

Date _____

Toxaphene (camphechlor)

Tin (leave empty if Organotin and Tin excl Organotin results used)

Dibutyltin; DiBT

Tributyltin; TriBT

Triphenyltin; TriPT

Tetrabutyltin; TeBT

Tin excluding Organotin

Tin excl Organotin

associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!". 00000", testing has NOT been undertaken that contributes to that Hazardous Property.

[illegible]



Haswaste, developed by Dr. Iain Haslock.

Ref. 1

Ref. 2

Date

Asbestos in Soil

Thresholds

Asbestos detected in Soil (enter Y or N)

Y

Asbestos % Composition in Soil (Matrix Loose Fibres or Microscopic Identifiable Pieces only)

see "Carc HP7 % Asbestos in Soil (Fibres)" below

Carcinogenic HP7 % Asbestos in Soil (fibres or micro pieces)

Please be advised, if the calculation cell is "0.00000" DOES NOT MEAN asbestos testing has been undertaken and the result is zero.

≥0.1%

Asbestos Identifiable Pieces visible with the naked eye detected in the Soil (enter Y or N)

Y

ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!". "00000", testing has NOT been undertaken that contributes to that Hazardous Property.

RBH503	RBH501	RBH501	RBH504	RBH504	RBH504
4.00	0.80	2.00	1.50	1.90	3.10
31-Oct-23	01-Nov-23	01-Nov-23	02-Nov-23	02-Nov-23	02-Nov-23

N	N	N	N	N	N
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sbestos in Soil above is "Y", the soil is Hazardous Waste HP5 and HP7

0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

", the soil is Non Hazardous Waste. You can only use Asbestos % results where loose fibres or micro pieces are only present. You not use Asbestos % results when visual identifiable pieces are present.

			N	N	N
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Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

RBH503	RBH501	RBH501	RBH504	RBH504	RBH504
4.00	0.80	2.00	1.50	1.90	3.10
31-Oct-23	01-Nov-23	01-Nov-23	02-Nov-23	02-Nov-23	02-Nov-23

ie Asbestos % results and the whole soil sample is Hazardous Waste HP5 and HP7 Construction material containing Asbestos 17 06
stos % above is "<0.1%", but the Asbestos Identifiable Pieces visible with the naked eye is "Y", the soil is Hazardous Waste.

are Cement, Fragments, Board, Rope etc. ie anything ACM that is not Loose Fibres.
/ fibres (or micro pieces) with an Asbestos % Composition in Soil result of <0.1% for the soil to become non-hazardous waste.

Hazardous Property	Thresholds	Cut Off Value	allow and the text turns red, the samples should be classified as Hazardous Waste.					
Corrosive HP8	≥5%	<1%	0.00169	0.00541	0.00330	0.01515	0.00849	0.00281
Irritant HP4	≥10%	<1%	0.00083	0.00222	0.00177	0.20418	0.01539	0.00156
Irritant HP4	≥20%	<1%	0.00202	0.00707	0.00500	0.33080	0.19373	0.02957
Specifc Target Organ Toxicity HP5	≥1%		0.00019	0.00019	0.00019	0.00019	0.00019	0.00019
Specifc Target Organ Toxicity HP5	≥20%		0.00012	0.00001	0.00001	0.13100	0.17500	0.02570
Specifc Target Organ Toxicity HP5	≥1%		0.00154	0.00525	0.00364	0.00768	0.00606	0.00263
Specifc Target Organ Toxicity HP5	≥10%		0.00120	0.00220	0.00080	4.41000	1.45000	0.04840
Aspiration Toxicity HP5	≥10%		0.00120	0.00020	0.00020	1.19004	1.45003	0.04841
Acute Toxicity HP6	≥0.1%	<0.1%	0.00019	0.00019	0.00019	0.00019	0.00019	0.00019
Acute Toxicity HP6	≥0.25%	<0.1%	0.00015	0.00041	0.00041	0.01228	0.00266	0.00028
Acute Toxicity HP6	≥5%	<0.1%	0.00170	0.00515	0.00304	0.00328	0.00599	0.00269
Acute Toxicity HP6	≥25%	<1%	0.00266	0.00932	0.00585	4.74092	0.49577	0.03502
Acute Toxicity HP6	≥0.25%	<0.1%	0.00021	0.00021	0.00021	0.00045	0.00021	0.00021
Acute Toxicity HP6	≥2.5%	<0.1%	0.00154	0.00499	0.00288	0.00307	0.00576	0.00250

Haswaste, developed by Dr. Iain Haslock.

