

Ref: 14-255-L2
Date: 9th December 2021

Multimaq Limited
Unit 6 Pacific Park
Bridge Road North
Wrexham Industrial Estate
Wrexham
LL13 9PN

BY Email

Dear Sirs,

SUPPLEMENTARY GROUND INVESTIGATION PACIFIC PARK, WREXHAM

1. INTRODUCTION

1.1. BACKGROUND

E3P has been recently completed a phase of intrusive ground investigation works at the site known as Pacific Park, Wrexham. The previous reports are as follows:

- ✦ Phase I Geoenvironmental Site Assessment – Report Ref: 14-255-R1-1, dated July 2020;
- ✦ Phase II Geoenvironmental Site Assessment – Report Ref: 14-255-R2-1, dated May 2021;
- ✦ Ground Gas Addendum Report – Report Ref: 14-255-R3-1, dated July 2021; and,
- ✦ Remediation and Enabling Works Strategy – Report Ref: 14-255-R4-1, dated July 2021.

As part of the Remediation and Enabling Works Strategy a phase of supplementary site investigation was required in an area of concrete slab in the south of the site due to its previous use as a car park meaning access was not available. Additionally further investigation in the vicinity of the former pond was required.

E3P has subsequently been commissioned by the client to undertake a supplementary investigation at the subject site.



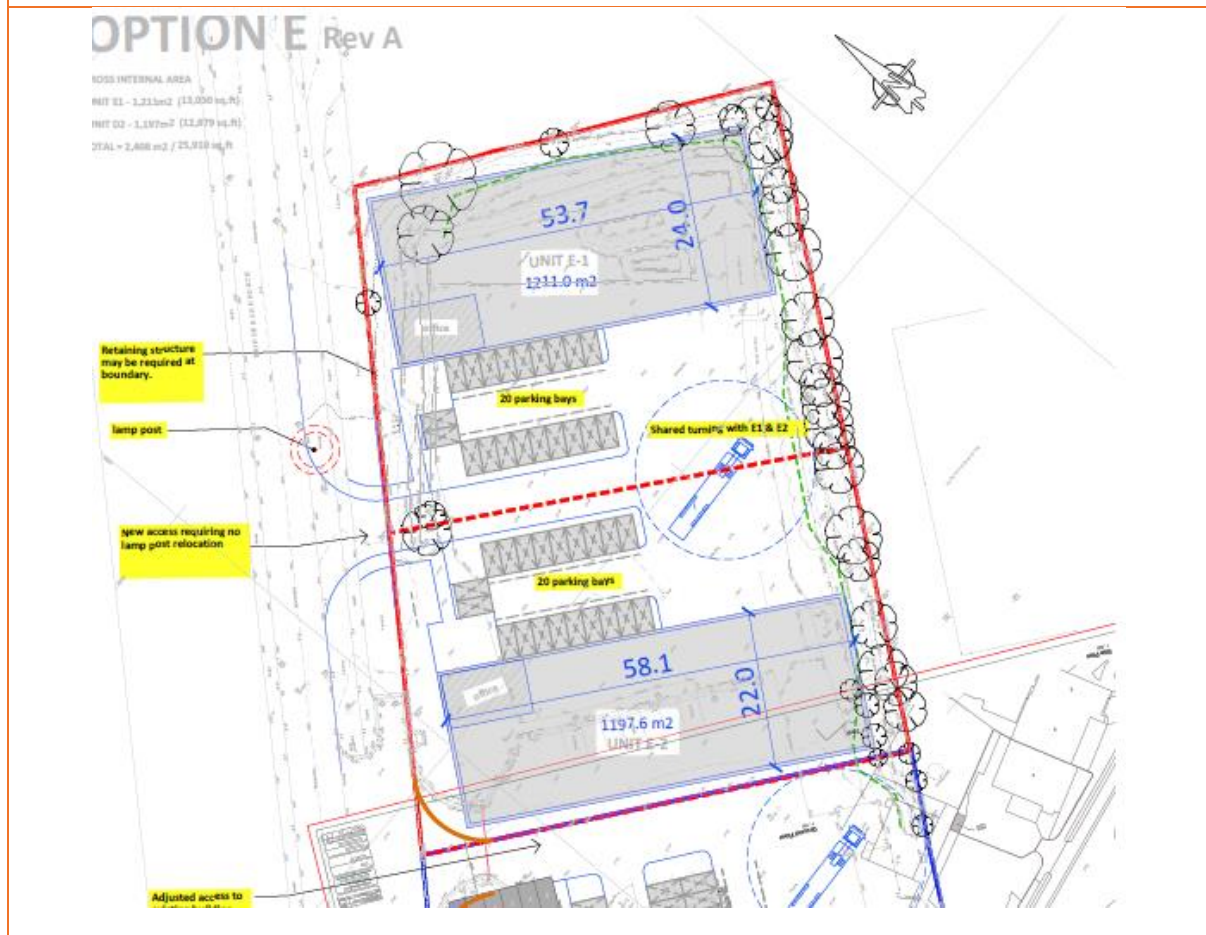
1.2. PROPOSED DEVELOPMENT

E3P understands that the proposed development will comprise of two industrial units with associated adopted estate roads and utility infrastructure.

Drawing 14-255-002 (Appendix III) identifies the proposed development layout.

A snapshot of the proposed development layout is indicated in Figure 1.1.

FIGURE 1.1 SNAPSHOT OF PROPOSED DEVELOPMENT



2. GROUND INVESTIGATION

Exploratory fieldwork was completed on the 15th September 2021. The works are summarised in Table 2.1.

TABLE 2.1 SUMMARY OF FIELDWORK

POTENTIAL SOURCE/RATIONALE	LOCATION HOLE	TYPE	MAXIMUM DEPTH (m bgl)	MONITORING WELLS RESPONSE ZONE (m bgl)
Investigation of general ground conditions in the south of the site.	TP201-TP203	Mechanically Excavated Trial Pit	1.45	N/A

Mechanically excavated trial pits were advanced to investigate ground conditions and to retrieve environmental samples within the south of the site.

Pad foundation excavations had been advanced in the vicinity of the former pond prior to E3P's attendance to site, however the excavations were still open which allowed a visual inspection to be completed to confirm no organic or deleterious materials were present. Shallow Made Ground was identified to overlie natural CLAY drift deposits. No further works were deemed necessary.

3. GROUND AND GROUNDWATER CONDITIONS

The ground investigation identified the strata set out in Table 3.1 below.

TABLE 3.1 SUMMARY OF STRATA

HOLE	DEPTH TO STRATUM (M BGL)	
	MADE GROUND	CLAY
TP201	0.00-1.25	1.25-1.40
TP202	0.00-1.30	1.30-1.45
TP203	0.00-0.80	0.80-1.00

The sampling locations are illustrated in Drawing 14-255-005 (Appendix III). The ground conditions encountered are indicated on the logs included in Appendix V.

MADE GROUND

Made Ground deposits were encountered in all three trial pit locations to a maximum depth of 1.30mbgl. The depth of Made Ground was proven in all supplementary locations.

