Next Page	{8.00}		

EQUIPMENT: Geotechnical Pioneer rig.

METHOD: Hand dug inspection pit 0.00-1.20m. Dynamic sampled (128mm) 1.20-3.20m, (113mm) 4.00-15.20m. Waterflush rotary core drilled (116mm) 15.20-60.00m.

CASING: 140mm diam to 18.20m.

BACKFILL: On completion, borehole backfilled with bentonite 60.00-40.00m. A slotted standpipe (50mm) was installed to 40.00m, granular response zone 40.00-25.00m and bentonite seal 25.00-18.00m. A second slotted standpipe (35mm) was installed to 18.00m, granular response zone 18.00-15.00m, bentonite seal 15.00-0.30m and concrete and raised cover 0.30-0.00m.

REMARKS: Downhole magnetometry for UXO risk mitigation undertaken 0.00-15.20m. No anomalies encountered. MMG = Mercia Mudstone Group. Weathering zone after Chandler RJ and Forster CIRIA C570; Engineering in Mercia Mudstone (2001).

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

water strike (m)	casing (m)	rose to (m)	time to rise (min)	remarks
1.20	Nil	0.54	20	

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 2 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
		8.10		7.00	V 35				8.10m: Low strength.			
	24P	8.20	9.00	8.20		P/S			8.20m: Soft.			
	25X	9.00	10.00									
										9.20	-2.20	
									Soft dark grey organic silty CLAY. (TFD)			
11/03/15 1700hrs 0.00m		9.50		8.20	V 24				9.50m: Low strength.			
12/03/15 0850hrs 0.00m	26P	10.00	10.80	10.00		P/S						
	27X	10.80	11.80									
	28P	11.80	12.60	10.00		P/S						
	29X	12.60	13.60									
										13.20	-6.20	
									Dark grey thickly interlaminated fine SAND and CLAY with frequent fragments of organic material (up to 2mm). (TFD)	13.30	-6.30	
	30P	13.60	14.05	12.60		P/S			Soft dark grey organic silty CLAY with frequent thick laminae of fine sand. (TFD)			
	31D	14.05	14.50	14.05	S 4							
	32X	14.05	15.20									
										15.00	-8.00	
	33D	15.20	15.59	15.20	S*64				Very dense grey thickly laminated silty fine and medium SAND with rare fragments of fibrous organic material (up to 2mm). (TFD)			
	34C	15.20	16.60			100	NA					
										15.60	-8.60	
									Grey thickly bedded silty fine and medium SAND with rare fragments of fibrous organic material (up to 2mm). (TFD)	16.00	-9.00	
12/03/15 1700hrs 0.00m									Grey and reddish brown gravelly fine to coarse SAND with frequent bivalve shells (up to 10mm). Gravel is subangular to rounded fine and medium sandstone and quartz. (TFD)	16.20	-9.20	
	35D	16.60	16.91	15.20	S*94					16.45	-9.45	
13/03/15 0915hrs 0.00m	36C	16.60	16.90	16.60		67				16.60	-9.60	
									Grey fine to coarse SAND with frequent shells (up to 10mm). (TFD)	16.90	-9.90	
	37C	16.90	18.20	16.60		15						
									Grey and reddish brown sandy subangular to rounded fine to coarse sandstone and quartzite GRAVEL with a low subrounded sandstone and quartz cobble content. (RTD)			
									Limited recovery. Grey slightly sandy gravelly subangular to rounded sandstone COBBLES. Gravel is subangular to			
									Continued Next Page	{18.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 3 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
	38C	18.20 - 18.48 18.20 - 18.30	18.20	S*100	100			rounded coarse sandstone. Loss of fines. (RTD)	18.20	-11.20	
	39C	18.30 - 19.30	18.20		100	NA		Limited recovery. Soft reddish brown slightly sandy silty CLAY. (RTD)	18.30	-11.30	
								Grey subrounded to well rounded sandstone and conglomerate COBBLES. (RTD)			
13/03/15 1600hrs 4.20m	40C	19.30 - 19.60	18.20		100			Hard fissured friable reddish brown gravelly silty CLAY locally tending to extremely weak mudstone frequent greenish grey reduction spots (up to 10mm). Gravel is angular fine and medium mudstone lithorelicts. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III) 19.40m: Cobble sized lithorelict of weak mudstone.			
		19.60 - 19.85	18.20	C*125							
16/03/15 0955hrs 5.70m	41C	19.60 - 21.10			97						
	42C	21.10 - 22.60	18.20		97						
						NA		Hard fissured reddish brown silty CLAY with frequent fine sand sized gypsum crystals along fissure surfaces. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)	22.30	-15.30	
	43C	22.60 - 24.10	18.20		100						
						NA		Hard fissured friable reddish brown gravelly silty CLAY frequent greenish grey reduction spots (up to 10mm). Gravel is angular fine and medium mudstone lithorelicts. Locally tending to extremely weak mudstone. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)	24.00	-17.00	
	44C	24.10 - 25.60	18.20		100						
	45C	25.60 - 27.10	18.20		100			25.55m: 50° relict fissure infilled with fine sand sized gypsum crystals.			
	46C	27.10 - 28.60	18.20		100 7 7						
								Continued Next Page	{28.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 4 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
16/03/15 1700hrs 5.10m								27.95 - 28.05m: Weak mudstone.	28.60	-21.60	
17/03/15 0930hrs 5.60m	47C	28.60 - 30.10	18.20		97 27 9	NI 80 150		Extremely weak reddish brown MUDSTONE locally disintegrated to gravelly clay with frequent greenish grey reduction spots (up to 40mm). Fractures are subhorizontal and 20° very closely and closely spaced undulating rough. (MMG) (Grade II)	29.50	-22.50	
						NA		Hard fissured reddish brown gravelly silty CLAY. Gravel is angular fine and medium mudstone lithorelicts. (MMG) (Grade III)			
	48C	30.10 - 31.60	18.20		93 45 32	NI 60 210		Extremely weak reddish brown MUDSTONE with rare greenish grey reduction spots (up to 20mm). Fractures are subhorizontal very closely to medium closely spaced undulating rough. (MMG) (Grade II)	30.30	-23.30	
	49C	31.60 - 33.10	18.20		97 19 0				32.50	-25.50	
						NA		Hard fissured reddish brown gravelly silty CLAY locally tending to extremely weak mudstone. Gravel is angular fine and medium extremely weak mudstone lithorelicts. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)			
	50C	33.10 - 34.60	18.20		100			34.20 - 34.75m: Frequent fine sand sized gypsum crystals along fissure surfaces.			
	51C	34.60 - 36.10	18.20		100 4 0	NI NI 60		Extremely weak reddish brown MUDSTONE. Fractures are subhorizontal, 20° and 70° extremely closely spaced undulating rough. (MMG) (Grade II)	34.75 35.25	-27.75 -28.25	
						NA		Hard fissured reddish brown gravelly silty CLAY with rare greenish grey reduction spots (up to 30mm). Gravel is angular fine and medium extremely weak mudstone lithorelicts. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)			
	52C	36.10 - 37.60	18.20		87						
17/03/15 1700hrs 6.20m											
18/03/15 0910hrs 5.60m	53C	37.60 - 39.10	18.20		90						
								Continued Next Page	{38.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

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BOREHOLE LOG

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CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 5 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
									39.10	-32.10	
	54C	39.10 - 40.60	18.20		100	NI		Extremely weak reddish brown MUDSTONE locally disintegrated to gravelly clay. Recovered non intact. (MMG) (Grade II/III)	39.70	-32.70	
								Hard fissured reddish brown gravelly silty CLAY. Gravel is angular fine and medium extremely weak mudstone lithorelicts. (MMG) (Grade III)	39.90	-32.90	
	55C	40.60 - 42.10	18.20		100 5 0			Extremely weak reddish brown MUDSTONE locally disintegrated to gravelly clay. Non-intact. (MMG) (Grade II/III)	41.10	-34.10	
						NA		Hard fissured reddish brown gravelly silty CLAY. Gravel is angular fine and medium extremely weak mudstone lithorelicts. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)	41.70	-34.70	
						NI		41.20 - 41.30m: Frequent fine and medium sand sized gypsum crystals.			
	56C	42.10 - 43.60	18.20		100 0 0			Extremely weak reddish brown MUDSTONE. Recovered non intact. (MMG) (Grade II)	42.40	-35.40	
						NA		Hard fissured reddish brown gravelly silty CLAY locally tending to extremely weak mudstone. Gravel is angular fine and medium extremely weak mudstone lithorelicts. Fissures are randomly orientated extremely closely spaced undulating rough. (MMG) (Grade III)			
	57C	43.60 - 45.10	18.20		87						
18/03/15 1600hrs 6.80m											
19/03/15 0940hrs 6.60m	58C	45.10 - 46.60	18.20		90 14 8				45.80	-38.80	
						NI 80 190		Extremely weak locally weak reddish brown MUDSTONE with frequent gypsum veining along healed fractures (up to 3mm thick). Rare greenish grey reduction spots (up to 20mm). Fractures are subhorizontal, 20° and 60° extremely closely to closely spaced planar smooth. (MMG) (Grade II)			
	59C	46.60 - 48.10	18.20		93 59 32			46.10m: Subvertical tending to 70° undulating gypsum vein (17mm thick).			
								47.05m: Subhorizontal and 70° intersecting planar gypsum veins (5mm thick).			
								47.50m: 60° planar gypsum vein (5mm thick).			
								47.80m: 20° undulating gypsum vein (15mm thick).			
								Continued Next Page	{48.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

AGS

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Geotechnical Engineering Limited

BOREHOLE LOG

BH423

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 6 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
	60C	48.10 - 49.10	18.20		85 39 19						
	61C	49.10 - 50.60	18.20		77 47 21						
19/03/15 1600hrs 7.00m								50.30m: 20° planar gypsum vein (up to 8mm thick).			
24/03/15 1220hrs 8.10m	62C	50.60 - 52.10	18.20		97 90 66	160 180 250		Very weak and weak reddish brown MUDSTONE with frequent gypsum infill along healed fractures. Fractures are subhorizontal to 20° and 70° to subvertical, closely and medium spaced planar smooth. (MMG) (Grade I) 51.10 - 52.00m: Subvertical tending to 70° undulating gypsum vein (20mm thick).	51.00	-44.00	
	63C	52.10 - 52.60	18.20		100 80 60						
	64C	52.60 - 54.10	18.20		100 76 61	50 100 160		53.25 - 54.60m: Fractures are subhorizontal, 20°, 50° and 70° very closely and closely spaced planar smooth. 53.55 - 53.80m: Frequent greenish grey reduction spots (up to 30mm thick).			
24/03/15 1745hrs 8.50m								53.90 - 54.05m: 70° undulating gypsum vein (15mm thick). 54.10 - 54.25m: 70° planar gypsum vein (12mm thick).			
25/03/15 0945hrs 8.60m	65C	54.10 - 55.60	18.20		97 90 53	40 150 300		54.60 - 58.60m: Fractures are subhorizontal, 20° and 30° closely and medium spaced planar smooth.			
	66C	55.60 - 57.10	18.20		93 78 57			55.90 - 56.10m: 70° undulating gypsum vein (12mm thick).			
	67C	57.10 - 58.60	18.20		97 79 63			57.10 - 57.20m: 70° undulating gypsum vein (30mm thick).			
								Continued Next Page	{58.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

AGS

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Geotechnical Engineering Limited

BOREHOLE LOG

BH423

CLIENT WELSH GOVERNMENT

SITE M4 CORRIDOR AROUND NEWPORT — Sheet 7 of 7

Start Date 10 March 2015 — Easting 332656.3 — Scale 1 : 50

End Date 27 March 2015 — Northing 185435.3 — Ground level 7.00mOD — Depth 60.00 m

progress date/time water depth	sample no & type	depth (m) from	depth (m) to	casing depth (m)	test type & value	samp. /core range	I_f	instru -ment	description	depth (m)	reduced level (m)	legend
25/03/15 1530hrs 8.70m												
26/03/15 1020hrs 8.70m	68C	58.60	60.00	18.20		89 89 86	80 110 250		58.75 - 58.80m: 20° planar gypsum vein (4mm thick).			
26/03/15 1430hrs 8.50m									59.55 - 59.57m: 20° planar gypsum vein (7mm thick).	60.00	-53.00	
									Borehole completed at 60.00m.	{68.00}		

water strike (m) casing (m) rose to (m) time to rise (m) remarks

AGS

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TRIAL PIT LOG

TP410

CLIENT	WELSH GOVERNMENT					Sheet	1 of 1
SITE	M4 CORRIDOR AROUND NEWPORT					Scale	1 : 25
Start Date	9 March 2015	Easting	332693.1				
End Date	9 March 2015	Northing	185424.0	Ground level	7.20mOD	Depth	4.00 m

water record	sample/test no/type	sample/test result	sample/test depth (m)	description	depth (m)	level (m)	legend
	1B	Vo 0.0	0.00- 0.20	Grass over soft dark brown peaty silty CLAY with frequent roots (up to 5mm diam) and rootlets (up to 1mm diam). Frequent plastic bottles, steel cans and cobble sized fragments of wood, timber and plastic. (MG)			
	2D		0.10		0.20	7.00	
				Soft dark brownish grey slightly sandy slightly gravelly silty CLAY. Gravel is angular and subangular medium and coarse red brick, crystalline and sandstone. Low angular and subangular red brick, crystalline and sandstone cobble content. (MG)			
0.90m: Fast inflow.	3B	Vo 1.2	0.90- 1.00				
	4D		1.00				
	5B	Vo 1.1	1.40- 1.50				
	6D		1.50				
					1.80	5.40	
				Soft greenish brown silty CLAY with frequent partings of soft black organic CLAY. (TFD)			
		H 24	2.00				
	7B	Vo 2.6	2.50- 2.60				
	8D	H 22	2.50				
	9B	Vo 0.6	3.70- 3.80				
3.85m	10D		3.80				
					4.00	3.20	

Trial pit completed at 4.00m.

Notes

Trial pit excavated by JCB 3CX mechanical excavator.
Groundwater encountered below 0.90m.
Trial pit sides remained stable and vertical.
Trial pit dimensions 3.50x0.80x4.00m.
On completion, the trial pit was backfilled with materials arising.

Sketch of Foundation - Not to scale. All dimensions in metres.

EXPLORATORY HOLE LOGS SHOULD BE READ IN CONJUNCTION WITH KEY SHEETS

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30238	EC

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BOREHOLE LOG

Borehole No. **BHM4CANA034**

Sheet 1 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 10/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332495	Drilling Method:	51.30m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.33	Logged By: EJH	1:50

Casing Diameter (mm)	Casing Depth (m)

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							0.00		6.33		Soft dark grey brownish CLAY with frequent rootlets (TIDAL FLAT DEPOSITS)	
								(1.00)				
		1.00	B				1.00		5.33		Very soft dark grey CLAY. (TIDAL FLAT DEPOSITS)	1
		1.00	ES									
		2.00	B									2
												3
												4
												5
								(13.20)				
												6
												7
												8
												9
												10
					Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.95m. Air mist and water flush rotary drilled 18.95 - 51.3m. Borehole terminated and redrilled approximately 1m away as BHM4CANA034A due to casing issues.
BACKFILL: On completion hole backfilled with bentonite 51.3 - 0.2m and arisings 0.2 - 0.0m.
REMARKS: No groundwater strikes identified, possibly impeded by drilling technique. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - .16.3m. No anomalies encountered. HDP testing undertaken within bedrock.