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RBH503	RBH501	RBH501	RBH504	RBH504	RBH504
4.00	0.80	2.00	1.50	1.90	3.10
31-Oct-23	01-Nov-23	01-Nov-23	02-Nov-23	02-Nov-23	02-Nov-23

Acute Toxicity HP6	≥15%	<0.1%	0.00002	0.00002	0.00002	0.00007	0.00009	0.00005
Acute Toxicity HP6	≥55%	<1%	0.00005	0.00005	0.00005	0.00015	0.00006	0.00005
Acute Toxicity HP6	≥0.1%	<0.1%	0.00019	0.00019	0.00019	0.00019	0.00019	0.00019
Acute Toxicity HP6	≥0.5%	<0.1%	0.00160	0.00506	0.00295	0.00348	0.00583	0.00256
Acute Toxicity HP6	≥3.5%	<0.1%	0.00016	0.00016	0.00016	0.00021	0.00023	0.00019
Acute Toxicity HP6	≥22.5%	<1%	0.00249	0.00926	0.00579	4.60980	0.32073	0.00927
Carcinogenic HP7	≥0.1%		0.00154	0.00525	0.00364	4.41000	1.45000	0.04840
Carcinogenic HP7	≥0.1%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
Carcinogenic HP7	≥1%		0.00012	0.00001	0.00001	0.13100	0.17500	0.02570
Carcinogenic HP7 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00
Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
pH Corrosive HP8 pH (soil or leachate)	H8 ≥11.5		8.40	8.05	7.76	7.94	7.38	7.89
pH Corrosive HP8 pH (soil or leachate)	H8 ≤2		8.40	8.05	7.76	7.94	7.38	7.89
Toxic for Reproduction HP10	≥0.3%		0.00121	0.00525	0.00364	4.41000	0.30200	0.02570
Toxic for Reproduction HP10	≥3%		0.00154	0.00499	0.00288	1.19000	1.45000	0.04840
Mutagenic HP11	≥0.1%		0.00154	0.00499	0.00288	1.19000	1.45000	0.04840
Mutagenic HP11 Unknown TPH with ID	≥1,000mg/kg	0.00	0.00	0.00	0.00	0.00	0.00	



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Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%
Mutagenic HP11	≥1%
Produces Toxic Gases HP12 Sulphide	≥1,400mg/kg
Produces Toxic Gases HP12 Cyanide	≥1,200mg/kg
Produces Toxic Gases HP12 Thiocyanate	≥2,600mg/kg
HP13 Sensitising	≥10%

Ecotoxic HP14 amended v6	≥25%	<0.1%
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ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

RBH503	RBH501	RBH501	RBH504	RBH504	RBH504
4.00	0.80	2.00	1.50	1.90	3.10
31-Oct-23	01-Nov-23	01-Nov-23	02-Nov-23	02-Nov-23	02-Nov-23

#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
0.00121	0.00525	0.00364	0.13100	0.17500	0.02570
0.0	0.0	0.0	0.0	0.0	0.0
1.0	1.0	1.0	1.0	1.0	1.0
0.0	0.0	0.0	0.0	0.0	0.0
0.00154	0.00525	0.00364	0.13100	0.17500	0.02570

0.00730	0.02243	0.01347	4.81935	0.51789	0.04125
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ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

RBH503	RBH501	RBH501	RBH504	RBH504	RBH504
4.00	0.80	2.00	1.50	1.90	3.10
31-Oct-23	01-Nov-23	01-Nov-23	02-Nov-23	02-Nov-23	02-Nov-23