Made Ground deposits generally comprised a grey sandy gravel of limestone and sandstone overlying a red brown slightly silty gravelly clay with gravel of brick, sandstone, rare coal and rare wood. Within TP202 at 0.40-0.45mbgl a thick band of organic black sandy gravel with wood was identified. Within TP203 beneath the overlying grey sandy gravel a red brown slightly sandy gravel of brick and sandstone was identified.

Within TP202 a brick obstruction, likely former foundations was identified between 0.30m and 1.10mbgl.

DRIFT DEPOSITS

Drift deposits were encountered in all exploratory hole locations and comprised a red brown slightly silty slightly gravelly CLAY with gravel of sandstone.

SOLID GEOLOGY

The solid bedrock geology was not encountered during the ground investigation. A review of BGS borehole records in the vicinity of the site have not encountered the underlying bedrock geology, and it is assumed to be in excess of 30.00mbgl.

GROUNDWATER

Groundwater was encountered as a perched water within TP203 at 0.25mbgl only.

3.1. pH AND SULPHATE

Chemical analyses for pH and soluble sulphate content contained (summarised in Table 3.2), shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE *Special Digest 1* (2005).

Elevated sulphate concentrations meeting Class DS-2, AC-1s were noted within the natural deposits in TP203 at 0.90mbgl.

TABLE 3.2 SUMMARY OF PH AND SULPHATE DATA

LOCATION	DEPTH (m)	SO ₄ IN 2:1 WATER/SOIL (g/l)	pH VALUE	CLASSIFICATION
TP201	1.00	0.041	8.7	DS-1, AC-1s
TP201	1.30	0.019	8.9	DS-1, AC-1s
TP202	0.10	0.065	9.3	DS-1, AC-1s
TP202	0.40	0.11	8.2	DS-1, AC-1s
TP202	0.85	0.062	8.5	DS-1, AC-1s
TP203	0.35	0.11	8.2	DS-1, AC-1s
TP203	0.90	0.69	8.3	DS-2, AC-1s

4. TIER I QUALITATIVE CONTAMINATED LAND RISK ASSESSMENT

E3P has undertaken a Tier 1 qualitative risk assessment to determine if any potential contaminants within the underlying soils and groundwater pose an unacceptable level of risk to the identified receptors.

4.1. HUMAN HEALTH RISK ASSESSMENT

At Tier 1 stage, the long term (chronic) human health toxicity of the soil has been assessed by comparing the on-site concentrations of organic and inorganic compounds with reference values published in LQM/CIEH S4UL (S4UL3267).

The results of this comparison have been summarised within Table 4.1.

TABLE 4.1 SUMMARY OF INORGANIC AND HYDROCARBON TOXICITY ASSESSMENT FOR A COMMERCIAL END USE

DETERMINAND	UNIT S	GAC	N	MC	LOC. OF EX	PATH-WAY	ASSESSMENT
Arsenic	mg/kg	640	7	29	N/A	1	No Further Action
Cadmium	mg/kg	190	7	0.4	N/A	1	No Further Action
Chromium (VI)	mg/kg	33	7	<4.0	N/A	1	No Further Action
Lead	mg/kg	2300	7	52	N/A	1	No Further Action
Mercury	mg/kg	58	7	0.9	N/A	4	No Further Action
Nickel	mg/kg	980	7	49	N/A	1	No Further Action
Selenium	mg/kg	12000	7	<1.0	N/A	1	No Further Action
Copper	mg/kg	68000	7	42	N/A	1	No Further Action
Zinc	mg/kg	730000	7	130	N/A	1	No Further Action
Cyanide - Total	mg/kg	791	7	<1.0	N/A	1	No Further Action
Phenols - Total.	mg/kg	440	7	<1.0	N/A	1	No Further Action
Asbestos	Fibres	NFD	7	NFD	N/A	3	No Further Action
Naphthalene	mg/kg	190	7	<0.05	N/A	4	No Further Action
Acenaphthylene	mg/kg	83000	7	<0.05	N/A	2	No Further Action
Acenaphthene	mg/kg	84000	7	<0.05	N/A	1	No Further Action
Fluorene	mg/kg	63000	7	<0.05	N/A	1	No Further Action
Phenanthrene	mg/kg	22000	7	3.7	N/A	2	No Further Action
Anthracene	mg/kg	520000	7	0.54	N/A	2	No Further Action
Fluoranthene	mg/kg	23000	7	4.2	N/A	2	No Further Action
Pyrene	mg/kg	54000	7	3.7	N/A	2	No Further Action
Benzo(a)Anthracene	mg/kg	170	7	2.5	N/A	2	No Further Action
Chrysene	mg/kg	350	7	2.1	N/A	2	No Further Action
Benzo(b)Fluoranthene	mg/kg	44	7	2.7	N/A	2	No Further Action
Benzo(k)Fluoranthene	mg/kg	1200	7	0.93	N/A	2	No Further Action
Benzo(a)Pyrene	mg/kg	35	7	2.3	N/A	2	No Further Action
Indeno(123-cd)Pyrene	mg/kg	500	7	0.81	N/A	2	No Further Action
Dibenzo(a,h)Anthracene	mg/kg	3.5	7	0.23	N/A	2	No Further Action
Benzo(ghi)Perylene	mg/kg	3900	7	0.92	N/A	2	No Further Action
TPH C5-C6 (aliphatic)*	mg/kg	3200	7	<1.0	N/A	4	No Further Action
TPH C6-C8 (aliphatic)*	mg/kg	7800	7	<0.1	N/A	4	No Further Action
TPH C8-C10 (aliphatic)*	mg/kg	2000	7	<0.1	N/A	4	No Further Action
TPH C10-C12 (aromatic)*	mg/kg	16000	7	<2.0	N/A	4	No Further Action
TPH C12-C16 (aromatic)*	mg/kg	36000	7	6.0	N/A	4	No Further Action
TPH C16-C21 (aromatic)*	mg/kg	28000	7	32	N/A	1	No Further Action
TPH C21-C35 (aromatic)*	mg/kg	28000	7	54	N/A	1	No Further Action

Notes

PL1 = soil ingestion; PL2 = dermal contact and ingestion; PL3 = dust inhalation; PL4 = Vapour/Gas Inhalation; PL5 = Vertical / Lateral Migration; PL6 = Corrosion of concrete; PL7=Tainting of water supply; PL8 = Uptake by plants

Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration; Loc of Ex = location of exceedance; NFD = no fibres detected.

* The Tier 1 GAC for the hydrocarbon fraction is derived from the CIEH assessment for petroleum hydrocarbons Criteria Working Group (CWG) for both aliphatic and aromatic compounds. E3P has utilised the Tier 1 values for aliphatic compounds for the volatile and semi volatile fractions (C5-C12) and the Tier 1 values for aromatic compound for the non-volatile fractions (C12-C35). The comparison of a total (aliphatic/aromatic) compounds to an individual fraction is considered to be a conservative approach and satisfactory for the protection of human health.

Pacific Park

Supplementary Ground Investigation
December 2021

Referring to Table 4.1, the results of this direct comparison indicates that the data obtained from the supplementary sampling has not exceeded the screening criteria for a commercial end-use.

All 7 samples were analysed for asbestos and no fibres were detected.

