

APPENDIX 11.1

Geo-environmental assessment,
Phase 2 Development

Part 4 of 4



APPENDIX D
QUANTUM SUPPLEMENTARY GEO-ENVIRONMENTAL REPORT

APPENDIX IV – QUANTUM GEOTECHNICAL REPORT
(REF: G345 ENVIROPARK_LR01, OCTOBER 2013)

Document:	Supplementary Geotechnical & Geo-Environmental Report		
Project Title:	Enviropark, Hirwaun	Date:	4 th October, 2013
Client:	Dawnus Construction Ltd	Our Ref:	G345 Enviropark_LR01

Introduction:

Upon the instruction of the Client, Dawnus Construction Ltd, in conjunction with the Project Consultant Engineers, Waterman, Quantum Geotechnical have been requested to undertake a review of the geotechnical and geo-environmental studies undertaken on Phase 1 of the development site for Enviropark, Hirwaun.

The purpose of this document is to provide added guidance and recommendations on geotechnical and environmental issues in relation to specific issues highlighted as part of the tendering and design process.

The specific issues Quantum were asked to address in this Report relate to:

- Main Foundations
- Ground Bearing Floor Slab
- Extent of Possible Alluvium
- Contamination Hotspot

The Client has provided a site investigation report prepared by Soil Mechanics (reference H8076, January 2009) which provides extensive data over the whole development site. In addition to this, a *Ground Conditions Review* letter report prepared by consultants Pell Frischmann on behalf of Enviropark. The Pell Frischmann letter report reviewed the Soil Mechanics report conclusions and highlighted specific aspects where the ground conditions indicated alternative foundation and infrastructure solutions, or where additional information may be required to allow detailed design to be completed.

In the interests of brevity, data from the earlier Soil Mechanics Report is not included. This report must be read in conjunction with these earlier reports to derive specific data in support of the conclusions drawn by Quantum Geotechnical.

The Notes & Limitations pertinent to Ground Investigation work should be read in conjunction with this Report, which are presented at the end of the Report.

Background

Early discussions in the design process with Waterman highlighted potential areas of concern. Namely; Main foundations; risk of differential settlement; feasibility of a ground bearing slab; any contamination hotspots; and groundwater levels.

The consultants for the Client (Pell Frischmann) pointed out in their letter of July 2011 that the Made Ground, although predominantly granular, contains many inclusions of brick/concrete etc at cobble and boulder size and clayey horizons (in Soil Mechanics TP logs, not BH logs), that could lead to differential settlements. We would agree with this statement.

From our own assessment of the site prior to the additional investigation, it was considered extremely optimistic to expect an allowable bearing capacity of 150kPa as suggested in the Soil Mechanics GI Report in the made ground.

At a load of 65kPa, as indicated in the GI for floor slab load, it was considered that total settlements may reach 40mm with differentials of 20mm to 30mm, without some sort of pre-treatment.

The question of hotspots appeared to be only relevant as regards the risk to controlled waters and appears to be concentrated around TP2 (within current development area). Human health is not considered at risk.

Groundwater depths were indicated to vary over the site from the GI information. It appears to be sitting within the made ground, so is likely to be encountered in any excavations up to 2.5m deep.

In order to try and bring some clarity to these matters, some additional sampling and testing was recommended.

This was suggested to comprise of trial pits to sample around the location of TP2 to sample for contamination testing; and the southern fringe for the possible presence of alluvium. In addition some dynamic probing over the main building footprint would give additional comfort to the possibility of a ground bearing slab and any need for excavate and re-compact or replace.

Ground Conditions Revealed by Quantum Investigation

The findings of the additional trial pits and dynamic probes are presented in Appendix II.

In summary; the Dynamic Probes over the footprint of the main building have proved a very dense mantle of the fill to approximately 2-3m depth. The trial pits (TP201 – 204) excavated around original TP2 for additional sampling, confirmed the very dense nature of the top 2 – 3m of the made ground.

This appears to be a re-worked glacial soil, being essentially a sandy Gravel with variable cobble content. Although it is very dense it is not considered to be an engineered fill, put down in layers and compacted say.

The additional trial pits excavated to assess whether any Peat/Alluvium was present along southern fringe of the site (TPs 101 – 106), found no evidence found of Peat or soft alluvium.

The 'boggy' nature of the ground surface along the front of the site is considered to be due to drainage issues and the surface layer holding the run-off.

No groundwater was encountered in any of the trial pits excavated. The only water encountered was from surface run-off.

Foundations

Although the made ground as proved in the additional investigation has been found to be dense we would not recommend structural foundations to be placed within it. It is not an engineered fill and therefore could be subject to differential settlements at higher loads. Creep consolidation and consolidation due to the new load will affect it, irrespective of how long the fill has been in place.

We would recommend a safe bearing capacity of 75kPa for the made ground.

All structural loads should be supported by piles. Pell Frischmann recommended piling for foundation loads, even for lighter structures.

Floor Slab

The actual loading of any floor slabs is unclear based on information passed to Quantum to date; a loading of 65kPa having been indicated in the Soil Mechanics Report.

Pell Frischmann suggested suspended floor slabs. This would appear to be impractical for this type of development.

Depending on the actual finished floor level; if build up is required we would recommend that a simple topsoil strip be followed by proof rolling and placing of sub-base for the ground bearing slab. If the level is to be lowered, the same protocol should be followed after excavation to the required level.

Extent of Alluvium

The plan included with Soil Mechanics Report indicated an '*Area of Peat (assumed)*' along the southern frontage of the site.

In order to better assess this, a series of additional trial pits (TP 101 – 106) were excavated to try and identify any peat or alluvium. British Geological Survey mapping of the area indicates 'Alluvium' as clay, sand and gravel from the Quaternary Period being present on the site.

The additional trial holes proved up to 1.8m of made ground (TP104) overlying a compact brown and grey sandy very silty Gravel with some cobbles. This stratum could be of alluvial origin, although sub-angular gravels were present which isn't typical of true alluvial soils; but was not proved as a typical compressible alluvium. There was no evidence of any Peat being present in the additional trial pits.

The ground surface in this area does give the appearance of being waterlogged, as can be found with peaty ground, but this appeared to be due to the poor drainage of this area, with water standing at surface, rather than organic soils.

Geo-Environmental Assessment

The purpose of the additional sampling for contamination purposes was to provide information as to whether the contamination found in TP2 of the original Soil Mechanics investigation was of wider extent.

A slight exceedance of TPH (Total Petroleum Hydrocarbon) was recorded that could be considered a risk to site users. However banded analysis of component hydrocarbons suggested that hydrocarbon contamination may not be an issue for the proposed end use. Additional testing was performed as part of this Report to confirm this to be the case.