Ecotoxic HP14 amended v6	≥25%	<0.1% (except Be, V, Te, Tl, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T- Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene , Xylene + BTEX 1%).	0.00853	0.02265	0.01370	6.00945	1.96800	0.08971
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ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

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RBH503	RBH501	RBH501	RBH504	RBH504	RBH504
4.00	0.80	2.00	1.50	1.90	3.10
31-Oct-23	01-Nov-23	01-Nov-23	02-Nov-23	02-Nov-23	02-Nov-23

Ecotoxic HP14 amended v6	≥25%	<0.1% (except Be, V, Te, Tl, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T- Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene , Xylene + BTEX 1%).	0.74240	2.24490	1.34940	493.83523	66.28962	4.60951
Persistent Organic Pollutant (PCB, PBB or POP Pesticides)	>0.005%		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Persistent Organic Pollutant (Total Dioxins+Furans)	>0.0000015%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000

Date _____

>0.0000015%

RBH503	RBH501	RBH501	RBH504	RBH504	RBH504
4.00	0.80	2.00	1.50	1.90	3.10
31-Oct-23	01-Nov-23	01-Nov-23	02-Nov-23	02-Nov-23	02-Nov-23

0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
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Haswaste, developed by Dr. Iain Haslock.

TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

8.19	8.02	8.04	7.83	8.51	8.01
2	21	13	13	2	6
0.5	1.4	2.0	0.6	0.5	4.8
38	70	529	57	12	1,520
14	31	35	17	12	49
61	700	221	104	7	267
0.17	0.54	0.17	0.17	0.17	0.95
8	24	28	19	11	48
1	1	1	1	1	1
75	177	481	58	25	874
41.00	121.00	371.00	104.00	25.00	620.00
0.5	0.8	0.5	0.7	0.6	0.5
10	27	27	24	15	21
1.00	3.00	4.00	2.00	1.00	6.00
5	5	6	5	5	10

Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

Titanium
Tungsten
Ammoniacal N ws Boron

1.3	1.4	4.3	<1.0	14.2	9.4

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(ghi)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(ah)anthracene
Fluoranthene
Fluorene
Indeno(123cd)pyrene
Naphthalene
Phenanthrene
Pyrene
Coronene
Total PAHs (16 or 17)

2.40	1.33	11.20	0.08	0.08	5.75

TPH	
Petrol	

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Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

Diesel
Lube Oil

mg/kg

mg/kg

Crude Oil

mg/kg

White Spirit / Kerosene

mg/kg

Creosote

mg/kg

Unknown TPH with ID

mg/kg

Unknown TPHCWG

mg/kg

Total Sulphide

mg/kg

Complex Cyanide

mg/kg

Free (or Total) Cyanide

mg/kg

Thiocyanate

mg/kg

Elemental/Free Sulphur

mg/kg

Phenols Input Total Phenols HPLC **OR** individual Phenol results.

Phenol

mg/kg

Cresols

mg/kg

Xylenols

mg/kg

Resourcinol

mg/kg

Phenols Total by HPLC

mg/kg

BTEX Input Total BTEX **OR** individual BTEX results.

Benzene

mg/kg

Toluene

mg/kg

Ethylbenzene

mg/kg

Xylenes

mg/kg

				1.0	
1	1	1	1	1	1

				0.2	
				0.2	
				0.2	
				0.2	

				0.01	
				0.01	
				0.01	
				0.01	



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If any calculation cells below state "0.00000", testing has NOT been undertaken that α

Ref. 1
Ref. 2
Date

TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

Total BTEX	
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mg/kg

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PCBs (POPs)

mg/kg

PCBs Total (eg EC7/WHO12)	
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PBBs (POPs)

mg/kg

Hexabromobiphenyl (Total or PBB153; 2,2',4,4',5,5'- if only available)	
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Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

POPs Dioxins and Furans Input Total Dioxins and Furans
OR individual Dioxin and Furan results.