PCBs analysis was completed on all samples, where total PCBs above the limit of detection were identified in the following samples:

-  TP201 at 1.00m – 0.12 mg/kg
-  TP202 at 0.10m – 0.057 mg/kg
-  TP202 at 0.40m – 0.27 mg/kg
-  TP202 at 0.85m – 0.082 mg/kg

As detailed within the Remediation and Enabling Works Strategy the threshold being utilised at the subject site is 7.2 mg/kg due to its acceptance as a threshold level on adjacent sites. Based on this threshold no elevated concentrations have been identified within this most recent phase of ground investigation.

As part of the initial phase of ground investigation across the entire site, a Tier I human health risk assessment was undertaken using the chemical analysis results of the soils and comparing to the relevant Tier I criteria for a commercial development. This assessment identified the presence of elevated levels of asbestos, non-volatile PAHs, PCBs and detectable SVOC presence.

The risk to chronic human health associated with the elevated concentrations of non-volatile PAH compounds can be mitigated through the installation of a suitable cover system in all, landscaping and public open space to remove any potential for direct exposure to impacted soils or for the commercial premises covered by suitable hardstanding.

Asbestos in the form of chrysotile and amosite was also identified within localised areas in shallow Made Ground deposits. Asbestos quantification identified concentrations between <0.001% and 0.002%. No visual signs of ACM were encountered during the ground investigation; it is therefore likely that only trace fibres are present. It is likely that trace fibres are present within all Made Ground deposits on site. Impacted soils should be managed according to the asbestos risk mitigation conceptual site model. Asbestos has been identified in WS101 and TP108 at a concentration of 0.002%. It was determined that these areas should therefore be isolated and undergo a phase of delineation and hotspot removal with placement within an area of low sensitivity in line with the asbestos risk mitigation conceptual site model.

PCBs were identified within Made Ground and CLAY drift deposits within WS101, and it was considered the materials will be suitable for retention on site beneath a clean cover system and hardstanding to mitigate.

Concentrations of SVOCs (2-methylnaphthalene, Dibenzofuran, Carbazole and Anthraquinone) above the laboratory limit of detection have been identified however given the properties of the SVOCs and associated pathways the risk has been determined to be low and no further works are required.

4.2. CONTROLLED WATERS RISK ASSESSMENT

E3P has undertaken a controlled waters risk assessment for the site based on the consideration of the conceptual site model and the sensitive receptors which are summarised in Table 4.2.

TABLE 4.2 CONTROLLED WATERS CONCEPTUAL MODEL AND SENSITIVITY PROFILE

DISCUSSION		SENSITIVITY RATING
Contaminant Source		
Made Ground PAHs, TPHs, SVOCs and PCBs have been identified within Made Ground deposits underlying the subject site associated with historical features on-site.		High
Pathway		
Vertical Migration Due to majority of the site being underlain by cohesive clay deposits, migration of contaminants towards the underlying aquifer is unlikely to occur as a result of the low permeability of the drift deposits. The presence of this low permeability drift will offer some protection to the underlying aquifer and inhibit vertical migration of any contaminants.		Low
Lateral migration Lateral migration of contaminants is considered unlikely due to the presence of cohesive clay deposits across the site which are of low permeability.		Low
Receptor		
Aquifer Classification in Superficial Drift Deposits	Secondary Undifferentiated Aquifer	Low
Aquifer Classification in Bedrock	Secondary A aquifer	Medium
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not located within a source protection zone.	Low
Distance to the Closest Groundwater Abstraction Point	The nearest abstraction borehole is located c. 686m south of the site at Calypso Soft Drinks Ltd for process water.	Medium
Is the Site Located Within 50 m of a Surface Watercourse?	No surface watercourses have been identified within influencing distance of the site.	Low
The ICSM developed within the context of the site setting has identified a single viable pollutant pathway, which would be the downward migration of potentially mobile phase-soluble contaminants towards the underlying secondary A aquifer.		

To ensure a robust appraisal of the identified risk to controlled waters, E3P has identified the sources of potential contamination that represent a risk to controlled waters from the initial CSM, we have then assessed the availability of ground investigation data in the form of analysis of the solid phase (soil) and dissolved phase within the perched groundwater or aquifer. The results of this assessment are presented in Table 4.3 which has been based on supplementary sampling only.

TABLE 4.3 QUALITATIVE RISK TO CONTROLLED WATERS FROM SOIL ANALYTICAL RESULTS

CONTAMINANT	ASSESSMENT RATING	DISCUSSION
BTEX > 1 mg/kg	The soil data analysis has not identified any detectable concentrations of TPH C5 to C6 that might otherwise be indicative of VOC impact.	None
Total VOC > 1 mg/kg		
Total SVOC > 1 mg/kg	N/A	None
C5-C10 > 5 mg/kg	All concentrations are below the laboratory LOD.	None
C10-C12 > 10 mg/kg	All concentrations are below the laboratory LOD.	None
C12-C16 > 50 mg/kg	Concentrations of C12-C16 are less than 50 mg/kg.	None
Phenols > 2 mg/kg	All concentrations are below the laboratory LOD.	None
Naphthalene > 2 mg/kg	All concentrations are below the laboratory LOD	None
Total PAH > 10 mg/kg	Total concentrations of low-solubility PAH compounds greater than 10 mg/kg have been detected in one location, TP202 at 0.40mbgl.	Further discussion
PCB > 1 mg/kg	PCB's have been detected on site but all concentrations are < 1 mg/kg.	None
Heavy metals > 500 mg/kg	Concentrations of heavy metals above 500 mg/kg have not been recorded.	None

The Tier I assessment has included a comparison of leachate analysis from samples of the Made Ground to drinking water standards in the first instance due to the presence of a Secondary A Aquifer within the underlying bedrock, and where absent environmental quality standards (EQS).

These are presented in Table 4.4.

TABLE 4.4 COMPARISON OF LEACHATE ANALYSIS WITH TIER 1 SCREENING LEVELS

DETERMINAND	UNIT	EQS ^{1, 2, 3}	DWS _{3,4,5}	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA					
Arsenic	µg/l	50	10	2	3.2	-	No Further Action
Cadmium	µg/l	0.08-0.25	5	2	<0.08	-	
Chromium (VI)	µg/l	3.4	-	2	<5.0	-	
Chromium (III)	µg/l	4.7	50	2	1.3	-	
Copper	µg/l	1	2000	2	14	-	
Total Cyanide	µg/l	1	50	2	<1.0	-	
Lead	µg/l	1.2	10	2	3.3	-	
Mercury	µg/l	-	1.0	2	<0.5	-	
Nickel	µg/l	4	20	2	3.7	-	
Selenium	µg/l	-	10	2	<4.0	-	
Zinc	µg/l	10.9	-	2	8.3	-	
pH	-	6-9		2	7.9	-	
Naphthalene	µg/l	2	10*	2	<0.01	-	
Anthracene	µg/l	0.1	10*	2	<0.01	-	
Benzo[b]fluoranthene	µg/l	0.00017*	10*	2	<0.01	-	
Benzo[k]fluoranthene	µg/l	0.00017*	10*	2	<0.01	-	
Benzo(a)pyrene	µg/l	0.00017*	10*	2	<0.01	-	
Indeno(123-cd)pyrene	µg/l	0.00017*	10*	2	<0.01	-	
Fluoranthene	µg/l	0.0063	10*	2	<0.01	-	
Benzo(ghi)perylene	µg/l	1.7-4	10*	2	<0.01	-	