A summary of the most recent test results is tabulated below, compared to accepted thresholds.

Analyte	Results					SGV/GAC Human Health (Residential) ⁽¹⁾	SGV/GAC Leachate/Controlled Waters
Location	TP201 1m	TP201 2m	TP202 1m	TP203 2m	TP204 1.8m		
SOILS (mg/kg)							
PAH (total)	< 1.6	8	24	28	36	> 30,232	
BTEX	< 1	< 1	< 1	< 1	< 1	> 948	
TPH Aliphatic	< 10	40	21	18	53	50	
TPH Aromatic	< 10	59	30	42	66	50	
LEACHATE (µg/l)							
PAH (total)	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2		0.1 ⁽²⁾
BTEX	< 10	< 10	< 10	< 10	< 10		15 ⁽²⁾
TPH Aliphatic	< 10	< 10	< 10	< 10	< 10		10 ⁽²⁾
TPH Aromatic	< 10	< 10	< 10	< 10	< 10		10 ⁽²⁾

Notes: 1. Sum of individual compounds for Residential End Use without Plant Uptake
2. UK Drinking Water Standards (No Environmental Quality Standard (EQS) exists in UK)

Human Health Risk Conclusions

The Residential End Use without Plant Uptake Thresholds set By DEFRA/CLEA have been adopted to assess the risk to human health, from coming into contact with the soils on site.

Based on these additional test results; overall there is no perceived risk from manual handling of the soils. One compound in one sample within the Polyaromatic Hydrocarbons exceeds the minimum threshold for Benz(a)pyrene (Result 1.3mg/kg: Threshold 1.0mg/kg).

This one value exceeding the quoted threshold does not in itself constitute a risk. The corresponding threshold for the site's end use as commercial/industrial of 14mk/kg demonstrates that the soil does not present an undue risk. It simply gives an indication that some intervention may be appropriate or that site management should be introduced to mitigate against the risk.

This should take the form of Operatives working with or likely to come into contact with Made Ground observing good practice as regards hygiene on site. Appropriate personal protective equipment should be issued and personnel should be instructed in safe working methods. Operatives should be warned to avoid contact between hands and mouth before washing. The consumption of food must be confined to designated clean areas. Suitable welfare including washing facilities should be provided.

Assessment of Risk to Controlled Waters

The risk to controlled waters, i.e. nearby watercourses or groundwater bodies, is defined by the potential for any contaminants present on site to leach from the soils or by held contaminated water migration beneath the site.

The previous investigation and test results from the site indicated that “the majority of contaminants in the ground do not pose a risk to groundwater outside the site or to controlled surface waters”. The additional testing undertaken on samples around the identified potential hotspot confirm that no risk exists from contaminated groundwater.

We trust that the above is of assistance; however, if you need any further clarification or have any queries please do not hesitate to contact us.

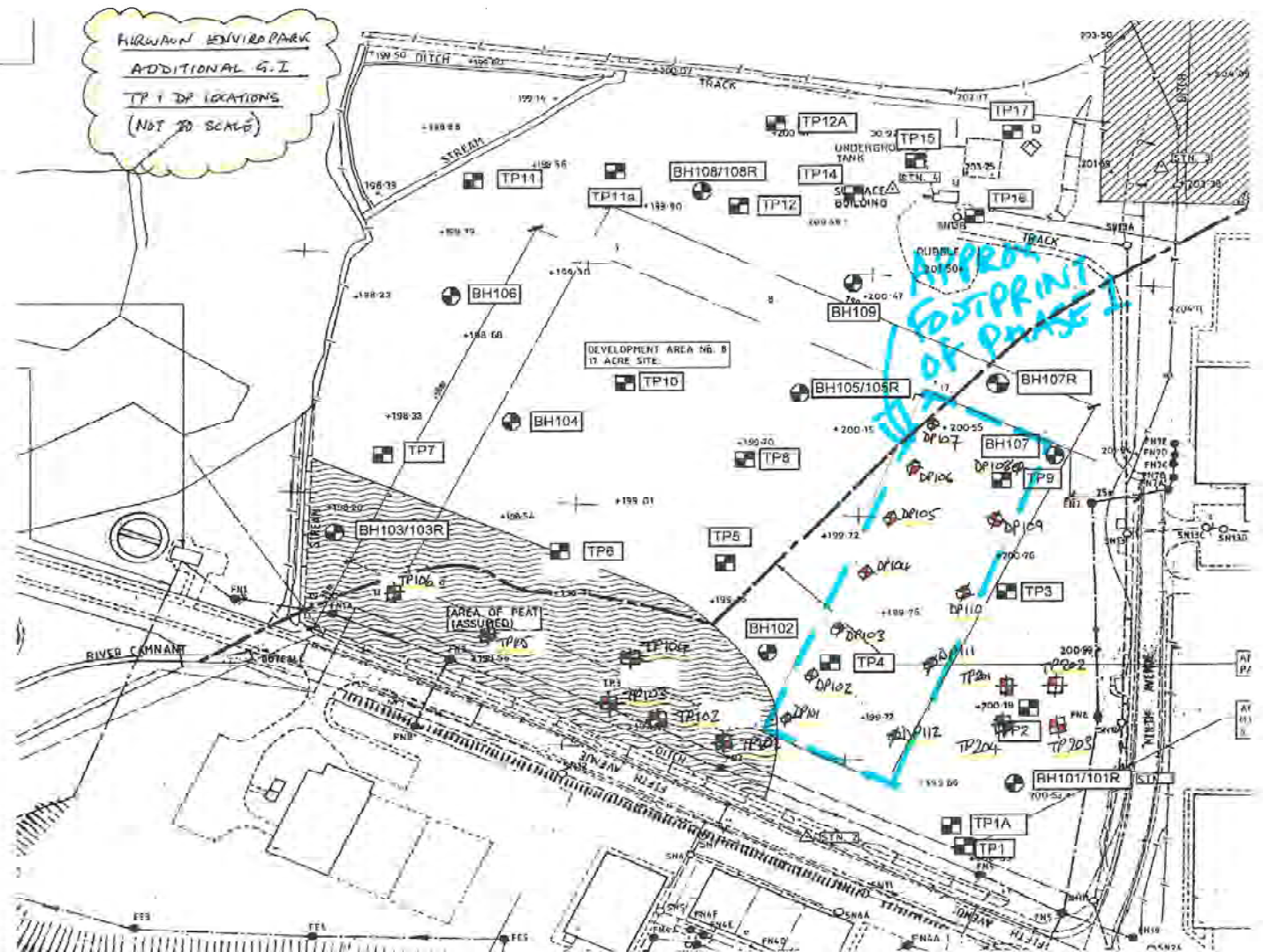
For and on behalf of **QUANTUM GEOTECHNICAL LTD**