2,3,7,8-TeCDDmg/kg

1,2,3,7,8-PeCDDmg/kg

1,2,3,4,7,8-HxCDDmg/kg

1,2,3,6,7,8-HxCDDmg/kg

1,2,3,7,8,9-HxCDDmg/kg

1,2,3,4,6,7,8-HpCDDmg/kg

OCDDmg/kg

2,3,7,8-TeCDFmg/kg

1,2,3,7,8-PeCDFmg/kg

2,3,4,7,8-PeCDFmg/kg

1,2,3,4,7,8-HxCDFmg/kg

1,2,3,6,7,8-HxCDFmg/kg

2,3,4,6,7,8-HxCDFmg/kg

1,2,3,7,8,9-HxCDFmg/kg

1,2,3,4,6,7,8-HpCDFmg/kg

1,2,3,4,7,8,9-HpCDFmg/kg

OCDFmg/kg

Total Dioxins and Furansmg/kg

Some Pesticides (POPs unless otherwise stated)

Aldrinmg/kg

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TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

α Hexachlorocyclohexane (alpha-HCH) <i>(leave empty if total HCH results used)</i>	mg/kg					
β Hexachlorocyclohexane (beta-HCH) <i>(leave empty if total HCH results used)</i>	mg/kg					
α Cis-Chlordane (alpha) OR Total Chlordane	mg/kg					
δ Hexachlorocyclohexane (delta-HCH) <i>(leave empty if total HCH results used)</i>	mg/kg					
Dieldrin	mg/kg					
Endrin	mg/kg					
χ Hexachlorocyclohexane (gamma-HCH) (lindane) OR Total HCH	mg/kg					
Heptachlor	mg/kg					
Hexachlorobenzene	mg/kg					
o,p'-DDT <i>(leave empty if total DDT results used)</i>	mg/kg					
p,p'-DDT OR Total DDT	mg/kg					
χ Trans-Chlordane (gamma) <i>(leave empty if total Chlordane results used)</i>	mg/kg					
Chlordecone (kepone)	mg/kg					

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TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

Pentachlorobenzene
Mirex
Toxaphene (camphechlor)

mg/kg
mg/kg
mg/kg

Tin

Tin (leave empty if Organotin and Tin excl Organotin results used)

mg/kg

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Organotin
Dibutyltin; DiBT
Tributyltin; TriBT
Triphenyltin; TriPT
Tetrabutyltin; TeBT

mg/kg

mg/kg

mg/kg

mg/kg

Tin excluding Organotin
Tin excl Organotin

mg/kg

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Ref. 1

Ref. 2

Date

Asbestos in Soil

Thresholds

Asbestos detected in Soil (enter Y or N)

Y

Asbestos % Composition in Soil (Matrix Loose Fibres or Microscopic Identifiable Pieces only)

see "Carc HP7 % Asbestos in Soil (Fibres)" below

Carcinogenic HP7 % Asbestos in Soil (fibres or micro pieces)

Please be advised, if the calculation cell is "0.00000" DOES NOT MEAN asbestos testing has been undertaken and the result is zero.

≥0.1%

Asbestos Identifiable Pieces visible with the naked eye detected in the Soil (enter Y or N)

Y

Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

N	N	Y	N		N
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If Asbestos in Soil above is "Y", the soil is Hazardous Waste HP5 and I

		0.00100			
0.00000	0.00000	0.00100	0.00000	0.00000	0.00000

If Asbestos in Soil above is "Y", but Asbestos % above is "<0.1%", the soil is Non Hazardous Waste. You can only use Asbestos %
cannot use Asbestos % results when visual identifiable pieces are pres

N	N	N	N	N	N
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Date

Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

If visual identifiable pieces of asbestos are present, you cannot use Asbestos % results and the whole soil sample is Hazardous Was
05. Therefore, if Asbestos in Soil above is "Y", the Asbestos % above is "<0.1%", but the Asbestos Identifiable Pieces visib