DETERMINAND	UNIT	EQS 1, 2, 3	DWS 3,4,5	NO. OF LEACHATE SAMPLES	MAX CONC. IN LEACHATE	LOCATION OF EXCEEDANCE	ASSESSMENT
		AA					
TPH Aromatic							
TPH C5-C6 (benzene)	µg/l	10	1	2	<1.0	-	No Further Action
TPH C6-C8 (toluene)	µg/l	74	700	2	<1.0	-	
TPH C8-C10 (ethyl benzene)	µg/l	20	300	2	<1.0	-	
TPH C10-C12 (xylene)	µg/l	30	500	2	<10	-	
TPH C12-C16	µg/l	2	90 ⁵	2	<10	-	
TPH C16-C35	µg/l	50#	90 ⁵	2	<10	-	
TPH Aliphatic							
TPH C5-C6	µg/l	–	15000	2	<1.0	-	No Further Action
TPH C6-C8	µg/l	–	15000	2	<1.0	-	
TPH C8-C10	µg/l	–	300	2	<1.0	-	
TPH C10-C12	µg/l	–	300	2	<10	-	
TPH C12-C16	µg/l	–	300	2	<10	-	
TPH C16-C21	µg/l	–	300**	2	<10	-	
TPH C21-C35	µg/l	–	300**	2	<10	-	

Notes

Solubility <0.01µg/l

AA - Annual Average

MAC- Maximum Admissible Concentration

* Polyaromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water

** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.

1. The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations (2015)
2. Directive establishing a framework for Community action in the field of water policy (Water Framework Directive)
3. Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) - List II substances
4. Council Directive on the quality of water intended for human consumption (Drinking Water Directive)
5. WHO Guidelines for Drinking Water Quality. Third edition (2004)

4.2.1. CONTROLLED WATERS RISK ASSESSMENT AND MITIGATION

The Tier I controlled waters risk assessment has not identified any determinants to exceed the DWS screening values and as such there is not considered to be a change to the previously completed controlled waters risk assessment for the subject site.

The controlled waters risk assessment completed as part of the initial ground investigation identified elevated concentrations of chromium (VI), zinc, pH, naphthalene and TPH Aromatic C12-C16 within leachate analysis. Within the groundwater analysis elevated levels of selenium and zinc were identified. However given the site is underlain by cohesive CLAY drift deposits which are of low permeability, the absence of any surface water features within influencing distance of the site, and distance to the closest groundwater abstraction point (>500m) it was considered there was a low risk to controlled waters from the site.

I trust this information is satisfactory to your requirements, and should I be able to be of any further assistance, please do not hesitate to contact me.

Yours sincerely,
For and on behalf of E3P Ltd

Rebecca Hodnett
Senior Geoenvironmental Consultant

Enclosed:

Appendix I	Limitations
Appendix II	Glossary
Appendix III	Drawings
Appendix IV	Photographs
Appendix V	Exploratory Hole Logs
Appendix VI	Chemical Analysis Results
Appendix VII	Origin of Tier 1 Generic Assessment



APPENDIX I

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the client as indicated in Section 1.3.
2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.
3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.
4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.
5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.
6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.
7. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and do not constitute or replace full and proper surveys.
8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.
9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.
10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.



APPENDIX II

GLOSSARY

TERMS

ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme



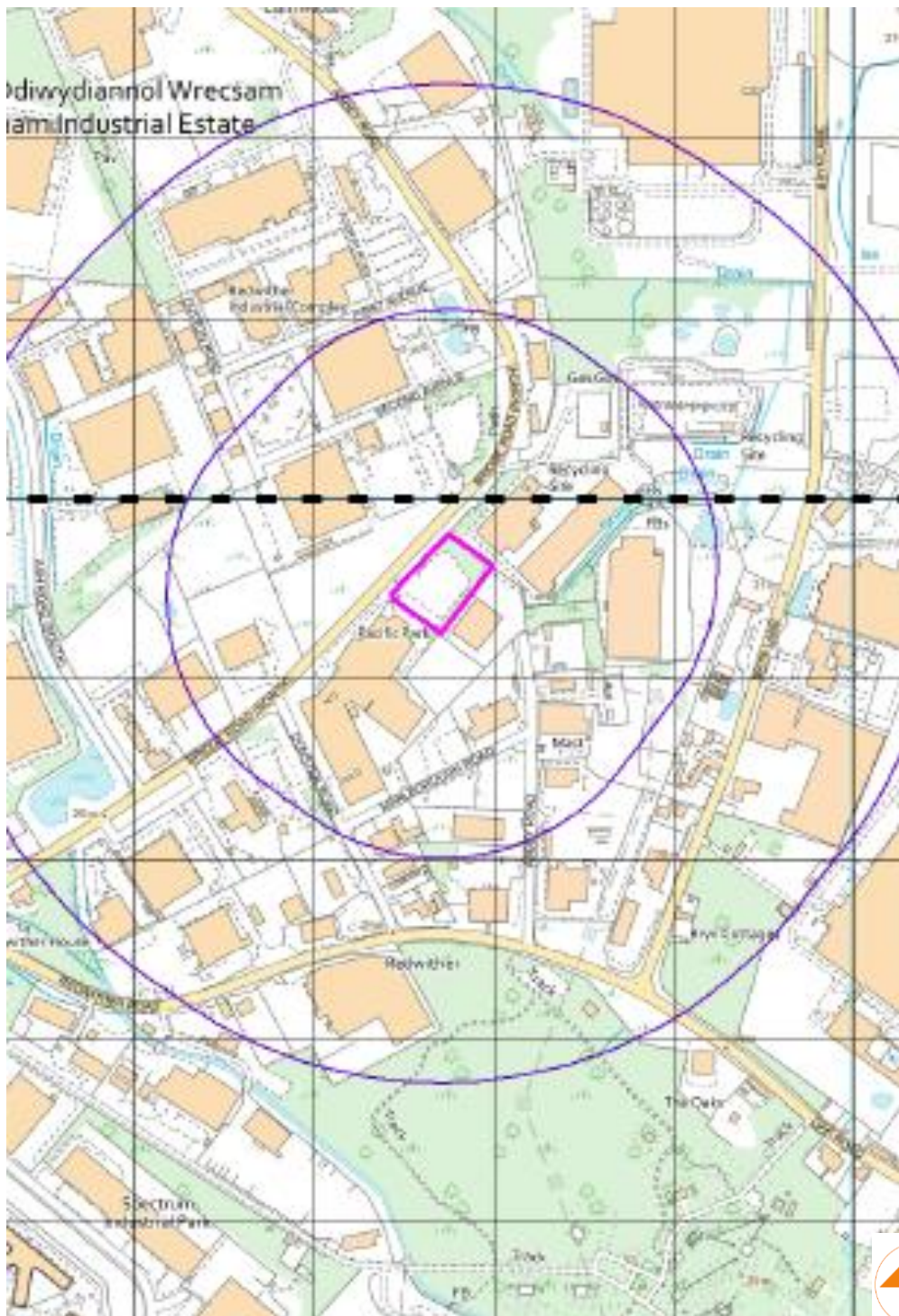
MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection



APPENDIX III

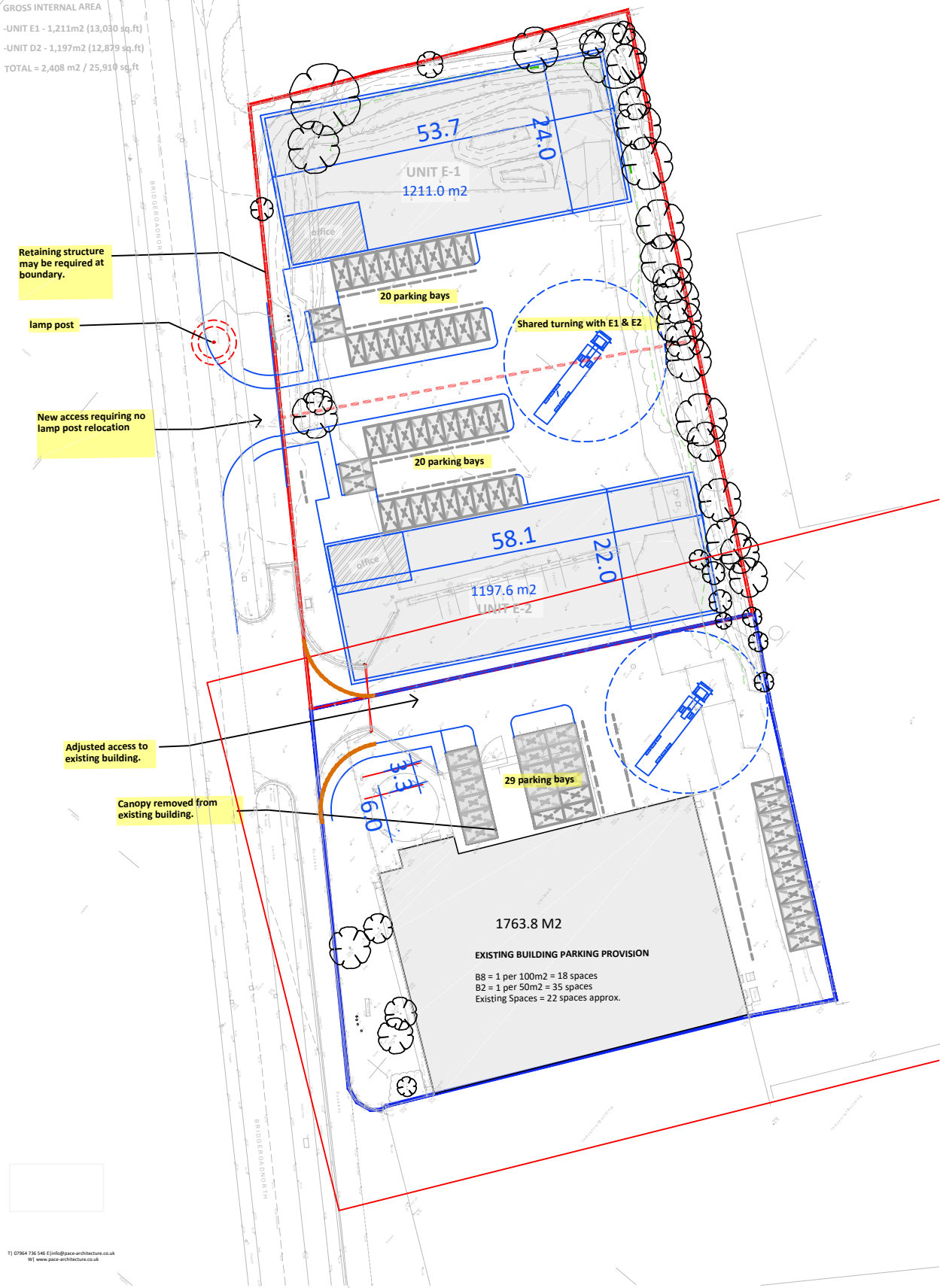
DRAWINGS

DRAWING 14-255-001 – SITE LOCATION PLAN



OPTION E Rev A

GROSS INTERNAL AREA
-UNIT E1 - 1,211m2 (13,030 sq.ft)
-UNIT D2 - 1,197m2 (12,879 sq.ft)
TOTAL = 2,408 m2 / 25,910 sq.ft



T: 0161 738 546 E: info@e3p.co.uk
W: www.e3p.co.uk



Notes:				
P1	REVA	06.07.2020	LM	BH
Phase	Issue	Date	Drawn	Checked

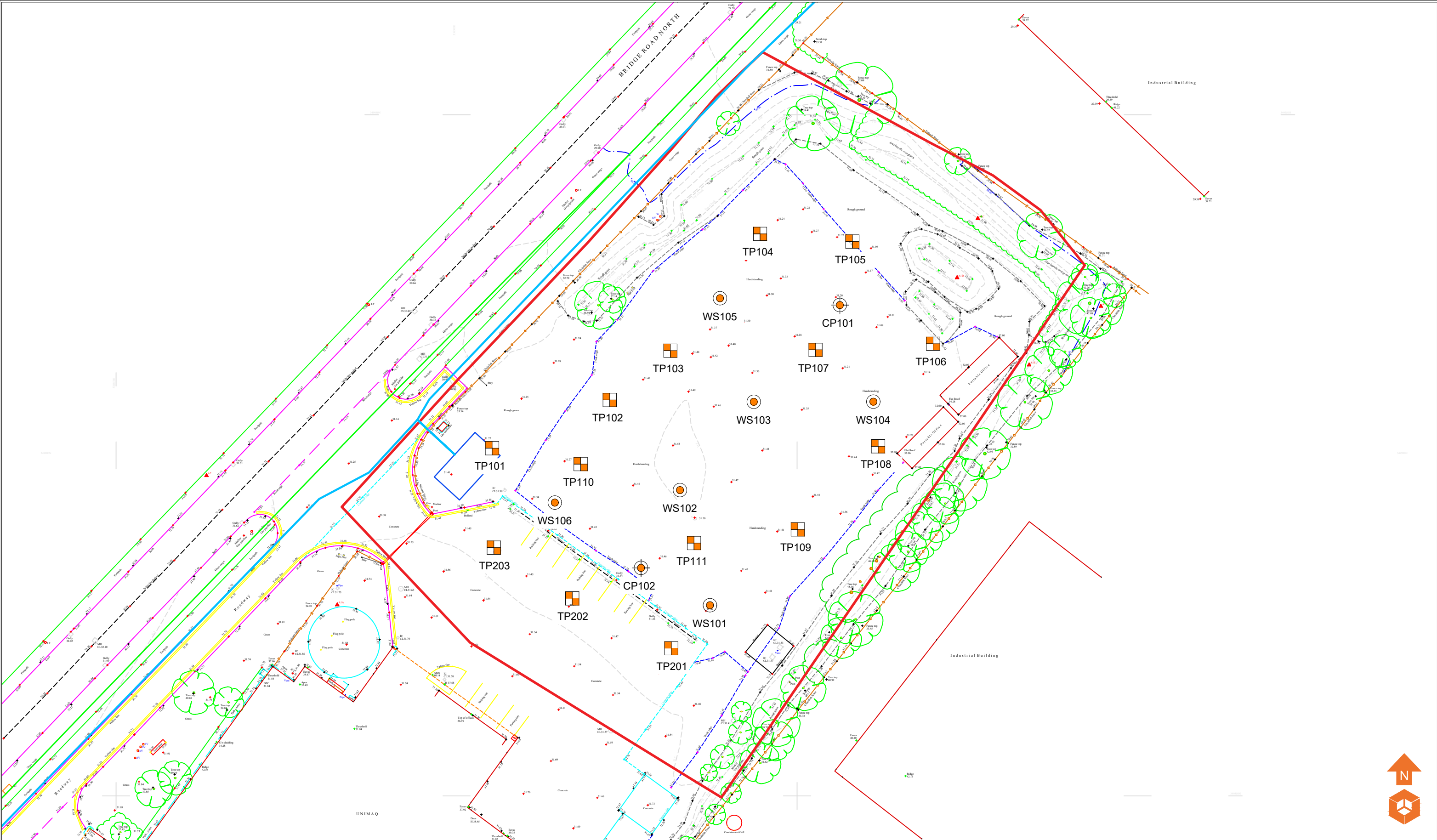
Client:	
Multimaq Ltd	
Job Title:	
Pacific Park, Wrexham	

