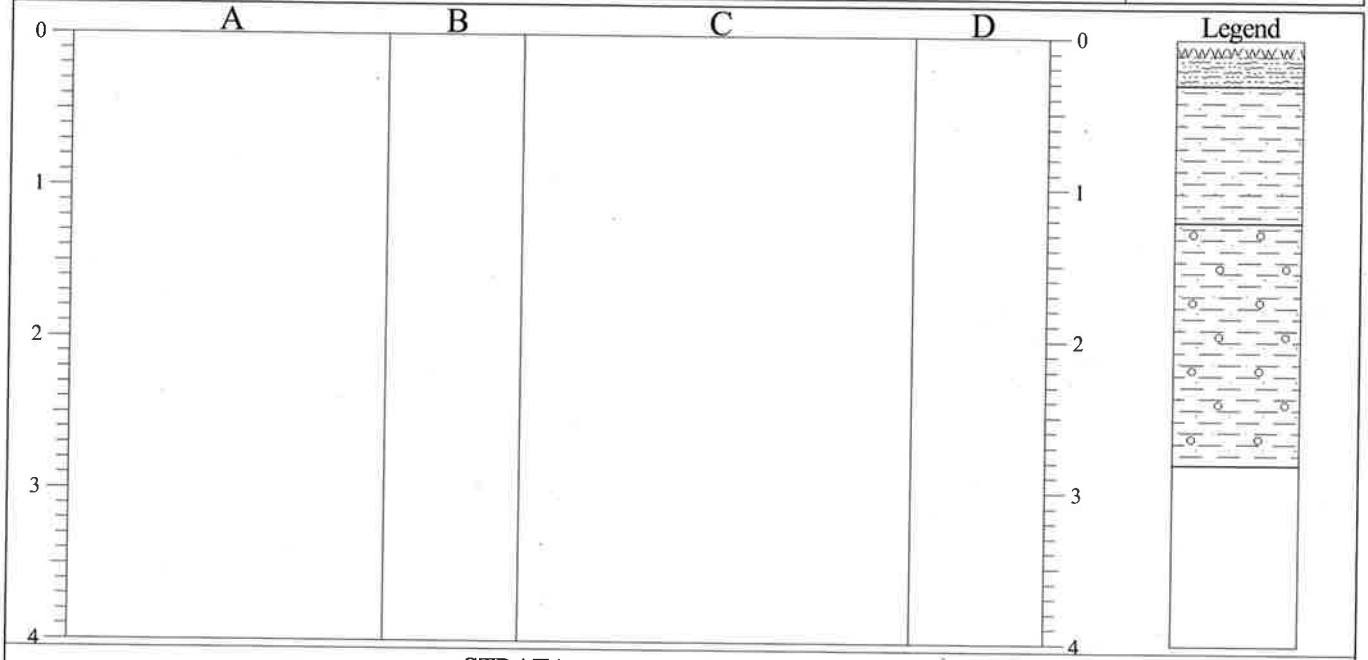
BETTS ASSOCIATES Betts Geo Ltd

TRIAL PIT LOG

Project				TRIAL PIT No
Barrow Road Whalley				TP205
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1

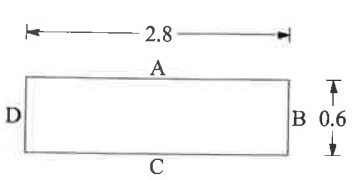


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.30		Grass over TOPSOIL: Brown sandy CLAY. Frequent rootlets. Occasional coal fragment.	0.10	ES	
0.30-1.20		Firm to stiff / stiff slightly sandy CLAY. Occasional gravel and cobble of various sizes and lithologies.	0.80	ES	
1.20-2.80		Stiff dark greyish brown sandy gravelly CLAY. Occasional to frequent subrounded to subangular cobbles of various lithologies. Rare boulder. Friable.			

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Dry.

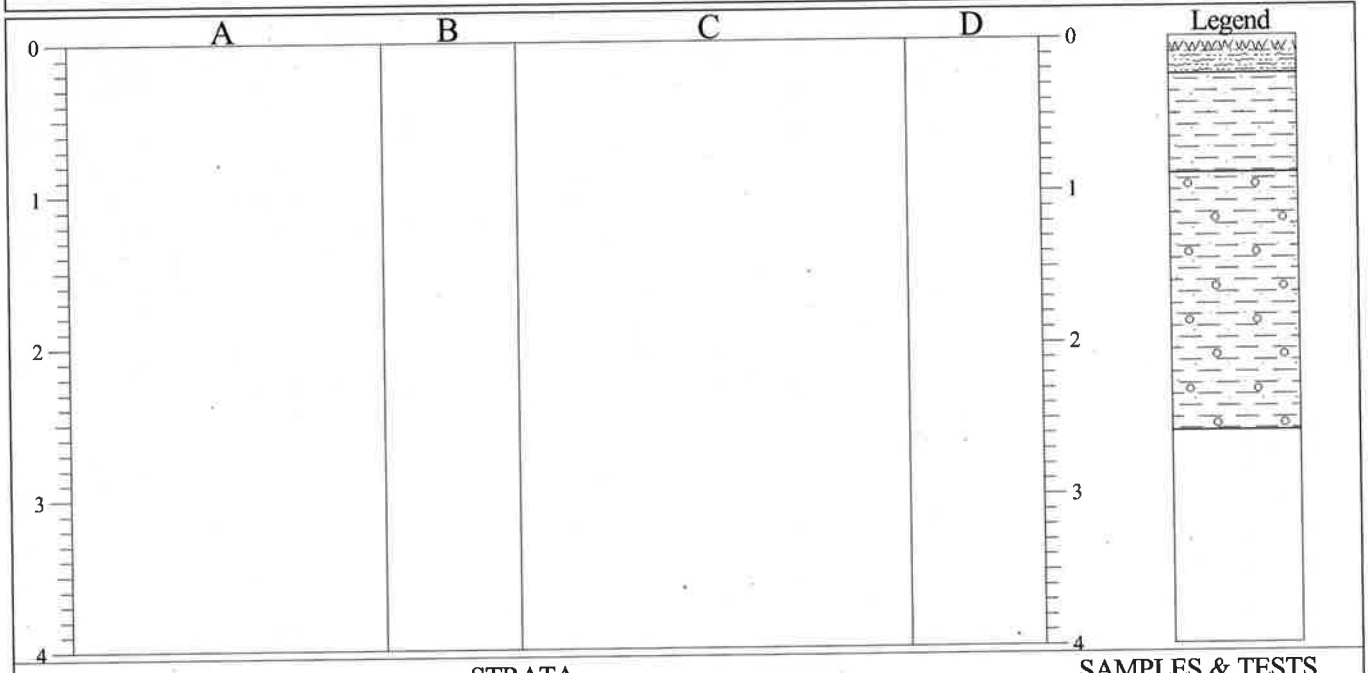
All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used 13t tracked excavator	Logged By PH

AGS3 UK TP 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

BETTS ASSOCIATES Betts Geo Ltd

TRIAL PIT LOG

Project				TRIAL PIT No
Barrow Road Whalley				TP206
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1

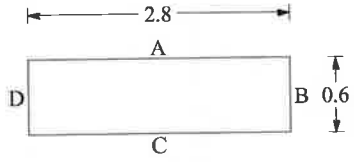


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.25		Grass over TOPSOIL: Brown sandy CLAY. Occasional rootlets. (One or two fragments of glass and ceramic noted within topsoil).	0.10	ES	
0.25-0.90		Firm orangish brown slightly sandy CLAY.			
0.90-2.60		Firm to stiff / stiff dark greyish brown sandy gravelly CLAY. Occasional to frequent subrounded to subangular cobbles of various lithologies. Rare boulder. Friable.	1.30	D	

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Dry.

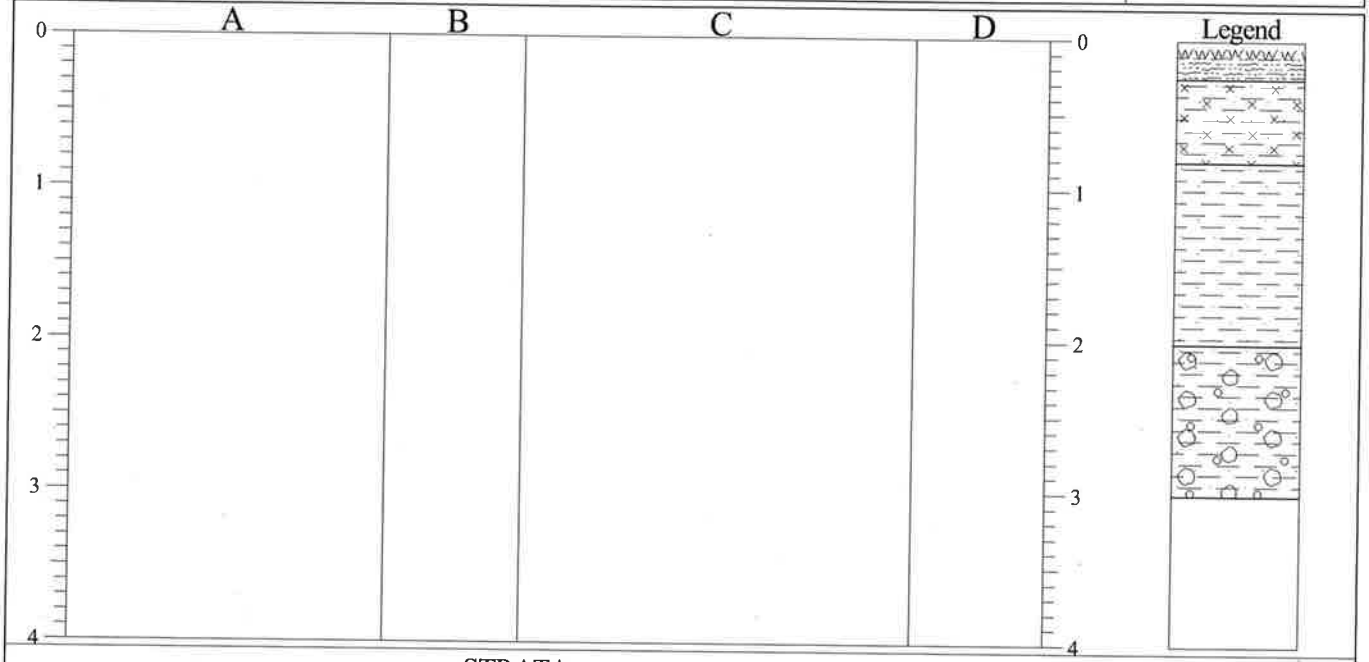
All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used 13t tracked excavator	Logged By PH

AGS3 UK TP 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

BETTS ASSOCIATES Betts Geo Ltd

TRIAL PIT LOG

Project				TRIAL PIT No
Barrow Road Whalley				TP207
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1



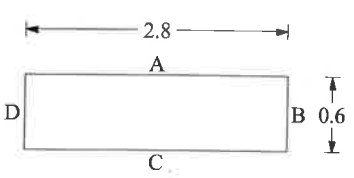
STRATA

Depth	No	DESCRIPTION
0.00-0.25		Grass over TOPSOIL: Brown sandy CLAY. Frequent rootlets. Occasional coal fragment.
0.25-0.80		Firm orangish brown silty sandy CLAY. Occasional rounded gravel.
0.80-2.00		Stiff grey slightly sandy laminated CLAY. Occasional gravel and cobble of various lithologies.
2.00-3.00		Firm to stiff damp greyish brown sandy gravelly cobbly CLAY. Gravel and cobble are subrounded to subangular of various sizes and lithologies.

SAMPLES & TESTS

Depth	No	Remarks/Tests
0.10	ES	
1.50	ES	

Shoring/Support:
Stability: Stable



N

GENERAL REMARKS

Dry.