Identifiable Pieces are Cement, Fragments, Board, Rope etc. ie anything ACM that is
All visual asbestos pieces need to be removed leaving only fibres (or micro pieces) with an Asbestos % Composition in Soil re

Hazardous Property	Thresholds	Cut Off Value	If cells below turn yellow and the text turns red, the samples should be classified a					
Corrosive HP8	≥5%	<1%	0.00705	0.02082	0.04554	0.01538	0.00513	0.07220
Irritant HP4	≥10%	<1%	0.00634	0.01549	0.06630	0.01243	0.00437	0.17629
Irritant HP4	≥20%	<1%	0.00653	0.01371	0.06738	0.01091	0.00404	0.18316
Specifc Target Organ Toxicity HP5	≥1%		0.00019	0.00019	0.00019	0.00019	0.00019	0.00019
Specifc Target Organ Toxicity HP5	≥20%		0.00178	0.00481	0.00481	0.00427	0.00267	0.00374
Specifc Target Organ Toxicity HP5	≥1%		0.00269	0.00595	0.00672	0.00427	0.00267	0.00970
Specifc Target Organ Toxicity HP5	≥10%		0.00610	0.07000	0.02210	0.01040	0.00070	0.02670
Aspiration Toxicity HP5	≥10%		0.00000	0.00000	0.00000	0.00000	0.00010	0.00000
Acute Toxicity HP6	≥0.1%	<0.1%	0.00019	0.00019	0.00019	0.00019	0.00019	0.00019
Acute Toxicity HP6	≥0.25%	<0.1%	0.00028	0.00283	0.00173	0.00173	0.00028	0.00089
Acute Toxicity HP6	≥5%	<0.1%	0.00716	0.01856	0.04419	0.01412	0.00528	0.07178
Acute Toxicity HP6	≥25%	<1%	0.01468	0.08844	0.09438	0.02562	0.00763	0.21415
Acute Toxicity HP6	≥0.25%	<0.1%	0.00021	0.00024	0.00021	0.00021	0.00021	0.00028
Acute Toxicity HP6	≥2.5%	<0.1%	0.00269	0.00595	0.00672	0.00326	0.00230	0.00941



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Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

Acute Toxicity HP6	≥15%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00006	0.00000
Acute Toxicity HP6	≥55%	<1%	0.00065	0.00074	0.00092	0.00066	0.00065	0.00065	0.00168
Acute Toxicity HP6	≥0.1%	<0.1%	0.00019	0.00019	0.00019	0.00019	0.00019	0.00019	0.00019
Acute Toxicity HP6	≥0.5%	<0.1%	0.00298	0.00651	0.00717	0.00366	0.00264	0.00264	0.01021
Acute Toxicity HP6	≥3.5%	<0.1%	0.00014	0.00014	0.00014	0.00014	0.00016	0.00016	0.00014
Acute Toxicity HP6	≥22.5%	<1%	0.01789	0.09966	0.12944	0.03535	0.00945	0.00945	0.27389
Carcinogenic HP7	≥0.1%		0.00610	0.07000	0.02210	0.01040	0.00230	0.00230	0.02670
Carcinogenic HP7	≥0.1%		0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
Carcinogenic HP7	≥1%		0.00178	0.00481	0.00481	0.00427	0.00267	0.00267	0.00374
Carcinogenic HP7 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
pH Corrosive HP8 pH (soil or leachate)	H8 ≥11.5		8.19	8.02	8.04	7.83	8.51	8.51	8.01
pH Corrosive HP8 pH (soil or leachate)	H8 ≤2		8.19	8.02	8.04	7.83	8.51	8.51	8.01
Toxic for Reproduction HP10	≥0.3%		0.00610	0.07000	0.02210	#VALUE!	0.00457	0.00457	0.02670
Toxic for Reproduction HP10	≥3%		0.00269	0.00595	0.00672	0.00427	0.00267	0.00267	0.00941
Mutagenic HP11	≥0.1%		0.00269	0.00595	0.00672	0.00326	0.00230	0.00230	0.00941
Mutagenic HP11 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00



Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

Haswaste, developed by Dr. Iain Haslock.