Job No:	14-255	Date:	06.07.2020
Drawing No:	002	Scale:	NTS@ A3
Drawing Title:		Proposed Development Plan	



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Taylor Road, Trafford Park
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Location Symbols  WSP Approximate Window Sample Probehole Location  TP Approximate Trial Pit Location  CPB Approximate Cable Percussive Borehole Location					Notes:					Client: Portal Construction		Job No: 14-255	Date: 08.12.2021	 e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk			
					P1 REVB 08.12.2021 LM RH P1 REVA 26.02.2021 EB MJ					Job Title: Pacific Park, Wrexham		Drawing No: 005		Scale: NTS@ A3		The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.	
Phase Issue Date Drawn Checked							Drawing Title: Exploratory Hole Location Plan										

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APPENDIX IV

PHOTOGRAPHS

PLATE 1 GROUND CONDITIONS IN VICINITY OF FORMER POND SHWOING NO ORGANIC OF
DELETRIOUS MATERIALS AND GENERAL MADE GROUND DEPOSITS



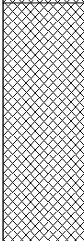
PLATE 2 GROUND CONDITIONS IN VICINITY OF FORMER POND SHWOING NO ORGANIC OF
DELETRIOUS MATERIALS AND GENERAL MADE GROUND DEPOSITS



APPENDIX V

EXPLORATORY HOLE LOGS

Project Name: Pacific Park	Project No. 14255	Co-ords: 338526.00 - 349866.00 Level:	Date 14/09/2021
Location: Wrexham	Dimensions (m): 1.50 0.60		Scale 1:30
Client: Multimaq Limited	Depth 1.40		Logged R. Hodnett

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.30			MADE GROUND: Grey slightly sandy gravel. Gravel is medium to coarse angular to sub-angular of limestone and sandstone. (Geotextile membrane at base).	
	1.00	ES					MADE GROUND: Red brown slightly silty gravelly clay. Gravel is fine to coarse angular to sub-angular to sub-rounded of brick, sandstone, rare coal and rare wood.	1
	1.30	ES		1.25 1.40			Red brown slightly silty slightly gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded of sandstone.	
							End of Pit at 1.40m	2 3 4

Trial Pit Photographs



TP201



TP201 SPOIL

Remarks: Complete.

Stability: Stable

Project Name: Pacific Park	Project No. 14255	Co-ords: 338514.00 - 349878.00 Level:	Date 14/09/2021
Location: Wrexham		Dimensions (m): 1.50 Depth 1.45	Scale 1:30
Client: Multimaq Limited			Logged R. Hodnett

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.20			MADE GROUND: Grey slightly sandy gravel. Gravel is medium to coarse angular to sub-angular of limestone and sandstone.	
	0.40	ES		0.40 0.45			MADE GROUND: Red brown slightly silty gravelly clay. Gravel is fine to coarse angular to sub-angular to sub-rounded of brick, sandstone, rare coal and rare wood. MADE GROUND: Black sandy gravel (organic). Gravel is fine to coarse angular to subangular of wood. MADE GROUND: Red brown slightly silty gravelly clay. Gravel is fine to coarse angular to sub-angular to sub-rounded of brick, sandstone, rare coal and rare wood. (Clayey gravel band at 0.80-1.00m bgl, gravel is fine to medium sub-angular to sub-rounded of sandstone).	
	0.85	ES		1.30 1.45			Red brown slightly silty slightly gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded of sandstone.	
							End of Pit at 1.45m	

Trial Pit Photographs



TP202

TP202 SPOIL

Remarks: Brick structure encountered at 0.30m-1.0m bgl.

Stability: Stable

Project Name: Pacific Park	Project No. 14255	Co-ords: 338511.00 - 349884.00 Level:	Date 14/09/2021
Location: Wrexham	Dimensions (m): 1.50 0.60		Scale 1:30
Client: Multimaq Limited	Depth 1.00		Logged R. Hodnett

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
0.25	0.90	ES		0.20			MADE GROUND: Grey slightly sandy gravel. Gravel is medium to coarse angular to sub-angular of limestone and sandstone.	1

Trial Pit Photographs



TP203



TP203 SPOIL

Remarks: Perched water encountered at 0.25m bgl.

Stability: Stable

APPENDIX VI

CHEMICAL TESTING

RESULTS



Rebecca Hodnett

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Taylor Road
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i2 Analytical Ltd.
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Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404

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e: reception@i2analytical.com

Analytical Report Number : 21-10251

Project / Site name:	Pacific Park Wrexham	Samples received on:	15/09/2021
Your job number:	14 255	Samples instructed on/ Analysis started on:	15/09/2021
Your order number:	14255 BH N	Analysis completed by:	23/09/2021
Report Issue Number:	1	Report issued on:	23/09/2021
Samples Analysed:	2 leachate samples - 10 soil samples		

Signed: *Karolina Marek*

Karolina Marek
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 21-10251
Project / Site name: Pacific Park Wrexham
Your Order No: 14255 BH N

Lab Sample Number				2012757	2012758	2012759	2012760	2012761
Sample Reference				TP201	TP201	TP202	TP202	TP202
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.00	1.30	0.10	0.40	0.85
Date Sampled				15/09/2021	15/09/2021	15/09/2021	15/09/2021	15/09/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	20	17	6.4	20	10
Total mass of sample received	kg	0.001	NONE	0.50	0.50	0.50	0.50	0.50