Type: Method	From (m)	To (m)
CP	0.00	18.50
RC	18.50	50.80
RO	50.80	51.30

Groundwater: Depth Strike (m)	Depth Casing (m)	Level After 20 Mins

Chiselling: Duration (hh:mm)	Top Depth (m)	Base Depth (m)

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034**

Sheet 2 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 10/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332495	Drilling Method:	51.30m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.33	Logged By: EJH	1:50

Casing Diameter (mm): | Casing Depth (m):

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
												11
												12
												13
												14
							14.20		-7.87		Very soft dark grey medium sandy CLAY with rare shells. (TIDAL FLAT DEPOSITS)	
								(1.60)				15
							15.80		-9.47		Medium to coarse dark grey SAND. (TIDAL FLAT DEPOSITS)	
								(0.50)				16
							16.30		-9.97		Coarse gravels and cobbles with medium to coarse dark grey SAND. (GLACIOFLUVIAL DEPOSITS)	
								(1.90)				17
												18
		18.50 - 18.90					18.50		-12.17		Very weak reddish brown MUDSTONE with frequent greyish green reduction spots. Fractures are closely to medium spaced, dip horizontally to 10 degrees and are rough. (MERCIA MUDSTONE)	
		18.90 - 19.40										19
		19.40 - 20.40										
					Core	Fractures					Continued on next sheet	20

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.95m. Air mist and water flush rotary drilled 18.95 - 51.3m. Borehole terminated and redrilled approximately 1m away as BHM4CANA034A due to casing issues.
BACKFILL: On completion hole backfilled with bentonite 51.3 - 0.2m and arisings 0.2 - 0.0m.
REMARKS: No groundwater strikes identified, possibly impeded by drilling technique. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - .16.3m. No anomalies encountered. HDP testing undertaken within bedrock.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.50						
RC	18.50	50.80						
RO	50.80	51.30						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034**

Sheet 3 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 10/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332495	Drilling Method:	51.30m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.33	Logged By: EJH	1:50

Casing Diameter (mm)	Casing Depth (m)

Well	Water Strike (s)	Samples & In Situ Testing			Rotary Coring		Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		Depth (m)	Type	Results	Core (%)	Fractures (mm)						
		20.40 - 21.20										
		21.20	SPT(C)	100 (25 for 88mm/100 for 262mm)								21
		21.20 - 21.70			TCR: 27 SCR: 16 RQD: 0						*Recovered as GRAVELS from 21.20-21.60m.*	
		21.70 - 22.10			TCR: 37 SCR: 33 RQD: 0							22
		22.10 - 22.40			TCR: 23	Min: 20 Avg: 70 Max: 270					*Recovered as soft red brown CLAY from 22.10-22.25m.*	
		22.30	HPD1								*Recovered as GRAVELS from 22.40-65m.*	
		22.40 - 23.30			TCR: 78 SCR: 56 RQD: 30							23
		23.30	SPT(C)	28 (105 for 125mm/28 for 237mm)								
		23.30 - 24.80										24
		24.80	SPT(C)	102 (25 for 135mm/102 for 287mm)							*Becoming thinly laminated from 24.80m.*	
		24.80 - 25.80			TCR: 85 SCR: 65 RQD: 60						*White crystalline gypsum inclusions at 25.10-25.50m.*	25
		25.80	SPT(C)	62 (63 for 148mm/62 for 296mm)							*From 27.00m becoming weak.*	
		25.80 - 26.90			TCR: 54 SCR: 36 RQD: 0							26
		26.90	SPT(C)	53 (72 for 135mm/53 for 289mm)								
		26.90 - 27.80			TCR: 67 SCR: 67 RQD: 34	Min: 50 Avg: 100 Max: 290						27
		27.50	SPT(C)	47 (88 for 135mm/47 for 283mm)								
		27.80 - 28.50			TCR: 100 SCR: 90 RQD: 50						*Very weak at 28.00-28.50m.*	28
		28.50	SPT(C)	100 (54 for 145mm/100 for 260mm)							*Recovered as soft CLAY.*	
		28.50 - 30.50			TCR: 85 SCR: 73 RQD: 34							29
		29.50	HPD2									
					Core	Fractures					Continued on next sheet	30

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.95m. Air mist and water flush rotary drilled 18.95 - 51.3m. Borehole terminated and redrilled approximately 1m away as BHM4CANA034A due to casing issues.
BACKFILL: On completion hole backfilled with bentonite 51.3 - 0.2m and arisings 0.2 - 0.0m.
REMARKS: No groundwater strikes identified, possibly impeded by drilling technique. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - .16.3m. No anomalies encountered. HDP testing undertaken within bedrock.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.50						
RC	18.50	50.80						
RO	50.80	51.30						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034**

Sheet 4 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 10/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332495	Drilling Method:	51.30m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.33	Logged By: EJH	1:50

Casing Diameter (mm)	Casing Depth (m)

Well	Water Strike (s)	Samples & In Situ Testing			Rotary Coring		Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		Depth (m)	Type	Results	Core (%)	Fractures (mm)						
		30.30	SPT(C)	100 (7,12/100 for 250mm)							*Very weak band at 30.10-30.50m.*	
											Recovered as soft sandy CLAY at 30.30-31.80m.	
		30.50 - 31.30			TCR: 63 SCR: 30 RQD: 0							31
						Min: 30 Avg: 100 Max: 150						
		31.30 - 32.80			TCR: 100 SCR: 97 RQD: 26							32
											Recovered as non-intact for 30mm at 32.40-34.70mm.	
		32.80	SPT(C)	110 (47 for 155mm/110 for 255mm)							*Recovered as GRAVELS for 10mm.*	
											Weak very thinly laminated band and highly fractured.	33
		32.80 - 34.30			TCR: 93 SCR: 92 RQD: 56						*Fracture dipping at approximately 50 degrees with a stepped rough surface at 32.2m.*	
											Large grey green reduction spot, 70mm in diameter at 33.30m.	
						Min: 50 Avg: 200 Max: 330						34
		34.30	SPT(C)	25 (105 for 115mm/25 for 233mm)							*Very weak band at 34.20-34.40m.*	
											Below 34.50m fractures becoming predominantly medium spaced.	
		34.30 - 35.80			TCR: 150 SCR: 92 RQD: 90			(23.15)				35
		35.80	SPT(C)	75 (61 for 90mm/75 for 250mm)							*Recovered as soft CLAY from 35.80-36.00m.*	
											Recovered as GRAVELS from 36.00-36.10m.	36
											Recovered as GRAVELS from 36.26-36.60m.	
						Min: 20 Avg: 50 Max: 110					*Recovered as GRAVELS from 36.50-36.60m.*	
		35.80 - 37.80			TCR: 78 SCR: 45 RQD: 5							
		37.00	HPD3									37
											Extremely weak band from 37.80-38.50m.	
		37.80 - 38.80			TCR: 100 SCR: 95 RQD: 30							38
		38.80	SPT(C)	79 (54 for 105mm/79 for 239mm)								
											Extremely weak bands from 39.10-40.10m.	39
		38.80 - 40.30			TCR: 81 SCR: 73 RQD: 9							
					Core	Fractures					Continued on next sheet	40

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.95m. Air mist and water flush rotary drilled 18.95 - 51.3m. Borehole terminated and redrilled approximately 1m away as BHM4CANA034A due to casing issues.
BACKFILL: On completion hole backfilled with bentonite 51.3 - 0.2m and arisings 0.2 - 0.0m.
REMARKS: No groundwater strikes identified, possibly impeded by drilling technique. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - .16.3m. No anomalies encountered. HDP testing undertaken within bedrock.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.50						
RC	18.50	50.80						
RO	50.80	51.30						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034**

Sheet 5 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 10/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332495	Drilling Method:	51.30m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.33	Logged By: EJH	1:50

Casing Diameter (mm)	Casing Depth (m)

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
											Recovered as soft sandy CLAY from 40.10-40.30m.	
											Recovered as soft CLAY from 40.30-41.10m.	
		40.30 - 41.80			TCR: 74 SCR: 58 RQD: 25							41
											Recovered as GRAVELS from 41.10-41.20m.	
											Recovered as GRAVELS from 41.28-41.58m. *Recovered as GRAVELS from 41.40-41.90m.*	
		41.80	SPT(C)	25 (100 for 135mm/25 for 240mm)		Min: 20 Avg: 100 Max: 180	41.65		-35.32		Medium strong reddish brown MUDSTONE with frequent grey green reduction spots of various sizes and randomly orientated veins of calcite of varying thickness. Fractures are horizontal closely to medium spaced with a planar rough surface. (MERCIA MUDSTONE)	42
		41.80 - 43.30			TCR: 90 SCR: 77 RQD: 55						*Recovered as GRAVELS from 42.60-42.80m.*	
											Recovered as soft sandy gravelly CLAY from 43.3-43.50m.	43
		43.30 - 45.00			TCR: 100 SCR: 84 RQD: 44	Min: 20 Avg: 70 Max: 200						44
		44.45	HPD4								*Recovered as GRAVELS at 44.70m.*	
		45.00 - 45.50			TCR: 13 SCR: 14 RQD: 0						*Recovered as coarse GRAVELS from 45.00-45.30m.*	45
		45.30	SPT(C)	98 (68 for 110mm/98 for 260mm)								
		45.50 - 46.30			TCR: 100 SCR: 83 RQD: 82			(9.15)			*Recovered as sandy clayey SAND from 45.50-45.60m.* *Fractures predominantly medium spaced after 45.60m.*	46
		46.30	SPT(C)	N=0 (55 for 95mm/,,,)		Min: 290 Avg: 300 Max: 530					*Fracture dipping at approximately 35 degrees with an undulating rough surface at 45.90m.* *Very weak band at 46.30-46.40m.*	
		46.30 - 47.80			TCR: 93 SCR: 93 RQD: 87							47
											Recovered as soft sandy CLAY.	48
		47.80 - 49.30			TCR: 93 SCR: 87 RQD: 87	Min: 300 Avg: 400 Max: 550						49
											Continued on next sheet	50
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.95m. Air mist and water flush rotary drilled 18.95 - 51.3m. Borehole terminated and redrilled approximately 1m away as BHM4CANA034A due to casing issues.
BACKFILL: On completion hole backfilled with bentonite 51.3 - 0.2m and arisings 0.2 - 0.0m.
REMARKS: No groundwater strikes identified, possibly impeded by drilling technique. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - .16.3m. No anomalies encountered. HDP testing undertaken within bedrock.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.50						
RC	18.50	50.80						
RO	50.80	51.30						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034**

Sheet 6 of 6

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 10/03/2016	Final Depth:
Project No:	JFR8703	Easting:	332495	Drilling Method:	51.30m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.33	Logged By: EJH	1:50

Casing Diameter (mm)	Casing Depth (m)

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		49.30 - 50.80			TCR: 92 SCR: 92 RQD: 92							
							50.80	(0.50)	-44.47		Open holed to release the casing. No recovery, geology inferred. (NO RECOVERY)	51
											End of Borehole at 51.300m	52
												53
												54
												55
												56
												57
												58
												59
					Core	Fractures						60

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.95m. Air mist and water flush rotary drilled 18.95 - 51.3m. Borehole terminated and redrilled approximately 1m away as BHM4CANA034A due to casing issues.
BACKFILL: On completion hole backfilled with bentonite 51.3 - 0.2m and arisings 0.2 - 0.0m.
REMARKS: No groundwater strikes identified, possibly impeded by drilling technique. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - .16.3m. No anomalies encountered. HDP testing undertaken within bedrock.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.50						
RC	18.50	50.80						
RO	50.80	51.30						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034A**

Sheet 1 of 10

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/05/2016 - 01/06/2016	Final Depth:
Project No:	JFR8703	Easting:	332496	Drilling Method:	90.40m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Casing Diameter (mm): 200 / Casing Depth (m): 18.20
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.49	Logged By: HE	Scale: 1:50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							0.00		6.49		Soft brown silty CLAY with frequent rootlets and bark. (TIDAL FLAT DEPOSITS)	
								(1.40)				
		1.00	ES									1
		1.20	SPT(S)	2 (1,/2 for 225mm)								
		1.20 - 1.70	B				1.40		5.09		Soft to very soft brownish grey silty CLAY with rare, fine subrounded to subangular gravels. (TIDAL FLAT DEPOSITS)	
		1.60	P									
		1.70 - 2.15	UT									
		2.15 - 2.30	D					(1.40)				2
		2.30	SPT(S)	N=1 (1,/,,1,)								
		2.30 - 2.75	D									
		2.40	ES									
		2.80 - 3.80	P				2.80		3.69		Very soft bluish grey silty CLAY with frequent organic matter with an organic odour. (TIDAL FLAT DEPOSITS)	
		3.80 - 4.80	P									3
												4
		4.80 - 5.80	P					(3.80)				5
		5.80 - 6.25	UT									
		6.25 - 6.60	D									6
		6.60 - 7.60	ES				6.60		-0.11		Soft bluish grey silty CLAY with a faint organic odour. (TIDAL FLAT DEPOSITS)	
		6.60 - 7.60	P									
		7.60 - 8.60	P									7
												8
								(3.60)				
												9
		9.60 - 10.60	P									
					Core	Fractures					Continued on next sheet	10

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.40m. Rotary open hole technique 18.40 - 48.00m. Air mist and water flush rotary cored 48.0 - 90.4m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 90.4 - 0.3m and topsoil 0.3 - 0.0m.
REMARKS: Borehole terminated upon achieving proposed final depth. Installed with raised cover. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - 16.0m. No anomalies encountered. Hole moved 1.5m south of BHM4CANA034. HDP testing undertaken within the bedrock. No groundwater strikes encountered, likely impeded by drilling technique.

Type

Method	From (m)	To (m)
CP	0.00	18.40
RO	18.40	48.00
RC	48.00	90.40

Groundwater

Depth Strike (m)	Depth Casing (m)	Level After 20 Mins

Chiselling

Duration (hh:mm)	Top Depth (m)	Base Depth (m)
00:45	16.50	16.70
01:00	18.20	18.40

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034A**

Sheet 2 of 10

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/05/2016 - 01/06/2016	Final Depth:
Project No:	JFR8703	Easting:	332496	Drilling Method:	90.40m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Casing Diameter (mm): 200 / Casing Depth (m): 18.20 — Scale: 1:50
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.49	Logged By: HE	

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
							10.20		-3.71		Soft to firm blackish grey CLAY. (TIDAL FLAT DEPOSITS)	
		11.00 - 12.00	P					(2.30)				11
		12.00 - 13.00	P									12
		12.50	ES				12.50		-6.01		Firm to soft bluish grey slightly sandy, slightly gravelly CLAY, with occasional bivalves (up to 40mm in diameter). Gravels are medium to fine, rounded to subrounded. (TIDAL FLAT DEPOSITS) *Becoming Stiff from 13.0-16.0m.*	
		13.10 - 14.10	P									13
		14.30	P					(3.50)				14
		14.30 - 15.30	B									
		15.30	SPT(C)	N=10 (1,1/1,2,3,4)								15
		15.30 - 15.75	D									
		15.80 - 16.80	B									
		16.30	SPT(C)	N=48 (4,8/10,10,12,16)			16.00		-9.51		Dense red and brown, GRAVELS of mudstone and sandstone. Gravels are subrounded with grey soft silty clay matrix and become very dense with depth grading into cobbles. (GLACIOFLUVIAL DEPOSITS)	16
		16.30 - 16.75	D					(1.40)				
		17.40	SPT(C)	N=60 (10,23/15,15,15,15)			17.40		-10.91		Very dense brown silty clayey GRAVEL. Gravel is rounded to subrounded with a silty matrix between clasts. (GLACIOFLUVIAL DEPOSITS)	17
		17.40 - 17.90	B					(0.45)				
		17.90 - 18.40	B				17.85		-11.36		Red very weathered MUDSTONE (Weathering Grade V). (WEATHERED MERCIA MUDSTONE)	
								(0.35)				18
							18.20		-11.71		Red weathered MUDSTONE with greenish grey reduction spots (Weathering Grade V). (WEATHERED MERCIA MUDSTONE)	
		18.40	SPT(C)	50 (25 for 45mm/50 for 35mm)			18.40	(0.20)	-11.91		Rotary open holed. Geology inferred. (MERCIA MUDSTONE)	
												19
											Continued on next sheet	20

Core | Fractures

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.40m. Rotary open hole technique 18.40 - 48.00m. Air mist and water flush rotary cored 48.0 - 90.4m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 90.4 - 0.3m and topsoil 0.3 - 0.0m.
REMARKS: Borehole terminated upon achieving proposed final depth. Installed with raised cover. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - 16.0m. No anomalies encountered. Hole moved 1.5m south of BHM4CANA034. HDP testing undertaken within the bedrock. No groundwater strikes encountered, likely impeded by drilling technique.

Type

Method	From (m)	To (m)
CP	0.00	18.40
RO	18.40	48.00
RC	48.00	90.40

Groundwater

Depth Strike (m)	Depth Casing (m)	Level After 20 Mins

Chiselling

Duration (hh:mm)	Top Depth (m)	Base Depth (m)
00:45	16.50	16.70
01:00	18.20	18.40

AGS

BOREHOLE LOG

Borehole No.
BHM4CANA034A
Sheet 3 of 10

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/05/2016 - 01/06/2016		Final Depth:
Project No:	JFR8703	Easting:	332496	Drilling Method:		90.40m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Casing Diameter (mm): 200 / Casing Depth (m): 18.20	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.49	Logged By: HE		1:50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
												21 22 23 24 25 26 27 28 29 30
					Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.40m. Rotary open hole technique 18.40 - 48.00m. Air mist and water flush rotary cored 48.0 - 90.4m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 90.4 - 0.3m and topsoil 0.3 - 0.0m.
REMARKS: Borehole terminated upon achieving proposed final depth. Installed with raised cover. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - 16.0m. No anomalies encountered. Hole moved 1.5m south of BHM4CANA034. HDP testing undertaken within the bedrock. No groundwater strikes encountered, likely impeded by drilling technique.

Type

Method	From (m)	To (m)
CP	0.00	18.40
RO	18.40	48.00
RC	48.00	90.40

Groundwater

Depth Strike (m)	Depth Casing (m)	Level After 20 Mins

Chiselling

Duration (hh:mm)	Top Depth (m)	Base Depth (m)
00:45	16.50	16.70
01:00	18.20	18.40

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034A**

Sheet 4 of 10

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/05/2016 - 01/06/2016	Final Depth:
Project No:	JFR8703	Easting:	332496	Drilling Method:	90.40m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.49	Logged By: HE	1:50

Casing Diameter (mm)	Casing Depth (m)
200	18.20

Well	Water Strike (s)	Samples & In Situ Testing			Rotary Coring		Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		Depth (m)	Type	Results	Core (%)	Fractures (mm)						
								(29.60)				31 32 33 34 35 36 37 38 39 40
					Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.40m. Rotary open hole technique 18.40 - 48.00m. Air mist and water flush rotary cored 48.0 - 90.4m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 90.4 - 0.3m and topsoil 0.3 - 0.0m.
REMARKS: Borehole terminated upon achieving proposed final depth. Installed with raised cover. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - 16.0m. No anomalies encountered. Hole moved 1.5m south of BHM4CANA034. HDP testing undertaken within the bedrock. No groundwater strikes encountered, likely impeded by drilling technique.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.40				00:45	16.50	16.70
RO	18.40	48.00				01:00	18.20	18.40
RC	48.00	90.40						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034A**

Sheet 5 of 10

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/05/2016 - 01/06/2016	Final Depth:
Project No:	JFR8703	Easting:	332496	Drilling Method:	90.40m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.49	Logged By: HE	1:50

Casing Diameter (mm)	Casing Depth (m)
200	18.20

Well	Water Strike (s)	Samples & In Situ Testing			Rotary Coring		Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		Depth (m)	Type	Results	Core (%)	Fractures (mm)						
		48.00	SPT(C)	100 (25 for 70mm/100 for 128mm)			48.00		-41.51		Very weak reddish brown MUDSTONE with frequent greyish green reduction spots up to 50mm in diameter. Fractures are horizontal to subhorizontal, with a soft slightly sandy CLAY infill. Whitish grey crystalline gypsum is present in bands up to 40mm thick (MERCIA MUDSTONE)	48
		48.00 - 50.10 49.20	HPD5		TCR: 55 SCR: 47 RQD: 23	Min: 190 Avg: 100 Max: 40					*Recovered as medium to coarse GRAVELS and COBBLES at 48.65-48.67, 50.00-50.08, 50.25-50.45m.*	49
											Continued on next sheet	50
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.40m. Rotary open hole technique 18.40 - 48.00m. Air mist and water flush rotary cored 48.0 - 90.4m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 90.4 - 0.3m and topsoil 0.3 - 0.0m.
REMARKS: Borehole terminated upon achieving proposed final depth. Installed with raised cover. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - 16.0m. No anomalies encountered. Hole moved 1.5m south of BHM4CANA034. HDP testing undertaken within the bedrock. No groundwater strikes encountered, likely impeded by drilling technique.