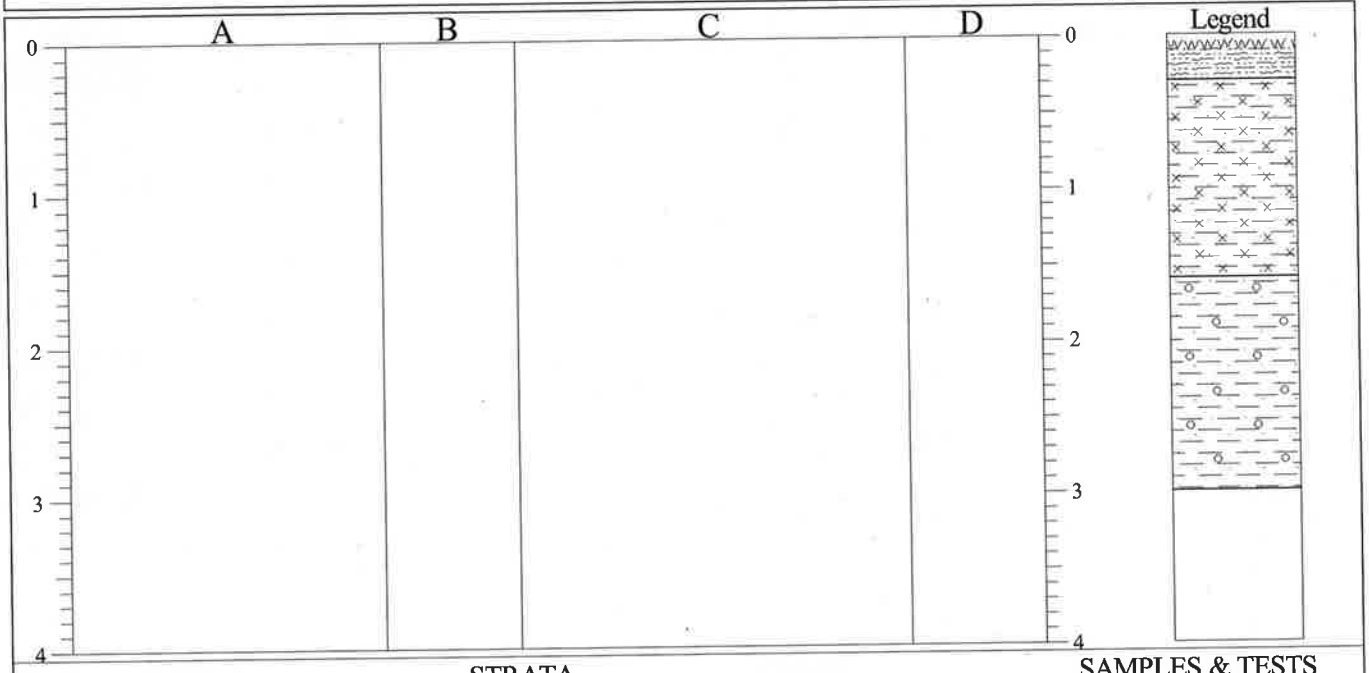
All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used 13t tracked excavator	Logged By PH

AGS3 UK TP 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

BETTS ASSOCIATES Betts Geo Ltd

TRIAL PIT LOG

Project				TRIAL PIT No
Barrow Road Whalley				**TP208**
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1



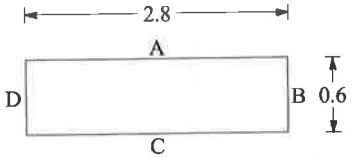
STRATA

Depth	No	DESCRIPTION
0.00-0.30		Grass over TOPSOIL: Brown sandy CLAY. Frequent rootlets. Occasional coal fragment.
0.30-1.60		Firm orangish brown silty sandy CLAY. Occasional rounded gravel.
1.60-3.00		Stiff dark greyish brown sandy gravelly CLAY. Occasional to frequent subrounded to subangular cobbles of various lithologies. Rare boulder. Friable.

SAMPLES & TESTS

Depth	No	Remarks/Tests
0.10	ES	
0.70	ES	

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Dry.

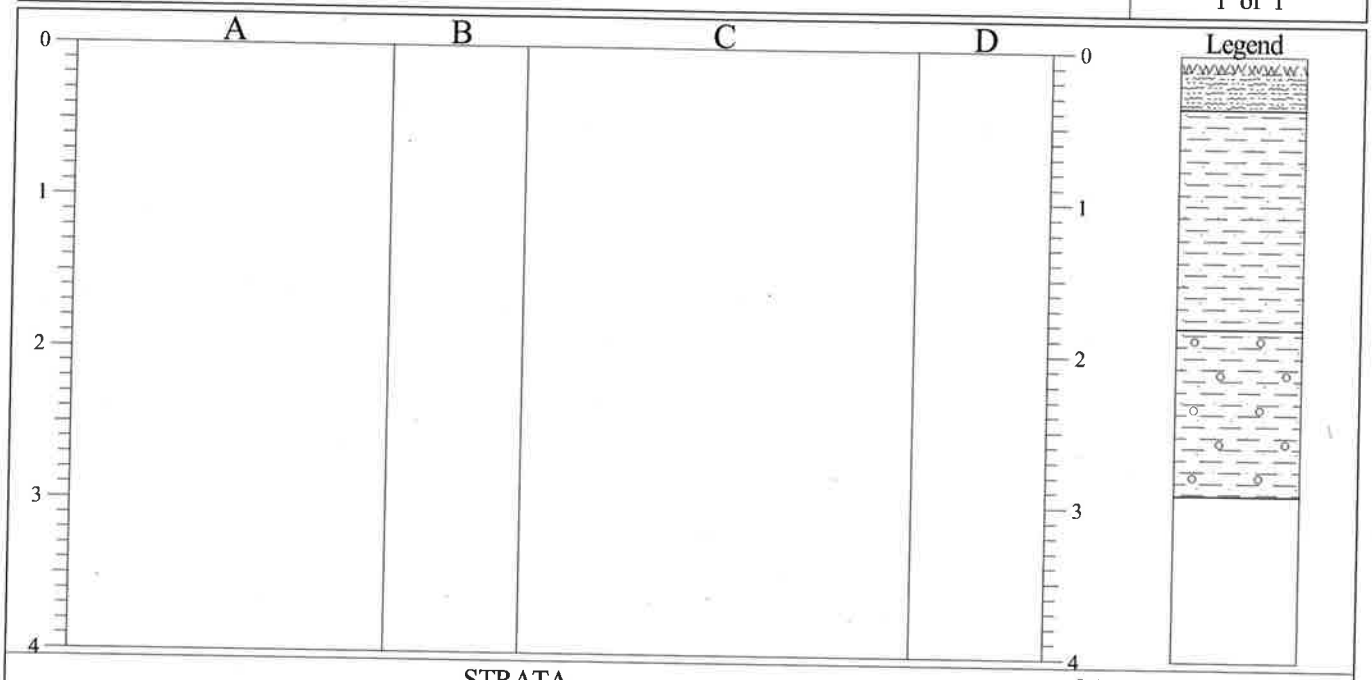
All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used 13t tracked excavator	Logged By PH

AGS3 UK TP 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

BETTS ASSOCIATES Betts Geo Ltd

TRIAL PIT LOG

Project				TRIAL PIT No
Barrow Road Whalley				TP209
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1



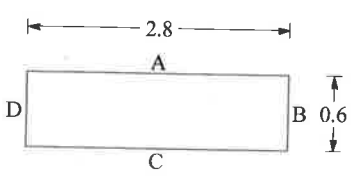
STRATA

Depth	No	DESCRIPTION
0.00-0.35		Grass over TOPSOIL: Brown sandy CLAY. Frequent rootlets. Occasional coal fragment.
0.35-1.80		Soft to firm damp orangish brown sandy CLAY. Rare coal fragment. Slight instability. Right side of pit collapsed between 0.35m and1.80m.
1.80-2.90		Firm to stiff / stiff dark greyish brown sandy gravelly CLAY. Occasional to frequent subrounded to subangular cobbles of various lithologies. Rare boulder. Friable.

SAMPLES & TESTS

Depth	No	Remarks/Tests
0.10	ES	
1.00	ES	

Shoring/Support:
Stability: 0.35m - 1.8m - Slight instability. - Collapse on right side of pit.



GENERAL REMARKS

0.35m - 1.8m - Damp.

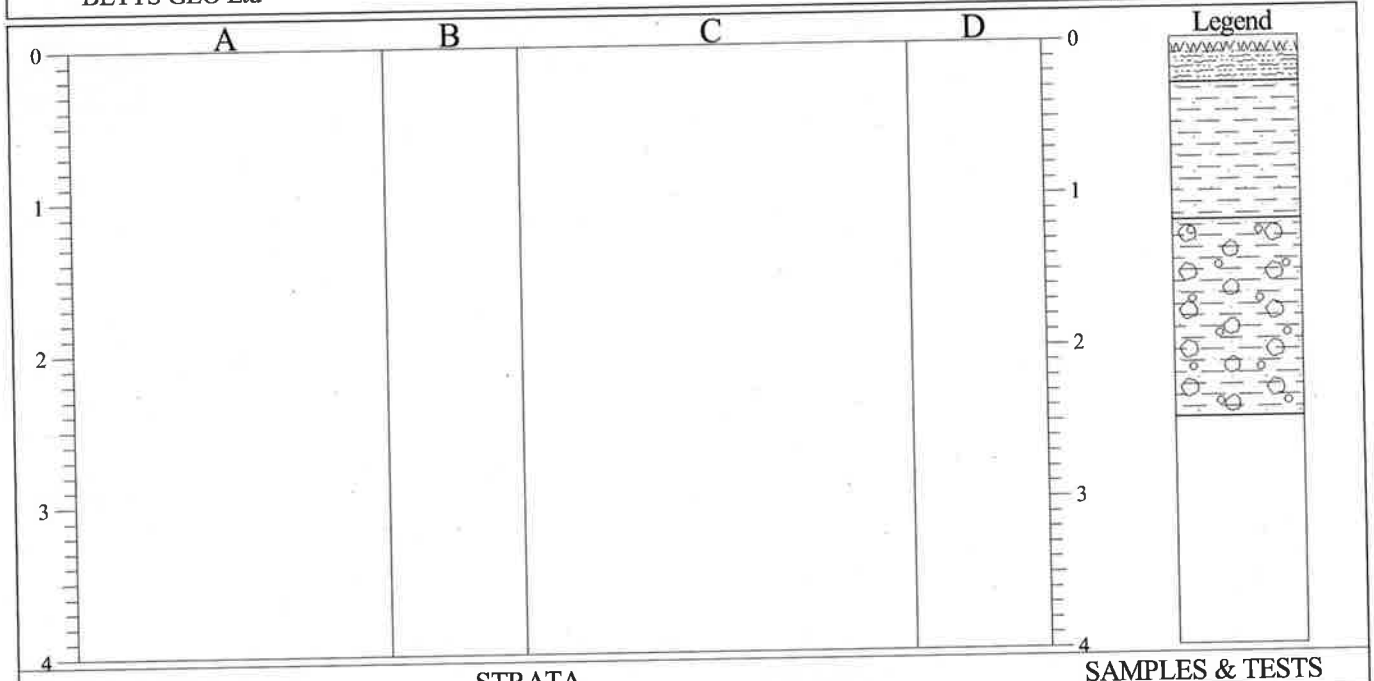
All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used 13t tracked excavator	Logged By PH

AGS3 UK TP 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

BETTS ASSOCIATES Betts Geo Ltd

TRIAL PIT LOG

Project				TRIAL PIT No
Barrow Road Whalley				TP210
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1



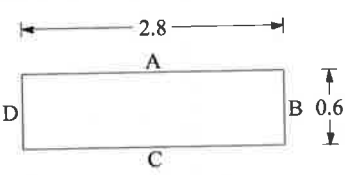
STRATA

Depth	No	DESCRIPTION
0.00-0.30		Grass over TOPSOIL: Brown sandy CLAY. Frequent rootlets.
0.30-1.20		Firm to stiff orangish brown / brown slightly sandy laminated CLAY.
1.20-2.50		Stiff greyish brown gravelly cobbly very sandy CLAY. Occasional boulder. Gravel, cobbles and boulders are subrounded to subangular of various sizes and lithologies.

SAMPLES & TESTS

Depth	No	Remarks/Tests
0.10	ES	
1.50	ES	

Shoring/Support:
Stability: Stable



GENERAL REMARKS

Dry.