J.E. STARK, B.Sc. (Hons), C.Geol., F.G.S.
Technical Director

Date

APPENDIX I – Site Plan

HERMAN ENVIRO PARK
ADDITIONAL G.I
TP 1 DP LOCATIONS
(NOT TO SCALE)



APPENDIX II – Trial Pit & Dynamic Probe Records

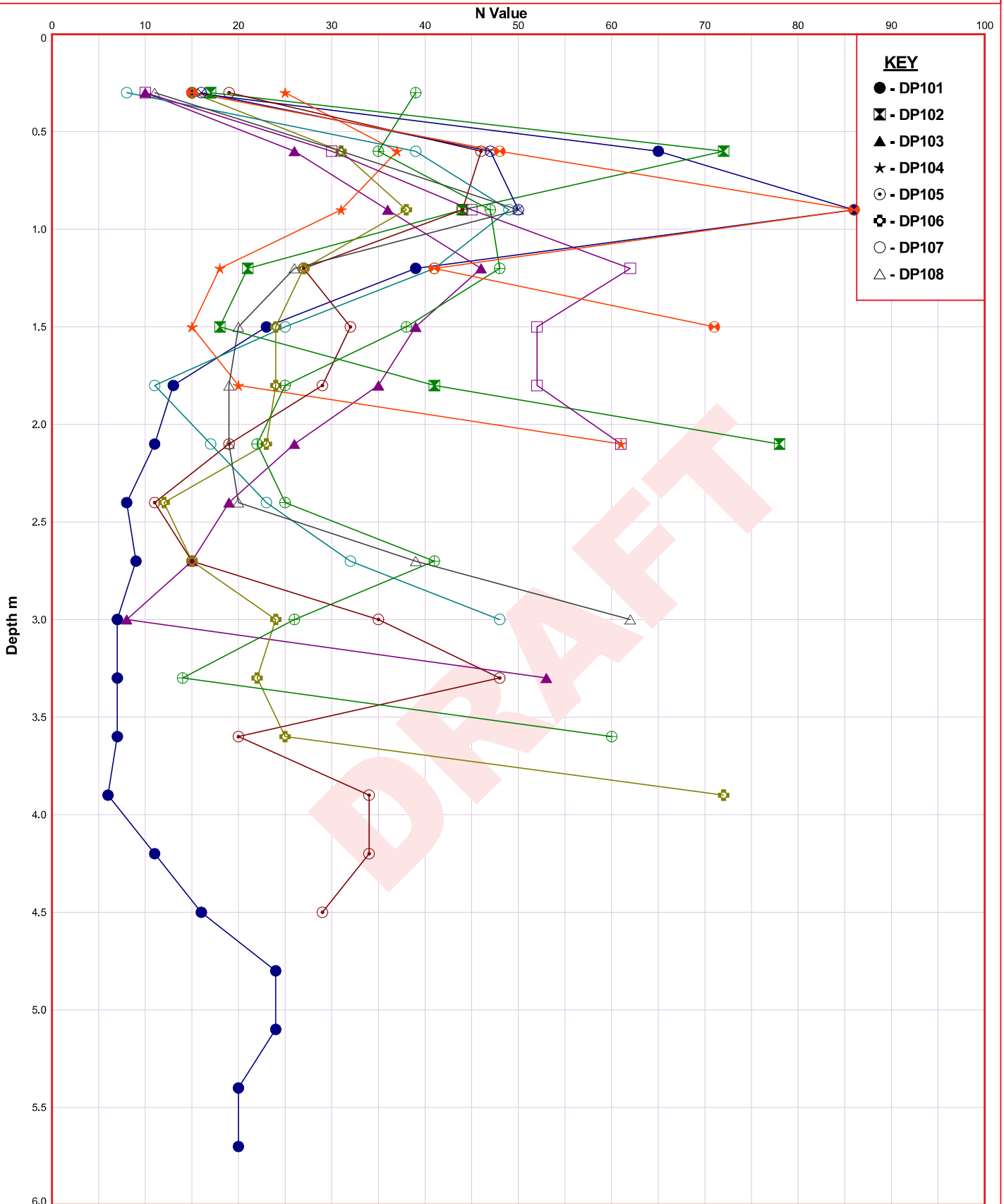
Contract : Enviroparks, Hirwaun
Client : Dawnus Construction Ltd

Point Plotted
DP101, DP102, DP103, DP104,
DP105, DP106, DP107, DP108,
DP109, DP110

Job Number : G345

Engineer : Waterman

SPT N VALUE Vs. DEPTH



Remarks:



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Date: 16/09/2013

All measurements in
metres unless
otherwise stated

Figure No.

1

Contract : Enviroparks, Hirwaun Client : Dawnus Construction Ltd							Trial Pit No. TP101				
Dates : 11/09/13 - 11/09/13 Location :				Job Number : G345 Engineer : Waterman		Ground Level : Coordinates:					
m B.G.L.	Samples		Tests		STRATA				Water		
	Depth	Type No.	Depth	Test Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)			
1						MADE GROUND: Grass over: Compact brown slightly silty sandy GRAVEL (fine to coarse, ang to sub ang of natural + occ brick) with some to many cobbles and occasional boulders		(1.10)			
					1.10	Possible MADE GROUND: Loose pale brown & grey silty fine SAND, with clayey inclusions; becoming grey and brown mottled with coarse gravels and occasional rounded cobbles		1.10			
								(0.70)			
					1.80	Loose to compact , with some laminations, slightly gravelly fine sandy clayey SILT with some sub-ang cobbles		1.80			
2								(0.90)			
					2.70	Compact brown-grey silty gravelly (fine to coarse, sub-ang to sub-rounded) fine SAND		2.70			
3								(0.30)			
					3.00	EOTP		3.00			
PLAN 			Groundwater: Stability: Stable Shoring: None			Remarks :					
Equipment Used: JCB 3CX											
			Ty Bervig, Bynea Llanelli, Carmarthenshire SA14 9ST Tel: 01554 744880 Fax: 01554 776150 email: enquiries@quantum-geotech.co.uk			Operator:	Logged By: JS	Sheet No. 1 Of 2	m Per Page 4	All measurements in metres unless otherwise stated	

Contract : Enviroparks, Hirwaun Client : Dawnus Construction Ltd		Trial Pit No. TP101
Dates : 11/09/13 - 11/09/13 Location :	Job Number : G345 Engineer : Waterman	Ground Level : Coordinates:



Above:- TP101 spoil



Right:- TP101 pit

Contract : Enviroparks, Hirwaun
Client : Dawnus Construction Ltd

Trial Pit No.
TP102

Dates : 11/09/13 - 11/09/13

Job Number : G345

Ground Level :