Type

Method	From (m)	To (m)
CP	0.00	18.40
RO	18.40	48.00
RC	48.00	90.40

Groundwater

Depth Strike (m)	Depth Casing (m)	Level After 20 Mins

Chiselling

Duration (hh:mm)	Top Depth (m)	Base Depth (m)
00:45	16.50	16.70
01:00	18.20	18.40

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034A**

Sheet 6 of 10

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/05/2016 - 01/06/2016	Final Depth:
Project No:	JFR8703	Easting:	332496	Drilling Method:	90.40m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Casing Diameter (mm): 200 / Casing Depth (m): 18.20
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.49	Logged By: HE	Scale: 1:50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		50.10	SPT(C)	100 (25 for 55mm/100 for 87mm)								
		50.10 - 51.00			TCR: 70 SCR: 37 RQD: 32	Min: 180 Avg: 120 Max: 50						
											Gypsum found as inclusions up to 50mm in diameter. Recovered as angular to subangular gravels with a sandy CLAY infill at 51.60-51.7, 52.00-52.30 and 52.80m.	51
								(5.50)				
		51.00 - 53.50			TCR: 96 SCR: 66 RQD: 56	Min: 380 Avg: 140 Max: 30						52
												53
		53.30	SPT(C)	100 (25 for 60mm/100 for 83mm)			53.50		-47.01			
											Weak reddish brown MUDSTONE with frequent greyish green reduction spots and gypsum bands. Fractures are horizontal to subhorizontal with a fine to medium sandy GRAVEL infill. (MERCIA MUDSTONE)	54
											Gravel is subrounded to angular at 54.10, 54.20, 54.90-55.00 and 55.60m.	
		53.50 - 56.00			TCR: 100 SCR: 92 RQD: 68	Min: 280 Avg: 180 Max: 20						55
								(4.50)				
		56.00	SPT(C)	100 (25 for 60mm/100 for 15mm)								56
											GRAVELS and Cobbles with a clayey, silty matrix from 56.00-56.50m Gravels are angular to subrounded.	
		56.00 - 58.00 57.10	HPD6		TCR: 95 SCR: 73 RQD: 55	Min: 300 Avg: 150 Max: 25						57
							58.00		-51.51			58
											Very weak reddish brown thinly laminated MUDSTONE. Fractures are horizontal to subhorizontal, closely to medium spaced, with a clay infill. Greenish grey reduction spots are frequent (Weathering Grade II). (MERCIA MUDSTONE)	
		58.00 - 59.00			TCR: 100 SCR: 72 RQD: 64	Min: 140 Avg: 80 Max: 40					*White crystalline bands of gypsum are found in horizontal to subhorizontal fractures at 58.00, 58.68,-58.75, 59.5-59.8, 60.08 and 60.60m.*	
		59.00	SPT(C)	100 (25 for 45mm/100 for 75mm)				(3.00)			*Mudstone recovered as slightly clayey, angular to subangular fine GRAVELS at 58.40, 58.58,58.70, 59.23, 59.50, 59.80 and 60.20m.*	59
											Band of slightly gravelly CLAY. Gravel is fine subrounded to subangular at 59.10-59.14m.	
											White crystalline bands of gypsum are found in horizontal to subhorizontal fractures at 59.5-59.8m.	
		59.00 - 61.00										60
					Core	Fractures					Continued on next sheet	

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.40m. Rotary open hole technique 18.40 - 48.00m. Air mist and water flush rotary cored 48.0 - 90.4m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 90.4 - 0.3m and topsoil 0.3 - 0.0m.
REMARKS: Borehole terminated upon achieving proposed final depth. Installed with raised cover. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - 16.0m. No anomalies encountered. Hole moved 1.5m south of BHM4CANA034. HDP testing undertaken within the bedrock. No groundwater strikes encountered, likely impeded by drilling technique.

Type

Method	From (m)	To (m)
CP	0.00	18.40
RO	18.40	48.00
RC	48.00	90.40

Groundwater

Depth Strike (m)	Depth Casing (m)	Level After 20 Mins

Chiselling

Duration (hh:mm)	Top Depth (m)	Base Depth (m)
00:45	16.50	16.70
01:00	18.20	18.40

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034A**

Sheet 7 of 10

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/05/2016 - 01/06/2016	Final Depth:
Project No:	JFR8703	Easting:	332496	Drilling Method:	90.40m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.49	Logged By: HE	1:50

Casing Diameter (mm)	Casing Depth (m)
200	18.20

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
					TCR: 97 SCR: 65 RQD: 63	Min: 350 Avg: 200 Max: 30						
							61.00		-54.51		Weak reddish brown thinly laminated MUDSTONE with occasional green reduction spots. Fractures are horizontal to subhorizontal, closely to medium spaced with a slightly clayey, slightly sandy, gravelly infill (Weathering Grade II). (MERCIA MUDSTONE)	61
		61.00 - 61.50			TCR: 100 SCR: 100 RQD: 100							
		61.50	SPT(C)	100 (25 for 45mm/100 for 75mm)								62
		61.50 - 64.00			TCR: 78 SCR: 60 RQD: 60	Min: 160 Avg: 100 Max: 40						63
		64.00	SPT(C)	100 (25 for 95mm/100 for 55mm)				(6.00)			*White crystalline bands of gypsum in horizontal to subhorizontal fractures at 64.07, 64.29, 65.50, 65.72, 66.80m.*	64
		65.10	HPD7									65
		64.00 - 67.00			TCR: 86 SCR: 78 RQD: 75	Min: 200 Avg: 120 Max: 30						66
		67.00	SPT(C)	100 (9,13/100 for 282mm)			67.00		-60.51		Very weak reddish brown thinly laminated MUDSTONE with occasional green reduction spots. Fractures are horizontal, closely to medium spaced with a gravelly clay infill (Weathering Grade II). (MERCIA MUDSTONE)	67
											White crystalline gypsum bands present at 67.50, 67.68, 67.90, 68.60 and 69.50m.	
		67.00 - 69.50			TCR: 95 SCR: 85 RQD: 83	Min: 320 Avg: 140 Max: 25		(3.48)				68
												69
		69.50	SPT(C)	100 (25 for 103mm/100 for 40mm)							*White crystalline gypsum bands present at 69.80, 70.00m. Recovered as gravelly clay. Gravel is fine, subangular to subrounded at 69.5-70.48m.*	
					Core	Fractures					Continued on next sheet	70

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.40m. Rotary open hole technique 18.40 - 48.00m. Air mist and water flush rotary cored 48.0 - 90.4m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 90.4 - 0.3m and topsoil 0.3 - 0.0m.
REMARKS: Borehole terminated upon achieving proposed final depth. Installed with raised cover. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - 16.0m. No anomalies encountered. Hole moved 1.5m south of BHM4CANA034. HDP testing undertaken within the bedrock. No groundwater strikes encountered, likely impeded by drilling technique.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.40				00:45	16.50	16.70
RO	18.40	48.00				01:00	18.20	18.40
RC	48.00	90.40						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034A**

Sheet 8 of 10

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/05/2016 - 01/06/2016	Final Depth:
Project No:	JFR8703	Easting:	332496	Drilling Method:	90.40m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Scale:
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.49	Logged By: HE	1:50

Casing Diameter (mm)	Casing Depth (m)
200	18.20

Well	Water Strike (s)	Samples & In Situ Testing			Rotary Coring		Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		Depth (m)	Type	Results	Core (%)	Fractures (mm)						
							70.48		-63.99		Very weak green grey thinly laminated MUDSTONE with occasional reddish brown mottling. White crystalline gypsum also seen (Weathering Grade II). (MERCIA MUDSTONE)	
		69.50 - 72.00			TCR: 86 SCR: 80 RQD: 80	Min: 330 Avg: 200 Max: 60		(1.02)				71
							71.50		-65.01		Weak reddish brown MUDSTONE with green reduction spots. White crystalline gypsum present (Weathering Grade I). (MERCIA MUDSTONE)	
								(0.50)				
		72.00	SPT(C)	100 (6,3/100 for 145mm)			72.00		-65.51		Very weak reddish brown thinly laminated MUDSTONE with rare green reduction spots. fractures are clean, horizontal to subhorizontal closely spaced and undulating (Weathering Grade II). (MERCIA MUDSTONE)	72
											White crystalline bands of gypsum present at 72.7, 73.08, 73.15, 73.38 and 74.10m.	
		73.10	HPD8									73
		72.00 - 75.00			TCR: 96 SCR: 88 RQD: 88	Min: 330 Avg: 120 Max: 50						74
		75.00	SPT(C)	100 (9,13/100 for 40mm)							*Recovered as clayey GRAVELS. gravels coarse are subrounded to subangular at 75.00-75.10m.*	75
											White crystalline bands of gypsum up to 30mm wide present at 75.30, 76.10, 76.15, 76.30, 79.50, 79.70, 80.50-80.70, 81.20, 81.50, and 82.50m.	
								(11.50)				76
		75.00 - 77.50			TCR: 100 SCR: 96 RQD: 96	Min: 270 Avg: 150 Max: 50						77
												78
		77.50 - 80.00			TCR: 83 SCR: 80 RQD: 78	Min: 360 Avg: 220 Max: 45						79
		80.00	SPT(C)	100 (25 for 35mm/100 for 53mm)							Continued on next sheet	80
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.40m. Rotary open hole technique 18.40 - 48.00m. Air mist and water flush rotary cored 48.0 - 90.4m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 90.4 - 0.3m and topsoil 0.3 - 0.0m.
REMARKS: Borehole terminated upon achieving proposed final depth. Installed with raised cover. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - 16.0m. No anomalies encountered. Hole moved 1.5m south of BHM4CANA034. HDP testing undertaken within the bedrock. No groundwater strikes encountered, likely impeded by drilling technique.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.40				00:45	16.50	16.70
RO	18.40	48.00				01:00	18.20	18.40
RC	48.00	90.40						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034A**

Sheet 9 of 10

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/05/2016 - 01/06/2016	Final Depth:
Project No:	JFR8703	Easting:	332496	Drilling Method:	90.40m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Casing Diameter (mm): 200 / Casing Depth (m): 18.20
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.49	Logged By: HE	Scale: 1:50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
											Recovered as fine to coarse slightly clayey GRAVELS. Gravels are coarse subrounded to subangular at 79.90-80.00m.	
		81.10 80.00 - 82.50	HPD9		TCR: 89 SCR: 89 RQD: 89	Min: 450 Avg: 150 Max: 30						81
												82
											White crystalline gypsum becoming less frequent below 82.50m.	
		82.50 - 83.50			TCR: 100 SCR: 90 RQD: 72						*Recovered as angular to subrounded fine to medium Gravels of MUDSTONE at 82.90-82.95m.*	83
		83.50	SPT(C)	100 (25 for 95mm/100 for 67mm)			83.50		-77.01		Weak reddish brown thinly laminated MUDSTONE with rare green reduction spots (Weathering Grade I). (MERCIA MUDSTONE)	
											Whitish grey crystalline gypsum bands at 83.90, 84.03, 84.08, 85.30, 85.75, 86.45 and 87.30m.	84
		83.50 - 85.50			TCR: 96 SCR: 91 RQD: 91	Min: 370 Avg: 300 Max: 150						85
		85.50	SPT(C)	100 (25 for 30mm/100 for 47mm)				(4.50)				86
		85.50 - 88.00			TCR: 96 SCR: 96 RQD: 96							87
		88.00	SPT(C)	100 (8,14/100 for 68mm)		Min: 540 Avg: 300 Max: 150	88.00		-81.51		Extremely weak reddish brown thinly laminated MUDSTONE with occasional green reduction spots. Fractures are horizontal to subhorizontal, clean and closely spaced. White crystalline gypsum bands present up to 40mm (Weathering Grade II). (MERCIA MUDSTONE)	88
					TCR: 92 SCR: 70 RQD: 60			(2.40)			*Recovered as slightly silty, slightly gravelly CLAY. Gravel is fine, subangular to subrounded of mudstone.*	89
		88.00 - 90.40 89.40	HPD10									90
					Core	Fractures					Continued on next sheet	

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Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.40m. Rotary open hole technique 18.40 - 48.00m. Air mist and water flush rotary cored 48.0 - 90.4m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 90.4 - 0.3m and topsoil 0.3 - 0.0m.
REMARKS: Borehole terminated upon achieving proposed final depth. Installed with raised cover. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - 16.0m. No anomalies encountered. Hole moved 1.5m south of BHM4CANA034. HDP testing undertaken within the bedrock. No groundwater strikes encountered, likely impeded by drilling technique.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.40				00:45	16.50	16.70
RO	18.40	48.00				01:00	18.20	18.40
RC	48.00	90.40						

AGS

BOREHOLE LOG

Borehole No. **BHM4CANA034A**

Sheet 10 of 10

Project Name:	M4 CaN Additional GI	Co-ordinates:		Date(s): 12/05/2016 - 01/06/2016	Final Depth:
Project No:	JFR8703	Easting:	332496	Drilling Method:	90.40m
Location:	Newport	Northing:	185453	Dando 2000 & MC 450 Comacchio Unimog 2150	Casing Diameter (mm): 200 / Casing Depth (m): 18.20
Client:	Costain Vinci Joint Venture	Ground Level (mAOD):	6.49	Logged By: HE	Scale: 1:50

Well	Water Strike (s)	Samples & In Situ Testing: Depth (m)	Type	Results	Rotary Coring: Core (%)	Fractures (mm)	Depth (mbGL)	Thickness (m)	Level (mAOD)	Legend	Stratum Description	Scale
		90.40	SPT(C)	100 (25 for 95mm/100 for 295mm)		Min: 200 Avg: 100 Max: 50					*Recovered as gravels at 90.20-90.40m.* End of Borehole at 90.400m	91 92 93 94 95 96 97 98 99 100
					Core	Fractures						

DRAFT

Remarks:
METHOD: Hand dug inspection pit 0.0 - 1.2m. Cable percussion 1.20m - 18.40m. Rotary open hole technique 18.40 - 48.00m. Air mist and water flush rotary cored 48.0 - 90.4m. Borehole terminated upon achieving proposed final depth.
BACKFILL: On completion hole backfilled with bentonite 90.4 - 0.3m and topsoil 0.3 - 0.0m.
REMARKS: Borehole terminated upon achieving proposed final depth. Installed with raised cover. Downhole magnetometry for UXO risk mitigation undertaken between 1.2 - 16.0m. No anomalies encountered. Hole moved 1.5m south of BHM4CANA034. HDP testing undertaken within the bedrock. No groundwater strikes encountered, likely impeded by drilling technique.

Type			Groundwater			Chiselling		
Method	From (m)	To (m)	Depth Strike (m)	Depth Casing (m)	Level After 20 Mins	Duration (hh:mm)	Top Depth (m)	Base Depth (m)
CP	0.00	18.40				00:45	16.50	16.70
RO	18.40	48.00				01:00	18.20	18.40
RC	48.00	90.40						

AGS

SUPPLEMENTARY HOLE INFORMATION

BHM4CANA034

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
10/03/2016 07:30:00	0.00	0.00	
10/03/2016 18:00:00	13.50	13.50	
15/03/2016 07:30:00	13.50	13.50	
15/03/2016 18:00:00	18.95	18.95	
21/03/2016 07:30:00	18.50	18.50	
21/03/2016 18:00:00	19.40	18.50	
22/03/2016 07:30:00	19.40	18.50	
22/03/2016 18:00:00	21.70	18.50	
23/03/2016 07:30:00	21.70	18.50	
23/03/2016 18:00:00	23.30	18.50	
24/03/2016 07:30:00	23.30	18.50	
24/03/2016 18:00:00	26.90	18.50	
29/03/2016 07:30:00	26.90	18.50	
29/03/2016 18:00:00	30.30	18.50	
30/03/2016 07:30:00	30.30		
30/03/2016 18:00:00	32.80		

Sample Information

Type/Ref	Depth (m)	Date
ES	1.00	10-03-2016
B	1.00	
B	2.00	

Standard Penetration Tests

Depth (m)	Type	Reported Result
21.20	C	100 (25 for 88mm/100 for 262mm)
23.30	C	28 (105 for 125mm/28 for 237mm)
24.80	C	102 (25 for 135mm/102 for 287mm)
25.80	C	62 (63 for 148mm/62 for 296mm)
26.90	C	53 (72 for 135mm/53 for 289mm)
27.50	C	47 (88 for 135mm/47 for 283mm)
28.50	C	100 (54 for 145mm/100 for 260mm)
30.30	C	100 (7,12/100 for 250mm)
32.80	C	110 (47 for 155mm/110 for 255mm)
34.30	C	25 (105 for 115mm/25 for 233mm)
35.80	C	75 (61 for 90mm/75 for 250mm)
38.80	C	79 (54 for 105mm/79 for 239mm)
41.80	C	25 (100 for 135mm/25 for 240mm)
45.30	C	98 (68 for 110mm/98 for 260mm)
46.30	C	N=0 (55 for 95mm/,,,)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

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SUPPLEMENTARY HOLE INFORMATION

BHM4CANA034A

Start & End of Shift Observations

Date & Time	Depth (m)	Casing (m)	Water (m)
13/05/2016 07:30:00	0.00	0.00	
13/05/2016 18:00:00	3.30	3.00	
16/05/2016 07:30:00	3.30	3.00	
16/05/2016 18:00:00	16.30	15.60	6
17/05/2016 07:30:00	15.30	15.60	5.07
17/05/2016 18:00:00	18.40	18.10	
18/05/2016 07:30:00	18.30	18.30	
18/05/2016 18:00:00	48.20	19.50	40
19/05/2016 07:30:00	48.20	19.50	6.5
19/05/2016 18:00:00	50.24	19.50	9.6
20/05/2016 07:30:00	51.10	19.50	5
20/05/2016 18:00:00	56.13	36.00	8.8
23/05/2016 07:30:00	56.13	36.00	5.4
23/05/2016 18:00:00	61.50	36.00	10.2
24/05/2016 07:30:00	61.50	36.00	6.1
24/05/2016 18:00:00	69.57	36.00	9.8
25/05/2016 07:30:00	69.57	36.00	6.8
25/05/2016 18:00:00	77.50	36.00	10.55
26/05/2016 07:30:00	77.50	36.00	6
26/05/2016 18:00:00	85.50	36.00	9.3
27/05/2016 07:30:00	85.50	36.00	7.5
27/05/2016 18:00:00	90.40	36.00	8.3