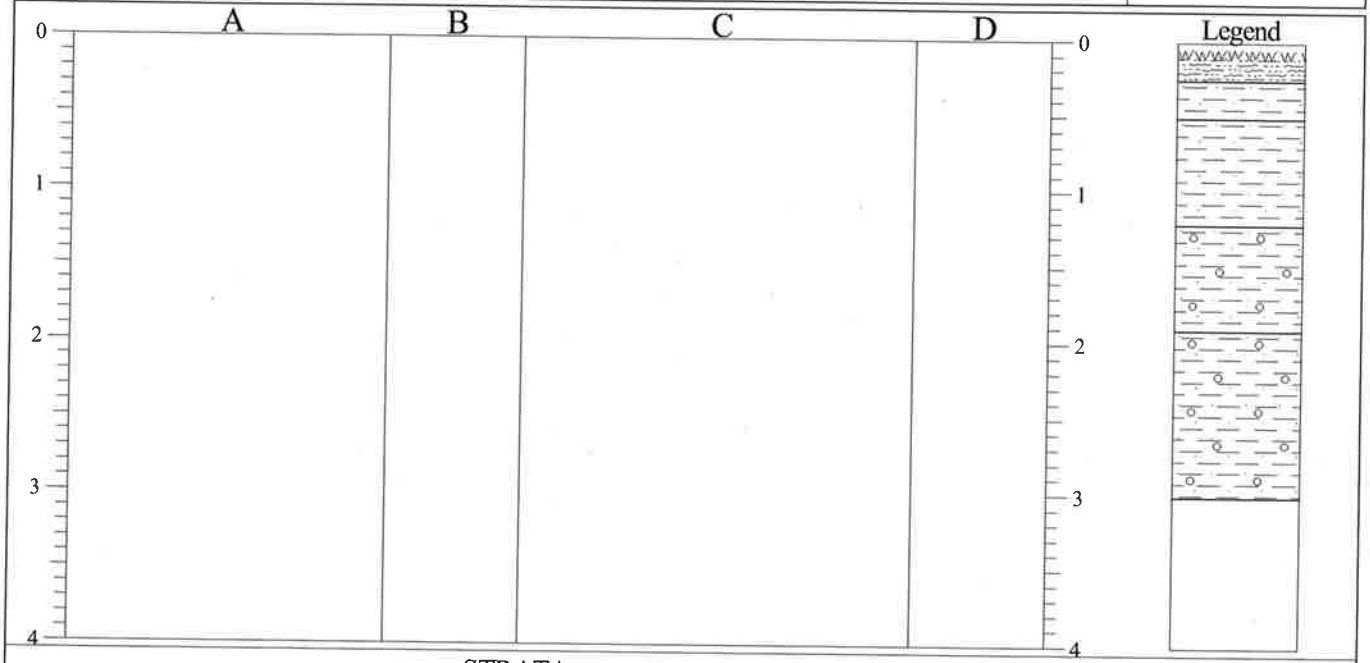
All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used 13t tracked excavator	Logged By PH

AGS3 UK TP 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

BETTS ASSOCIATES Betts Geo Ltd

TRIAL PIT LOG

Project				TRIAL PIT No
Barrow Road Whalley				TP211
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1

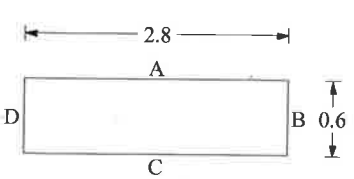


STRATA

SAMPLES & TESTS

Depth	No	DESCRIPTION	Depth	No	Remarks/Tests
0.00-0.25		Grass over TOPSOIL: Brown sandy CLAY. Frequent rootlets. Occasional coal fragment.			
0.25-0.50		Soft to firm orangish brown sandy CLAY.			
0.50-1.20		Firm brown damp sandy CLAY. Frequent gravel, occasional cobble of various lithologies. Occasional coal fragment.			
1.20-1.90		Firm to stiff damp in places gravelly very sandy CLAY. Gravel and cobbles are subrounded to subangular of various sizes and lithologies.	1.70	D	
1.90-3.00		Stiff greyish brown sandy gravelly CLAY. Occasional to frequent subrounded to subangular cobbles of various lithologies. Rare boulder. Friable.			

Shoring/Support:
Stability: Stable



N

GENERAL REMARKS

0.5m - 1.9m - Damp.

All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used 13t tracked excavator	Logged By PH

AGS3 UK TP 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

BETTS ASSOCIATES Betts Geo Ltd

BOREHOLE LOG

Project				BOREHOLE No
Barrow Road Whalley				WS201
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
						0.30	Grass over TOPSOIL: Brown damp sandy CLAY. Frequent rootlets. Occasional coal fragment.		
						(1.40) 1.70	Firm orangish brown / brown slightly sandy CLAY.		
						(0.60) 2.30	Firm brown slightly sandy CLAY.		
						(0.70) 3.00	Stiff slightly sandy gravelly CLAY. Occasional cobble. Gravel and cobble are subrounded to subangular of various sizes and lithologies.		

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

Dry.

All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used Competitor Rig	Logged By PH

AGS3 UK BH 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

BETTS ASSOCIATES Betts Geo Ltd

BOREHOLE LOG

Project				BOREHOLE No
Barrow Road Whalley				WS202
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
						0.20	Grass over TOPSOIL: Brown damp sandy CLAY. Frequent rootlets. Occasional coal fragment.		
						(0.70)	Firm orangish brown sandy CLAY.		
						0.90			
						(0.90)	Firm to stiff brown slightly sandy CLAY. Occasional gravel and cobble. Refusal on cobble / boulder at 1.80m.		
						1.80			

Boring Progress and Water Observations					
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt

Chiselling			Water Added	
From	To	Hours	From	To

GENERAL REMARKS

1.2m - Land drain - Moderate inflow of water.
1.8m - Refusal on boulder.

All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used Competitor Rig	Logged By PH

AGS3 UK BH 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

BETTS ASSOCIATES Betts Geo Ltd

BOREHOLE LOG

Project				BOREHOLE No
Barrow Road Whalley				WS203
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1

SAMPLES & TESTS			Water	STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION			
						0.30	Grass over TOPSOIL: Brown damp sandy CLAY. Frequent rootlets. Occasional coal fragment.			
						(0.90) 1.20	Firm damp orangish brown sandy CLAY.			
						(0.80) 2.00	Firm to stiff brown sandy gravelly CLAY.			
						(0.60) 2.60	No Recovery - Assumed pushing a cobble down.			
						(0.40) 3.00	Firm to stiff sandy gravelly CLAY. Occasional cobbles. Gravel and cobbles are subrounded to subangular of various sizes and lithologies.			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	2.0m - 2.6m - No recovery.

All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used Competitor Rig	Logged By PH

AGS3 UK BH 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

BETTS ASSOCIATES Betts Geo Ltd

BOREHOLE LOG

Project				BOREHOLE No
Barrow Road Whalley				WS204
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1

SAMPLES & TESTS			Water	STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION			
						0.25	Grass over TOPSOIL: Brown damp sandy CLAY. Frequent rootlets. Occasional coal fragment.			
						(1.75)	Firm to stiff orangish brown / brown slightly sandy laminated CLAY.			
						2.00				
						(1.00)	Stiff dark greyish brown sandy gravelly CLAY. Occasional to frequent subrounded to subangular cobbles of various lithologies. Rare boulder. Friable.			
						3.00				

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	Dry.

All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used Competitor Rig	Logged By PH

AGS3 UK BH 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

BETTS ASSOCIATES Betts Geo Ltd

BOREHOLE LOG

Project				BOREHOLE No
Barrow Road Whalley				WS205
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
						0.30	Grass over TOPSOIL: Brown damp sandy CLAY. Frequent rootlets. Occasional coal fragment.		
						(1.20) 1.50	Firm damp orangish brown sandy CLAY. Occasional cobbles. Gravel and cobbles are subrounded to subangular of various sizes and lithologies.		
						(1.50) 3.00	No Recovery - Assumed pushing a cobble down.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	1.5m - 3.0m - No recovery.

All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used Competitor Rig	Logged By PH

AGS3 UK BH 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

BETTS ASSOCIATES Betts Geo Ltd

BOREHOLE LOG

Project				BOREHOLE No
Barrow Road Whalley				WS206
Job No	Date	Ground Level (m)	Co-Ordinates ()	
18DWH018	06-04-18			
Contractor				Sheet
BETTS GEO Ltd				1 of 1

SAMPLES & TESTS			Water	STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)		DESCRIPTION		
0.10	ES					0.30		Grass over TOPSOIL: Brown damp sandy CLAY. Frequent rootlets. Occasional coal fragment.		
						(0.50)	0.80	Firm damp orangish brown slightly sandy CLAY.		
						(1.00)	1.80	Firm to stiff sandy gravelly CLAY. Occasional cobbles. Gravel and cobbles are subrounded to subangular of various sizes and lithologies. Refused on cobble / boulder.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	0.8m - 1.8m - Damp. 1.8m - Refusal on cobble / boulder.

All dimensions in metres Scale 1:50	Client David Wilson Homes	Method/ Plant Used Competitor Rig	Logged By PH

AGS3 UK BH 18DWH018 - BARROW ROAD WHALLEY.GPJ GINT STD AGS 3_1.GDT 19/4/18

APPENDIX D

(i) Contamination Test Results

(ii) Geotechnical Test Results

SUMMARY OF CONTAMINATION ANALYSIS: METALS

Project Name Whalley Rd, Barrow
Project No 18DWH018
Date 05/06/2018

SOIL TYPE	TS	TS	NS	TS	TS	NS	TS	NS	TS	TS	NS	TS	NS	TS	NS	TS	NS	TS
SAMPLE LOCATION	TP201	TP202	TP202	TP203	TP204	TP204	TP205	TP205	TP206	TP207	TP207	TP208	TP208	TP209	TP209	TP210	TP210	WS206
DEPTH (m)	0.10	0.10	0.80	0.10	0.10	0.50	0.10	0.80	0.10	0.10	1.50	0.10	0.70	0.10	1.00	0.10	1.50	0.10
pH	7.32	6.69	7.49	6.88	6.58	6.87	6.7	7.34	6.69	7.35	8.02	7.61	7.82	7.52	7.85	6.76	8.07	6.24
Sulphate (water sol 2:1)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Organic matter	8	9.1	1.9	11.6	6.4	1.8	6.5	2.1	7	6.4	2.9	6.4	2.2	5.2	1.5	9.1	3	11.1
Arsenic	6	7	6	7	5	2	5	4	6	5	4	7	5	6	4	12	3	11
Cadmium	0.9	1.1	1.2	0.9	1.1	1.1	1	1.4	1.1	1.1	1.2	0.9	1.1	0.7	0.9	0.9	0.7	1
Copper	23	33	24	25	19	14	22	23	25	23	24	22	18	21	11	43	12	43
Chromium (hexavalent)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Lead	75	78	28	97	48	20	46	29	63	54	25	40	24	42	22	102	15	91
Mercury	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	0.36	0.31	<0.17	0.44	0.21	0.73	0.48	<0.17
Nickel	30	31	55	25	28	32	29	56	30	30	43	24	38	18	26	30	23	28
Selenium	<1	2	1	<1	1	1	2	2	<1	1	2	<1	<1	<1	<1	1	2	1
Zinc	127	123	98	109	119	86	101	75	137	125	95	99	132	89	82	136	67	133
Asbestos in Soil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asbestos Matrix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quantification	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Organic matter	8	9.1	1.9	11.6	6.4	1.8	6.5	2.1	7	6.4	2.9	6.4	2.2	5.2	1.5	9.1	3	11.1

Metals	Mean Value Test *	Range		AtRisk 2017 (mg/kg)	AtRisk 2017 (mg/kg)	DEFRA C4SL 2017
	US_{95}	Largest Value (mg/kg)	Smallest Value (mg/kg)	With Homegrown Produce (1% SOM)	With Homegrown Produce (6% SOM)	
pH	7.44	8.07	6.24			-
Sulphate (water sol 2:1)	0.02	0.04	0.01			-
Organic matter	7.03	11.60	1.50			
Arsenic	6.85	12.00	2.00	32	32	37
Cadmium	1.09	1.40	0.70	10	10	22.1
Copper	27.19	43.00	11.00	4730	4790	-
Chromium (hexavalent)	1.00	<1	<1	3.62	3.63	20.5
Lead	61.50	102.00	15.00			200
Mercury	0.32	0.73	<0.17	8.81	15.8	-
Nickel	36.16	56.00	18.00	EA/ATRisk withdrawn Aug 2015		
Selenium	1.47	2.00	<1	375	375	-
Zinc	116.56	137.00	67.00	20000	20300	-

NOTE:
Any individual results and mean value tests above SGVs are shown RED highlighted
Any outlier values which exceed relevant SGVs are shown in red

* - The calculations for the mean value test include outliers
** - Results for this determiand are assessed with no background levels taken into account
Results are expressed as mg/kg unless otherwise stated

ALL RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'

SGVs are derived from the EA 2009 SGV's which are taken from AtRisk 2015 Category 4 screening levels have been adopted by the EA and have been included as new guidance
Note: The SGV for elemental mercury has been used to assess total mercury concentrations at the site. The Environment Agency's Science Report SC050021 /Mercury SGV states that 'for general surface contamination and to simplify the assessment the SGV's for inorganic mercury can normally be compared with chemical analysis for total mercury content'. Based on the latter, SGV for elemental mercury (170mg/kg) in the soil assessment is used
NAD - NO ASBESTOS DETECTED

TS - Topsoil, MG - Made Ground and N - Natural Ground

SUMMARY OF CONTAMINATION ANALYSIS: TPH

Project Name Whalley Rd, Barrow
Project No 18DWH018
Date 05/06/2018

SOIL TYPE	TS	TS	NS	TS	TS	NS	TS	NS	TS	TS	NS	TS	NS	TS	NS	TS	NS	TS
SAMPLE LOCATION	TP201	TP202	TP202	TP203	TP204	TP204	TP205	TP205	TP206	TP207	TP207	TP208	TP208	TP209	TP209	TP210	TP210	WS208
DEPTH (m)	0.10	0.10	0.80	0.10	0.10	0.50	0.10	0.80	0.10	0.10	1.50	0.10	0.70	0.10	1.00	0.10	1.50	0.10
Ali >C5-C6	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Ali >C6-C8	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Ali >C8-C10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Ali >C10-C12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C12-C16	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C16-C21	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ali >C21-C35	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total Aliphatics	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C5-C7	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Aro >C7-C8	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Aro >C8-C9	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Aro >C9-C10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Aro >C10-C12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C12-C16	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aro >C16-C21	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.7	<0.1	0.9	<0.1	<0.1
Aro >C21-C35	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.1	1.4	<0.1	<0.1
Total Aromatics	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.1	<0.1	2.3	<0.1	<0.1
TPH (Ali & Aro)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.1	<0.1	2.3	<0.1	<0.1
BTEX - Benzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
BTEX - Toluene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
BTEX - Ethyl Benzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
BTEX - m & p Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
BTEX - o Xylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
MTBE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Organic Matter	6	9.1	1.9	11.6	8.4	1.8	6.5	2.1	7	8.4	2.9	6.4	2.2	5.2	1.5	9.1	3	11.1