Location :

Engineer : Waterman

Coordinates:



Above:- TP102 spoils



*Right:-
TP102 pit*



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All measurements in
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Contract : Enviroparks, Hirwaun		Trial Pit No. TP103
Client : Dawnus Construction Ltd		
Dates : 11/09/13 - 11/09/13	Job Number : G345	Ground Level :
Location :	Engineer : Waterman	Coordinates:



Above:- TP103 spoil



Right:-
TP103 pit

Contract : Enviroparks, Hirwaun Client : Dawnus Construction Ltd							Trial Pit No. TP104	
Dates : 11/09/13 - 11/09/13 Location :				Job Number : G345 Engineer : Waterman		Ground Level : Coordinates:		

m B.G.L.	Samples		Tests		STRATA				Water
	Depth	Type No.	Depth	Test Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)	
1						MADE GROUND: Grass over: Compact brown slightly silty sandy GRAVEL (fine to coarse, ang to sub ang of natural + occ brick) with some to many cobbles and occasional boulders		(1.10)	
					1.10	MADE GROUND: Compact grey and dark grey slightly clayey slightly silty sandy GRAVEL (fine to coarse, ang to sub ang) with some to many cobbles		1.10	
						1.80	Compact brown and grey mottled sandy very silty fine to coarse sub-angular to sub-rounded GRAVEL with some sub-rounded Cobbles (Sandstone)	1.80	
						2.00	EOTP	2.00	
2							(0.20)		

PLAN

Groundwater:

Stability: Stable

Shoring: None

Remarks :

Equipment Used: JCB 3CX

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Contract : Enviroparks, Hirwaun		Trial Pit No. TP104
Client : Dawnus Construction Ltd		
Dates : 11/09/13 - 11/09/13	Job Number : G345	Ground Level :
Location :	Engineer : Waterman	Coordinates:



Above:- TP104 spoil



Right:- TP104 pit

Contract : Enviroparks, Hirwaun Client : Dawnus Construction Ltd							Trial Pit No. TP105	
Dates : 11/09/13 - 11/09/13 Location :				Job Number : G345 Engineer : Waterman		Ground Level : Coordinates:		

m B.G.L.	Samples		Tests		STRATA			Water
	Depth	Type No.	Depth	Test Results	Depth (Thickness)	DESCRIPTION	Legend	
1						MADE GROUND: Grass over: Compact brown slightly silty sandy GRAVEL (fine to coarse, ang to sub ang of natural + occ brick) with some to many cobbles and occasional boulders		(0.40)
					0.40	MADE GROUND: Compact grey and dark grey slightly clayey slightly silty sandy GRAVEL (fine to coarse, ang to sub ang) with some to many cobbles		0.40
					0.50	Compact brown and grey mottled sandy very silty fine to coarse sub-angular to sub-rounded GRAVEL with some sub-rounded Cobbles (Sandstone)		0.50
								(1.00)
					1.50	EOTP		1.50

DRAFT

PLAN 		Groundwater: Stability: Stable Shoring: None	Remarks :
Equipment Used: JCB 3CX			

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Contract : Enviroparks, Hirwaun
Client : Dawnus Construction Ltd

Trial Pit No.
TP105

Dates : 11/09/13 - 11/09/13

Job Number : G345

Ground Level :

Location :

Engineer : Waterman

Coordinates:



Above:- TP105 spoil



*Right:-
TP105 pit*



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All measurements in
metres unless
otherwise stated



Contract : Enviroparks, Hirwaun Client : Dawnus Construction Ltd							Trial Pit No. TP106				
Dates : 11/09/13 - 11/09/13 Location :				Job Number : G345 Engineer : Waterman		Ground Level : Coordinates:					
m B.G.L.	Samples		Tests		STRATA				Water		
	Depth	Type No.	Depth	Test Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)			
1						MADE GROUND: Grass over: Compact brown slightly silty sandy GRAVEL (fine to coarse, ang to sub ang of natural + occ brick) with some to many cobbles and occasional boulders		(0.60)			
					0.60	MADE GROUND: Compact yellow brown slightly clayey slightly silty sandy GRAVEL (fine to coarse, ang to sub ang) with some cobbles		0.60 (0.60)			
					1.20	Compact brown and grey mottled sandy very silty fine to coarse sub-angular to sub-rounded GRAVEL with some sub-rounded Cobbles (Sandstone)		1.20 (0.30)			
					1.50	EOTP		1.50			
PLAN 			Groundwater: Stability: Stable Shoring: None			Remarks :					
Equipment Used: JCB 3CX											
			Ty Berwig, Bynea Llanelli, Carmarthenshire SA14 9ST Tel: 01554 744880 Fax: 01554 776150 email: enquiries@quantum-geotech.co.uk			Operator:	Logged By: JS	Sheet No. 1 Of 2	m Per Page 4	All measurements in metres unless otherwise stated	

Contract : Enviroparks, Hirwaun
Client : Dawnus Construction Ltd

Trial Pit No.
TP106

Dates : 11/09/13 - 11/09/13

Job Number : G345

Ground Level :

Location :

Engineer : Waterman

Coordinates:



Above:- TP106 spoil



*Right:-
TP106 pit*



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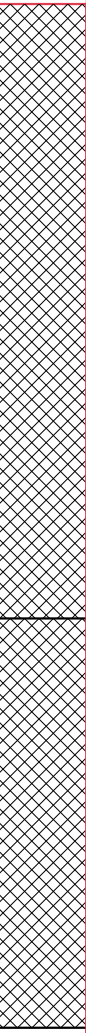
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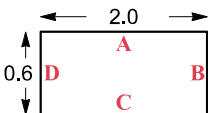
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Contract : Enviroparks, Hirwaun Client : Dawnus Construction Ltd							Trial Pit No. TP201	
Dates : 11/09/13 - 11/09/13 Location :				Job Number : G345 Engineer : Waterman		Ground Level : Coordinates:		

m B.G.L.	Samples		Tests		STRATA				Water
	Depth	Type No.	Depth	Test Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)	
1	1.00 -	D1				MADE GROUND: Grass over: Compact brown slightly silty sandy GRAVEL (fine to coarse, ang to sub ang of natural + occ brick) with some to many cobbles and occasional boulders		(1.80)	
2	2.00 -	ES1 ES2			1.80	MADE GROUND: Compact grey and dark grey slightly clayey slightly silty sandy GRAVEL (fine to coarse, ang to sub ang of natural with some brick) with some to many cobbles		1.80	
3					3.00	EOTP		3.00	

PLAN





Groundwater:

Stability: Stable

Shoring: None

Remarks :

Equipment Used: JCB 3CX

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Contract : Enviroparks, Hirwaun
Client : Dawnus Construction Ltd