Sample Types

ACM - Asbestos Containing Material
B - Bulk
C - Core (including Waxed)
CBR - CBR Mould
CPT - Cone Penetration Test
D - Disturbed
ES - Environmental Soil
EW - Environmental Water
L - Leachate
LB - Large Bulk
P - Piston
PID - Gas
R - Radiological
U - Undisturbed
UT - Undisturbed Thin Wall
W - Water
X - Explosives

Sample Information

Type/Ref	Depth (m)	Date
ES	1.00	12-05-2016
B	1.20 - 1.70	
P	1.60	
UT	1.70 - 2.15	
D	2.15 - 2.30	
D	2.30 - 2.75	
ES	2.40	13-05-2016
P	2.80 - 3.80	
P	3.80 - 4.80	
P	4.80 - 5.80	
UT	5.80 - 6.25	
D	6.25 - 6.60	
P	6.60 - 7.60	
ES	6.60 - 7.60	
P	7.60 - 8.60	
P	9.60 - 10.60	
P	11.00 - 12.00	
P	12.00 - 13.00	
ES	12.50	
P	13.10 - 14.10	
P	14.30	
B	14.30 - 15.30	
D	15.30 - 15.75	
B	15.80 - 16.80	
D	16.30 - 16.75	
B	17.40 - 17.90	
B	17.90 - 18.40	

Standard Penetration Tests

Depth (m)	Type	Reported Result
1.20	S	2 (1,/2 for 225mm)
2.30	S	N=1 (1,/,,1,)
15.30	C	N=10 (1,1/1,2,3,4)
16.30	C	N=48 (4,8/10,10,12,16)
17.40	C	N=60 (10,23/15,15,15,15)
18.40	C	50 (25 for 45mm/50 for 35mm)
48.00	C	100 (25 for 70mm/100 for 128mm)
50.10	C	100 (25 for 55mm/100 for 87mm)
53.30	C	100 (25 for 60mm/100 for 83mm)
56.00	C	100 (25 for 60mm/100 for 15mm)
59.00	C	100 (25 for 45mm/100 for 75mm)
61.50	C	100 (25 for 45mm/100 for 75mm)
64.00	C	100 (25 for 95mm/100 for 55mm)
67.00	C	100 (9,13/100 for 282mm)
69.50	C	100 (25 for 103mm/100 for 40mm)
72.00	C	100 (6,3/100 for 145mm)
75.00	C	100 (9,13/100 for 40mm)
80.00	C	100 (25 for 35mm/100 for 53mm)
83.50	C	100 (25 for 95mm/100 for 67mm)
85.50	C	100 (25 for 30mm/100 for 47mm)
88.00	C	100 (8,14/100 for 68mm)
90.40	C	100 (25 for 95mm/100 for 295mm)

In Situ Gas Monitoring

Depth (m)	Test No.	Result (ppm)

In Situ Vane Tests

Depth (m)	Test No.	Result (kPa)

Hand Penetrometer Testing

Depth (m)	Test No.	Result (kPa)

In Situ CBR Testing

Depth (m)	Test No.	CBR Value

Groundwater Monitoring

Date & Time	Reference	Depth (mbGL)

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Appendix 2

Gas and Groundwater Monitoring Data

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH423	28/04/15 11:00:00	1016	0								0.0	10		53 litres purged, base depth 18.00m.
BH423	28/04/15 11:01:00										0.0			
BH423	28/04/15 11:02:00										0.0			
BH423	28/04/15 11:03:00										0.0			
BH423	28/04/15 11:04:00										0.0			
BH423	28/04/15 11:05:00			0.2	0.4	19.8	11.1	0	0	0.6				
BH423	28/04/15 11:06:00			0.3	0.4	19.9	9.3	0	0	0.6				
BH423	28/04/15 11:07:00			0.3	0.6	19.9	16.7	0	0	0.5				
BH423	28/04/15 11:08:00			0.2	0.9	19.8	23.0	0	0	0.5				
BH423	28/04/15 11:09:00			0.2	1.0	19.8	23.4	0	0	0.4				
BH423	28/04/15 11:10:00			0.2	1.0	19.8	23.4	0	0	0.4				
BH423	28/04/15 11:11:00			0.1	1.0	19.9	24.0	0	0	0.3				
BH423	28/04/15 11:12:00			0.1	1.0	19.9	24.2	0	0	0.3				
BH423	28/04/15 11:13:00			0.1	1.0	19.9	23.6	0	0	0.1				
BH423	28/04/15 11:14:00			0.1	1.0	19.9	23.6	0	0	0.1			6.21	
BH423	06/05/15 11:00:00	1004	-1.16								0.0	13		57 litres purged, base depth 18.00m.
BH423	06/05/15 11:01:00										0.0			
BH423	06/05/15 11:02:00										0.0			

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

CONTRACT	CHECKED
30238	**EC**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH423	06/05/15 11:03:00										0.0			
BH423	06/05/15 11:04:00										0.0			
BH423	06/05/15 11:05:00			0.0	0.1	20.4	1.0	0	0	3.3				
BH423	06/05/15 11:06:00			0.0	0.1	20.5	1.0	0	0	3.0				
BH423	06/05/15 11:07:00			0.0	0.1	20.5	1.0	0	0	2.8				
BH423	06/05/15 11:08:00			0.0	0.1	20.6	1.0	0	0	2.7				
BH423	06/05/15 11:09:00			0.0	0.0	20.6	0.0	0	0	2.6				
BH423	06/05/15 11:10:00			0.0	0.0	20.6	0.0	0	0	2.6				
BH423	06/05/15 11:11:00			0.0	0.0	20.7	0.0	0	0	2.5				
BH423	06/05/15 11:12:00			0.0	0.0	20.7	0.0	0	0	2.4				
BH423	06/05/15 11:13:00			0.0	0.0	20.7	0.0	0	0	2.3				
BH423	06/05/15 11:14:00			0.0	0.0	20.7	0.0	0	0	2.3			5.18	
BH423	11/05/15 09:00:00	1015	0								0.0	15		52 litres purged, base depth 18.00m.
BH423	11/05/15 09:31:00										0.0			
BH423	11/05/15 10:02:00										0.0			
BH423	11/05/15 10:33:00										0.0			
BH423	11/05/15 11:04:00										0.0			
BH423	11/05/15 11:35:00			0.0	0.0	20.5	0.0	0	0	1.4				

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

CONTRACT	CHECKED
30238	**EC**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH423	11/05/15 12:06:00			0.0	0.0	20.4	0.0	0	0	1.1				
BH423	11/05/15 12:37:00			0.0	0.0	20.4	0.0	0	0	1.0				
BH423	11/05/15 13:08:00			0.0	0.0	20.4	0.0	0	0	1.0				
BH423	11/05/15 13:39:00			0.0	0.0	20.4	0.0	0	0	0.9				
BH423	11/05/15 14:10:00			0.1	0.0	20.4	0.0	0	0	0.9				
BH423	11/05/15 14:41:00			0.0	0.0	20.3	0.0	0	0	0.8				
BH423	11/05/15 15:12:00			0.0	0.0	20.3	0.0	0	0	0.8				
BH423	11/05/15 15:43:00			0.0	0.0	20.3	0.0	0	0	0.8				
BH423	11/05/15 16:14:00			0.0	0.0	20.3	0.0	0	0	0.8			6.37	
BH423	19/05/15 09:38:00	1004	0								-3.4	12		
BH423	19/05/15 09:39:00										0.0			
BH423	19/05/15 09:40:00										-0.4			
BH423	19/05/15 09:41:00										0.0			
BH423	19/05/15 09:42:00										-1.6			
BH423	19/05/15 09:43:00			0.0	0.0	20.3	0.0	0	0	0.1				
BH423	19/05/15 09:44:00			0.0	0.0	20.3	0.0	0	0	0.1				
BH423	19/05/15 09:45:00			0.0	0.0	20.3	0.0	0	0	0.1				
BH423	19/05/15 09:46:00			0.0	0.0	20.3	0.0	0	0	0.1				

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

CONTRACT	CHECKED
30238	**EC**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH423	19/05/15 09:47:00			0.0	0.0	20.3	0.0	0	0	0.0				
BH423	19/05/15 09:48:00			0.0	0.0	20.3	0.0	0	0	0.0				
BH423	19/05/15 09:49:00			0.0	0.0	20.3	0.0	0	0	0.0				
BH423	19/05/15 09:50:00			0.0	0.0	20.3	0.0	0	0	0.0				
BH423	19/05/15 09:51:00			0.0	0.0	20.3	0.0	0	0	0.0				
BH423	19/05/15 09:52:00			0.0	0.0	20.3	0.0	0	0	0.0				
BH423	19/05/15 09:53:00												7.40	

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Shallow install.

CONTRACT	CHECKED
30238	**EC**

Geotechnical Engineering Limited

GAS AND GROUNDWATER LEVELS

CLIENT: WELSH GOVERNMENT

SITE: M4 CORRIDOR AROUND NEWPORT

Borehole /trial pit no.	date and time	barometric pressure (mb)	pressure differentiation (mm H_2O)	carbon dioxide (%)	methane (%)	oxygen (%)	LEL (%)	hydrogen sulphide (ppm)	carbon monoxide (ppm)	VOC (ppm)	gas flow (ltr/hr)	temperature (°C)	water level (m - bgl)	remarks
BH423	28/04/15 11:14:00												6.02	203 litres purged, base depth 40.00m.
BH423	06/05/15 11:14:00												5.27	208 litres purged, base depth 40.00m.
BH423	11/05/15 16:14:00												6.20	202 litres purged, base depth 40.00m.
BH423	19/05/15 09:54:00												6.90	

remarks
# denotes result exceeding capacity of gas monitoring equipment
VOC - Photoionisation Detector Mini RAE 2000 measures VOC vapours with 10.6eV lamp calibrated against isobutylene.
Deep install.

CONTRACT **30238**

CHECKED **EC**

Appendix 3

Soil Laboratory Data

M4CAN
Soil Sample Analysis & Screening Assessment
CL-18
17/06/2016

Notes

NFD No Fibres Detected
NAD No Asbestos Detected
Chromium VI criteria used
Elemental Mercury criteria used
Screening criterion for lead is C4SL in the absence of a S4UL

Geological Formation Legend

Made Ground	MG
Tidal Flat Deposits	TFD

Screening Values and Assessment

Exceeds S4ULs Criteria	
Laboratory detection level higher than screening criterion	X

Sample Reference	Units	TP410	TP410	BH423	BH423	BHM4CANA034a	BHM4CANA034a
Specimen Depth (m)		0 - 0.1	0.9 - 1	0.2 - 0.5	0.5 - 1	1	2.4
OD Level (m)		7.2	6.3	6.8	6.5	5.49	4.09
Sample Type		ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	TFD	TFD	TFD	TFD
Cluster Code		2015 GI	2015 GI	2015 GI	2015 GI	2016 GI	2016 GI
Metals							
Arsenic	mg/kg	8.9	31	26	17	20.9	28.7
Boron	mg/kg	4.4	3.3	7.6	6.8		
Cadmium	mg/kg	0.41	0.14	1.2	0.2	0.729	2.47
Chromium	mg/kg	16	20	36	19	53.2	50.3
Copper	mg/kg	17	18	42	25	45.4	54.9
Lead	mg/kg	120	53	99	46	107	137
Mercury	mg/kg	1.3	0.21	0.84	0.38	0.329	0.921
Nickel	mg/kg	16	22	33	19	42.7	44.3
Selenium	mg/kg	0.68	0	0.39	0	<1	<1
Vanadium	mg/kg					56	57.7
Zinc	mg/kg	150	86	260	130	340	424
Non-Metal Inorganics							
Cyanide (total)	mg/kg	<0.5	<0.5	<0.5	<0.5		
Cyanide (free)	mg/kg	<0.5	<0.5	<0.5	<0.5		
Other							
Asbestos Presence Screen	None	NAD	NAD				
Asbestos Identification	%	0	0				
pH Value	pH Units	7.9	8.4	8.3	8.7	8.32	7.76
Organics							
BTEX							
GRO (C4-C12)	mg/kg					<0.044	0.463
MTBE	mg/kg					<0.005	<0.005
Benzene	mg/kg					<0.01	<0.01
Toluene	mg/kg					<0.002	0.00636
Ethyl benzene	mg/kg					<0.003	<0.003
m & p Xylene	mg/kg					<0.006	0.00954
o Xylene	mg/kg					<0.003	<0.003
Sum of Detected BTEX	mg/kg					<0.024	<0.024
Sum of Detected Xylenes	mg/kg					<0.009	0.00954
Phenols							
Phenols (total)	mg/kg	<0.3	<0.3				
PAH							
Acenaphthene	mg/kg	1.1	0.23	0.36	0.11	0.122	0.394
Acenaphthylene	mg/kg	0.5	<0.1	0.34	0.22	0.0694	0.134
Anthracene	mg/kg	0.64	0.11	0.16	0.12	0.207	0.581
Benzo(a)anthracene	mg/kg	1.1	<0.1	0.57	0.36	0.925	0.987
Benzo(a)pyrene	mg/kg	1.3	<0.1	0.58	0.1	0.748	0.976
Benzo(b)fluoranthene	mg/kg	2.1	<0.1	0.6	0.69	1.37	1.29
Benzo(ghi)perylene	mg/kg	0.5	<0.1	0.33	<0.1	0.511	0.733
Benzo(k)fluoranthene	mg/kg	0.5	<0.1	0.14	0.14	0.446	0.449
Chrysene	mg/kg	0.57	<0.1	0.85	0.24	1.12	1
Dibenzo(ah)anthracene	mg/kg	0.61	<0.1	<0.1	<0.1	0.174	0.209
Fluoranthene	mg/kg	3.1	0.67	1.3	0.93	1.33	2
Fluorene	mg/kg	0.52	0.27	0.36	0.19	0.16	0.924
Indeno(123cd)pyrene	mg/kg	0.67	<0.1	0.24	<0.1	0.49	0.617
Naphthalene	mg/kg	0.58	0.3	0.61	0.3	0.471	2.2
Phenanthrene	mg/kg	2.7	0.94	1.2	0.77	0.851	1.86
Pyrene	mg/kg	2.6	0.48	0.97	0.82	0.925	1.44
PAH 16 Total	mg/kg	19	3	8.6	5	9.92	15.8
TPH							
TPH >C6-C8	mg/kg	<1	<1	<1	<1		
TPH >C8-C10	mg/kg	<1	<1	<1	<1		
TPH >C10-C12	mg/kg	<1	<1	<1	<1		
TPH >C12-C16	mg/kg	<1	<1	<1	<1		
TPH >C16-C21	mg/kg	<1	<1	<1	<1		
TPH >C21-C35	mg/kg	<1	<1	<1	<1		
Aliphatics C5-C6	mg/kg					<0.01	0.0111
Aliphatics >C6-C8	mg/kg					<0.01	0.0254
Aliphatics >C8-C10	mg/kg					<0.01	0.0398
Aliphatics >C10-C12	mg/kg					<0.01	0.199
Aliphatics >C12-C16	mg/kg					0.446	5.28
Aliphatics >C16-C21	mg/kg					4.68	28.4
Aliphatics >C21-C35	mg/kg					44.8	101
Aliphatics >C35-C44	mg/kg					10.4	19.8
Total Aliphatics >C12-C44	mg/kg					60.3	154
Aromatics >C5-C7	mg/kg					<0.01	<0.01
Aromatics >C7-C8	mg/kg					<0.01	<0.01
Aromatics >EC8-EC10	mg/kg					<0.01	0.0398
Aromatics >EC10-EC12	mg/kg					<0.01	0.134
Aromatics >EC12-EC16	mg/kg					1.17	3.36
Aromatics >EC16-EC21	mg/kg					4.7	12.1
Aromatics >EC21-EC35	mg/kg					30.1	58.7
Aromatics >EC35-EC44	mg/kg					11.5	14.9
Aromatics >EC40-EC44	mg/kg					4.27	4
Total Aromatics >EC12-EC44	mg/kg					47.5	89.1
TPH (Aliphatics and Aromatics C5-C44)	mg/kg					108	244

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Notes

NFD No Fibres Detected
NAD No Asbestos Detected
Chromium VI criteria used
Elemental Mercury criteria used
Screening criterion for lead is C4SL in the absence of a S4UL

Geological Formation Legend

Made Ground	MG
Tidal Flat Deposits	TFD

Screening Values and Assessment

Exceeds S4ULs Criteria	
Laboratory detection level higher than screening criterion	X