TPH	Mean Value Test *	Range		AtRisk 2017 (mg/kg) Residential with Home Grown Produce	AtRisk 2017 (mg/kg) Residential with Home Grown Produce	DEFRA C4SL 2017
	US_m	Largest Value (mg/kg)	Smallest Value (mg/kg)	1% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***
Ali >C5-C6	0.02	<0.01	<0.01	42.7	369	-
Ali >C6-C8	0.02	<0.01	<0.01	99.3	1240	-
Ali >C8-C10	0.02	<0.01	<0.01	13.9	204	-
Ali >C10-C12	0.10	<0.1	<0.1	81.7	1180	-
Ali >C12-C16	0.10	<0.1	<0.1	385	4130	-
Ali >C16-C21	0.10	<0.1	<0.1	210000	210100	-
Ali >C21-C35	0.10	<0.1	<0.1			
Total Aliphatics	0.10	<0.1	<0.1			
Aro >C5-C7	0.02	<0.01	<0.01	0.137	0.871	-
Aro >C7-C8	0.02	<0.01	<0.01	113	780	-
Aro >C8-C9	0.02	<0.01	<0.01	20.5	232	-
Aro >C9-C10	0.02	<0.01	<0.01	20.5	232	-
Aro >C10-C12	0.10	<0.1	<0.1	70	468	-
Aro >C12-C16	0.10	<0.1	<0.1	165	830	-
Aro >C16-C21	0.27	0.90	<0.1	319	1040	-
Aro >C21-C35	0.32	1.40	<0.1	1120	1710	-
Total Aromatics	0.51	2.30	<0.1			
TPH (Ali & Aro)	0.51	2.30	<0.1			
BTEX - Benzene	0.02	<0.01	<0.01	0.0493	0.33	0.871
BTEX - Toluene	0.02	<0.01	<0.01	113	780	-
BTEX - Ethyl Benzene	0.02	<0.01	<0.01	50.7	453	-
BTEX - m & p Xylene	0.02	<0.01	<0.01	24	312	-
BTEX - o Xylene	0.02	<0.01	<0.01	26.4	336	-
MTBE	0.02	<0.01	<0.01	27.6	220	

	UU Drinking Water Guidelines
	PE Threshold
Total BTEX &MTBE	0.1
EC5-EC10 Ali-Aro	2
EC10-EC16 Ali-Aro	10
EC16-EC40 Ali-Aro	500

Results expressed as mg/kg air dried unless otherwise stated

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'

NOTES:

For the Purpose of this investigation- results will be assessed against **RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT**.

BETTS ASSOCIATES

SUMMARY OF CONTAMINATION ANALYSIS: PAH

Project Name Whalley Rd, Barrow
Project No 18DWH018
Date 05/06/18

SOIL TYPE	TS	TS	NS	TS	TS	NS	TS	NS	TS	TS	NS	TS	NS	TS	NS
SAMPLE LOCATION	TP201	TP202	TP202	TP203	TP204	TP204	TP205	TP205	TP206	TP207	TP207	TP208	TP208	TP209	TP209
DEPTH (m)	0.10	0.10	0.80	0.10	0.10	0.50	0.10	0.80	0.10	0.10	1.50	0.10	0.70	0.10	1.00
Acenaphthene	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.04	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	<0.02
Benzo(a)anthracene	<0.04	<0.04	<0.04	0.07	0.12	<0.04	<0.04	<0.04	0.12	0.05	<0.04	0.11	<0.04	0.25	<0.04
Benzo(a)pyrene	<0.04	<0.04	<0.04	0.06	0.12	<0.04	<0.04	<0.04	0.12	<0.04	<0.04	0.11	<0.04	0.25	<0.04
Benzo(b)fluoranthene	<0.05	<0.05	<0.05	0.09	0.18	<0.05	<0.05	<0.05	0.17	0.07	<0.05	0.16	<0.05	0.33	<0.05
Benzo(ghi)perylene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	<0.05
Benzo(k)fluoranthene	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	0.12	<0.07
Chrysene	<0.06	<0.06	<0.06	0.1	0.16	<0.06	<0.06	<0.06	0.16	<0.06	<0.06	0.16	<0.06	0.33	<0.06
Dibenzo(ah)anthracene	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Fluoranthene	<0.08	<0.08	<0.08	0.17	0.27	<0.08	<0.08	<0.08	0.26	0.13	<0.08	0.26	<0.08	0.59	<0.08
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Indeno(123-cd)pyrene	<0.03	<0.03	<0.03	0.04	0.09	<0.03	<0.03	<0.03	0.09	<0.03	<0.03	0.09	<0.03	0.16	<0.03
Naphthalene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Phenanthrene	<0.03	0.06	<0.03	0.13	0.13	<0.03	0.04	<0.03	0.1	0.07	<0.03	0.13	<0.03	0.27	<0.03
Pyrene	<0.07	<0.07	<0.07	0.16	0.24	<0.07	<0.07	<0.07	0.23	0.12	<0.07	0.25	<0.07	0.54	<0.07
Organic Matter	8	9.1	1.9	11.6	6.4	1.8	6.5	2.1	7	6.4	2.9	6.4	2.2	5.2	1.5

PAH	Mean Value Test *	Range		AtRisk 2017 (mg/kg) Residential with Home Grown Produce	AtRisk 2017 (mg/kg) Residential with Home Grown Produce	DEFRA's C4SL 2017
	US_{95}	Largest Value (mg/kg)	Smallest Value (mg/kg)	1% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***	6% SOM WITHOUT Free Product***
Acenaphthene	0.02	0.04	<0.01	608	2760	-
Acenaphthylene	0.01	<0.01	<0.01			-
Anthracene	0.03	0.05	<0.02	10200	26200	-
Benzo(a)anthracene	0.10	0.25	<0.04	4.52	8.54	-
Benzo(a)pyrene	0.10	0.25	<0.04	1.51	2.05	4.95
Benzo(b)fluoranthene	0.14	0.33	<0.05	7.72	9.86	-
Benzo(ghi)perylene	0.06	0.12	<0.05	96.2	103	-
Benzo(k)fluoranthene	0.08	0.12	<0.07	84.4	100	-
Chrysene	0.14	0.33	<0.06	585	927	-
Dibenzo(ah)anthracene	0.04	<0.04	<0.04	0.838	1	-
Fluoranthene	0.24	0.59	<0.08	983	2980	-
Fluorene	0.01	0.02	<0.01	735	2610	-
Indeno(123-cd)pyrene	0.07	0.16	<0.03	7.31	9.75	-
Naphthalene	0.03	<0.03	<0.03	0.829	12.2	-
Phenanthrene	0.13	0.27	<0.03			-
Pyrene	0.22	0.54	<0.07	668	2120	-

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

NOTES:

For the Purpose of this investigation- results will be assessed egains RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 18/02614
Issue Number: 1 **Date:** 24 April, 2018

Client:
Betts Geo Environmental
Old Marsh Farm Barns
Welsh Road
Sealand
Flintshire
UK
CH5 2LY

Project Manager: Betts Geolab/Paul Harrison
Project Name: Whalley Rd, Barrow
Project Ref: 18DWH018
Order No: BG2716
Date Samples Received: 09/04/18
Date Instructions Received: 10/04/18
Date Analysis Completed: 23/04/18

Prepared by:

MMarshall

Melanie Marshall
Laboratory Coordinator

Approved by:

GKing

Georgia King
Admin & Client Services Supervisor

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME

UKAS TESTING 1247

envirolab

Envirolab Job Number: 18/02614

Client Project Name: Whalley Rd, Barrow

Client Project Ref: 18DWH018

Lab Sample ID	18/02614/1	18/02614/2	18/02614/3	18/02614/4	18/02614/5	18/02614/6	18/02614/7	18/02614/8	Units	Method ref
Client Sample No										
Client Sample ID	TP201	TP201	TP202	TP202	TP203	TP203	TP204	TP204		
Depth to Top	0.10	1.50	0.10	0.80	0.10	1.20	0.10	0.50		
Depth To Bottom										
Date Sampled	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18		
Sample Type	Soil - ES	Soil - D	Soil - ES	Soil - ES	Soil - ES	Soil - D	Soil - ES	Soil - ES		
Sample Matrix Code	6E	6A	6E	6E	6E	6A	6E	5E		
% Stones >10mm$_A$	<0.1	11.1	<0.1	<0.1	<0.1	5.6	<0.1	<0.1	% w/w	A-T-044
pH$_D$ M#	7.32	8.08	6.69	7.49	6.88	7.72	6.58	6.87	pH	A-T-031s
Sulphate (water sol 2:1)$_D$ M#	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	<0.01	<0.01	g/l	A-T-026s
Cyanide (free)$_A$ M#	<1	-	<1	<1	<1	-	<1	<1	mg/kg	A-T-042sFCN
Cyanide (total)$_A$ M#	<1	-	<1	<1	<1	-	<1	<1	mg/kg	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	mg/kg	A-T-060s
Organic matter$_D$ M#	8.0	-	9.1	1.9	11.6	-	6.4	1.8	% w/w	A-T-032 OM
Arsenic$_D$ M#	6	-	7	6	7	-	5	2	mg/kg	A-T-024s
Cadmium$_D$ M#	0.9	-	1.1	1.2	0.9	-	1.1	1.1	mg/kg	A-T-024s
Copper$_D$ M#	23	-	33	24	25	-	19	14	mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	-	<1	<1	<1	-	<1	<1	mg/kg	A-T-040s
Lead$_D$ M#	75	-	78	28	97	-	48	20	mg/kg	A-T-024s
Mercury$_D$	<0.17	-	<0.17	<0.17	<0.17	-	<0.17	<0.17	mg/kg	A-T-024s
Nickel$_D$ M#	30	-	31	55	25	-	28	32	mg/kg	A-T-024s
Selenium$_D$ M#	<1	-	2	1	<1	-	1	1	mg/kg	A-T-024s
Zinc$_D$ M#	127	-	123	98	109	-	119	86	mg/kg	A-T-024s
VPH total (>C5-C10)$_A$ #	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
1.01 % Moisture BS1377 1990 pt2 cl3.2$_A$ #	-	Appended	-	-	-	Appended	-	-		Subcon SS
1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4$_A$ #	-	Appended	-	-	-	Appended	-	-		Subcon SS

Envirolab Job Number: 18/02614

Client Project Name: Whalley Rd, Barrow

Client Project Ref: 18DWH018

Lab Sample ID	18/02614/1	18/02614/2	18/02614/3	18/02614/4	18/02614/5	18/02614/6	18/02614/7	18/02614/8	Units	Method ref
Client Sample No										
Client Sample ID	TP201	TP201	TP202	TP202	TP203	TP203	TP204	TP204		
Depth to Top	0.10	1.50	0.10	0.80	0.10	1.20	0.10	0.50		
Depth To Bottom										
Date Sampled	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18		
Sample Type	Soil - ES	Soil - D	Soil - ES	Soil - ES	Soil - ES	Soil - D	Soil - ES	Soil - ES		
Sample Matrix Code	6E	6A	6E	6E	6E	6A	6E	5E		
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A$#	NAD	-	NAD	NAD	NAD	-	NAD	NAD		A-T-046
Asbestos ACM - Suitable for Water Absorption Test?	N/A	-	N/A	N/A	N/A	-	N/A	N/A		