Ref. 1

Ref. 2

Date

TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%
Mutagenic HP11	≥1%
Produces Toxic Gases HP12 Sulphide	≥1,400mg/kg
Produces Toxic Gases HP12 Cyanide	≥1,200mg/kg
Produces Toxic Gases HP12 Thiocyanate	≥2,600mg/kg
HP13 Sensitising	≥10%

#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
0.00178	0.00485	0.00566	0.00427	0.00267	0.00970
0.0	0.0	0.0	0.0	0.0	0.0
1.0	1.0	1.0	1.0	1.0	1.0
0.0	0.0	0.0	0.0	0.0	0.0
0.00269	0.00595	0.00672	0.00384	0.00230	0.00970

Ecotoxic HP14 amended v6	≥25%	<0.1%
-----------------------------	------	-------

0.02497	0.11426	0.15776	0.03332	0.01040	0.32909
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Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

Haswaste, developed by Dr. Iain Haslock.



Ref. 1
Ref. 2
Date

TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

Ecotoxic HP14 amended v6	≥25%	<0.1% (except Be, V, Te, Tl, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T- Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene , Xylene + BTEX 1%).	0.02698	0.11943	0.16279	0.03791	0.01348	0.33305
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Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23

Ecotoxic HP14 amended v6	≥25%	<0.1% (except Be, V, Te, TI, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T- Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene , Xylene + BTEX 1%).	2.51738	11.47801	15.82634	3.37821	1.06854	32.94816
Persistent Organic Pollutant (PCB, PBB or POP Pesticides)	>0.005%		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Persistent Organic Pollutant (Total Dioxins+Furans)	>0.0000015%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000



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Persistent Organic Pollutant
(Individual Dioxins+Furans)

>0.0000015%

Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

TP309	TP301	TP302	TP302	WS311	MP301
3.00	0.50	0.40	1.10	1.80	1.00
11-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23	20-Apr-23	05-Apr-23
0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000

Date _____

pH (leachate)

mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg

[illegible]

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

7.99	7.89	8.02	8.46	8.67	8.34
36	13	5	12	4	5
3.1	15.4	7.0	1.6	0.7	0.7
503	4,520	1,520	502	62	10
43	161	88	33	30	16
471	1,220	700	254	48	9
2.42	4.76	3.31	0.87	0.18	0.17
70	303	80	36	29	16
1	2	1	1	1	1
910	5,180	3,390	305	57	33
343.00	1,430.00	503.00	188.00	124.00	30.00
1.6	0.6	0.5	1.1	1.2	0.5
43	32	25	29	33	17
9.00	26.00	16.00	3.00	1.00	1.00
16	50	26	7	5	5

Date _____

Ammoniacal N	
ws Boron	

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(ghi)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(ah)anthracene
Fluoranthene
Fluorene
Indeno(123cd)pyrene
Naphthalene
Phenanthrene
Pyrene
Coronene
Total PAHs (16 or 17)

Petrol	
--------	--

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

3.0	5.8	18.6	13.4	1.7	1.4

24.70	4.47	11.70	16.40	0.26	0.08

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Date _____

Lube Oil

Crude Oil

White Spirit / Kerosene

Creosote

Unknown TPH with ID

Unknown TPHCWG

Total Sulphide

Complex Cyanide

Free (or Total) Cyanide

Thiocyanate

Elemental/Free Sulphur

Phenols Input Total Phenols HPLC **OR** individual Phenol results.