Sample Reference	Units	TP410	TP410	BH423	BH423	BHM4CANA034a	BHM4CANA034a
Specimen Depth (m)		0 - 0.1	0.9 - 1	0.2 - 0.5	0.5 - 1	1	2.4
OD Level (m)		7.2	6.3	6.8	6.5	5.49	4.09
Sample Type		ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	TFD	TFD	TFD	TFD
Cluster Code		2015 GI	2015 GI	2015 GI	2015 GI	2016 GI	2016 GI
PCBs							
PCB 105	mg/kg		<0.01			0.00509	0.0387
PCB 114	mg/kg		<0.01			<0.003	<0.003
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg		<0.01			0.0108	0.094
PCB 123	mg/kg		<0.01			<0.003	<0.003
PCB 126	mg/kg		<0.01			<0.003	<0.003
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg		<0.01			<0.003	0.014
PCB 157	mg/kg		<0.01			<0.003	<0.003
PCB 167	mg/kg		<0.01			<0.003	0.0215
PCB 169	mg/kg		<0.01			<0.003	<0.003
PCB 189	mg/kg		<0.01			<0.003	<0.003
PCB 77	mg/kg		<0.01			<0.003	0.0061
PCB 81	mg/kg		<0.01			<0.003	<0.003
Sum of detected WHO 12 PCBs	mg/kg					<0.036	0.174
SVOCs							
Phenols							
2-Chlorophenol	mg/kg					<0.1	<0.1
2-Methylphenol	mg/kg					<0.1	<0.1
2-Nitrophenol	mg/kg					<0.1	<0.1
2,4-Dichlorophenol	mg/kg					<0.1	<0.1
2,4-Dimethylphenol	mg/kg					<0.1	<0.1
2,4,5-Trichlorophenol	mg/kg					<0.1	<0.1
2,4,6-Trichlorophenol	mg/kg					<0.1	<0.1
4-Chloro-3-methylphenol	mg/kg					<0.1	<0.1
4-Methylphenol	mg/kg					<0.1	<0.1
4-Nitrophenol	mg/kg					<0.1	<0.1
Pentachlorophenol	mg/kg					<0.1	<0.1
Phenol	mg/kg					<0.1	<0.1
PAHs							
2-Chloronaphthalene	mg/kg					<0.1	<0.1
2-Methylnaphthalene	mg/kg					<0.1	0.521
Acenaphthene	mg/kg					<0.1	<0.1
Acenaphthylene	mg/kg					<0.1	<0.1
Anthracene	mg/kg					<0.1	<0.1
Benzo(a)anthracene	mg/kg					<0.1	0.219
Benzo(a)pyrene	mg/kg					<0.1	0.23
Benzo(b)fluoranthene	mg/kg					0.174	0.262
Benzo(ghi)perylene	mg/kg					<0.1	<0.1
Benzo(k)fluoranthene	mg/kg					<0.1	0.215
Chrysene	mg/kg					0.198	0.297
Dibenzo(a,h)anthracene	mg/kg					<0.1	<0.1
Fluoranthene	mg/kg					0.315	0.54
Fluorene	mg/kg					<0.1	0.236
Indeno(1,2,3-cd)pyrene	mg/kg					<0.1	0.175
Naphthalene	mg/kg					0.198	0.679
Phenanthrene	mg/kg					0.251	0.492
Pyrene	mg/kg					0.252	0.418
Pthalates							
Bis(2-ethylhexyl) phthalate	mg/kg					<0.1	<0.1
Butylbenzyl phthalate	mg/kg					<0.1	<0.1
Di-n-butyl phthalate	mg/kg					<0.1	<0.1
Di-n-Octyl phthalate	mg/kg					<0.1	<0.1
Diethyl phthalate	mg/kg					<0.1	<0.1
Dimethyl phthalate	mg/kg					<0.1	<0.1
Other Semi-Volatiles							
1,2-Dichlorobenzene	mg/kg					<0.1	<0.1
1,2,4-Trichlorobenzene	mg/kg					<0.1	<0.1
1,3-Dichlorobenzene	mg/kg					<0.1	<0.1
1,4-Dichlorobenzene	mg/kg					<0.1	<0.1
2-Nitroaniline	mg/kg					<0.1	<0.1
2,4-Dinitrotoluene	mg/kg					<0.1	<0.1
2,6-Dinitrotoluene	mg/kg					<0.1	<0.1
3-Nitroaniline	mg/kg					<0.1	<0.1
4-Bromophenylphenylether	mg/kg					<0.1	<0.1
4-Chloroaniline	mg/kg					<0.1	<0.1
4-Chlorophenylphenylether	mg/kg					<0.1	<0.1
4-Nitroaniline	mg/kg					<0.1	<0.1
Azobenzene	mg/kg					<0.1	<0.1
Bis(2-chloroethoxy)methane	mg/kg					<0.1	<0.1
Bis(2-chloroethyl)ether	mg/kg					<0.1	<0.1
Bis(2-chloroisopropyl)ether	mg/kg					<0.1	<0.1
Carbazole	mg/kg					<0.1	<0.1
Dibenzofuran	mg/kg					<0.1	0.302
Hexachlorobenzene	mg/kg					<0.1	<0.1
Hexachlorobutadiene	mg/kg					<0.1	<0.1
Hexachlorocyclopentadiene	mg/kg					<0.1	<0.1
Hexachloroethane	mg/kg					<0.1	<0.1
Isophorone	mg/kg					<0.1	<0.1

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Notes

NFD No Fibres Detected
NAD No Asbestos Detected
Chromium VI criteria used
Elemental Mercury criteria used
Screening criterion for lead is C4SL in the absence of a S4UL

Geological Formation Legend

Made Ground	MG
Tidal Flat Deposits	TFD

Screening Values and Assessment

Exceeds S4ULs Criteria	
Laboratory detection level higher than screening criterion	X

Sample Reference	Units	TP410	TP410	BH423	BH423	BHM4CANA034a	BHM4CANA034a
Specimen Depth (m)		0 - 0.1	0.9 - 1	0.2 - 0.5	0.5 - 1	1	2.4
OD Level (m)		7.2	6.3	6.8	6.5	5.49	4.09
Sample Type		ES	ES	ES	ES	ES	ES
Geology Code		MG	MG	TFD	TFD	TFD	TFD
Cluster Code		2015 GI	2015 GI	2015 GI	2015 GI	2016 GI	2016 GI
N-nitrosodi-n-propylamine	mg/kg					<0.1	<0.1
Nitrobenzene	mg/kg					<0.1	<0.1
VOCs							
Methyl Tertiary Butyl Ether	ug/kg					<100	<100
Benzene	ug/kg					<90	<90
Toluene	ug/kg					<70	<70
Ethylbenzene	ug/kg					<40	<40
p/m-Xylene	ug/kg					<100	<100
o-Xylene	ug/kg					<100	<100
Naphthalene	ug/kg					<130	<130
Hexachlorobutadiene	ug/kg					<200	<200
1.2.4-Trichlorobenzene	ug/kg					<200	<200
1.2-Dichlorobenzene	ug/kg					<100	<100
1.3-Dichlorobenzene	ug/kg					<80	<80
1.4-Dichlorobenzene	ug/kg					<50	<50
1.1.1.2-Tetrachloroethane	ug/kg					<100	<100
1.1.1-Trichloroethane	ug/kg					<70	<70
1.1.2.2-Tetrachloroethane	ug/kg					<100	<100
1.1.2-Trichloroethane	ug/kg					<100	<100
1.1-Dichloropropene	ug/kg					<100	<100
1.1-Dichloroethane	ug/kg					<80	<80
1.1-Dichloroethene	ug/kg					<100	<100
1.2.3-Trichlorobenzene	ug/kg					<200	<200
1.2.3-Trichloropropane	ug/kg					<160	<160
1.2.4-Trimethylbenzene	ug/kg					<90	<90
1.2-Dibromo-3-chloropropane	ug/kg					<140	<140
1.2-Dichloroethane	ug/kg					<50	<50
cis-1-2-Dichloroethene	ug/kg					<60	<60
1.2-Dibromoethane	ug/kg					<100	<100
1.2-Dichloropropane	ug/kg					<100	<100
1.3.5-Trimethylbenzene	ug/kg					<80	<80
cis-1-3-Dichloropropene	ug/kg					<100	<100
1.3-Dichloropropane	ug/kg					<70	<70
2.2-Dichloropropane	ug/kg					<100	<100
2-Chlorotoluene	ug/kg					<90	<90
4-Chlorotoluene	ug/kg					<100	<100
4-Isopropyltoluene	ug/kg					<100	<100
Bromobenzene	ug/kg					<100	<100
Bromochloromethane	ug/kg					<100	<100
Bromoform	ug/kg					<100	<100
Bromomethane	ug/kg					<100	<100
Bromodichloromethane	ug/kg					<70	<70
Chlorobenzene	ug/kg					<50	<50
Carbon Disulphide	ug/kg					<70	<70
Chloroethane	ug/kg					<100	<100
Chloroform	ug/kg					<80	<80
Chloromethane	ug/kg					<70	<70
Carbontetrachloride	ug/kg					<100	<100
Dibromomethane	ug/kg					<90	<90
Dichlorodifluoromethane	ug/kg					<60	<60
Dibromochloromethane	ug/kg					<100	<100
Dichloromethane	ug/kg					<100	<100
Isopropylbenzene	ug/kg					<50	<50
n-Butylbenzene	ug/kg					<110	<110
Propylbenzene	ug/kg					<100	<100
sec-Butylbenzene	ug/kg					<100	<100
Styrene	ug/kg					<100	<100
Tert-amyl methyl ether	ug/kg					<100	<100
trans-1-2-Dichloroethene	ug/kg					<100	<100
trans-1-3-Dichloropropene	ug/kg					<100	<100
Trichlorofluoromethane	ug/kg					<60	<60
tert-Butylbenzene	ug/kg					<140	<140
Tetrachloroethene	ug/kg					<50	<50
Trichloroethene	ug/kg					<90	<90
Vinyl Chloride	ug/kg					<60	<60

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Screening Values and Assessment

	Exceeds S4ULs Criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
NAD No Asbestos Detected
Chromium VI criteria used
Elemental Mercury criteria used
Screening criterion for lead is C4SL in the absence of a S4UL

Sample Reference / Specimen Depth (m) / OD Level (m) / Sample Type / Geology Code / Cluster Code	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
Metals								
Arsenic	mg/kg	6	6	31	8.9	TP410 @ 0.9 - 1mbGL	170	0
Boron	mg/kg	4	4	7.6	3.3	BH423 @ 0.2 - 0.5mbGL	46000	0
Cadmium	mg/kg	6	6	2.47	0.14	BHM4CANA034a @ 2.4mbGL	190	0
Chromium	mg/kg	6	6	53.2	16	BHM4CANA034a @ 1mbGL	33	3
Copper	mg/kg	6	6	54.9	17	BHM4CANA034a @ 2.4mbGL	44000	0
Lead	mg/kg	6	6	137	46	BHM4CANA034a @ 2.4mbGL	1300	0
Mercury	mg/kg	6	6	1.3	0.21	TP410 @ 0 - 0.1mbGL	30	0
Nickel	mg/kg	6	6	44.3	16	BHM4CANA034a @ 2.4mbGL	980	0
Selenium	mg/kg	6	4	0.68	0	TP410 @ 0 - 0.1mbGL	1800	0
Vanadium	mg/kg	2	2	57.7	56	BHM4CANA034a @ 2.4mbGL	5000	0
Zinc	mg/kg	6	6	424	86	BHM4CANA034a @ 2.4mbGL	170000	0
Non-Metal Inorganics								
Cyanide (total)	mg/kg	4	0	None > LOD	None > LOD			
Cyanide (free)	mg/kg	4	0	None > LOD	None > LOD			
Other								
Asbestos Presence Screen	None	2	0	None > LOD	None > LOD			
Asbestos Identification	%	2	2	0	0	TP410 @ 0 - 0.1mbGL		
pH Value	pH Units	6	6	8.7	7.76	BH423 @ 0.5 - 1mbGL	6-9	0
Organics								
BTEX								
GRO (C4-C12)	mg/kg	2	1	0.463	0.463	BHM4CANA034a @ 2.4mbGL		
MTBE	mg/kg	2	0	None > LOD	None > LOD			
Benzene	mg/kg	2	0	None > LOD	None > LOD		27	0
Toluene	mg/kg	2	1	0.00636	0.00636	BHM4CANA034a @ 2.4mbGL	56000	0
Ethyl benzene	mg/kg	2	0	None > LOD	None > LOD		5700	0
m & p Xylene	mg/kg	2	1	0.00954	0.00954	BHM4CANA034a @ 2.4mbGL	5900	0
o Xylene	mg/kg	2	0	None > LOD	None > LOD		6600	0
Sum of Detected BTEX	mg/kg	2	0	None > LOD	None > LOD			
Sum of Detected Xylenes	mg/kg	2	1	0.00954	0.00954	BHM4CANA034a @ 2.4mbGL		
Phenols								
Phenols (total)	mg/kg	2	0	None > LOD	None > LOD		440	0
PAH								
Acenaphthene	mg/kg	6	6	1.1	0.11	TP410 @ 0 - 0.1mbGL	29000	0
Acenaphthylene	mg/kg	6	5	0.5	0.0694	TP410 @ 0 - 0.1mbGL	29000	0
Anthracene	mg/kg	6	6	0.64	0.11	TP410 @ 0 - 0.1mbGL	150000	0
Benzo(a)anthracene	mg/kg	6	5	1.1	0.36	TP410 @ 0 - 0.1mbGL	49	0
Benzo(a)pyrene	mg/kg	6	5	1.3	0.1	TP410 @ 0 - 0.1mbGL	11	0
Benzo(b)fluoranthene	mg/kg	6	5	2.1	0.6	TP410 @ 0 - 0.1mbGL	13	0
Benzo(ghi)perylene	mg/kg	6	4	0.733	0.33	BHM4CANA034a @ 2.4mbGL	1400	0
Benzo(k)fluoranthene	mg/kg	6	5	0.5	0.14	TP410 @ 0 - 0.1mbGL	370	0
Chrysene	mg/kg	6	5	1.12	0.24	BHM4CANA034a @ 1mbGL	93	0
Dibenzo(ah)anthracene	mg/kg	6	3	0.61	0.174	TP410 @ 0 - 0.1mbGL	1.1	0
Fluoranthene	mg/kg	6	6	3.1	0.67	TP410 @ 0 - 0.1mbGL	6300	0
Fluorene	mg/kg	6	6	0.924	0.16	BHM4CANA034a @ 2.4mbGL	20000	0
Indeno(123cd)pyrene	mg/kg	6	4	0.67	0.24	TP410 @ 0 - 0.1mbGL	150	0
Naphthalene	mg/kg	6	6	2.2	0.3	BHM4CANA034a @ 2.4mbGL	190	0
Phenanthrene	mg/kg	6	6	2.7	0.77	TP410 @ 0 - 0.1mbGL	6200	0
Pyrene	mg/kg	6	6	2.6	0.48	TP410 @ 0 - 0.1mbGL	15000	0
PAH 16 Total	mg/kg	6	6	19	3	TP410 @ 0 - 0.1mbGL		
TPH								
TPH >C6-C8	mg/kg	4	0	None > LOD	None > LOD		7800	0
TPH >C8-C10	mg/kg	4	0	None > LOD	None > LOD		2000	0
TPH >C10-C12	mg/kg	4	0	None > LOD	None > LOD		9200	0
TPH >C12-C16	mg/kg	4	0	None > LOD	None > LOD		10000	0
TPH >C16-C21	mg/kg	4	0	None > LOD	None > LOD		7600	0
TPH >C21-C35	mg/kg	4	0	None > LOD	None > LOD		7800	0
Aliphatics C5-C6	mg/kg	2	1	0.0111	0.0111	BHM4CANA034a @ 2.4mbGL	3200	0
Aliphatics >C6-C8	mg/kg	2	1	0.0254	0.0254	BHM4CANA034a @ 2.4mbGL	7800	0
Aliphatics >C8-C10	mg/kg	2	1	0.0398	0.0398	BHM4CANA034a @ 2.4mbGL	2000	0
Aliphatics >C10-C12	mg/kg	2	1	0.199	0.199	BHM4CANA034a @ 2.4mbGL	9700	0
Aliphatics >C12-C16	mg/kg	2	2	5.28	0.446	BHM4CANA034a @ 2.4mbGL	25000	0
Aliphatics >C16-C21	mg/kg	2	2	28.4	4.68	BHM4CANA034a @ 2.4mbGL	450000	0
Aliphatics >C21-C35	mg/kg	2	2	101	44.8	BHM4CANA034a @ 2.4mbGL	450000	0
Aliphatics >C35-C44	mg/kg	2	2	19.8	10.4	BHM4CANA034a @ 2.4mbGL	450000	0
Total Aliphatics >C12-C44	mg/kg	2	2	154	60.3	BHM4CANA034a @ 2.4mbGL	25000	0
Aromatics >C5-C7	mg/kg	2	0	None > LOD	None > LOD		26000	0
Aromatics >C7-C8	mg/kg	2	0	None > LOD	None > LOD		56000	0
Aromatics >EC8-EC10	mg/kg	2	1	0.0398	0.0398	BHM4CANA034a @ 2.4mbGL	3500	0
Aromatics >EC10-EC12	mg/kg	2	1	0.134	0.134	BHM4CANA034a @ 2.4mbGL	9200	0
Aromatics >EC12-EC16	mg/kg	2	2	3.36	1.17	BHM4CANA034a @ 2.4mbGL	10000	0
Aromatics >EC16-EC21	mg/kg	2	2	12.1	4.7	BHM4CANA034a @ 2.4mbGL	7600	0
Aromatics >EC21-EC35	mg/kg	2	2	58.7	30.1	BHM4CANA034a @ 2.4mbGL	7800	0
Aromatics >EC35-EC44	mg/kg	2	2	14.9	11.5	BHM4CANA034a @ 2.4mbGL	7800	0
Aromatics >EC40-EC44	mg/kg	2	2	4.27	4	BHM4CANA034a @ 1mbGL	7800	0
Total Aromatics >EC12-EC44	mg/kg	2	2	89.1	47.5	BHM4CANA034a @ 2.4mbGL	7600	0
TPH (Aliphatics and Aromatics C5-C44)	mg/kg	2	2	244	108	BHM4CANA034a @ 2.4mbGL	2000	0
PCBs								
PCB 105	mg/kg	3	2	0.0387	0.00509	BHM4CANA034a @ 2.4mbGL	0.24	0
PCB 114	mg/kg	3	0	None > LOD	None > LOD		0.24	0
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	mg/kg	3	2	0.094	0.0108	BHM4CANA034a @ 2.4mbGL	0.24	0
PCB 123	mg/kg	3	0	None > LOD	None > LOD		0.24	0
PCB 126	mg/kg	3	0	None > LOD	None > LOD		0.24	0
Pcb-156 2,3,3,4,4,5 - Hexachlorobiphenyl	mg/kg	3	1	0.014	0.014	BHM4CANA034a @ 2.4mbGL	0.24	0

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	Exceeds S4ULs Criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
NAD No Asbestos Detected
Chromium VI criteria used
Elemental Mercury criteria used
Screening criterion for lead is C4SL in the absence of a S4UL