Envirolab Job Number: 18/02614

Client Project Name: Whalley Rd, Barrow

Client Project Ref: 18DWH018

Lab Sample ID	18/02614/1	18/02614/2	18/02614/3	18/02614/4	18/02614/5	18/02614/6	18/02614/7	18/02614/8	Units	Method ref
Client Sample No										
Client Sample ID	TP201	TP201	TP202	TP202	TP203	TP203	TP204	TP204		
Depth to Top	0.10	1.50	0.10	0.80	0.10	1.20	0.10	0.50		
Depth To Bottom										
Date Sampled	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18		
Sample Type	Soil - ES	Soil - D	Soil - ES	Soil - ES	Soil - ES	Soil - D	Soil - ES	Soil - ES		
Sample Matrix Code	6E	6A	6E	6E	6E	6A	6E	5E		
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	-	<0.01	<0.01	0.01	-	0.01	<0.01	mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Anthracene$_A^{M\#}$	<0.02	-	<0.02	<0.02	<0.02	-	0.03	<0.02	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	-	<0.04	<0.04	0.07	-	0.12	<0.04	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	-	<0.04	<0.04	0.06	-	0.12	<0.04	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	-	<0.05	<0.05	0.09	-	0.18	<0.05	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	-	<0.07	<0.07	<0.07	-	<0.07	<0.07	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	<0.06	-	<0.06	<0.06	0.10	-	0.16	<0.06	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	-	<0.04	<0.04	<0.04	-	<0.04	<0.04	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	-	<0.08	<0.08	0.17	-	0.27	<0.08	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	-	<0.03	<0.03	0.04	-	0.09	<0.03	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.03	-	<0.03	<0.03	<0.03	-	<0.03	<0.03	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	-	0.06	<0.03	0.13	-	0.13	<0.03	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	<0.07	-	<0.07	<0.07	0.16	-	0.24	<0.07	mg/kg	A-T-019s
PAH (total 16)$_A^{M\#}$	<0.08	-	<0.08	<0.08	0.86	-	1.35	<0.08	mg/kg	A-T-019s

Envirolab Job Number: 18/02614

Client Project Name: Whalley Rd, Barrow

Client Project Ref: 18DWH018

Lab Sample ID	18/02614/1	18/02614/2	18/02614/3	18/02614/4	18/02614/5	18/02614/6	18/02614/7	18/02614/8	Units	Method ref
Client Sample No										
Client Sample ID	TP201	TP201	TP202	TP202	TP203	TP203	TP204	TP204		
Depth to Top	0.10	1.50	0.10	0.80	0.10	1.20	0.10	0.50		
Depth To Bottom										
Date Sampled	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18		
Sample Type	Soil - ES	Soil - D	Soil - ES	Soil - ES	Soil - ES	Soil - D	Soil - ES	Soil - ES		
Sample Matrix Code	6E	6A	6E	6E	6E	6A	6E	5E		
TPH CWG										
Ali >C5-C6$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Ali >C6-C8$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Ali >C8-C10$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Ali >C10-C12$_A^\#$	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Ali >C12-C16$_A^\#$	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Ali >C16-C21$_A^\#$	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Ali >C21-C35$_A^\#$	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Total Aliphatics$_A$	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Aro >C5-C7$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Aro >C7-C8$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Aro >C8-C9$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Aro >C9-C10$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
Aro >C10-C12$_A^\#$	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Aro >C12-C16$_A^\#$	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Aro >C16-C21$_A^\#$	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Aro >C21-C35$_A^\#$	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
Total Aromatics$_A$	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
TPH (Ali & Aro)$_A$	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	mg/kg	A-T-023s
BTEX - Benzene$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Toluene$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
BTEX - m & p Xylene$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
BTEX - o Xylene$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s
MTBE$_A^\#$	<0.01	-	<0.01	<0.01	<0.01	-	<0.01	<0.01	mg/kg	A-T-022s

Envirolab Job Number: 18/02614

Client Project Name: Whalley Rd, Barrow

Client Project Ref: 18DWH018

Lab Sample ID	18/02614/9	18/02614/10	18/02614/11	18/02614/12	18/02614/13	18/02614/14	18/02614/15	18/02614/16	Units	Method ref
Client Sample No										
Client Sample ID	TP205	TP205	TP206	TP206	TP207	TP207	TP208	TP208		
Depth to Top	0.10	0.80	0.10	1.30	0.10	1.50	0.10	0.70		
Depth To Bottom										
Date Sampled	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - D	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6E	6E	6E	6E	6E	6A	6AE	6A		
% Stones >10mm$_A$	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	2.0	5.3	% w/w	A-T-044
pH$_D$ M#	6.70	7.34	6.69	7.80	7.35	8.02	7.61	7.82	pH	A-T-031s
Sulphate (water sol 2:1)$_D$ M#	0.01	<0.01	<0.01	0.04	0.04	<0.01	<0.01	<0.01	g/l	A-T-026s
Cyanide (free)$_A$ M#	<1	<1	<1	-	<1	<1	<1	<1	mg/kg	A-T-042sFCN
Cyanide (total)$_A$ M#	<1	<1	<1	-	<1	<1	<1	<1	mg/kg	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	-	<0.2	<0.2	<0.2	<0.2	mg/kg	A-T-050s
Organic matter$_D$ M#	6.5	2.1	7.0	-	6.4	2.9	6.4	2.2	% w/w	A-T-032 OM
Arsenic$_D$ M#	5	4	6	-	5	4	7	5	mg/kg	A-T-024s
Cadmium$_D$ M#	1.0	1.4	1.1	-	1.1	1.2	0.9	1.1	mg/kg	A-T-024s
Copper$_D$ M#	22	23	25	-	23	24	22	18	mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	-	<1	<1	<1	<1	mg/kg	A-T-040s
Lead$_D$ M#	46	29	63	-	54	25	40	24	mg/kg	A-T-024s
Mercury$_D$	<0.17	<0.17	<0.17	-	<0.17	0.36	0.31	<0.17	mg/kg	A-T-024s
Nickel$_D$ M#	29	56	30	-	30	43	24	38	mg/kg	A-T-024s
Selenium$_D$ M#	2	2	<1	-	1	2	<1	<1	mg/kg	A-T-024s
Zinc$_D$ M#	101	75	137	-	125	95	99	132	mg/kg	A-T-024s
VPH total (>C5-C10)$_A$ #	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
1.01 % Moisture BS1377 1990 pt2 cl3.2$_A$ #	-	-	-	Appended	-	-	-	-		Subcon SS
1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4$_A$ #	-	-	-	Appended	-	-	-	-		Subcon SS

Envirolab Job Number: 18/02614

Client Project Name: Whalley Rd, Barrow

Client Project Ref: 18DWH018

Lab Sample ID	18/02614/9	18/02614/10	18/02614/11	18/02614/12	18/02614/13	18/02614/14	18/02614/15	18/02614/16	Units	Method ref
Client Sample No										
Client Sample ID	TP205	TP205	TP206	TP206	TP207	TP207	TP208	TP208		
Depth to Top	0.10	0.80	0.10	1.30	0.10	1.50	0.10	0.70		
Depth To Bottom										
Date Sampled	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - D	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6E	6E	6E	6E	6E	6A	6AE	6A		
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_A^{\#}$	NAD	NAD	NAD	-	NAD	-	NAD	NAD		A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A	-	N/A	-	N/A	N/A		

Envirolab Job Number: 18/02614

Client Project Name: Whalley Rd, Barrow

Client Project Ref: 18DWH018

Lab Sample ID	18/02614/9	18/02614/10	18/02614/11	18/02614/12	18/02614/13	18/02614/14	18/02614/15	18/02614/16	Units	Method ref
Client Sample No										
Client Sample ID	TP205	TP205	TP206	TP206	TP207	TP207	TP208	TP208		
Depth to Top	0.10	0.80	0.10	1.30	0.10	1.50	0.10	0.70		
Depth To Bottom										
Date Sampled	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - D	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6E	6E	6E	6E	6E	6A	6AE	6A		
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	0.01	<0.01	mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-019s
Anthracene$_A^{M\#}$	<0.02	<0.02	<0.02	-	<0.02	<0.02	<0.02	<0.02	mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	<0.04	0.12	-	0.05	<0.04	0.11	<0.04	mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	<0.04	0.12	-	<0.04	<0.04	0.11	<0.04	mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	<0.05	0.17	-	0.07	<0.05	0.16	<0.05	mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	<0.05	<0.05	-	<0.05	<0.05	<0.05	<0.05	mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	<0.07	<0.07	-	<0.07	<0.07	<0.07	<0.07	mg/kg	A-T-019s
Chrysene$_A^{M\#}$	<0.06	<0.06	0.16	-	<0.06	<0.06	0.16	<0.06	mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	<0.04	<0.04	-	<0.04	<0.04	<0.04	<0.04	mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	<0.08	0.26	-	0.13	<0.08	0.26	<0.08	mg/kg	A-T-019s
Fluorene$_A^{M\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	<0.03	0.09	-	<0.03	<0.03	0.09	<0.03	mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.03	<0.03	<0.03	-	<0.03	<0.03	<0.03	<0.03	mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	0.04	<0.03	0.10	-	0.07	<0.03	0.13	<0.03	mg/kg	A-T-019s
Pyrene$_A^{M\#}$	<0.07	<0.07	0.23	-	0.12	<0.07	0.25	<0.07	mg/kg	A-T-019s
PAH (total 16)$_A^{M\#}$	<0.08	<0.08	1.25	-	0.46	<0.08	1.30	<0.08	mg/kg	A-T-019s

Envirolab Job Number: 18/02614

Client Project Name: Whalley Rd, Barrow

Client Project Ref: 18DWH018

Lab Sample ID	18/02614/9	18/02614/10	18/02614/11	18/02614/12	18/02614/13	18/02614/14	18/02614/15	18/02614/16	Units	Method ref
Client Sample No										
Client Sample ID	TP205	TP205	TP206	TP206	TP207	TP207	TP208	TP208		
Depth to Top	0.10	0.80	0.10	1.30	0.10	1.50	0.10	0.70		
Depth To Bottom										
Date Sampled	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18		
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - D	Soil - ES	Soil - ES	Soil - ES	Soil - ES		
Sample Matrix Code	6E	6E	6E	6E	6E	6A	6AE	6A		
TPH CWG										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C8-C10$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Ali >C10-C12$_A^{\#}$	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C12-C16$_A^{\#}$	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C16-C21$_A^{\#}$	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Ali >C21-C35$_A^{\#}$	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Total Aliphatics$_A$	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C8-C9$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C9-C10$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
Aro >C10-C12$_A^{\#}$	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C12-C16$_A^{\#}$	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C16-C21$_A^{\#}$	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Aro >C21-C35$_A^{\#}$	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
Total Aromatics$_A$	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
TPH (Ali & Aro)$_A$	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1	mg/kg	A-T-023s
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01	-	<0.01	<0.01	<0.01	<0.01	mg/kg	A-T-022s

Envirolab Job Number: 18/02614

Client Project Name: Whalley Rd, Barrow

Client Project Ref: 18DWH018

Lab Sample ID	18/02614/17	18/02614/18	18/02614/19	18/02614/20	18/02614/21	18/02614/22			Units	Method ref
Client Sample No										
Client Sample ID	TP209	TP209	TP210	TP210	TP211	WS206				
Depth to Top	0.10	1.00	0.10	1.50	1.70	0.10				
Depth To Bottom										
Date Sampled	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - D	Soil - ES				
Sample Matrix Code	6AE	6A	6E	6AE	6E	6E				
% Stones >10mm$_A$	5.4	10.2	<0.1	19.2	<0.1	<0.1			% w/w	A-T-044
pH$_D$ M#	7.52	7.85	6.76	8.07	8.04	6.24			pH	A-T-031s
Sulphate (water sol 2:1)$_D$ M#	<0.01	<0.01	0.02	<0.01	0.05	<0.01			g/l	A-T-026s
Cyanide (free)$_A$ M#	<1	<1	<1	<1	-	<1			mg/kg	A-T-042sFCN
Cyanide (total)$_A$ M#	<1	<1	<1	<1	-	<1			mg/kg	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	<0.2	-	<0.2			mg/kg	A-T-060s
Organic matter$_D$ M#	5.2	1.5	9.1	3.0	-	11.1			% w/w	A-T-032 OM
Arsenic$_D$ M#	6	4	12	3	-	11			mg/kg	A-T-024s
Cadmium$_D$ M#	0.7	0.9	0.9	0.7	-	1.0			mg/kg	A-T-024s
Copper$_D$ M#	21	11	43	12	-	43			mg/kg	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1	-	<1			mg/kg	A-T-040s
Lead$_D$ M#	42	22	102	15	-	91			mg/kg	A-T-024s
Mercury$_D$	0.44	0.21	0.73	0.48	-	<0.17			mg/kg	A-T-024s
Nickel$_D$ M#	18	26	30	23	-	28			mg/kg	A-T-024s
Selenium$_D$ M#	<1	<1	1	2	-	1			mg/kg	A-T-024s
Zinc$_D$ M#	89	82	136	67	-	133			mg/kg	A-T-024s
VPH total (>C5-C10)$_A$ #	<0.01	<0.01	<0.01	<0.01	-	<0.01			mg/kg	A-T-022s
1.01 % Moisture BS1377 1990 pt2 cl3.2$_A$ #	-	Appended	-	-	Appended	-				Subcon SS
1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4$_A$ #	-	Appended	-	-	Appended	-				Subcon SS

envirolab

Envirolab Job Number: 18/02614

Client Project Name: Whalley Rd, Barrow

Client Project Ref: 18DWH018

Lab Sample ID	18/02614/17	18/02614/18	18/02614/19	18/02614/20	18/02614/21	18/02614/22			Units	Method ref
Client Sample No										
Client Sample ID	TP209	TP209	TP210	TP210	TP211	WS206				
Depth to Top	0.10	1.00	0.10	1.50	1.70	0.10				
Depth To Bottom										
Date Sampled	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - D	Soil - ES				
Sample Matrix Code	6AE	6A	6E	6AE	6E	6E				
Asbestos in Soil (Inc. matrix)										
Asbestos in soil$_A$#	NAD	-	NAD	-	-	NAD				A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	-	N/A	-	-	N/A				