Phenol

Cresols

Xylenols

Resourcinol

Phenols Total by HPLC	
1	0.000
2	0.000
3	0.000
4	0.000
5	0.000
6	0.000
7	0.000
8	0.000
9	0.000
10	0.000
11	0.000
12	0.000
13	0.000
14	0.000
15	0.000
16	0.000
17	0.000
18	0.000
19	0.000
20	0.000
21	0.000
22	0.000
23	0.000
24	0.000
25	0.000
26	0.000
27	0.000
28	0.000
29	0.000
30	0.000
31	0.000
32	0.000
33	0.000
34	0.000
35	0.000
36	0.000
37	0.000
38	0.000
39	0.000
40	0.000
41	0.000
42	0.000
43	0.000
44	0.000
45	0.000
46	0.000
47	0.000
48	0.000
49	0.000
50	0.000
51	0.000
52	0.000
53	0.000
54	0.000
55	0.000
56	0.000
57	0.000
58	0.000
59	0.000
60	0.000
61	0.000
62	0.000
63	0.000
64	0.000
65	0.000
66	0.000
67	0.000
68	0.000
69	0.000
70	0.000
71	0.000
72	0.000
73	0.000
74	0.000
75	0.000
76	0.000
77	0.000
78	0.000
79	0.000
80	0.000
81	0.000
82	0.000
83	0.000
84	0.000
85	0.000
86	0.000
87	0.000
88	0.000
89	0.000
90	0.000
91	0.000
92	0.000
93	0.000
94	0.000
95	0.000
96	0.000
97	0.000
98	0.000
99	0.000
100	0.000

BTEX Input Total BTEX **OR** individual BTEX results.

Benzene

Toluene

Ethylbenzene

Xylenes

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

		3,620.0	441.0	6.0	2.0
1					

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Haswaste, developed by Dr. Iain Haslock.

Ref. 1

Ref. 2

Date

Total BTEX

PCBs (POPs)

PCBs Total (eg EC7/WHO12)

PBBs (POPs)

Hexabromobiphenyl (Total or PBB153; 2,2',4,4',5,5'- if only available)

initially display either "0.0000" or "#DIV/0!".
contributes to that Hazardous Property.

Please enter available data in the rows associated with that Hazardous Property.
If any calculation cells below state "0.0000", please check the data entered.

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					
	0.07				

Date _____

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

2,3,7,8-TeCDD
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
2,3,7,8-TeCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
Total Dioxins and Furans

[illegible]

Aldrin

mg/kg

--	--	--	--	--	--

Date _____

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

α Hexachlorocyclohexane (alpha-HCH) <i>(leave empty if total HCH results used)</i>	mg/kg					
β Hexachlorocyclohexane (beta-HCH) <i>(leave empty if total HCH results used)</i>	mg/kg					
α Cis-Chlordane (alpha) OR Total Chlordane	mg/kg					
δ Hexachlorocyclohexane (delta-HCH) <i>(leave empty if total HCH results used)</i>	mg/kg					
Dieldrin	mg/kg					
Endrin	mg/kg					
χ Hexachlorocyclohexane (gamma-HCH) (lindane) OR Total HCH	mg/kg					
Heptachlor	mg/kg					
Hexachlorobenzene	mg/kg					
o,p'-DDT <i>(leave empty if total DDT results used)</i>	mg/kg					
p,p'-DDT OR Total DDT	mg/kg					
χ Trans-Chlordane (gamma) <i>(leave empty if total Chlordane results used)</i>	mg/kg					
Chlordecone (kepone)	mg/kg					



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Ref. 1

Ref. 2

Date

Pentachlorobenzene

Mirex

Toxaphene (camphechlor)

Tin

Tin *(leave empty if Organotin and Tin excl Organotin results used)*

Organotin

Dibutyltin; DiBT

Tributyltin; TriBT

Triphenyltin; TriPT

Tetrabutyltin; TeBT

Tin excluding Organotin

Tin excl Organotin

initially display either "0.0000" or "#DIV/0!".
contributes to that Hazardous Property.

Please enter available data in the rows associated with the Hazardous Property.
If any calculation cells below state "0.0000", it indicates that the value is zero.