Sample Reference / Specimen Depth (m) / OD Level (m) / Sample Type / Geology Code / Cluster Code	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
PCB 157	mg/kg	3	0	None > LOD	None > LOD		0.24	0
PCB 167	mg/kg	3	1	0.0215	0.0215	BHM4CANA034a @ 2.4mbGL	0.24	0
PCB 169	mg/kg	3	0	None > LOD	None > LOD		0.24	0
PCB 189	mg/kg	3	0	None > LOD	None > LOD		0.24	0
PCB 77	mg/kg	3	1	0.0061	0.0061	BHM4CANA034a @ 2.4mbGL	0.24	0
PCB 81	mg/kg	3	0	None > LOD	None > LOD		0.24	0
Sum of detected WHO 12 PCBs	mg/kg	2	1	0.174	0.174	BHM4CANA034a @ 2.4mbGL	0.24	0
SVOCs								
Phenols								
2-Chlorophenol	mg/kg	2	0	None > LOD	None > LOD			
2-Methylphenol	mg/kg	2	0	None > LOD	None > LOD			
2-Nitrophenol	mg/kg	2	0	None > LOD	None > LOD			
2,4-Dichlorophenol	mg/kg	2	0	None > LOD	None > LOD			
2,4-Dimethylphenol	mg/kg	2	0	None > LOD	None > LOD			
2,4,5-Trichlorophenol	mg/kg	2	0	None > LOD	None > LOD			
2,4,6-Trichlorophenol	mg/kg	2	0	None > LOD	None > LOD			
4-Chloro-3-methylphenol	mg/kg	2	0	None > LOD	None > LOD			
4-Methylphenol	mg/kg	2	0	None > LOD	None > LOD			
4-Nitrophenol	mg/kg	2	0	None > LOD	None > LOD			
Pentachlorophenol	mg/kg	2	0	None > LOD	None > LOD			
Phenol	mg/kg	2	0	None > LOD	None > LOD		440	0
PAHs								
2-Chloronaphthalene	mg/kg	2	0	None > LOD	None > LOD			
2-Methylnaphthalene	mg/kg	2	1	0.521	0.521	BHM4CANA034a @ 2.4mbGL		
Acenaphthene	mg/kg	2	0	None > LOD	None > LOD		29000	0
Acenaphthylene	mg/kg	2	0	None > LOD	None > LOD		29000	0
Anthracene	mg/kg	2	0	None > LOD	None > LOD		150000	0
Benzo(a)anthracene	mg/kg	2	1	0.219	0.219	BHM4CANA034a @ 2.4mbGL	49	0
Benzo(a)pyrene	mg/kg	2	1	0.23	0.23	BHM4CANA034a @ 2.4mbGL	11	0
Benzo(b)fluoranthene	mg/kg	2	2	0.262	0.174	BHM4CANA034a @ 2.4mbGL	13	0
Benzo(ghi)perylene	mg/kg	2	0	None > LOD	None > LOD		1400	0
Benzo(k)fluoranthene	mg/kg	2	1	0.215	0.215	BHM4CANA034a @ 2.4mbGL	370	0
Chrysene	mg/kg	2	2	0.297	0.198	BHM4CANA034a @ 2.4mbGL	93	0
Dibenzo(a,h)anthracene	mg/kg	2	0	None > LOD	None > LOD			
Fluoranthene	mg/kg	2	2	0.54	0.315	BHM4CANA034a @ 2.4mbGL	6300	0
Fluorene	mg/kg	2	1	0.236	0.236	BHM4CANA034a @ 2.4mbGL	20000	0
Indeno(1,2,3-cd)pyrene	mg/kg	2	1	0.175	0.175	BHM4CANA034a @ 2.4mbGL		
Naphthalene	mg/kg	2	2	0.679	0.198	BHM4CANA034a @ 2.4mbGL	190	0
Phenanthrene	mg/kg	2	2	0.492	0.251	BHM4CANA034a @ 2.4mbGL	6200	0
Pyrene	mg/kg	2	2	0.418	0.252	BHM4CANA034a @ 2.4mbGL	15000	0
Pthalates								
Bis(2-ethylhexyl) phthalate	mg/kg	2	0	None > LOD	None > LOD			
Butylbenzyl phthalate	mg/kg	2	0	None > LOD	None > LOD			
Di-n-butyl phthalate	mg/kg	2	0	None > LOD	None > LOD			
Di-n-Octyl phthalate	mg/kg	2	0	None > LOD	None > LOD			
Diethyl phthalate	mg/kg	2	0	None > LOD	None > LOD			
Dimethyl phthalate	mg/kg	2	0	None > LOD	None > LOD			
Other Semi-Volatiles								
1,2-Dichlorobenzene	mg/kg	2	0	None > LOD	None > LOD			
1,2,4-Trichlorobenzene	mg/kg	2	0	None > LOD	None > LOD		220	0
1,3-Dichlorobenzene	mg/kg	2	0	None > LOD	None > LOD			
1,4-Dichlorobenzene	mg/kg	2	0	None > LOD	None > LOD			
2-Nitroaniline	mg/kg	2	0	None > LOD	None > LOD			
2,4-Dinitrotoluene	mg/kg	2	0	None > LOD	None > LOD			
2,6-Dinitrotoluene	mg/kg	2	0	None > LOD	None > LOD			
3-Nitroaniline	mg/kg	2	0	None > LOD	None > LOD			
4-Bromophenylphenylether	mg/kg	2	0	None > LOD	None > LOD			
4-Chloroaniline	mg/kg	2	0	None > LOD	None > LOD			
4-Chlorophenylphenylether	mg/kg	2	0	None > LOD	None > LOD			
4-Nitroaniline	mg/kg	2	0	None > LOD	None > LOD			
Azobenzene	mg/kg	2	0	None > LOD	None > LOD			
Bis(2-chloroethoxy)methane	mg/kg	2	0	None > LOD	None > LOD			
Bis(2-chloroethyl)ether	mg/kg	2	0	None > LOD	None > LOD			
Bis(2-chloroisopropyl)ether	mg/kg	2	0	None > LOD	None > LOD			
Carbazole	mg/kg	2	0	None > LOD	None > LOD			
Dibenzofuran	mg/kg	2	1	0.302	0.302	BHM4CANA034a @ 2.4mbGL		
Hexachlorobenzene	mg/kg	2	0	None > LOD	None > LOD		30	0
Hexachlorobutadiene	mg/kg	2	0	None > LOD	None > LOD		31	0
Hexachlorocyclopentadiene	mg/kg	2	0	None > LOD	None > LOD			
Hexachloroethane	mg/kg	2	0	None > LOD	None > LOD			
Isophorone	mg/kg	2	0	None > LOD	None > LOD			
N-nitrosodi-n-propylamine	mg/kg	2	0	None > LOD	None > LOD			
Nitrobenzene	mg/kg	2	0	None > LOD	None > LOD			
VOCs								
Methyl Tertiary Butyl Ether	ug/kg	2	0	None > LOD	None > LOD			
Benzene	ug/kg	2	0	None > LOD	None > LOD		27000	0
Toluene	ug/kg	2	0	None > LOD	None > LOD		56000000	0
Ethylbenzene	ug/kg	2	0	None > LOD	None > LOD		5700000	0
p/m-Xylene	ug/kg	2	0	None > LOD	None > LOD			
o-Xylene	ug/kg	2	0	None > LOD	None > LOD		6600000	0
Naphthalene	ug/kg	2	0	None > LOD	None > LOD		190000	0
Hexachlorobutadiene	ug/kg	2	0	None > LOD	None > LOD		31000	0
1.2.4-Trichlorobenzene	ug/kg	2	0	None > LOD	None > LOD		220000	0
1.2-Dichlorobenzene	ug/kg	2	0	None > LOD	None > LOD			
1.3-Dichlorobenzene	ug/kg	2	0	None > LOD	None > LOD			

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Screening Values and Assessment

	Exceeds S4ULs Criteria
X	Laboratory detection level higher than screening criterion

Notes

NFD No Fibres Detected
NAD No Asbestos Detected
Chromium VI criteria used
Elemental Mercury criteria used
Screening criterion for lead is C4SL in the absence of a S4UL

Sample Reference Specimen Depth (m) OD Level (m) Sample Type Geology Code Cluster Code	Units	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	Selected S4ULs Criteria	No. Data Exceeding S4ULs Criteria
1.4-Dichlorobenzene	ug/kg	2	0	None > LOD	None > LOD			
1.1.1.2-Tetrachloroethane	ug/kg	2	0	None > LOD	None > LOD			
1.1.1-Trichloroethane	ug/kg	2	0	None > LOD	None > LOD			
1.1.2.2-Tetrachloroethane	ug/kg	2	0	None > LOD	None > LOD			
1.1.2-Trichloroethane	ug/kg	2	0	None > LOD	None > LOD			
1.1-Dichloropropene	ug/kg	2	0	None > LOD	None > LOD			
1.1-Dichloroethane	ug/kg	2	0	None > LOD	None > LOD			
1.1-Dichloroethene	ug/kg	2	0	None > LOD	None > LOD			
1.2.3-Trichlorobenzene	ug/kg	2	0	None > LOD	None > LOD		102000	0
1.2.3-Trichloropropane	ug/kg	2	0	None > LOD	None > LOD			
1.2.4-Trimethylbenzene	ug/kg	2	0	None > LOD	None > LOD			
1.2-Dibromo-3-chloropropane	ug/kg	2	0	None > LOD	None > LOD			
1.2-Dichloroethane	ug/kg	2	0	None > LOD	None > LOD			
cis-1-2-Dichloroethene	ug/kg	2	0	None > LOD	None > LOD			
1.2-Dibromoethane	ug/kg	2	0	None > LOD	None > LOD			
1.2-Dichloropropane	ug/kg	2	0	None > LOD	None > LOD			
1.3.5-Trimethylbenzene	ug/kg	2	0	None > LOD	None > LOD			
cis-1-3-Dichloropropene	ug/kg	2	0	None > LOD	None > LOD			
1.3-Dichloropropane	ug/kg	2	0	None > LOD	None > LOD			
2.2-Dichloropropane	ug/kg	2	0	None > LOD	None > LOD			
2-Chlorotoluene	ug/kg	2	0	None > LOD	None > LOD			
4-Chlorotoluene	ug/kg	2	0	None > LOD	None > LOD			
4-Isopropyltoluene	ug/kg	2	0	None > LOD	None > LOD			
Bromobenzene	ug/kg	2	0	None > LOD	None > LOD			
Bromochloromethane	ug/kg	2	0	None > LOD	None > LOD			
Bromoform	ug/kg	2	0	None > LOD	None > LOD			
Bromomethane	ug/kg	2	0	None > LOD	None > LOD			
Bromodichloromethane	ug/kg	2	0	None > LOD	None > LOD			
Chlorobenzene	ug/kg	2	0	None > LOD	None > LOD		56000	0
Carbon Disulphide	ug/kg	2	0	None > LOD	None > LOD		11000	0
Chloroethane	ug/kg	2	0	None > LOD	None > LOD			
Chloroform	ug/kg	2	0	None > LOD	None > LOD		99000	0
Chloromethane	ug/kg	2	0	None > LOD	None > LOD			
Carbontetrachloride	ug/kg	2	0	None > LOD	None > LOD			
Dibromomethane	ug/kg	2	0	None > LOD	None > LOD			
Dichlorodifluoromethane	ug/kg	2	0	None > LOD	None > LOD			
Dibromochloromethane	ug/kg	2	0	None > LOD	None > LOD			
Dichloromethane	ug/kg	2	0	None > LOD	None > LOD			
Isopropylbenzene	ug/kg	2	0	None > LOD	None > LOD			
n-Butylbenzene	ug/kg	2	0	None > LOD	None > LOD			
Propylbenzene	ug/kg	2	0	None > LOD	None > LOD			
sec-Butylbenzene	ug/kg	2	0	None > LOD	None > LOD			
Styrene	ug/kg	2	0	None > LOD	None > LOD			
Tert-amyl methyl ether	ug/kg	2	0	None > LOD	None > LOD			
trans-1-2-Dichloroethene	ug/kg	2	0	None > LOD	None > LOD			
trans-1-3-Dichloropropene	ug/kg	2	0	None > LOD	None > LOD			
Trichlorofluoromethane	ug/kg	2	0	None > LOD	None > LOD			
tert-Butylbenzene	ug/kg	2	0	None > LOD	None > LOD			
Tetrachloroethene	ug/kg	2	0	None > LOD	None > LOD		19000	0
Trichloroethene	ug/kg	2	0	None > LOD	None > LOD		1200	0
Vinyl Chloride	ug/kg	2	0	None > LOD	None > LOD		59	0

Appendix 4

Groundwater Laboratory Data

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Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Geological Formation Legend

TFD	Tidal Flat Deposits
RTD	River Terrace Deposits
MMG	Mercia Mudstone Group

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: cadmium, copper and zinc
No installation details on PDF. Not clear from fieldwork records N/A

Monitoring Round	Units	Screening Criteria		1		2		3	
Location		EQS	DWS	BH423	BH423	BH423	BH423	BH423	BH423
Location Type				BH					
Depth (m)				7.73	6.71	5.74	9.45	6.62	9.76
Installation Details				Shallow	Deep	Shalllow	Deep	Shallow	Deep
Response Zone				TFD/RTD	MMG	TFD/RTD	MMG	TFD/RTD	MMG
Date Sampled				28/04/2015		06/05/2015		11/05/2015	
Metals									
Arsenic Dissolved	ug/l	50	10	24	10	24	12	19	31
Boron	ug/l	2000	1000	1500	490	2900	1100	1800	480
Chromium Dissolved	ug/l		50	55	36	27	16	17	24
Copper Dissolved	ug/l	10	2000	20	4.8	29	16	7.8	3.5
Lead Dissolved	ug/l	1.2	10	<1	<1	<1	<1	<1	<1
Nickel Dissolved	ug/l	4	20	6.1	2.5	5.7	4.4	3.1	<1
Selenium Dissolved	ug/l		10	34	15	19	18	23	14
Cadmium Dissolved	ug/l	0.15	5	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Zinc Dissolved	ug/l	75		6.4	31	9	38	14	34
Mercury Dissolved	ug/l	0.07	1	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**<0.5**
Non-Metal Inorganics									
Total Alkalinity as CaCO3	mg/l					1500	120	840	63
Chloride	mg/l	250	250			6800	3200	5600	3700
Ammoniacal Nitrogen as N	mg/l	0.6				45	2.5	34	1.6
Total Cyanide	mg/l	0.001	0.05	**<0.05**	**<0.05**	**<0.05**	**<0.05**	**<0.05**	**<0.05**
Free Cyanide	mg/l			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
pH Value	pH units	6-9	6.5-10	8.2	8.2	7.4	7.7	8	8
Phenols									
Phenol	ug/l	7.7				<0.5	<0.5	<0.5	<0.5
Phenols	mg/l	0.0077				**<0.03**	**<0.03**	**<0.03**	**<0.03**
BTEX									
MTBE	ug/l					<1	<1	<1	<1
Benzene	ug/l	10	1	<1	<1	<1	<1	<1	<1
Toluene	ug/l	50		<1	<1	<1	<1	<1	<1
Ethyl benzene	ug/l	20		<1	<1	<1	<1	<1	<1
m & p Xylene	ug/l	30		<1	<1	<1	<1	<1	<1
o Xylene	ug/l	30		<1	<1	<1	<1	<1	<1
TPH									
Aliphatics C5-C6	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aliphatics >C6-C8	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aliphatics >C8-C10	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aliphatics >C10-C12	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aliphatics >C12-C16 Aqueous	ug/l			<0.1	<0.1	<0.1	87	<0.1	<0.1
Aliphatics >C16-C21 Aqueous	ug/l			<0.1	<0.1	<0.1	77	<0.1	<0.1
Aliphatics >C21-C35 Aqueous	ug/l			<0.1	<0.1	<0.1	3000	<0.1	<0.1
Aliphatics >C35-44	ug/l			<0.1	<0.1	<0.1	240	<0.1	<0.1
Aromatics >C5-C7	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aromatics >C7-C8	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aromatics >EC8-EC10	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aromatics >EC10-EC12	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aromatics >EC12-EC16 Aqueous	ug/l			<0.1	<0.1	<0.1	23	<0.1	<0.1
Aromatics >EC16-EC21 Aqueous	ug/l			<0.1	<0.1	<0.1	25	<0.1	<0.1
Aromatics >EC21-EC35 Aqueous	ug/l			<0.1	<0.1	<0.1	180	<0.1	<0.1
Aromatics >C35-44	ug/l			<0.1	<0.1	<0.1	30	<0.1	<0.1
Total Aliphatic TPH	ug/l			<5	<5	<5	3400	<5	<5
Total Aromatic TPH	ug/l			<5	<5	<5	260	<5	<5
Total petroleum hydrocarbons	ug/l			<10	<10	<10	3700	<10	<10
Speciated PAHs									

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Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Geological Formation Legend

TFD	Tidal Flat Deposits
RTD	River Terrace Deposits
MMG	Mercia Mudstone Group

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: cadmium, copper and zinc
No installation details on PDF. Not clear from fieldwork records N/A