Envirolab Job Number: 18/02614

Client Project Name: Whalley Rd, Barrow

Client Project Ref: 18DWH018

Lab Sample ID	18/02614/17	18/02614/18	18/02614/19	18/02614/20	18/02614/21	18/02614/22			Units	Method ref
Client Sample No										
Client Sample ID	TP209	TP209	TP210	TP210	TP211	WS206				
Depth to Top	0.10	1.00	0.10	1.50	1.70	0.10				
Depth To Bottom										
Date Sampled	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - D	Soil - ES				
Sample Matrix Code	6AE	6A	6E	6AE	6E	6E				
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.04	<0.01	0.03	<0.01	-	0.04			mg/kg	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	-	<0.01			mg/kg	A-T-019s
Anthracene$_A^{M\#}$	0.05	<0.02	0.05	<0.02	-	0.05			mg/kg	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.25	<0.04	0.20	<0.04	-	0.12			mg/kg	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.25	<0.04	0.17	<0.04	-	0.09			mg/kg	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.33	<0.05	0.25	<0.05	-	0.12			mg/kg	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.12	<0.05	0.08	<0.05	-	<0.05			mg/kg	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	0.12	<0.07	<0.07	<0.07	-	<0.07			mg/kg	A-T-019s
Chrysene$_A^{M\#}$	0.33	<0.06	0.26	<0.06	-	0.14			mg/kg	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	<0.04	<0.04	<0.04	-	<0.04			mg/kg	A-T-019s
Fluoranthene$_A^{M\#}$	0.59	<0.08	0.47	<0.08	-	0.32			mg/kg	A-T-019s
Fluorene$_A^{M\#}$	0.01	<0.01	0.02	<0.01	-	0.02			mg/kg	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.16	<0.03	0.11	<0.03	-	<0.03			mg/kg	A-T-019s
Naphthalene$_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	-	<0.03			mg/kg	A-T-019s
Phenanthrene$_A^{M\#}$	0.27	<0.03	0.26	<0.03	-	0.25			mg/kg	A-T-019s
Pyrene$_A^{M\#}$	0.54	<0.07	0.42	<0.07	-	0.28			mg/kg	A-T-019s
PAH (total 16)$_A^{M\#}$	3.04	<0.08	2.35	<0.08	-	1.43			mg/kg	A-T-019s

Envirolab Job Number: 18/02614

Client Project Name: Whalley Rd, Barrow

Client Project Ref: 18DWH018

Lab Sample ID	18/02614/17	18/02614/18	18/02614/19	18/02614/20	18/02614/21	18/02614/22			Units	Method ref
Client Sample No										
Client Sample ID	TP209	TP209	TP210	TP210	TP211	WS206				
Depth to Top	0.10	1.00	0.10	1.50	1.70	0.10				
Depth To Bottom										
Date Sampled	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18	06-Apr-18				
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - D	Soil - ES				
Sample Matrix Code	6AE	6A	6E	6AE	6E	6E				
TPH CWG										
Ali >C5-C6$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s
Ali >C6-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s
Ali >C8-C10$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s
Ali >C10-C12$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	-	<0.1			mg/kg	A-T-023s
Ali >C12-C16$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	-	<0.1			mg/kg	A-T-023s
Ali >C16-C21$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	-	<0.1			mg/kg	A-T-023s
Ali >C21-C35$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	-	<0.1			mg/kg	A-T-023s
Total Aliphatics$_A$	<0.1	<0.1	<0.1	<0.1	-	<0.1			mg/kg	A-T-023s
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s
Aro >C8-C9$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s
Aro >C9-C10$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s
Aro >C10-C12$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	-	<0.1			mg/kg	A-T-023s
Aro >C12-C16$_A^{\#}$	<0.1	<0.1	<0.1	<0.1	-	<0.1			mg/kg	A-T-023s
Aro >C16-C21$_A^{\#}$	0.7	<0.1	0.9	<0.1	-	<0.1			mg/kg	A-T-023s
Aro >C21-C35$_A^{\#}$	0.4	<0.1	1.4	<0.1	-	<0.1			mg/kg	A-T-023s
Total Aromatics$_A$	1.1	<0.1	2.3	<0.1	-	<0.1			mg/kg	A-T-023s
TPH (Ali & Aro)$_A$	1.1	<0.1	2.3	<0.1	-	<0.1			mg/kg	A-T-023s
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01	<0.05	-	<0.01			mg/kg	A-T-022s

REPORT NOTES

General:
This report shall not be reproduced, except in full, without written approval from Envirolab.
All samples contained within this report, and any received with the same delivery, will be disposed of one month after the date of this report.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure and there is insufficient sample to repeat the analysis. These are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed.
Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

STRUCTURAL SOILS LTD

TEST REPORT

Report No. 783088 R1

1774

Date 23-April-2018 Contract 18/02614

Client Envirolab Ltd
Address Units 7 & 8 Sandpits Business Park
Mottram Road
Hyde
SK14 3AR

For the Attention of Iain Haslock

Samples submitted by client	11/04/2018	Client Reference	18/02614
Testing Started	13/04/2018	Client Order No.	P0737850
Testing Completed	23/04/2018	Instruction Type	Written

UKAS Accredited Tests Undertaken

Moisture Content (oven drying method) BS1377:Part 2:1990,clause 3.2 (superseded)**
Liquid Limit (definitive method) BS1377:Part 2:1990,clause 4.3
Plastic Limit BS1377:Part 2:1990,clause 5.3
Plasticity Index Derivation BS1377:Part 2:1990,clause 5.4

* This clause of BS1377 is no longer the most up to date method due to the publication of ISO17892

Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of.
Test were undertaken on samples 'as received' unless otherwise stated.
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

Structural Soils Ltd, The Potteries, Pottery Street, Castleford, WF10 1NJ Tel.01977 552255. E-mail mark.athorne@soils.co.uk

SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

Exploratory Position ID	Sample Ref	Sample Type	Depth (m)	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425um	Description of Sample
TP1	18/02614/2	D	1.50	18	39	26	13	77	Dark grey brown slightly sandy slightly gravelly CLAY
TP3	18/02614/6	D	1.20	11	32	15	17	64	Dark grey slightly sandy slightly gravelly CLAY
TP6	18/02614/12	D	1.30	11	31	15	16	60	Dark grey slightly sandy slightly gravelly CLAY
TP9	18/02614/18	D	1.00	14	42	19	23	70	Brown slightly sandy slightly gravelly CLAY
TP11	18/02614/21	D	1.70	10	29	14	15	69	Dark grey slightly sandy slightly gravelly CLAY

STRUCTURAL SOILS LTD

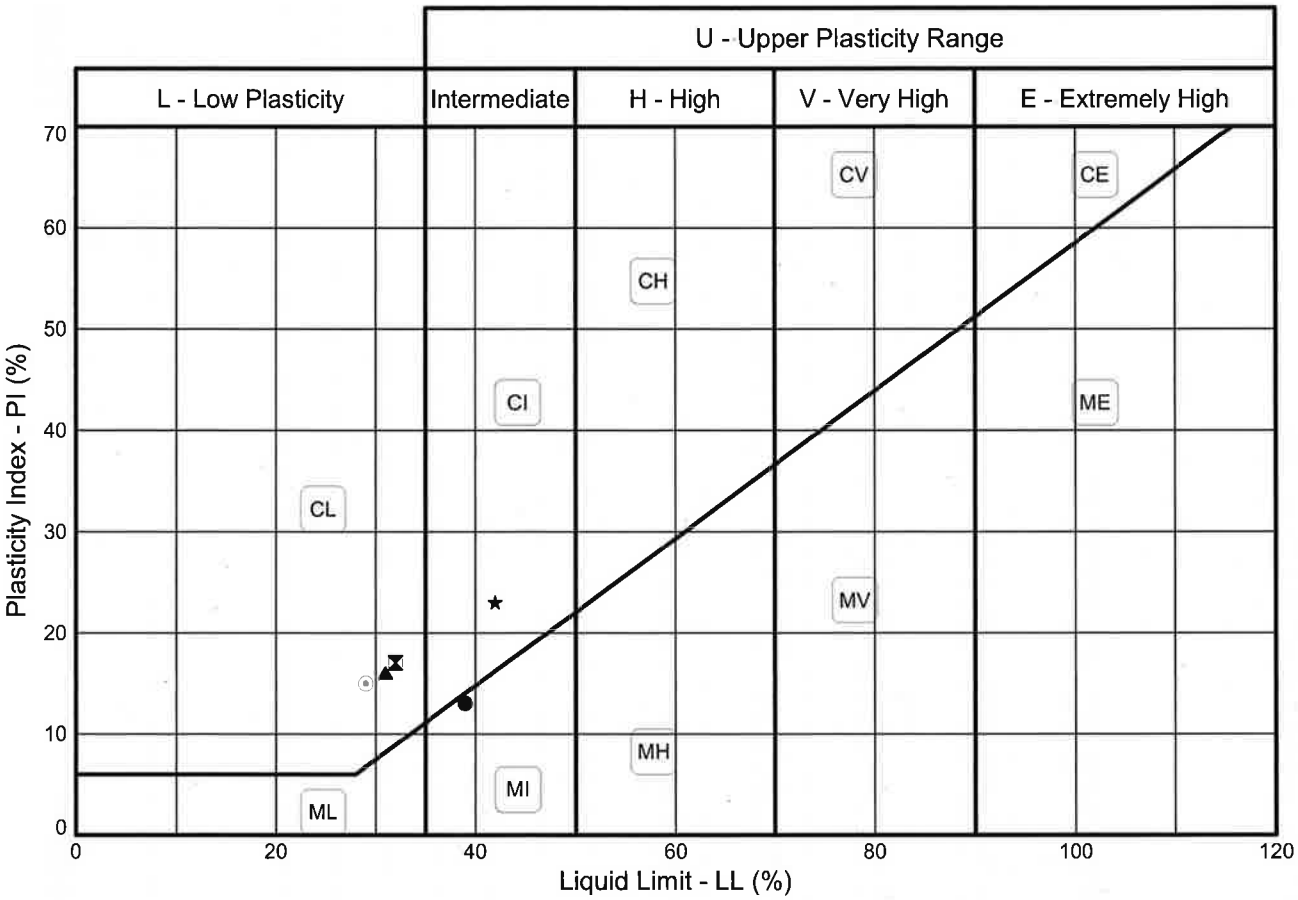
Contract: **18/02614**

Contract Ref: **783088**

AGS

PLASTICITY CHART - PI Vs LL

In accordance with BS5930:2015
Testing in accordance with BS1377-2:1990



Sample Identification				BS Test Method #	Preparation Method +	MC %	LL %	PL %	PI %	<425um %	Lab location
Exploratory Position ID	Sample		Depth (m)								
● TP1	18/02614/2D		1.50	3.2/4.3/5.3/5.4	4.2.4	18	39	26	13	77	C
⧗ TP3	18/02614/6D		1.20	3.2/4.3/5.3/5.4	4.2.4	11	32	15	17	64	C
▲ TP6	18/02614/12D		1.30	3.2/4.3/5.3/5.4	4.2.4	11	31	15	16	60	C
★ TP9	18/02614/18D		1.00	3.2/4.3/5.3/5.4	4.2.4	14	42	19	23	70	C
⊙ TP11	18/02614/21D		1.70	3.2/4.3/5.3/5.4	4.2.4	10	29	14	15	69	C

Tested in accordance with the following clauses of BS1377-2:1990.

3.2 - Moisture Content
4.3 - Cone Penetrometer Method
4.4 - One Point Cone Penetrometer Method
4.6 - One Point Casagrande Method
5.3 - Plastic Limit Method
5.4 - Plasticity Index

+ Tested in accordance with the following clauses of BS1377-2:1990.

4.2.3 - Natural State
4.2.4 - Wet Sieved

Key: * = Non-standard test, NP = Non plastic.

Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)

STRUCTURAL SOILS
The Potteries
Pottery Street
Castleford
W. Yorkshire WF10 1NJ

Compiled By		Date
M. Fisher	MAUREEN FISHER	23/04/18
Contract: 18/02614	Contract Ref: 783088	

APPENDIX E

(i) Gas Monitoring Data

Site: Barrow Road, Whalley
Job Number: 18DWH018
Date of Monitoring: 20/04/18

Ground Gas Monitoring Round 1

BETTS ASSOCIATES
GEO ENVIRONMENTAL

Borehole	Gas Flow (l/hr)	Atmospheric Pressure (mB)	Methane CH_4(%v/v)		Carbon Dioxide CO_2 (% v/v)		Oxygen (%v/v)		Other Gases			Depth to Water	
			Peak	Steady	Peak	Steady	Min	Steady	PID	H_2S	CO	(mbgl)	BH depth
WS1	0.3	1020	0	0	0.6	0.2	20.8	21.0	-	-	-	1.02	3.01
WS2	0.0	1020	0	0	3.3	3.3	16.9	16.9	-	-	-	1.17	2.04
WS3	Flooded											0.25	2.53
WS4	0	1020	0	0	0.2	0.0	20.0	20.7	-	-	-	0.79	1.94
WS5	0.1	1020	0	0	0.5	0.4	20.7	20.9	-	-	1	0.75	3.07
WS6	0	1020	0.1	0.1	0.9	0.8	20	20	-	-	1	2.47	3.05

Notes:
Monitoring order is left to right across the table
Monitoring should be for **not less** than 3 minutes. However, if high concentrations of gases are initially recorded, monitoring should be for up to 10 minutes

Relevant Information at the Time of Monitoring	
Monitored by:	PH
Weather:	Warm, Sunny with Cloud, Light Wind.
Equipment Used:	GA2000+
Visible signs of damage/stress:	None
Other Comments/Observations:	Pressure Stable.

Site: Barrow Road, Whalley
Job Number: 18DWH018
Date of Monitoring: 06/06/18

Ground Gas Monitoring Round 2

BETTS ASSOCIATES
GEO ENVIRONMENTAL

Borehole	Gas Flow (l/hr)	Atmospheric Pressure (mB)	Methane CH_4(%v/v)		Carbon Dioxide CO_2 (% v/v)		Oxygen (%v/v)		Other Gases			Depth to Water	
			Peak	Steady	Peak	Steady	Min	Steady	PID	H_2S	CO	(mbgl)	BH depth
WS1	0.20	1010	0.00	0.00	0.60	0.30	20.70	20.80	0.00	0.00	0.00	0.88	2.98
WS2	0.10	1010	0.00	0.00	1.60	1.60	20.40	20.40	0.00	0.00	0.00	1.10	1.95
WS3	0.10	1010	0.00	0.00	0.20	0.20	21.10	21.10	0.00	0.00	0.00	0.53	2.52
WS4	Unable to Locate due to Vegetation.												
WS5	Unable to Locate due to Vegetation.												
WS6	Well Destroyed.												

Notes:
Monitoring order is left to right across the table
Monitoring should be for **not less** than 3 minutes. However, if high concentrations of gases are initially recorded, monitoring should be for up to 10 minutes

Relevant Information at the Time of Monitoring	
Monitored by:	JS & RD
Weather:	Cloudy, Dry, Slight Wind.
Equipment Used:	GA2000+
Visible signs of damage/stress:	
Other Comments/Observations:	Pressure Stable.

APPENDIX F

(i) Conceptual Model

The report aims to identify land which could potentially be affected by contamination, such that it could affect the value or re-use of the land, or such that mitigation would be required for certain proposed end uses of the land.

The assessment also aims to identify land which would be regarded as 'contaminated land' under the terms of the Environmental Protection Act 1990, Part IIa. This act includes a stricter test for contaminated land than that outlined above. Land is considered to be contaminated if either:

- the land is causing significant harm to people, ecosystems or infrastructure; or
- there is a significant possibility that such harm could be caused; or
- Pollution of controlled waters is being, or is likely to be, caused.

The following situations are defined as being where harm is to be regarded as significant:

- chronic or quite toxic effect, serious injury or death to humans;
- irreversible or other adverse harm to the ecological system;
- substantial damage to or failure of buildings;
- death of, or disease or other physical damage affecting, livestock or crops;
- Pollution of controlled waters.

The risk assessment uses a 'Source-Pathway-Receptor' methodology for assessing whether a source of contamination could potentially lead to harmful consequences. This means that there needs to be a pollutant linkage from source to receptor for harm to be caused, this linkage consisting of:

- a source of pollution;
- a pathway for the pollutant to move along;
- A receptor that is affected by the pollutant.

As an example, the pollutant source could be an identified leak of oil or an area of dumped waste.

The pathways could include transport of the contaminant by groundwater, surface water, windblown dust, or vapours, and for human receptors will include the means, by which contaminants enter the body, for example skin contact, ingestion and inhalation.

Receptors include people, other living organisms, the built environment and groundwater and surface waters (these latter two also being contaminant pathways).

The source-pathway-receptor methodology relationship allows an assessment of the environmental risk to be determined, based on the nature of the source, the degree of exposure of the receptor to the source and the sensitivity of the receptor.

This section of the report is based on the information set out in the previous sections of the report and should not be read independently of such sections.

Initial Conceptual Model

From the available information the preliminary conceptual model is visualised as follows:

Target (Receptor)	POTENTIAL SOURCE-PATHWAY LINKAGE
Site users / residents	Inhalation of soil gas, odours or dust.
	Ingestion of, and skin contact with, contaminated soil.
	Ingestion of contaminants in vegetables etc. or in soils adhering to vegetables, etc.
Construction/ maintenance workers.	Inhalation of soil gas, odours or dust
	Ingestion of, and skin contact with, contaminated soil
Plants	Adverse effects on growth caused by presence of contaminants in soil
Buildings and Structures	Flow of ground gas into buildings. Asphyxiation, toxicity, explosion and fire hazards
	Sulphate attack of foundations
	Hydrocarbons penetrating plastic water supply pipes
Groundwater	Migration of soluble contaminants into groundwater on or off site. Migration of oils into groundwater on or off site.
Surface water	Migration of soluble contaminants and/or direct run-off of contaminants. Migration of oils into groundwater on or off site.

Initial Environmental Risk Assessment

General

It is accepted that an environmental risk assessment can be based on a source-pathway-target model. An examination is carried out as to whether a target will be at risk from a contamination source, that a source exists, and whether there are any pathways (routes of exposure) which might actually link the source to the target.

Environmental risk assessments rely heavily on numerical trigger concentrations or guidelines because exposure of targets to contamination is difficult to quantify directly. Quantification of risk is therefore mainly undertaken for general scenarios in order to derive trigger levels. These are derived for various contaminants for particular targets and routes of exposure. An example of a sensitive target would be users of a domestic back garden, where routes of exposure might be skin contact, dust inhalation, direct ingestion and indirect ingestion via cultivation and consumption of fruit and vegetables.

In March 2002, the first parts of the new CLEA risk assessment guidance were released by DEFRA/Environment Agency.

The risk assessment approach is an extension of the 'fit for use' concept whereby land is cleaned up to a standard fit for the proposed use, that is, so all remaining risks are acceptable. However, as well as being 'fit for use', the environmental risk assessment approach also addresses the soil and water environment so that these are also safeguarded where necessary. For example if a site was contaminated with heavy metals and the development comprised the proposed construction of hard standings and buildings only, the fit-for-use approach might require no remediation for the site. However, consideration of the wider environment needs to address whether groundwater is being contaminated, and if so whether remediation is required for this reason.

The following classification presented by CIRIA has been used in the assessment of risk:

Estimation of risk from consideration of magnitude, consequences and probabilities				
Probability	**Consequences**			
	Severe	**Moderate**	**Mild**	**Minor**
High	Very high	High	Moderate	Moderate / Low
Medium	High	Moderate	Moderate / Low	Low
Low	Moderate	Moderate / Low	Low	Very Low
Unlikely	Moderate / Low	Low	Very Low	Very Low

Reference: Contaminated Land Risk Management; A Guide to Good Practice, CIRIA C552:2001

CIRIA C665 Situation A Ground Gas Conceptual Model

The risk table contained in C665 is basically a modified risk assessment from CIRIA 152 1995, by which a conceptual model and semi-quantitative risk assessment can be made.

APPENDIX G

(i) Notes on Ground Gas

Ground Gas

The Building Regulations and BRE Report 212 state that precautions are not mandatory against carbon dioxide unless 5.0% volume is exceeded. These documents do not give a threshold level for methane, but Baker suggests that this level is 0.1% volume. For methane up to 1.0% volume, and carbon dioxide above 5.0% volume, the Building Regulations and BRE Report state that passive measures may be adopted. Above 1.0% methane further specific guidance must be sought.

CIRIA Report 149 gives further guidance on the appropriate precautions for various gas regimes, called characteristic situations in this report. In the DETR Guide for Design by Ove Arup, various types of passive measures are assessed for performance with different gas regimes. The assessments used computational fluid dynamic (CFD) modelling.

A gas regime is essentially defined by two parameters:

i) The concentration of the gas (e.g. % methane)

ii) The emission rate of the gas from the ground.

The fact that two parameters are used is problematic if the site is to be classified on the basis of Table 28 in CIRIA Report 149. This is because high gas concentrations are often encountered which fall into an onerous gas regime; whereas the low flow rates which are also frequently encountered fall into less onerous gas regimes.

In order to use the Guide for Design to decide if passive measures are suitable, it is necessary to combine the gas concentration and the emission rate.

Three recent publications are used for ground gas risk assessment:

- CIRIA C665 for high rise residential / flats
- 'Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present' Report Edition No.04 March 2007 NHBC – designed for use with low rise residential properties
- BS8485:2007 'Code of practice for the characterization and remediation from ground gas in affected developments'

These documents improve upon the approach used in previous CIRIA and Wilson /Card Papers, by placing emphasis on gas flow rates, but still retain some reliance on the gas concentrations themselves.

CIRIA C665 Situation A Ground Gas Conceptual Model

The risk table contained in C665 is basically a modified risk assessment from CIRIA 152 1995, by which a conceptual model and semi-quantitative risk assessment can be made.

High Rise / Flats (CIRIA 665 Table 8.5)

Characteristic Situation (CIRIA Report 149)	Risk Classification	Gas Screening Value (CH4 or CO2) (l/hr) [1]	Additional factors	Typical source of generation
1	Very low risk	<0.07	Typically methane ≤1%v/v and/or carbon dioxide ≤5%v/v. Otherwise consider increase to Situation 2	Natural soils with low Organic content. "Typical" Made Ground
2	Low risk	<0.7	Borehole flow rate not to exceed 70l/hr. Otherwise consider increase to Situation 3	Natural soil, high peat/organic content. "Typical" Made Ground
3	Moderate risk	<3.5		Old landfill, inert waste, mineworking flooded
4	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures	Mineworking susceptible to flooding, completed landfill (WMP 26B criteria)
5	High risk	<70		Mineworking unflooded inactive with shallow workings near surface
6	Very high risk	>70		Recent landfill site

Notes:

1. Gas screening value: litres of gas/hour is calculated by multiplying the gas concentration (%) by the measured borehole flow rate (l/hr);
2. Site characterisation should be based on gas monitoring of concentrations and borehole flow rates for the minimum periods as defined within within CIRIA Report 665;
3. Source of gas and generation potential/performance must be identified;
4. Soil gas investigation to be in accordance with guidance contained within CIRIA Report 665;
5. If there is no detectable flow, use the limit of detection of the instrument;
6. The boundaries between the Partners in Technology classifications do not fit exactly with the boundaries for the above classification.

Typical scope of protective measures (extract from CIRIA Report 665 Table 8.6)

Characteristic Situation (from Table 8.5)	Number of levels of protection	Typical scope of protective measures for residential building (not low-rise traditional housing)[1]
1	None	No special precautions
2	2	a) Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200g DPM and under-floor venting b) Beam and block or pre-cast concrete and 2000 g DPM/reinforced gas membrane and under-floor venting. All joints and penetrations sealed.
3	2	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised under-floor sub-space.
4	3	All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated under-floor subspace or positively pressurised under-floor sub-space, over-site capping or blinding and in ground venting layer
5	4	Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and ventilated or positively pressurised under-floor sub-space, over-site capping and in ground venting layer and in ground venting wells or barriers.
6	5	Not suitable unless gas regime is reduced first and quantitative risk assessment carried out to assess design of protection measures in conjunction with foundation design.

Notes:

1. Not suitable for use with low rise traditional housing. (Use the NHBC document instead);
2. Typical scope of protective measures may be rationalised for specific developments on the basis of quantitative risk assessments;
3. Note the type of protection is given for illustration purposes only. Information on the detailing and construction of passive protection measures is given in BR414 (Johnson, 2001). Individual site specific designs should provide the same number of separate protective methods for any given characteristic situation. See CIRIA Report 49;
4. In all cases there should be minimum penetration of ground slabs by services and minimum number of confined spaces such as cupboards above the ground slab. Any confined spaces should be ventilated;
5. Foundation design must minimise differential settlement particularly between structural elements and ground-bearing slabs;
6. Commercial buildings with basement car parks, provided with ventilation in accordance with the Building Regulations, may not require gas protection for Characteristic Situations 3 and 4;
7. Floor slabs should provide an acceptable formation on which to lay the gas membrane. If a block beam floor is used it should be well detailed so it has no voids in it that membranes have to span, and all holes for service penetrations should be filled. The minimum density of the blocks should be 600kg/m3 and the top surface should have a 4:1 ratio sand to cement grout brushed into all joints before placing any membrane (this is also good practice to stabilise the floor and should be carried out regardless of the need for ground gas membranes);
8. The ground gas-resistant membrane can also act as the damp-proof membrane;
9. Based on Building Regulations Approved Document C (Office of the Deputy Prime Minister, 2004a),which states that "a membrane below the concrete could be formed with a sheet of polyethylene, which should be at least 300mu thick (1200 gauge)". Please note the alteration from 300mm (as stated in the Approved Document C) to 300mu, as 300mm is a typographical error that has been recognised and corrected for within this report and CIRIA Report 665.