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.7	8.9	9.3	8.2	8.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	770	320	960	1000	2100
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.041	0.019	0.065	0.11	0.062
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	82	37	130	220	120
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	41.0	18.6	65.1	110	62.0
Sulphide	mg/kg	1	MCERTS	20	4.0	50	40	6.2
Total Sulphur	mg/kg	50	MCERTS	690	200	4100	1200	1400
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.8	0.4	0.6	2.4	1.1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.86	< 0.05	< 0.05	1.8	0.53
Anthracene	mg/kg	0.05	MCERTS	0.21	< 0.05	< 0.05	0.54	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	1.4	< 0.05	< 0.05	4.2	0.54
Pyrene	mg/kg	0.05	MCERTS	1.2	< 0.05	< 0.05	3.7	0.47
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.81	< 0.05	< 0.05	2.5	0.32
Chrysene	mg/kg	0.05	MCERTS	0.65	< 0.05	< 0.05	2.1	0.30
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.76	< 0.05	< 0.05	2.7	0.34
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.38	< 0.05	< 0.05	0.93	0.22
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.72	< 0.05	< 0.05	2.3	0.33
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.30	< 0.05	< 0.05	0.81	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.23	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.39	< 0.05	< 0.05	0.92	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	7.74	< 0.80	< 0.80	22.6	3.05
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	13	5.6	12	19
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	0.2	0.4	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	35	35	7.3	31	27
Copper (aqua regia extractable)	mg/kg	1	MCERTS	30	22	7.7	25	32
Lead (aqua regia extractable)	mg/kg	1	MCERTS	47	17	15	41	51
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	39	37	15	30	30
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	92	65	20	130	63

Analytical Report Number: 21-10251
Project / Site name: Pacific Park Wrexham
Your Order No: 14255 BH N

Lab Sample Number				2012757	2012758	2012759	2012760	2012761
Sample Reference				TP201	TP201	TP202	TP202	TP202
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.00	1.30	0.10	0.40	0.85
Date Sampled				15/09/2021	15/09/2021	15/09/2021	15/09/2021	15/09/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

Petroleum Hydrocarbons

TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	4.6	6.0
TPH (C16 - C21)	mg/kg	1	MCERTS	21	< 1.0	< 1.0	24	32
TPH (C21 - C35)	mg/kg	1	MCERTS	43	< 1.0	< 1.0	51	54
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	17	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	65	< 10	< 10	96	92

PCBs by GC-MS

PCB Congener 28	mg/kg	0.001	MCERTS	0.004	< 0.001	< 0.001	< 0.001	< 0.001
PCB Congener 52	mg/kg	0.001	MCERTS	0.013	< 0.001	0.006	0.022	0.005
PCB Congener 101	mg/kg	0.001	MCERTS	0.031	< 0.001	0.014	0.061	0.015
PCB Congener 118	mg/kg	0.001	MCERTS	0.023	< 0.001	0.012	0.057	0.009
PCB Congener 138	mg/kg	0.001	MCERTS	0.024	< 0.001	0.014	0.068	0.019
PCB Congener 153	mg/kg	0.001	MCERTS	0.023	< 0.001	0.011	0.052	0.018
PCB Congener 180	mg/kg	0.001	MCERTS	0.005	< 0.001	< 0.001	0.011	0.016

Total PCBs by GC-MS

Total PCBs	mg/kg	0.007	MCERTS	0.12	< 0.007	0.057	0.27	0.082
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U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 21-10251
 Project / Site name: Pacific Park Wrexham
 Your Order No: 14255 BH N

Lab Sample Number				2012762	2012763	2012764	2012765	2012766
Sample Reference				TP203	TP203	EXS101	EXS102	EXS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.35	0.90	None Supplied	None Supplied	None Supplied
Date Sampled				15/09/2021	15/09/2021	15/09/2021	15/09/2021	15/09/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	12	17	12	12	9.5
Total mass of sample received	kg	0.001	NONE	0.50	0.50	0.50	0.50	0.50

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
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General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.2	8.3	8.5	8.9	8.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Sulphate as SO ₄	mg/kg	50	MCERTS	7500	1500	6000	1500	670
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	g/l	0.00125	MCERTS	0.11	0.69	0.078	0.30	0.060
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/kg	2.5	MCERTS	230	1400	160	590	120
Water Soluble SO ₄ (2:1 Leach. Equiv.) 1hr extraction	mg/l	1.25	MCERTS	113	687	78.1	295	60.4
Sulphide	mg/kg	1	MCERTS	3.9	< 1.0	5.1	28	2.9
Total Sulphur	mg/kg	50	MCERTS	4900	550	2500	1100	380
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.8	0.5	1.4	1.2	1.0

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.58	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	0.54	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	3.7	< 0.05	6.5	0.80	< 0.05
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	2.7	0.25	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.62	< 0.05	19	2.1	0.35
Pyrene	mg/kg	0.05	MCERTS	0.38	< 0.05	18	2.3	0.33
Benzo(a)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	11	2.0	< 0.05
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	8.1	1.2	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	8.3	2.5	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	5.8	1.2	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	9.0	2.2	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	4.4	1.3	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	1.3	0.40	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	4.8	1.5	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	4.67	< 0.80	100	17.7	< 0.80
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	29	14	18	5.5	8.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	0.5	0.3
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	30	51	23	17	29
Copper (aqua regia extractable)	mg/kg	1	MCERTS	42	25	27	19	24
Lead (aqua regia extractable)	mg/kg	1	MCERTS	52	21	54	42	36
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.9	< 0.3	0.4	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	26	49	23	14	26
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	38	84	75	67	80

Analytical Report Number: 21-10251
 Project / Site name: Pacific Park Wrexham
 Your Order No: 14255 BH N

Lab Sample Number				2012762	2012763	2012764	2012765	2012766
Sample Reference				TP203	TP203	EXS101	EXS102	EXS103
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.35	0.90	None Supplied	None Supplied	None Supplied
Date Sampled				15/09/2021	15/09/2021	15/09/2021	15/09/2021	15/09/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Petroleum Hydrocarbons								
TPH (C5 - C6)	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH (C6 - C8)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C8 - C10)	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH (C10 - C12)	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH (C12 - C16)	mg/kg	4	MCERTS	< 4.0	< 4.0	11	19	< 4.0
TPH (C16 - C21)	mg/kg	1	MCERTS	< 1.0	< 1.0	81	70	< 1.0
TPH (C21 - C35)	mg/kg	1	MCERTS	< 1.0	< 1.0	250	370	< 1.0
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	61	130	< 10
TPH Total C5 - C40	mg/kg	10	MCERTS	< 10	< 10	400	580	< 10

PCBs by GC-MS

PCB Congener 28	mg/kg	0.001	MCERTS	< 0.001	< 0.001	0.47	< 0.001	0.007
PCB Congener 52	mg/kg	0.001	MCERTS	< 0.001	< 0.001	0.24	0.020	0.10
PCB Congener 101	mg/kg	0.001	MCERTS	< 0.001	< 0.001	0.098	0.043	0.21
PCB Congener 118	mg/kg	0.001	MCERTS	< 0.001	< 0.001	0.11	0.034	0.15
PCB Congener 138	mg/kg	0.001	MCERTS	< 0.001	< 0.001	0.081	0.036	0.14
PCB Congener 153	mg/kg	0.001	MCERTS	< 0.001	< 0.001	0.073	0.031	0.12
PCB Congener 180	mg/kg	0.001	MCERTS	< 0.001	< 0.001	0.097	< 0.001	0.025