Trial Pit No.
TP201

Dates : 11/09/13 - 11/09/13

Job Number : G345

Ground Level :

Location :

Engineer : Waterman

Coordinates:



Above:- TP201 spoil



*Right:-
TP201 pit*



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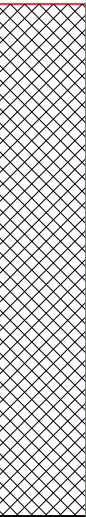
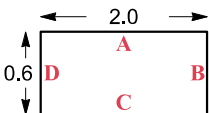


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Contract : Enviroparks, Hirwaun Client : Dawnus Construction Ltd							Trial Pit No. TP202		
Dates : 11/09/13 - 11/09/13 Location :				Job Number : G345 Engineer : Waterman		Ground Level : Coordinates:			
m B.G.L.	Samples		Tests		STRATA				Water
	Depth	Type No.	Depth	Test Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)	
1	1.00 -	D1 ES1 ES2				MADE GROUND: Grass over: Compact brown slightly silty sandy GRAVEL (fine to coarse, ang to sub ang of natural + occ brick) with some to many cobbles and occasional boulders		(1.50)	
					1.50	EOTP		1.50	
PLAN 			Groundwater: Stability: Stable Shoring: None				Remarks :		
Equipment Used: JCB 3CX									
 Ty Bervig, Bynea Llanelli, Carmarthenshire SA14 9ST Tel: 01554 744880 Fax: 01554 776150 email: enquiries@quantum-geotech.co.uk				Operator:		Logged By: JS		Sheet No. 1 Of 2	
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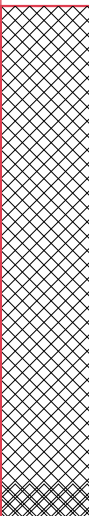
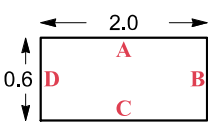


Contract : Enviroparks, Hirwaun Client : Dawnus Construction Ltd		Trial Pit No. TP202
Dates : 11/09/13 - 11/09/13 Location :	Job Number : G345 Engineer : Waterman	Ground Level : Coordinates:



Above:- TP202 spoil



Right:- TP202 pit

Contract : Enviroparks, Hirwaun Client : Dawnus Construction Ltd							Trial Pit No. TP203				
Dates : 11/09/13 - 11/09/13 Location :				Job Number : G345 Engineer : Waterman		Ground Level : Coordinates:					
m B.G.L.	Samples		Tests		STRATA				Water		
	Depth	Type No.	Depth	Test Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)			
1	1.00 -	D1				MADE GROUND: Grass over: Compact brown slightly silty sandy GRAVEL (fine to coarse, ang to sub ang of natural + occ brick) with some to many cobbles and occasional boulders		(1.50)			
	1.50 -	ES1 ES2			1.50	MADE GROUND: Compact grey and dark grey slightly clayey slightly silty sandy GRAVEL (fine to coarse, ang to sub ang of natural with some brick) with some to many cobbles EOTP		(0.10)			
PLAN 			Groundwater: Stability: Stable Shoring: None			Remarks :					
Equipment Used: JCB 3CX											
			Ty Berwig, Bynea Llanelli, Carmarthenshire SA14 9ST Tel: 01554 744880 Fax: 01554 776150 email: enquiries@quantum-geotech.co.uk			Operator: JS Logged By: JS		Sheet No. 1 Of 2	m Per Page 4	All measurements in metres unless otherwise stated	

Contract : Enviroparks, Hirwaun
Client : Dawnus Construction Ltd

Trial Pit No.
TP203

Dates : 11/09/13 - 11/09/13

Job Number : G345

Ground Level :

Location :

Engineer : Waterman

Coordinates:



Above:- TP203 spoils



*Right:-
TP203 pit*



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Operator:

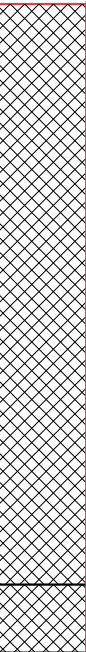
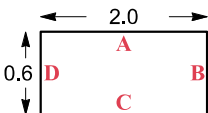


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Contract : Enviroparks, Hirwaun Client : Dawnus Construction Ltd							Trial Pit No. TP204				
Dates : 11/09/13 - 11/09/13 Location :				Job Number : G345 Engineer : Waterman		Ground Level : Coordinates:					
m B.G.L.	Samples		Tests		STRATA				Water		
	Depth	Type No.	Depth	Test Results	Depth (Thickness)	DESCRIPTION	Legend	Depth (Thickness)			
1	1.00 -	D1				MADE GROUND: Grass over: Compact brown slightly silty sandy GRAVEL (fine to coarse, ang to sub ang of natural + occ brick) with some to many cobbles and occasional boulders		(1.70)			
	1.80 -	ES1 ES2			1.70	MADE GROUND: Compact grey and dark grey slightly clayey slightly silty sandy GRAVEL (fine to coarse, ang to sub ang of natural with some brick) with some to many cobbles		1.70 (0.20)			
					1.90	EOTP		1.90			
PLAN 			Groundwater: Stability: Stable Shoring: None				Remarks :				
Equipment Used: JCB 3CX											
 Ty Bervig, Bynea Llanelli, Carmarthenshire SA14 9ST Tel: 01554 744880 Fax: 01554 776150 email: enquiries@quantum-geotech.co.uk				Operator: JS		Logged By: JS		Sheet No. 1 Of 2	m Per Page 4	All measurements in metres unless otherwise stated	

Contract : Enviroparks, Hirwaun Client : Dawnus Construction Ltd		Trial Pit No. TP204
Dates : 11/09/13 - 11/09/13 Location :	Job Number : G345 Engineer : Waterman	Ground Level : Coordinates:



Above:- TP204 spoil



Right:- TP204 pit

APPENDIX III – Laboratory Test Results

**Arwel Jones**

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Analytical Report Number : 13-46334

Project / Site name: Enviroparks , Hirwaun

Samples received on: 20/09/2013

Your job number: G345

Samples instructed on: 20/09/2013

Your order number:

Analysis completed by: 27/09/2013

Report Issue Number: 1

Report issued on: 27/09/2013

Samples Analysed: 5 leachate samples - 10 soil samples

Signed:

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed:

Rexona Rahman
Customer Services Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

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.