Low Rise Residential (NHBC)

Table 14.1: Gas Risk Assessment - Traffic Lights with Typical Maximum Concentrations and Gas Screening Values

	Methane [1]		Carbon Dioxide [1]	
Classification	**Typical Maximum Concentration** [3] (%v/v)	**Gas Screening Value** [2,4] (l/hr)	**Typical Maximum Concentration** [3] (%v/v)	**Gas Screening Value** [2,4] (l/hr)
Green				
Amber 1	1	**0.13**	5	**0.78**
Amber 2	5	**0.63**	10	**1.60**
Red	20	**1.60**	30	**3.10**

Notes:

1. The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst case temporal conditions that the site may be expected to encounter will be the decider as to what Traffic Light is allocated;
2. Borehole Gas Volume Flow Rate, in litres per hour as defined in Wilson and Card (1999), is the borehole flow rate multiplied by the concentration in the air stream of the particular gas being considered;
3. The Typical Maximum Concentrations can be exceeded in certain circumstances should the Conceptual Site Model indicate it is safe to do so;
4. The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.

Table 14.2: Ground Gas Protection Measures Required for the Traffic Lights

Traffic Light	Ground Gas Protection Measures Required
Green	Ground gas protection measures are not required. (note based on standard NHBC house detail with 150mm void space under suspended floor)
Amber 1	Low-level ground gas protection measures are required, using a membrane and ventilated sub-floor void that creates a permeability contrast to limit the ingress of gas into buildings. Gas protection measures are to be installed as prescribed in BRE 414. Ventilation of the sub-floor void should be designed to provide a minimum of one complete volume change per 24 hours.
Amber 2	High-level ground gas protection measures are required, creating a permeability contrast to prevent ingress of gas into buildings. Gas protection measures are to be installed as prescribed in BRE 414. **Membranes used should always be fitted by a specialist contractor and should be fully certified (see Appendix G).** As with Amber 1, ventilation of the sub-floor void should be designed to provide a minimum of one complete volume change per 24 hours.
Red	Standard residential housing is not normally acceptable without further Ground Gas Risk Assessment and/or possible remedial mitigation measures to reduce/remove the source of the ground gases. In certain circumstances, active protection methods could be applied, but only when there is a legal agreement assuring the management and maintenance of the system for the life of the property.

BS8485: 2007

Table 2: Required Gas Protection By Characteristic Gas Situation & Type Of Building

Characteristic gas situation, CS	NHBC traffic light	Required gas protection			
		Non-managed property, e.g. private housing	Public building A)	Commercial buildings	Industrial buildings B)
1	Green	0	0	0	0
2	Amber 1	3	3	2	1 C)
3	Amber 2	4	3	2	2
4	Red	6 D)	5 D)	4	3
5			6 E)	5	4
6				7	6

NOTE Traffic light indications are taken from NHBC Report no.: 10627-R01 (04) [3] and are mainly applicable to low-rise residential housing. These are for comparative purposes but the boundaries between the traffic light indications and CS values do not coincide.

A) Public buildings include, for example, managed apartments, schools and hospitals.
B) Industrial buildings are generally open and well ventilated. However, areas such as office pods might require a separate assessment and may be classified as commercial buildings and require a different scope of gas protection to the main building.
C) Maximum methane concentration 20% otherwise consider an increase to CS3.
D) Residential building on higher traffic light/CS sites is not recommended unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.
E) Consideration of issues such as ease of evacuation and how false alarms will be handled are needed when completing the design specification of any protection scheme.

Table 3: Solutions Scores

PROTECTION ELEMENT/SYSTEM		SCORE	COMMENTS
a) Venting/dilution (See Annex A)			
Passive sub floor ventilation (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.) A)	Very good performance	2.5	Ventilation performance in accordance with Annex A. If passive ventilation is poor this is generally unacceptable and some form of active system will be required.
	Good performance	1	
Subfloor ventilation with active abstraction/pressurization (venting layer can be a clear void or formed using gravel,		2.5	There have to be robust management systems in place to ensure the continued maintenance of any ventilation system.

geocomposites, polystyrene void formers, etc.) A)			Active ventilation can always be designed to meet good performance. Mechanically assisted systems come in two main forms: extraction and positive pressurization.
Ventilated car park (basement or undercroft)		4	Assumes car park is vented to deal with car exhaust fumes, designed to Building Regulations Document F [5] and IStructE guidance [6].
b) Barriers			
Floor slabs			It is good practice to install ventilation in all foundation systems to effect pressure relief as a minimum. Breaches in floor slabs such as joints have to be effectively sealed against gas ingress in order to maintain these performances.
Block and beam floor slab		0	
Reinforced concrete ground bearing floor slab		0.5	
Reinforced concrete ground bearing foundation raft with limited service penetrations that are cast into slab		1.5	
Reinforced concrete cast in situ suspended slab with minimal service penetrations and water bars around all slab penetrations and at joints		1.5	
Fully tanked basement		2	
c) Membranes			
Taped and sealed membrane to reasonable levels of workmanship/in line with current good practice with validation B), C)		0.5	The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation, and the integrity of joints
Proprietary gas resistant membrane to reasonable levels of workmanship/in line with current good practice under independent inspection (CQA) B), C)		1	
Proprietary gas resistant membrane installed to reasonable levels of workmanship/in line with current good practice under CQA with integrity testing and independent validation		2	
d) Monitoring and detection (not applicable to non-managed property, or in isolation)			
Intermittent monitoring using hand held equipment		0.5	
Permanent monitoring and alarm system A)	Installed in the underfloor venting/ dilution system	2	Where fitted, permanent monitoring systems ought to be installed in the underfloor venting/dilution system in the first instance but can also be provided within the occupied space as a fail safe
	Installed in the building	1	
e) Pathway Intervention			
Pathway intervention		-	This can consist of site protection measures for off-site or on-site sources (see Annex A).

NOTE In practice the choice of materials might well rely on factors such as construction method and the risk of damage after installation. It is important to ensure that the chosen combination gives an appropriate level of protection

A) It is possible to test ventilation systems by installing monitoring probes for post installation validation.

B) If a 1 200 g DPM material is to function as a gas barrier it should be installed according to BRE 212 [8]/BRE 414 [9], being taped and sealed to all penetrations.

C) Polymeric Materials >1 200 g can be used to improve confidence in the barrier. Remember that their gas resistance is robust and resistant to site damage.

APPENDIX H

(i) Off-site Disposal of Surplus Soil Guidance Notes

The disposal of waste (including surplus soils and contaminated soils) to landfill sites is governed by the *Landfill (England & Wales) Regulations 2002*, the *Hazardous Waste Technical Guidance document WM2 (2003)* and associated legislation.

One of the aims of the above legislation is to encourage waste producers (including developers disposing of surplus soils etc) to reduce their waste (and not just discard and disown it). This can be achieved by recycling or reusing the waste. In the case of contaminated sites where leaving contaminated material in-situ poses a risk to a potential receptor such as groundwater resources, further testing and assessment for such risk could reduce the quantities requiring disposal. If there is still unacceptable risk from contaminated soil being left in place, then it may be possible to reduce the risk to an acceptable level (such that the material can be left in place) by in-situ or ex-situ clean-up of the soils.

Before waste can be disposed of, the producer of the waste must undertake a number of steps. '*Initial Waste Testing and Characterisation*' is firstly undertaken to determine whether the waste is non-hazardous or hazardous. The exceptions are that some wastes such as coal tars, 'tank bottom sludge's', etc are immediately classed as hazardous, regardless of any testing or threshold concentrations.

Any inert or hazardous waste destined for landfill must undergo '*Compliance Testing*' using the Waste Acceptance Criteria (WAC). There are different inert and hazardous WAC limits relating to landfill sites that are correspondingly licensed to accept inert or hazardous waste.

If the '*Initial Waste Testing and Characterisation*' shows a waste to be hazardous, then it is a requirement that the material be tested against the WAC-hazardous suite of tests. If it *passes* the WAC-hazardous testing, then it can be taken to a hazardous waste landfill site. If the material *fails* the WAC-hazardous testing, then the material must be treated before undergoing re-characterisation, further WAC-hazardous testing and then potential disposal at a hazardous waste disposal site.

If the '*Initial Waste Testing and Characterisation*' shows a waste to be non-hazardous, then it can be taken to a non hazardous waste landfill site, without further testing. The producer may however decide to undertake WAC-inert testing, in an attempt to reclassify the waste as inert, in which case the waste could then go to an inert landfill site.

The volumes of soils associated with potential hotspots on a site (be they hazardous or non hazardous) which might require off-site disposal, could potentially be reduced by further on-site sampling and subsequent testing.

With regard to the *Compliance Testing*, it should be noted that some landfill sites are permitted to increase the standard WAC-hazardous/inert limit concentrations, such that they might accept waste that would normally fail such limits.

We would recommend that the contamination testing results (including the history of the site) be presented to the proposed landfills, to determine if they will accept waste generated at the site and what classification they would impose.

APPENDIX I

(i) Validation Report Guidance Notes

Unforeseen Hotspots of Contamination

Given the existence of made ground on the site it would be prudent to maintain vigilance during site clearance and construction, in case any further areas of suspected contamination are encountered.

If areas are found then a suitably qualified person should undertake appropriate sampling, testing and further risk assessment.

Any hotspots encountered during site clearance, not previously encountered in the ground investigation, are to be removed to a suitably licensed landfill site.

A validation report (see below) will be produced on completion of these works. This report will serve to confirm that the works were undertaken in accordance with the relevant legislation, the method statement, specification and planning conditions.

Validation Report Recommendations

It is suggested that the following records will be kept on site to provide a basis for the validation report:

- Daily record sheets of the remediation works to include a summary of the day's activities
- Weather conditions
- Plant, personnel and visitors to the remediation site
- Aspects relating to Health & Safety, environmental control or non-compliance with the specification or the Method Statements.
- All in situ and laboratory testing results.

All requirements of the remediation specification should be complied with; on completion of the remediation a validation report should be provided. This report will comprise the relevant site records and act as certification that the remedial and ground preparation works have been carried out in accordance with the specification.

The validation report will include the following:

- A description of the works undertaken.
- Records of any remediation works, including daily diary sheets.
- Progress photographs.
- Any chemical and geotechnical validation test results.
- As built surveys, including base excavations and top and bottom of capping layer.
- A statement that the works have been undertaken in accordance with the agreed specification

APPENDIX J

(i) Notes on Limitations

This report does not consider ecological impacts (e.g. bats) or botanical risks (e.g. Japanese knotweed). It is recommended that these are considered as part of the assessment of development constraints for the site.

The ground conditions described in the above reports relate only to the points of investigation and do not necessarily guarantee a continuation of the ground conditions throughout the non-inspected area of the site. Whilst such exploratory holes would usually provide a reasonable indication as to the general ground conditions, these cannot be determined with complete certainty. Betts Geo has endeavoured to assess all information provided to them, but makes no guarantees or warranties as to the accuracy or completeness of this information.

The assessment and judgements given in this report are directed by both the finite data on which they are based and the proposed works to which they are addressed. The data essentially comprised a study of available documented information from various sources (including Client Furnished reports) together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our environmental conclusions, we request the opportunity to review the information, reassess the potential concerns and modify our opinion if warranted.

It should be noted that any risks identified in this report are perceived risks based on the available information. Actual risks can only be assessed following a physical investigation of the site.

The site investigation has been carried out to provide information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made. Betts Geo Environmental Ltd undertake to exercise all reasonable skill, care and due diligence in the exercise of the investigation with respect to sampling techniques, sample storage and report interpretation.

The assessments and judgement given in this report are directed by both the finite data on which they are based and the proposed works to which they are addressed. Data acquisition is subject to the limitations of the methods of investigation used. Exploratory holes undertaken during fieldwork investigate small a small volume of ground in relation to the size of the site and as such can only provide an indication of site conditions. There may be conditions pertaining to the site and the proposed development i.e. localised "hotspots" of contamination, which have not been disclosed by the investigations.

The findings and opinions are relevant to the dates of our site works and should not be relied upon to represent conditions at substantially later dates. Conditions at the site will change over time due to natural variations and anthropogenic activities. Groundwater, surface water and soil gas conditions should be anticipated to change with diurnal, seasonal and meteorological variations.

The opinions expressed in this report regarding any contamination are based on simple statistical analysis and comparison with available guidance values. No liability can be accepted for the retrospective effects of any changes or amendments to these values.

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