Total PCBs by GC-MS

Total PCBs	mg/kg	0.007	MCERTS	< 0.007	< 0.007	1.2	0.17	0.76
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U/S = Unsuitable Sample I/S = Insufficient Sample



Analytical Report Number: 21-10251
Project / Site name: Pacific Park Wrexham

Your Order No: 14255 BH N

Lab Sample Number				2012767	2012768
Sample Reference				TP202	TP203
Sample Number				None Supplied	None Supplied
Depth (m)				0.85	0.35
Date Sampled				15/09/2021	15/09/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status		

General Inorganics

pH	pH Units	N/A	ISO 17025	7.9	7.4
Total Cyanide (Low Level 1 µg/l)	µg/l	1	ISO 17025	< 1.0	< 1.0

Total Phenols

Total Phenols (monohydric)	µg/l	1	ISO 17025	1.6	1.9
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Speciated PAHs

Naphthalene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthylene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Acenaphthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluorene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Phenanthrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)anthracene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Chrysene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(b)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Benzo(a)pyrene	µg/l	0.01	ISO 17025	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/l	0.01	NONE	< 0.01	< 0.01
Benzo(ghi)perylene	µg/l	0.01	NONE	< 0.01	< 0.01

Total PAH

Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2
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Heavy Metals / Metalloids

Arsenic (dissolved)	µg/l	1	ISO 17025	3.2	< 1.0
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08
Chromium (hexavalent)	µg/l	5	ISO 17025	< 5.0	< 5.0
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.1	1.3
Copper (dissolved)	µg/l	0.7	ISO 17025	14	12
Lead (dissolved)	µg/l	1	ISO 17025	1.8	3.3
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	2.6	3.7
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	8.3	7.2

Monoaromatics & Oxygenates

Benzene	µg/l	1	ISO 17025	< 1.0	< 1.0
Toluene	µg/l	1	ISO 17025	< 1.0	< 1.0
Ethylbenzene	µg/l	1	ISO 17025	< 1.0	< 1.0
p & m-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
o-xylene	µg/l	1	ISO 17025	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/l	10	NONE	< 10	< 10



Analytical Report Number: 21-10251
Project / Site name: Pacific Park Wrexham

Your Order No: 14255 BH N

Lab Sample Number				2012767	2012768
Sample Reference				TP202	TP203
Sample Number				None Supplied	None Supplied
Depth (m)				0.85	0.35
Date Sampled				15/09/2021	15/09/2021
Time Taken				None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	Units	Limit of detection	Accreditation Status		

Petroleum Hydrocarbons

TPH1 (C10 - C40)	µg/l	10	NONE	< 10	< 10
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TPH-CWG - Aliphatic >C5 - C6	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C6 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10

TPH-CWG - Aromatic >C5 - C7	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C7 - C8	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C8 - C10	µg/l	1	ISO 17025	< 1.0	< 1.0
TPH-CWG - Aromatic >C10 - C12	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C12 - C16	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C16 - C21	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic >C21 - C35	µg/l	10	NONE	< 10	< 10
TPH-CWG - Aromatic (C5 - C35)	µg/l	10	NONE	< 10	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 21-10251

Project / Site name: Pacific Park Wrexham

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2012757	TP201	None Supplied	1	Brown clay and sand with rubble.
2012758	TP201	None Supplied	1.3	Brown clay with gravel.
2012759	TP202	None Supplied	0.1	Brown clay and sand with gravel.
2012760	TP202	None Supplied	0.4	Brown clay and sand with gravel.
2012761	TP202	None Supplied	0.85	Brown clay and sand with rubble.
2012762	TP203	None Supplied	0.35	Brown clay and sand with rubble.
2012763	TP203	None Supplied	0.9	Brown clay with gravel.
2012764	EXS101	None Supplied	None Supplied	Brown clay and sand with gravel.
2012765	EXS102	None Supplied	None Supplied	Brown clay and sand with gravel.
2012766	EXS103	None Supplied	None Supplied	Brown clay and sand with gravel and brick.

Analytical Report Number : 21-10251
Project / Site name: Pacific Park Wrexham

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
BS EN 12457-1 (2:1) Leachate Prep	2:1 (as recieved, moisture adjusted) end over end extraction with water for 24 hours. Eluate filtered prior to analysis.	In-house method based on BSEN12457-1.	L043-PL	W	NONE
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in leachate - LOW LEVEL 1 ug/l	Determination of phenols in leachate by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	ISO 17025
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
PCB's By GC-MS in soil	Determination of PCB by extraction with acetone and hexane followed by GC-MS.	In-house method based on USEPA 8082	L027-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In house method.	L005-PL	W	ISO 17025
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS

Analytical Report Number : 21-10251
Project / Site name: Pacific Park Wrexham

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
TPH1 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in leachates (Monoaromatics)	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	ISO 17025
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	MCERTS
Total cyanide in leachate - 1µg/l	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	ISO 17025
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Sulphate, water soluble, in soil (1hr extraction)	Sulphate, water soluble, in soil (1hr extraction)	In-house method	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

APPENDIX VII

ORIGIN OF TIER I GENERIC ASSESSMENT CRITERIA

CONSTITUENT	ORIGIN OF RISK ASSESSMENT VALUE
Arsenic	2014 LQM/CIEH S4ULs
Cadmium	2014 LQM/CIEH S4ULs
Chromium	2014 LQM/CIEH S4ULs
Lead	2014 LQM/CIEH S4ULs
Mercury	2014 LQM/CIEH S4ULs – methylmercury
Nickel	2014 LQM/CIEH S4ULs
Selenium	2014 LQM/CIEH S4ULs
Copper	2014 LQM/CIEH S4ULs
Zinc	2014 LQM/CIEH S4ULs
Cyanide – Total	2014 LQM/CIEH S4ULs
Phenols – Total	2014 LQM/CIEH S4ULs
Naphthalene	General assessment criteria (GAC) developed by CIEH/LQM Suitable 4 Use Levels with supporting data from SR3, SR7 and existing Tox report where applicable. 1% SOM.
Acenaphthylene	
Acenaphthene	
Fluorene	
Phenanthrene	
Anthracene	
Fluoranthene	
Pyrene	
Benzo(a)Anthracene	
Chrysene	
Benzo(b/k)Fluoranthene (iii)	
Benzo(a)Pyrene	
Indeno(123-cd)Pyrene	
Dibenzo(a,h)Anthracene	
Benzo(ghi)Perylene	
TPH C ₅ -C ₆ (aliphatic)	
TPH C ₆ -C ₈ (aliphatic)	
TPH C ₈ -C ₁₀ (aliphatic)	
TPH C ₁₀ -C ₁₂ (aliphatic)	
TPH C ₁₂ -C ₁₆ (aromatic)	
TPH C ₁₆ -C ₂₁ (aromatic)	
TPH C ₂₁ -C ₃₅ (aromatic)	