Iss No 13-46334-1

Analytical Report Number: 13-46334

Project / Site name: Enviroparks , Hirwaun

Lab Sample Number	287007				287008	287009	287010	287011
Sample Reference	201				201	201	201	202
Sample Number	ES1				ES2	ES3	ES4	ES1
Depth (m)	1.00				1.00	2.00	2.00	1.00
Date Sampled	11/09/2013				11/09/2013	11/09/2013	11/09/2013	11/09/2013
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	%	N/A	NONE	7.9	6.3	13	9.8	9.7
Total mass of sample received	kg	0.001	NONE	0.44	0.17	0.40	0.15	0.43

General Inorganics

Organic Matter	%	0.1	MCERTS	0.7	-	6.6	-	1.1
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	-	< 0.05	-	0.47	-
Acenaphthylene	mg/kg	0.2	MCERTS	-	< 0.20	-	< 0.20	-
Acenaphthene	mg/kg	0.1	MCERTS	-	< 0.10	-	< 0.10	-
Fluorene	mg/kg	0.2	MCERTS	-	< 0.20	-	< 0.20	-
Phenanthrene	mg/kg	0.2	MCERTS	-	< 0.20	-	1.3	-
Anthracene	mg/kg	0.1	MCERTS	-	< 0.10	-	0.24	-
Fluoranthene	mg/kg	0.2	MCERTS	-	< 0.20	-	1.3	-
Pyrene	mg/kg	0.2	MCERTS	-	< 0.20	-	1.1	-
Benzo(a)anthracene	mg/kg	0.2	MCERTS	-	< 0.20	-	0.99	-
Chrysene	mg/kg	0.05	MCERTS	-	< 0.05	-	0.78	-
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	-	< 0.10	-	0.80	-
Benzo(k)fluoranthene	mg/kg	0.2	MCERTS	-	< 0.20	-	0.38	-
Benzo(a)pyrene	mg/kg	0.1	MCERTS	-	< 0.10	-	0.54	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.2	MCERTS	-	< 0.20	-	< 0.20	-
Dibenz(a,h)anthracene	mg/kg	0.2	MCERTS	-	< 0.20	-	< 0.20	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	< 0.05	-	< 0.05	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	-	< 1.6	-	8.0	-
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Monoaromatics

Benzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0

Analytical Report Number: 13-46334

Project / Site name: Enviroparks , Hirwaun

Lab Sample Number	287007	287008	287009	287010	287011
Sample Reference	201	201	201	201	202
Sample Number	ES1	ES2	ES3	ES4	ES1
Depth (m)	1.00	1.00	2.00	2.00	1.00
Date Sampled	11/09/2013	11/09/2013	11/09/2013	11/09/2013	11/09/2013
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-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	-	< 0.1
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	-	< 0.1
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	-	< 0.1
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	-	5.2	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	-	5.2	-	2.7
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	-	< 8.0	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	-	29	-	18
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	-	40	-	21

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	-	< 0.1
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	-	< 0.1
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	-	< 0.1	-	< 0.1
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	-	< 1.0	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	-	4.8	-	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	-	27	-	18
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	-	27	-	12
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	-	59	-	30

Analytical Report Number: 13-46334

Project / Site name: Enviroparks , Hirwaun

Lab Sample Number	287012	287013	287014	287015	287016
Sample Reference	202	203	203	204	204
Sample Number	ES2	ES1	ES2	ES1	ES2
Depth (m)	1.00	2.00	2.00	1.80	1.80
Date Sampled	11/09/2013	11/09/2013	11/09/2013	11/09/2013	11/09/2013
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
Moisture Content	%	N/A	NONE	9.1	9.7
Total mass of sample received	kg	0.001	NONE	0.16	0.15

General Inorganics

Organic Matter	%	0.1	MCERTS	-	1.3	-	1.5	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	-	< 0.05	-	0.71
Acenaphthylene	mg/kg	0.2	MCERTS	< 0.20	-	< 0.20	-	< 0.20
Acenaphthene	mg/kg	0.1	MCERTS	0.29	-	0.42	-	0.83
Fluorene	mg/kg	0.2	MCERTS	0.41	-	0.55	-	0.92
Phenanthrene	mg/kg	0.2	MCERTS	4.6	-	5.4	-	6.7
Anthracene	mg/kg	0.1	MCERTS	1.6	-	2.2	-	2.1
Fluoranthene	mg/kg	0.2	MCERTS	6.1	-	7.2	-	8.3
Pyrene	mg/kg	0.2	MCERTS	4.7	-	5.5	-	6.6
Benzo(a)anthracene	mg/kg	0.2	MCERTS	2.0	-	2.1	-	3.1
Chrysene	mg/kg	0.05	MCERTS	1.4	-	1.6	-	2.1
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	1.2	-	1.2	-	1.8
Benzo(k)fluoranthene	mg/kg	0.2	MCERTS	0.65	-	0.68	-	0.96
Benzo(a)pyrene	mg/kg	0.1	MCERTS	0.80	-	0.76	-	1.3
Indeno(1,2,3-cd)pyrene	mg/kg	0.2	MCERTS	< 0.20	-	< 0.20	-	0.42
Dibenz(a,h)anthracene	mg/kg	0.2	MCERTS	< 0.20	-	< 0.20	-	< 0.20
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	-	0.28	-	0.44

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	24	-	28	-	36
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Monoaromatics

Benzene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
Toluene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
p & m-xylene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
o-xylene	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-

Analytical Report Number: 13-46334

Project / Site name: Enviroparks , Hirwaun

Lab Sample Number				287012	287013	287014	287015	287016
Sample Reference				202	203	203	204	204
Sample Number				ES2	ES1	ES2	ES1	ES2
Depth (m)				1.00	2.00	2.00	1.80	1.80
Date Sampled				11/09/2013	11/09/2013	11/09/2013	11/09/2013	11/09/2013
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-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	-	4.7	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	< 8.0	-	16	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	18	-	32	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	18	-	53	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	-	< 0.1	-	< 0.1	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	< 1.0	-	< 1.0	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	< 2.0	-	4.9	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	21	-	36	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	22	-	25	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	42	-	66	-



Analytical Report Number: 13-46334
Project / Site name: Enviroparks , Hirwaun

Lab Sample Number				287017	287018	287019	287020	287021
Sample Reference				201	201	202	203	204
Sample Number				D1	ES3	D1	D1	D1
Depth (m)				1.00	2.00	1.00	1.00	1.00
Date Sampled				11/09/2013	11/09/2013	11/09/2013	11/09/2013	11/09/2013
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)				Units	Limit of detection	Accreditation Status		

Speciated PAHs

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

Total PAH

Total EPA-16 PAHs	µg/l	0.2	NONE	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
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Monoaromatics

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

TPH-CWG - Aliphatic >C5 - C6	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C6 - C8	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C8 - C10	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C10 - C12	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C12 - C16	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C16 - C21	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic >C21 - C35	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (C5 - C35)	µg/l	10	NONE	< 10	< 10	< 10	< 10	< 10

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



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**Analytical Report Number : 13-46334****Project / Site name: Enviroparks , Hirwaun**

* 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 topsoil/loam 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 2 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
287007	201	ES1	1.00	Light brown sandy topsoil with gravel.
287008	201	ES2	1.00	Light brown sandy topsoil with gravel.
287009	201	ES3	2.00	Black gravelly topsoil with coal.
287010	201	ES4	2.00	Black gravelly topsoil with coal.
287011	202	ES1	1.00	Light brown sandy topsoil with gravel and rubble.
287012	202	ES2	1.00	Light brown sandy topsoil with gravel and rubble.
287013	203	ES1	2.00	Light brown sandy topsoil with gravel and rubble.
287014	203	ES2	2.00	Light brown sandy topsoil with gravel and rubble.
287015	204	ES1	1.80	Light brown sandy topsoil with gravel and stones.
287016	204	ES2	1.80	Light brown sandy topsoil with gravel.