Monitoring Round	**Units**	**Screening Criteria**		**1**		**2**		**3**	
Location		**EQS**	**DWS**	**BH423**	**BH423**	**BH423**	**BH423**	**BH423**	**BH423**
Location Type				BH					
Depth (m)				7.73	6.71	5.74	9.45	6.62	9.76
Installation Details				Shallow	Deep	Shalllow	Deep	Shallow	Deep
Response Zone				TFD/RTD	MMG	TFD/RTD	MMG	TFD/RTD	MMG
Date Sampled				28/04/2015		06/05/2015		11/05/2015	
Acenaphthene	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	ug/l	0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene	ug/l	0.00017	0.01	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
Benzo(b)fluoranthene	ug/l	0.017	0.1	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
Benzo(k)fluoranthene	ug/l	0.017	0.1	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
Benzo(ghi)perylene	ug/l	0.0082	0.1	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
Indeno(1,2,3-cd)pyrene	ug/l		0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	ug/l	0.0063		**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**	**<0.1**
Fluorene	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Naphthalene	ug/l	2		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	ug/l			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total PAHs (USEPA 16)	ug/l			<2	<2	<2	<2	<2	<2
VOCs									
1,1,1,2-Tetrachloroethane	ug/l					<2	<2	<2	<2
1,1,1-Trichloroethane	ug/l	100				<1	<1	<1	<1
1,1,2-Trichloroethane	ug/l	400				<10	<10	<10	<10
1,1-Dichloroethane	ug/l					<1	<1	<1	<1
1,1-Dichloroethene	ug/l					<1	<1	<1	<1
1,1-Dichloropropene	ug/l					<1	<1	<1	<1
1,2,3-Trichlorobenzene	ug/l	0.4				**<2**	**<2**	**<2**	**<2**
1,2,3-Trichloropropane	ug/l					<50	<50	<50	<50
1,2,4-Trichlorobenzene	ug/l	0.4				**<1**	**<1**	**<1**	**<1**
1,2,4-Trimethylbenzene	ug/l					<1	<1	<1	<1
1,2-Dibromo-3-Chloropropane	ug/l					<50	<50	<50	<50
1,2-Dibromoethane	ug/l					<5	<5	<5	<5
1,2-Dichlorobenzene	ug/l	20				<1	<1	<1	<1
1,2-Dichloroethane	ug/l	10	3			<2	<2	<2	<2
1,2-Dichloropropane	ug/l					<1	<1	<1	<1
1,3,5-Trimethylbenzene	ug/l					<1	<1	<1	<1
1,3-Dichloropropane	ug/l					<2	<2	<2	<2
1,4-Dichlorobenzene	ug/l	20				<1	<1	<1	<1
2-Chlorotoluene	ug/l					<1	<1	<1	<1
4-Chlorotoluene	ug/l					<1	<1	<1	<1
4-Isopropyltoluene	ug/l					<1	<1	<1	<1
Benzene	ug/l	10	1	<1	<1	<1	<1	<1	<1
Bromobenzene	ug/l					<1	<1	<1	<1
Bromochloromethane	ug/l		100			<5	<5	<5	<5
Bromodichloromethane	ug/l					<5	<5	<5	<5
Bromomethane	ug/l					<5	<5	<5	<5
Chlorobenzene	ug/l					<1	<1	<1	<1
Chloroethane	ug/l					<1	<1	<1	<1
Chloroethene	ug/l					<1	<1	<1	<1
Chloroform	ug/l	2.5	100			<1	<1	<1	<1
Chloromethane	ug/l					<1	<1	<1	<1

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Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Geological Formation Legend

TFD	Tidal Flat Deposits
RTD	River Terrace Deposits
MMG	Mercia Mudstone Group

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: cadmium, copper and zinc
No installation details on PDF. Not clear from fieldwork records N/A

Monitoring Round	**Units**	**Screening Criteria**		**1**		**2**		**3**	
Location		**EQS**	**DWS**	**BH423**	**BH423**	**BH423**	**BH423**	**BH423**	**BH423**
Location Type				BH					
Depth (m)				7.73	6.71	5.74	9.45	6.62	9.76
Installation Details				Shallow	Deep	Shalllow	Deep	Shallow	Deep
Response Zone				TFD/RTD	MMG	TFD/RTD	MMG	TFD/RTD	MMG
Date Sampled				28/04/2015		06/05/2015		11/05/2015	
cis-1,2-Dichloroethene	ug/l					<1	<1	<1	<1
cis-1,3-Dichloropropene	ug/l					<10	<10	<10	<10
Dibromochloromethane	ug/l		100			<10	<10	<10	<10
Dibromomethane	ug/l					<10	<10	<10	<10
Dichlorodifluoromethane	ug/l					<1	<1	<1	<1
Ethylbenzene	ug/l	20		<1	<1	<1	<1	<1	<1
Hexachlorobutadiene (HCBD)	ug/l	0.6				**<1**	**<1**	**<1**	**<1**
Isopropylbenzene	ug/l					<1	<1	<1	<1
m,p xylenes	ug/l	30		<1	<1	<1	<1	<1	<1
Methyl tert-butyl ether (MTBE)	ug/l					<1	<1	<1	<1
n-Butylbenzene	ug/l					<1	<1	<1	<1
n-propylbenzene	ug/l					<1	<1	<1	<1
O-Xylene	ug/l	30		<1	<1	<1	<1	<1	<1
Sec-Butylbenzene	ug/l					<1	<1	<1	<1
Styrene	ug/l	50				<1	<1	<1	<1
Tert-Butylbenzene	ug/l					<1	<1	<1	<1
Tetrachloroethene	ug/l	10	10			<1	<1	<1	<1
Tetrachloromethane (Carbon Tetra Chl	ug/l	12	3			<1	<1	<1	<1
Toluene	ug/l	50		<1	<1	<1	<1	<1	<1
trans-1,2-Dichloroethene	ug/l					<1	<1	<1	<1
trans-1,3-Dichloropropene	ug/l					<10	<10	<10	<10
Tribromomethane	ug/l		100			<1	<1	<1	<1
Trichloroethene	ug/l	10	10			<1	<1	<1	<1
Trichlorofluoromethane	ug/l					<1	<1	<1	<1
SVOCs									
1,3-Dichlorobenzene	ug/l	20				<0.5	<0.5	<0.5	<0.5
2,4,5-Trichlorophenol	ug/l					<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l					<0.5	<0.5	<0.5	<0.5
2,4-Dichlorophenol	ug/l	20				<0.5	<0.5	<0.5	<0.5
2,4-Dimethylphenol	ug/l					<0.5	<0.5	<0.5	<0.5
2,4-Dinitrotoluene	ug/l					<0.5	<0.5	<0.5	<0.5
2,6-Dinitrotoluene	ug/l					<0.5	<0.5	<0.5	<0.5
2-Chloronaphthalene	ug/l					<0.5	<0.5	<0.5	<0.5
2-Chlorophenol	ug/l	50				<0.5	<0.5	<0.5	<0.5
2-Methyl-4,6-Dinitrophenol	ug/l					<0.5	<0.5	<0.5	<0.5
2-Methylnaphthalene	ug/l					<0.5	<0.5	<0.5	<0.5
2-Methylphenol	ug/l	100				<0.5	<0.5	<0.5	<0.5
2-Nitroaniline	ug/l					<0.5	<0.5	<0.5	<0.5
2-Nitrophenol	ug/l					<0.5	<0.5	<0.5	<0.5
3-Nitroaniline	ug/l					<0.5	<0.5	<0.5	<0.5
4-Bromophenyl Phenyl Ether	ug/l					<0.5	<0.5	<0.5	<0.5
4-Chloro-3-Methylphenol	ug/l	40				<0.5	<0.5	<0.5	<0.5
4-Chloroaniline	ug/l					<0.5	<0.5	<0.5	<0.5
4-Chlorophenyl Phenyl Ether	ug/l					<0.5	<0.5	<0.5	<0.5
4-Methylphenol	ug/l	100				<0.5	<0.5	<0.5	<0.5
4-Nitroaniline	ug/l					<0.5	<0.5	<0.5	<0.5
Azobenzene	ug/l					<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l					<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethyl)ether	ug/l					<0.5	<0.5	<0.5	<0.5

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Screening Values & Assessment

Environmental Quality Standards	EQS
Drinking Water Standard	DWS
Exceeds EQS	
Exceeds DWS	X
Laboratory detection level higher than screening criterion	X

Geological Formation Legend

TFD	Tidal Flat Deposits
RTD	River Terrace Deposits
MMG	Mercia Mudstone Group

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: cadmium, copper and zinc
No installation details on PDF. Not clear from fieldwork records N/A

Monitoring Round	**Units**	**Screening Criteria**		**1**		**2**		**3**	
Location		**EQS**	**DWS**	**BH423**	**BH423**	**BH423**	**BH423**	**BH423**	**BH423**
Location Type				BH					
Depth (m)				7.73	6.71	5.74	9.45	6.62	9.76
Installation Details				Shallow	Deep	Shalllow	Deep	Shallow	Deep
Response Zone				TFD/RTD	MMG	TFD/RTD	MMG	TFD/RTD	MMG
Date Sampled				28/04/2015		06/05/2015		11/05/2015	
Bis(2-chloroisopropyl)ether	ug/l					<0.5	<0.5	<0.5	<0.5
Bis(2-ethylhexyl)phthalate	ug/l	1.3				<0.5	<0.5	<0.5	<0.5
Butylbenzylphthalate	ug/l	20				<0.5	<0.5	<0.5	<0.5
Carbazole	ug/l					<0.5	<0.5	<0.5	<0.5
Dibenzofuran	ug/l					<0.5	<0.5	<0.5	<0.5
Diethylphthalate	ug/l	200				<0.5	<0.5	<0.5	<0.5
Dimethylphthalate	ug/l	800				<0.5	<0.5	<0.5	<0.5
Di-N-Butyl Phthalate	ug/l	8				<0.5	<0.5	<0.5	<0.5
Di-N-Octyl Phthalate	ug/l	20				<0.5	<0.5	<0.5	<0.5
Hexachlorobenzene (HCB)	ug/l	0.05				**<0.5**	**<0.5**	**<0.5**	**<0.5**
Hexachlorocyclopentadiene	ug/l					<0.5	<0.5	<0.5	<0.5
Hexachloroethane	ug/l					<0.5	<0.5	<0.5	<0.5
Isophorone	ug/l					<0.5	<0.5	<0.5	<0.5
Nitrobenzene	ug/l					<0.5	<0.5	<0.5	<0.5
n-nitrosodimethylamine	ug/l					<0.5	<0.5	<0.5	<0.5
N-Nitroso-Di-N-Propylamine	ug/l					<0.5	<0.5	<0.5	<0.5
Pentachlorophenol (PCP)	ug/l	0.4				**<0.5**	**<0.5**	**<0.5**	**<0.5**
Phenol	ug/l	7.7				**<0.5**	**<0.5**	**<0.5**	**<0.5**

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Screening Values & Assessment

EQS	Environmental Quality Standards
DWS	Drinking Water Standard
	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: cadmium, copper and zinc	
N/A	No installation details on PDF. Not clear from fieldwork records

Monitoring Round	Units	Screening Criteria		No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	No. Data Exceeding EQS	No. Data Exceeding DWS
Location										
Location Type										
Depth (m)										
Installation Details		EQS	DWS							
Response Zone										
Date Sampled										
Metals										
Arsenic Dissolved	ug/l	50	10	6	6	31	10	BH423 @ 9.76mbGL	0	5
Boron	ug/l	2000	1000	6	6	2900	480	BH423 @ 5.74mbGL	1	4
Chromium Dissolved	ug/l		50	6	6	55	16	BH423 @ 7.73mbGL		1
Copper Dissolved	ug/l	10	2000	6	6	29	3.5	BH423 @ 5.74mbGL	3	0
Lead Dissolved	ug/l	1.2	10	6	0	None > LOD	None > LOD		0	0
Nickel Dissolved	ug/l	4	20	6	5	6.1	2.5	BH423 @ 7.73mbGL	3	0
Selenium Dissolved	ug/l		10	6	6	34	14	BH423 @ 7.73mbGL		6
Cadmium Dissolved	ug/l	0.15	5	6	0	None > LOD	None > LOD		0	0
Zinc Dissolved	ug/l	75		6	6	38	6.4	BH423 @ 9.45mbGL	0	
Mercury Dissolved	ug/l	0.07	1	6	0	None > LOD	None > LOD		0	0
Non-Metal Inorganics										
Total Alkalinity as CaCO3	mg/l			4	4	1500	63	BH423 @ 5.74mbGL		
Chloride	mg/l	250	250	4	4	6800	3200	BH423 @ 5.74mbGL	4	4
Ammoniacal Nitrogen as N	mg/l	0.6		4	4	45	1.6	BH423 @ 5.74mbGL	4	
Total Cyanide	mg/l	0.001	0.05	6	0	None > LOD	None > LOD		0	0
Free Cyanide	mg/l			6	0	None > LOD	None > LOD			
pH Value	pH units	6-9	6.5-10	6	6	8.2	7.4	BH423 @ 7.73mbGL	0	0
Phenols										
Phenol	ug/l	7.7		4	0	None > LOD	None > LOD		0	
Phenols	mg/l	0.0077		4	0	None > LOD	None > LOD		0	
BTEX										
MTBE	ug/l			4	0	None > LOD	None > LOD			
Benzene	ug/l	10	1	6	0	None > LOD	None > LOD		0	0
Toluene	ug/l	50		6	0	None > LOD	None > LOD		0	
Ethyl benzene	ug/l	20		6	0	None > LOD	None > LOD		0	
m & p Xylene	ug/l	30		6	0	None > LOD	None > LOD		0	
o Xylene	ug/l	30		6	0	None > LOD	None > LOD		0	
TPH										
Aliphatics C5-C6	ug/l			6	0	None > LOD	None > LOD			
Aliphatics >C6-C8	ug/l			6	0	None > LOD	None > LOD			
Aliphatics >C8-C10	ug/l			6	0	None > LOD	None > LOD			
Aliphatics >C10-C12	ug/l			6	0	None > LOD	None > LOD			
Aliphatics >C12-C16 Aqueous	ug/l			6	1	87	87	BH423 @ 9.45mbGL		
Aliphatics >C16-C21 Aqueous	ug/l			6	1	77	77	BH423 @ 9.45mbGL		
Aliphatics >C21-C35 Aqueous	ug/l			6	1	3000	3000	BH423 @ 9.45mbGL		
Aliphatics >C35-44	ug/l			6	1	240	240	BH423 @ 9.45mbGL		
Aromatics >C5-C7	ug/l			6	0	None > LOD	None > LOD			
Aromatics >C7-C8	ug/l			6	0	None > LOD	None > LOD			
Aromatics >EC8-EC10	ug/l			6	0	None > LOD	None > LOD			
Aromatics >EC10-EC12	ug/l			6	0	None > LOD	None > LOD			
Aromatics >EC12-EC16 Aqueous	ug/l			6	1	23	23	BH423 @ 9.45mbGL		
Aromatics >EC16-EC21 Aqueous	ug/l			6	1	25	25	BH423 @ 9.45mbGL		
Aromatics >EC21-EC35 Aqueous	ug/l			6	1	180	180	BH423 @ 9.45mbGL		
Aromatics >C35-44	ug/l			6	1	30	30	BH423 @ 9.45mbGL		
Total Aliphatic TPH	ug/l			6	1	3400	3400	BH423 @ 9.45mbGL		
Total Aromatic TPH	ug/l			6	1	260	260	BH423 @ 9.45mbGL		
Total petroleum hydrocarbons	ug/l			6	1	3700	3700	BH423 @ 9.45mbGL		
Speciated PAHs										
Acenaphthene	ug/l			6	0	None > LOD	None > LOD			
Acenaphthylene	ug/l			6	0	None > LOD	None > LOD			
Anthracene	ug/l	0.1		6	0	None > LOD	None > LOD		0	
Benzo(a)anthracene	ug/l			6	0	None > LOD	None > LOD			
Benzo(a)pyrene	ug/l	0.00017	0.01	6	0	None > LOD	None > LOD		0	0
Benzo(b)fluoranthene	ug/l	0.017	0.1	6	0	None > LOD	None > LOD		0	0
Benzo(k)fluoranthene	ug/l	0.017	0.1	6	0	None > LOD	None > LOD		0	0
Benzo(ghi)perylene	ug/l	0.0082	0.1	6	0	None > LOD	None > LOD		0	0
Indeno(1,2,3-cd)pyrene	ug/l		0.1	6	0	None > LOD	None > LOD			0
Chrysene	ug/l			6	0	None > LOD	None > LOD			
Dibenzo(a,h)anthracene	ug/l			6	0	None > LOD	None > LOD			
Fluoranthene	ug/l	0.0063		6	0	None > LOD	None > LOD		0	
Fluorene	ug/l			6	0	None > LOD	None > LOD			
Naphthalene	ug/l	2		6	0	None > LOD	None > LOD		0	
Phenanthrene	ug/l			6	0	None > LOD	None > LOD			
Pyrene	ug/l			6	0	None > LOD	None > LOD			
Total PAHs (USEPA 16)	ug/l			6	0	None > LOD	None > LOD			
VOCs										
1,1,1,2-Tetrachloroethane	ug/l			4	0	None > LOD	None > LOD			
1,1,1-Trichloroethane	ug/l	100		4	0	None > LOD	None > LOD		0	
1,1,2-Trichloroethane	ug/l	400		4	0	None > LOD	None > LOD		0	
1,1-Dichloroethane	ug/l			4	0	None > LOD	None > LOD			
1,1-Dichloroethene	ug/l			4	0	None > LOD	None > LOD			
1,1-Dichloropropene	ug/l			4	0	None > LOD	None > LOD			
1,2,3-Trichlorobenzene	ug/l	0.4		4	0	None > LOD	None > LOD		0	
1,2,3-Trichloropropane	ug/l			4	0	None > LOD	None > LOD			
1,2,4-Trichlorobenzene	ug/l	0.4		4	0	None > LOD	None > LOD		0	
1,2,4-Trimethylbenzene	ug/l			4	0	None > LOD	None > LOD			
1,2-Dibromo-3-Chloropropane	ug/l			4	0	None > LOD	None > LOD			
1,2-Dibromoethane	ug/l			4	0	None > LOD	None > LOD			
1,2-Dichlorobenzene	ug/l	20		4	0	None > LOD	None > LOD		0	
1,2-Dichloroethane	ug/l	10	3	4	0	None > LOD	None > LOD		0	0
1,2-Dichloropropane	ug/l			4	0	None > LOD	None > LOD			
1,3,5-Trimethylbenzene	ug/l			4	0	None > LOD	None > LOD			
1,3-Dichloropropane	ug/l			4	0	None > LOD	None > LOD			
1,4-Dichlorobenzene	ug/l	20		4	0	None > LOD	None > LOD		0	
2-Chlorotoluene	ug/l			4	0	None > LOD	None > LOD			

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Screening Values & Assessment

EQS	Environmental Quality Standards
DWS	Drinking Water Standard
	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: cadmium, copper and zinc	
N/A	No installation details on PDF. Not clear from fieldwork records