Analytical Report Number : 13-46334

Project / Site name: Enviroparks , Hirwaun

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
BTEX and MTBE in leachates	Determination of BTEX and MTBE in leachates by headspace GC-MS.	In-house method based on USEPA8260	L017-UK		NONE
BTEX and MTBE in soil	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073S-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Organic matter in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	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	L064-UK		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
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Stones not passing through a 10 mm sieve is determined gravimetrically and reported as a percentage of the dry weight. Sample	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
TPH7 (Leachates)	Determination of dichloromethane extractable hydrocarbons in leachate by GC-MS.	In-house method	L070-PL	W	NONE
TPHCWG (Soil)	Determination of pentane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	W	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.

Notes & Limitations:

The following conditions and notes on site investigation procedures should be read in conjunction with this report.

Recommendations made and opinions expressed in this report are based on the strata observed on site, together with the results of any site or laboratory tests and survey data. No responsibility can be held for conditions which have not been revealed by the exposures or which occur between locations. Whilst the report may suggest the likely configuration of strata, this is only indicative and liability cannot be accepted for its accuracy.

Groundwater conditions referred to in this report are those taken from data supplied appertaining to the period of investigation. It should be noted, however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions or other causes.

Any advice, opinions, or recommendations within this document should be read and relied upon only in the context of the document as a whole; does not, in any way, purport to include any manner of legal advice or opinion; and are based upon the information made available to Quantum Geotechnical at the date of this document and on current UK standards, codes, technology and construction practices as at the date of this document.

It should be noted and it is expressly stated that no independent verification of any of the documents or information supplied to Quantum Geotechnical has been made. No liability is accepted by Quantum Geotechnical for any use of this document, other than for the purposes for which it was originally prepared and provided.

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APPENDIX V – QUANTUM GEOTECHNICAL REPORT (REF: G345-LET02 280115)

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28th January 2015
Our Ref: G345-Let02 280115

For the attention of Mr. Alan Wilkinson,

Re: Enviroparks, Hirwaun: Geo-Environmental Planning Conditions – Application No. 08/02488/FUL

This document aims to provide clarification and guidance relating to two particular existing Planning Conditions on the Enviroparks scheme as undertaken by Dawnus Construction Ltd, as set out in the Notice of Decision document stipulated by the Brecon Beacons National Park Authority also referred to as the 'Local Planning Authority' within the document.

The two Planning Conditions of note pertain to Geo-Environmental land issues and are headlined below:

<u>Ref;</u>	<u>Condition Summary;</u>
BB23	Submission and approval of a contaminated land risk assessment and monitoring verification plan
BB24	Submission and approval of a contaminated land remediation verification report

Prior to commencement of the development works, several stages of Geo-Environmental Assessments on the site were undertaken, most recently by Quantum Geotechnical Ltd in October 2013.

The following summarises and brings together all the elements of investigations and reporting undertaken on site, to demonstrate that the Planning Conditions quoted have been satisfied.

The table below summarises the investigation work undertaken on site that we are aware of. A commentary on the ownership of these is added.

	<u>Report</u>	<u>Comments</u>
1.	Wallace Evans & Partners (for Welsh Industrial Estate Corporation): Proposed Development of the Northern Section of the Hirwaun Industrial Estate. Report on a Ground Investigation. Ref.S/8731, January 1972.	Contained in Appendix to Report Ref.3, provided by Enviroparks via Employer's Agent.
2.	Exploration Associates (for Thomas Morgan & Associates): 17 Acre Site Hirwaun Industrial Estate, Interpretive Report on Ground Investigation. Ref. 155102, July 1992.	Contained in Appendix to Report Ref.3, provided by Enviroparks via Employer's Agent.
3.	Thomas Morgan & Associates (for Welsh Development Agency): Report on a 17 Acre Site at the Hirwaun Industrial Estate Site Investigation Data. Ref.P329.02, September 1995.	Provided by Enviroparks via Employer's Agent

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4.	Soil Mechanics (for Enviroparks, via Pell Frischmann): Hirwaun Industrial Estate Development, Interpretive Report on Site Investigation. Ref.H8076, January 2009.	Provided by Enviroparks via Employer's Agent. Soil Mechanics Report refers to 'A previous desk study report had been carried out by Enviroparks Ltd (dated November 2007).
	<u>Report</u>	<u>Comments</u>
5.	Pell Frischmann (for Enviroparks (Hirwaun) Ltd): Letter Report – Enviroparks Hirwaun Ground Conditions Review. Ref.E57006/MWJ/001, July 2011.	Provided by Enviroparks via Employer's Agent
6.	Quantum Geotechnical Ltd (for Dawnus Construction Ltd): Enviropark, Hirwaun – Supplementary Geotechnical & Geo-Environmental Report. Ref.G345 Enviropark_LR01, October 2013.	Issued via Dawnus Construction.

From the foregoing Reports the sequence of investigation and advice on the site can be shown.

Historical ground investigation has been undertaken on the site up to 1995 (Reports Ref.1, 2 & 3 above).

Subsequent to that a detailed investigation was commissioned and carried out by Soil Mechanics in 2009 (Ref.4), following a Desk Study prepared by Enviroparks (referenced in Soil Mechanics 2009 Report).

A summary interpretation was provided by Pell Frischmann (Ref.5) on the findings of the Soil Mechanics 2009 Report, giving recommendations on further investigation requirements to address the outstanding issues specifically relating to guidelines on foundation choice; potential contamination hot-spot around Trial Pit 2 from Soil Mechanics 2009 Investigation; and mobility of contamination affecting controlled waters.

These specific matters were investigated by Quantum and reported in Report Ref.6. The conclusions drawn were that the risk was negligible and that no further investigation or remediation was necessary.

Recommendations:

The aforementioned documentation should be provided in an ordered package to Brecon Beacons National Park Authority which should comply with and satisfy Planning Condition 23.

The reports have identified that no risk exists from contaminated soils or groundwater on site i.e. any potential contaminants held within the soils are non-mobile and therefore no source or pollutant linkage can be realised which may pose a risk to controlled waters i.e. ground water or proximal surface waters. Therefore, no Remediation Strategy and Verification Plan is considered necessary for the scheme based on ground investigation findings to date.

This in turn, would negate the requirement for a Verification Report which constitutes Planning Condition 24, effectively demonstrating that Condition 24 is not required for this scheme.

We trust that you will find the foregoing of assistance, but should you require any further information please do not hesitate to contact us.

Yours faithfully,
For and on behalf of
QUANTUM GEOTECHNICAL LTD

A handwritten signature in black ink, appearing to read "Ross McDermott", is written over a horizontal line.

Ross McDermott M.Sc., B.Sc. (Hons), C.Geol., F.G.S.

Notes & Limitations:

The following conditions and notes on site investigation procedures should be read in conjunction with this report.

Recommendations made and opinions expressed in this report are based on the strata observed on site, together with the results of any site or laboratory tests and survey data. No responsibility can be held for conditions which have not been revealed by the exposures or which occur between locations. Whilst the report may suggest the likely configuration of strata, this is only indicative and liability cannot be accepted for its accuracy.

Groundwater conditions referred to in this report are those taken from data supplied appertaining to the period of investigation. It should be noted, however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions or other causes.

Any advice, opinions, or recommendations within this document should be read and relied upon only in the context of the document as a whole; does not, in any way, purport to include any manner of legal advice or opinion; and are based upon the information made available to Quantum Geotechnical at the date of this document and on current UK standards, codes, technology and construction practices as at the date of this document.

It should be noted and it is expressly stated that no independent verification of any of the documents or information supplied to Quantum Geotechnical has been made. No liability is accepted by Quantum Geotechnical for any use of this document, other than for the purposes for which it was originally prepared and provided.

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APPENDIX E
STATISTICAL ASSESSMENT OF CHEMICAL ANALYSES

<div>Client/client ref: Project ref: EnviroPark, Hirwaun Site ref: EnviroPark, Hirwaun Data description: Contaminant(s): Metals Test scenario: Planning Date: 12 January 2017 User details: Olly Roberts</div>	antimony (mg/kg)	arsenic (mg/kg)	boron (mg/kg)	cadmium (mg/kg)	chromium in chromium(III) compounds (mg/kg)	chromium in chromium(VI) compounds (mg/kg)	copper (mg/kg)	lead (mg/kg)	mercury (mg/kg)	molybdenum (mg/kg)	nickel (mg/kg)	selenium (mg/kg)
Critical concentration, C _c		640	240000	410	8600	49	68000	2330	58		980	12,000
Notes												
Sample size, n	35	35	35	35	35	28	35	35	35	35	35	35
Sample mean, \bar{x}	0.57714286	6.31142857	2.65428571	0.21857143	12.3545714	0.1	19.9371429	17.0828571	0.12857143	0.72285714	15.9142857	0.53714286
Standard deviation, s	0.26018739	2.59725777	3.00062178	0.31920068	7.0091618	4.2397E-17	31.2953397	8.55238136	0.14268729	0.65037804	4.14517032	0.12387307
Number of non-detects	30	0	20	12	1	28	0	0	31	28	0	32
Set non-detect values to:	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit
Outliers?	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
Distribution	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Normal	Non-normal
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: One-sample t	Auto: Chebychev

Test scenario:	Planning: Is true mean lower than critical concentration ($\mu < C_c$)?			Evidence level required: 95%		Use Normal distribution to test for outliers						
t statistic, t ₀ (or k ₀)	-1443.427062	-473183.0757	-7594.907401	-7248.398166	-6.10308E+18	-12850.97013	-1599.952315	-2399.456735		-1375.964692	-573084.8426	
Upper confidence limit (on true mean concentration, μ)	0.76884591	8.22505796	4.86510903	0.45375479	17.5188405	0.1	42.995186	23.3841525	0.23370177	1.20204814	17.0990515	0.6284111
Evidence level		100%	100%	100%	100%	100%	100%	100%			100%	100%
Base decision on:	lower bound	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	lower bound	evidence level	evidence level
Result		$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$		$\mu < C_c$	$\mu < C_c$
Select dataset	<input checked="" type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y

Back to data

Go to outlier test

Go to normality test

Show individual summary

Client/client ref: Project ref: EnviroPark, Hirwaun Site ref: EnviroPark, Hirwaun Data description: Contaminant(s): TPH & BTEX Test scenario: Planning Date: 12 January 2017 User details: Olly Roberts	benzene (mg/kg)	toluene (mg/kg)	ethylbenzene (mg/kg)	xylene (mg/kg)	>C8-C10 (mg/kg)	>C10-C12 (mg/kg)	>C12-C16 (mg/kg)	>C16-C21 (mg/kg)	>C21-C35 (mg/kg)			
Critical concentration, C _c	98	56000	5700	5900	2000	9700	36000	28000	28000			
Notes					Ali	Ali	Aro	Aro	Aro			
Sample size, n	40	40	40	40	40	40	40	40	40	0	0	0
Sample mean, \bar{x}	18.25	18.25	18.25	36.675	1.93075	2.7775	52.99975	16.13125	44.67925	No Data	No Data	No Data
Standard deviation, s	44.4451549	44.4451549	44.4451549	89.036549	0.92419164	4.46200412	315.431231	42.1502852	123.989945			
Number of non-detects	40	40	40	40	39	38	30	26	19			
Set non-detect values to:	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit	Detection limit
Outliers?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Distribution	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal	Non-normal			
Statistical approach	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto: Chebychev	Auto	Auto	Auto
Test scenario:	Planning: Is true mean lower than critical concentration ($\mu < C_c$)					Evidence level required:	95%	Use Normal distribution to test for outliers				
t statistic, t ₀ (or k ₀)	-11.34844254	-7966.21534	-808.5142748	-416.4910226	-13673.46222	-13745.08371	-720.7554918	-4198.91645	-1425.962187			
Upper confidence limit (on true mean concentration, μ)	48.8817091	48.8817091	48.8817091	98.0392066	2.56770513	5.85272412	270.395723	45.1813293	130.133422			
Evidence level	99%	100%	100%	100%	100%	100%	100%	100%	100%			
Base decision on:	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level	evidence level			
Result	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$	$\mu < C_c$			
Select dataset	<input type="radio"/> Y	<input type="radio"/> Y	<input checked="" type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y	<input type="radio"/> Y
Back to data	Go to outlier test			Go to normality test			Show individual summary					