Monitoring Round / Location / Location Type / Depth (m) / Installation Details / Response Zone / Date Sampled	Units	Screening Criteria EQS	Screening Criteria DWS	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	No. Data Exceeding EQS	No. Data Exceeding DWS
4-Chlorotoluene	ug/l			4	0	None > LOD	None > LOD			
4-Isopropyltoluene	ug/l			4	0	None > LOD	None > LOD			
Benzene	ug/l	10	1	6	0	None > LOD	None > LOD		0	0
Bromobenzene	ug/l			4	0	None > LOD	None > LOD			
Bromochloromethane	ug/l		100	4	0	None > LOD	None > LOD			0
Bromodichloromethane	ug/l			4	0	None > LOD	None > LOD			
Bromomethane	ug/l			4	0	None > LOD	None > LOD			
Chlorobenzene	ug/l			4	0	None > LOD	None > LOD			
Chloroethane	ug/l			4	0	None > LOD	None > LOD			
Chloroethene	ug/l			4	0	None > LOD	None > LOD			
Chloroform	ug/l	2.5	100	4	0	None > LOD	None > LOD		0	0
Chloromethane	ug/l			4	0	None > LOD	None > LOD			
cis-1,2-Dichloroethene	ug/l			4	0	None > LOD	None > LOD			
cis-1,3-Dichloropropene	ug/l			4	0	None > LOD	None > LOD			
Dibromochloromethane	ug/l		100	4	0	None > LOD	None > LOD			0
Dibromomethane	ug/l			4	0	None > LOD	None > LOD			
Dichlorodifluoromethane	ug/l			4	0	None > LOD	None > LOD			
Ethylbenzene	ug/l	20		6	0	None > LOD	None > LOD		0	
Hexachlorobutadiene (HCBD)	ug/l	0.6		4	0	None > LOD	None > LOD		0	
Isopropylbenzene	ug/l			4	0	None > LOD	None > LOD			
m,p xylenes	ug/l	30		6	0	None > LOD	None > LOD		0	
Methyl tert-butyl ether (MTBE)	ug/l			4	0	None > LOD	None > LOD			
n-Butylbenzene	ug/l			4	0	None > LOD	None > LOD			
n-propylbenzene	ug/l			4	0	None > LOD	None > LOD			
O-Xylene	ug/l	30		6	0	None > LOD	None > LOD		0	
Sec-Butylbenzene	ug/l			4	0	None > LOD	None > LOD			
Styrene	ug/l	50		4	0	None > LOD	None > LOD		0	
Tert-Butylbenzene	ug/l			4	0	None > LOD	None > LOD			
Tetrachloroethene	ug/l	10	10	4	0	None > LOD	None > LOD		0	0
Tetrachloromethane (Carbon Tetra Ch	ug/l	12	3	4	0	None > LOD	None > LOD		0	0
Toluene	ug/l	50		6	0	None > LOD	None > LOD		0	
trans-1,2-Dichloroethene	ug/l			4	0	None > LOD	None > LOD			
trans-1,3-Dichloropropene	ug/l			4	0	None > LOD	None > LOD			
Tribromomethane	ug/l		100	4	0	None > LOD	None > LOD			0
Trichloroethene	ug/l	10	10	4	0	None > LOD	None > LOD		0	0
Trichlorofluoromethane	ug/l			4	0	None > LOD	None > LOD			
SVOCs										
1,3-Dichlorobenzene	ug/l	20		4	0	None > LOD	None > LOD		0	
2,4,5-Trichlorophenol	ug/l			4	0	None > LOD	None > LOD			
2,4,6-Trichlorophenol	ug/l			4	0	None > LOD	None > LOD			
2,4-Dichlorophenol	ug/l	20		4	0	None > LOD	None > LOD		0	
2,4-Dimethylphenol	ug/l			4	0	None > LOD	None > LOD			
2,4-Dinitrotoluene	ug/l			4	0	None > LOD	None > LOD			
2,6-Dinitrotoluene	ug/l			4	0	None > LOD	None > LOD			
2-Chloronaphthalene	ug/l			4	0	None > LOD	None > LOD			
2-Chlorophenol	ug/l	50		4	0	None > LOD	None > LOD		0	
2-Methyl-4,6-Dinitrophenol	ug/l			4	0	None > LOD	None > LOD			
2-Methylnaphthalene	ug/l			4	0	None > LOD	None > LOD			
2-Methylphenol	ug/l	100		4	0	None > LOD	None > LOD		0	
2-Nitroaniline	ug/l			4	0	None > LOD	None > LOD			
2-Nitrophenol	ug/l			4	0	None > LOD	None > LOD			
3-Nitroaniline	ug/l			4	0	None > LOD	None > LOD			
4-Bromophenyl Phenyl Ether	ug/l			4	0	None > LOD	None > LOD			
4-Chloro-3-Methylphenol	ug/l	40		4	0	None > LOD	None > LOD		0	
4-Chloroaniline	ug/l			4	0	None > LOD	None > LOD			
4-Chlorophenyl Phenyl Ether	ug/l			4	0	None > LOD	None > LOD			
4-Chloroaniline	ug/l			4	0	None > LOD	None > LOD			
4-Chlorophenyl Phenyl Ether	ug/l			4	0	None > LOD	None > LOD			
4-Methylphenol	ug/l	100		4	0	None > LOD	None > LOD		0	
4-Nitroaniline	ug/l			4	0	None > LOD	None > LOD			
Azobenzene	ug/l			4	0	None > LOD	None > LOD			
Bis(2-chloroethoxy)methane	ug/l			4	0	None > LOD	None > LOD			
Bis(2-chloroethyl)ether	ug/l			4	0	None > LOD	None > LOD			
Bis(2-chloroisopropyl)ether	ug/l			4	0	None > LOD	None > LOD			
Bis(2-ethylhexyl)phthalate	ug/l	1.3		4	0	None > LOD	None > LOD		0	
Butylbenzylphthalate	ug/l	20		4	0	None > LOD	None > LOD		0	
Carbazole	ug/l			4	0	None > LOD	None > LOD			
Dibenzofuran	ug/l			4	0	None > LOD	None > LOD			
Diethylphthalate	ug/l	200		4	0	None > LOD	None > LOD		0	
Dimethylphthalate	ug/l	800		4	0	None > LOD	None > LOD		0	
Di-N-Butyl Phthalate	ug/l	8		4	0	None > LOD	None > LOD		0	
Di-N-Octyl Phthalate	ug/l	20		4	0	None > LOD	None > LOD		0	
Hexachlorobenzene (HCB)	ug/l	0.05		4	0	None > LOD	None > LOD		0	
Hexachlorocyclopentadiene	ug/l			4	0	None > LOD	None > LOD			
Hexachloroethane	ug/l			4	0	None > LOD	None > LOD			
Isophorone	ug/l			4	0	None > LOD	None > LOD			
Nitrobenzene	ug/l			4	0	None > LOD	None > LOD			
n-nitrosodimethylamine	ug/l			4	0	None > LOD	None > LOD			
N-Nitroso-Di-N-Propylamine	ug/l			4	0	None > LOD	None > LOD			
Pentachlorophenol (PCP)	ug/l	0.4		4	0	None > LOD	None > LOD		0	
Phenol	ug/l	7.7		4	0	None > LOD	None > LOD		0	

Appendix 5

Soil Leachate Laboratory Data

M4CAN
Leachate Sample Analysis & Screening Assessment
CL-18
22/07/2015

Geological Formation Legend

MG	Made Ground

Screening Values & Assessment

EQS	Environmental Quality Standards
DWS	Drinking Water Standard
	Exceeds EQS
X	Exceeds DWS
X	Laboratory detection level higher than screening criterion

Notes

EQS calcium carbonate 100 - 150mg/l for heavy metals: cadmium, copper and zinc

Sample Reference	Units	Screening Criteria		TP410	No. Analyses	No. Analyses Above LOD	Maximum	Minimum	Location & Depth of Maximum Concentration	No. Data Exceeding EQS	No. Data Exceeding DWS
Specimen Depth (m)		EQS	DWS	0.9 - 1							
OD Level (m)				6.3							
Sample Type				ES							
Geology Code				MG							
Cluster Code				2015 GI							
2:1 Leachate Results											
Arsenic Dissolved	ug/l	50	10	8.4	1	1	8.4	8.4	TP410 @ 0.9 - 1mbGL	0	0
Boron Dissolved	ug/l	2000	1000		0	0	None > LOD	None > LOD		0	0
Boron	ug/l	2000	1000	370	1	1	370	370	TP410 @ 0.9 - 1mbGL	0	0
Barium Dissolved	ug/l				0	0	None > LOD	None > LOD			
Cadmium Dissolved	ug/l	0.15	5	2.5	1	1	2.5	2.5	TP410 @ 0.9 - 1mbGL	1	0
Chromium Dissolved	ug/l		50	22	1	1	22	22	TP410 @ 0.9 - 1mbGL		0
Copper Dissolved	ug/l	10	2000	25	1	1	25	25	TP410 @ 0.9 - 1mbGL	1	0
Mercury Dissolved	ug/l	0.07	1	<0.5	1	0	None > LOD	None > LOD		0	0
Molybdenum Dissolved	ug/l				0	0	None > LOD	None > LOD			
Nickel Dissolved	ug/l	4	20	2.7	1	1	2.7	2.7	TP410 @ 0.9 - 1mbGL	0	0
Lead Dissolved	ug/l	1.2	10	<1	1	0	None > LOD	None > LOD		0	0
Antimony Dissolved	ug/l		5		0	0	None > LOD	None > LOD			0
Selenium Dissolved	ug/l		10	13	1	1	13	13	TP410 @ 0.9 - 1mbGL		1
Zinc Dissolved	ug/l	75		7.2	1	1	7.2	7.2	TP410 @ 0.9 - 1mbGL	0	
Total Cyanide	mg/l	0.001	0.05	<0.05	1	0	None > LOD	None > LOD		0	0
Cyanide Free	mg/l			<0.05	1	0	None > LOD	None > LOD			
pH	pH units	6-9	6.5-10	8.3	1	1	8.3	8.3	TP410 @ 0.9 - 1mbGL	0	0
Organics											
Phenols	mg/l	0.0077		<0.03	1	0	None > LOD	None > LOD		0	
BTEX											
Benzene	ug/l	10	1	<1	1	0	None > LOD	None > LOD		0	0
Toluene	ug/l	50		<1	1	0	None > LOD	None > LOD		0	
Ethylbenzene	ug/l	20		<1	1	0	None > LOD	None > LOD		0	
m,p xylenes	ug/l	30		<1	1	0	None > LOD	None > LOD		0	
O-Xylene	ug/l	30		<1	1	0	None > LOD	None > LOD		0	
PCBs											
Pcb-101 2,2',4,5,5' - Pentachlorobiphenyl	ug/l	0	0	<0.01	1	0	None > LOD	None > LOD		0	0
Pcb-118 2,3',4,4',5 - Pentachlorobiphenyl	ug/l	0	0	<0.01	1	0	None > LOD	None > LOD		0	0
Pcb-138 2,2',3,4,4',5' - Hexachlorobiphenyl	ug/l	0	0	<0.01	1	0	None > LOD	None > LOD		0	0
Pcb-153 2,2',4,4',5,5' - Hexachlorobiphenyl	ug/l	0	0	<0.01	1	0	None > LOD	None > LOD		0	0
Pcb-180 2,2',3,4,4',5,5' - Heptachlorobiphenyl	ug/l	0	0	<0.01	1	0	None > LOD	None > LOD		0	0
Pcb-28 2,4,4' - Trichlororbiphenyl	ug/l	0	0	<0.01	1	0	None > LOD	None > LOD		0	0
Pcb-52 2,2',5,5' - Tetrachlorobiphenyl	ug/l	0	0	<0.01	1	0	None > LOD	None > LOD		0	0
TPH											
Aliphatics >C5-C6	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aliphatics >C6-C8	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aliphatics >C8-C10	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aliphatics >C10-C12	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aliphatics >C12-C16	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aliphatics >C16-C21	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aliphatics >C21-C35	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aliphatics >C35-44	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aromatics >C5-C7	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aromatics >C7-C8	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aromatics >C8-C10	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aromatics >C10-C12	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aromatics >C12-C16	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aromatics >C16-C21	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aromatics >C21-C35	ug/l			<0.1	1	0	None > LOD	None > LOD			
Aromatics >C35-44	ug/l			<0.1	1	0	None > LOD	None > LOD			
Total Aliphatic TPH	ug/l			<5	1	0	None > LOD	None > LOD			
Total Aromatic TPH	ug/l			<5	1	0	None > LOD	None > LOD			
Total petroleum hydrocarbons	ug/l			<10	1	0	None > LOD	None > LOD			
PAH											
Acenaphthene	ug/l			<0.1	1	0	None > LOD	None > LOD			
Acenaphthylene	ug/l			<0.1	1	0	None > LOD	None > LOD			
Anthracene	ug/l	0.1		<0.1	1	0	None > LOD	None > LOD		0	
Benz(a)anthracene	ug/l			<0.1	1	0	None > LOD	None > LOD			
Benzo(a)pyrene	ug/l	0.00017	0.01	<0.1	1	0	None > LOD	None > LOD		0	0
Benzo(b)fluoranthene	ug/l	0.017	0.1	<0.1	1	0	None > LOD	None > LOD		0	0
Benzo(ghi)perylene	ug/l	0.0082	0.1	<0.1	1	0	None > LOD	None > LOD		0	0
Benzo(k)fluoranthene	ug/l	0.017	0.1	<0.1	1	0	None > LOD	None > LOD		0	0
Chrysene	ug/l			<0.1	1	0	None > LOD	None > LOD			
Dibenzo(ah)anthracene	ug/l			<0.1	1	0	None > LOD	None > LOD			
Fluoranthene	ug/l	0.0063		<0.1	1	0	None > LOD	None > LOD		0	
Fluorene	ug/l			<0.1	1	0	None > LOD	None > LOD			
Indeno(123cd)pyrene	ug/l	N/A	0.1	<0.1	1	0	None > LOD	None > LOD		0	0
Naphthalene	ug/l	2		<0.1	1	0	None > LOD	None > LOD		0	
Phenanthrene	ug/l			<0.1	1	0	None > LOD	None > LOD			
Pyrene	ug/l			<0.1	1	0	None > LOD	None > LOD			
PAH 16 Total	ug/l			<2	1	0	None > LOD	None > LOD			

Appendix 6

Relevant Extraction of Additional Environmental Data

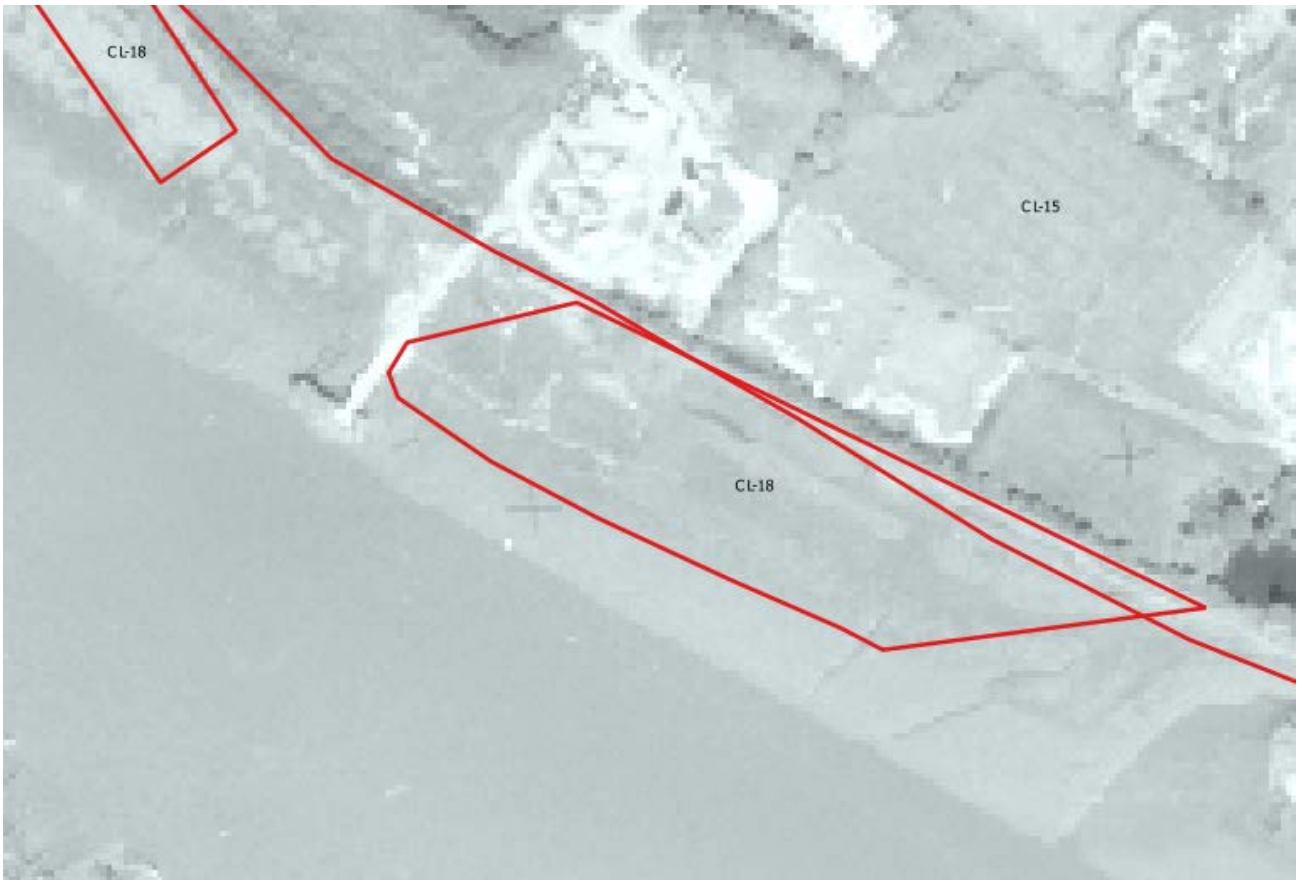

Plate 01: Extract of 1979 Aerial Photograph showing Works and jetty beyond the Site boundary.

Plate 02: Extract of 2014 High Resolution Aerial Photograph.

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: Oct 2015