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

mg/kg
mg/kg
mg/kg

mg/kg

--	--	--	--	--	--

mg/kg
mg/kg
mg/kg
mg/kg

mg/kg

--	--	--	--	--	--

Date _____

Asbestos detected in Soil (enter Y or N)
--

%

$\geq 0.1\%$

Asbestos Identifiable Pieces
visible with the naked eye
detected in the Soil (enter Y or N)

Y

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

N	N	N	N	N	N
---	---	---	---	---	---

If A:

0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

results where loose fibres or micro pieces are only present. You ent. If Asbestos in Soil above is "Y", but Asbestos % above is "<0.1% can

	N	N	N	N	N
--	---	---	---	---	---



Haswaste, developed by Dr. Iain Haslock.

Ref. 1

Ref. 2

Date

initially display either "0.0000" or "#DIV/0!".
contributes to that Hazardous Property.

Please enter available data in the rows associated with that Hazardous Property.
If any calculation cells below state "0.0000", this indicates that the value is not available.

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

HP5 and HP7 Construction material containing Asbestos 17 06
If visual identifiable pieces of asbestos are present, you cannot use the naked eye is "Y", the soil is Hazardous Waste.

not Loose Fibres.
Identifiable Pieces
result of <0.1% for the soil to become non-hazardous waste.
All visual asbestos pieces need to be removed leaving only

Hazardous Property	Thresholds	Cut Off Value	Is Hazardous Waste. If cells below turn yellow					
Corrosive HP8	≥5%	<1%	0.04731	0.17563	0.06786	0.02672	0.01869	0.00673
Irritant HP4	≥10%	<1%	0.06925	0.51817	0.17687	0.06347	0.01341	0.00482
Irritant HP4	≥20%	<1%	0.07553	0.57659	0.19172	0.06659	0.01359	0.00475
Specific Target Organ Toxicity HP5	≥1%		0.00019	0.00000	0.00000	0.00000	0.00000	0.00000
Specific Target Organ Toxicity HP5	≥20%		0.00765	0.00570	0.00445	0.00516	0.00587	0.00303
Specific Target Organ Toxicity HP5	≥1%		0.01414	0.06121	0.01690	0.00727	0.00587	0.00323
Specific Target Organ Toxicity HP5	≥10%		0.04710	0.12200	0.36200	0.04410	0.00480	0.00090
Aspiration Toxicity HP5	≥10%		0.00000	0.00001	0.36200	0.04410	0.00060	0.00020
Acute Toxicity HP6	≥0.1%	<0.1%	0.00019	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.25%	<0.1%	0.00499	0.00219	0.00099	0.00167	0.00055	0.00068
Acute Toxicity HP6	≥5%	<0.1%	0.04343	0.17447	0.06757	0.02578	0.01885	0.00644
Acute Toxicity HP6	≥25%	<1%	0.13043	0.70765	0.26736	0.09720	0.02423	0.00897
Acute Toxicity HP6	≥0.25%	<0.1%	0.00043	0.00048	0.00033	0.00009	0.00002	0.00002
Acute Toxicity HP6	≥2.5%	<0.1%	0.00826	0.03091	0.01690	0.00634	0.00576	0.00307

Table 3 of the CLP, CL Inventory, ATPs, IARC, Concawe, MSDSs, REACH + Pesticide Properties databases. Worst case REACH + MSDS's used for "STOT + Acute Toxicity".



Haswaste, developed by Dr. Iain Haslock.



Ref. 1

Ref. 2

Date

initially display either "0.0000" or "#DIV/0!".
contributes to that Hazardous Property.

Please enter available data in the rows associated with that Hazardous Property.
If any calculation cells below state "0.0000",

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

Acute Toxicity HP6	≥15%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥55%	<1%	0.00223	0.00755	0.00382	0.00100	0.00067	0.00067	0.00067
Acute Toxicity HP6	≥0.1%	<0.1%	0.00019	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.5%	<0.1%	0.00954	0.03320	0.01816	0.00708	0.00640	0.00339	0.00339
Acute Toxicity HP6	≥3.5%	<0.1%	0.00014	0.00028	0.00014	0.00014	0.00014	0.00014	0.00014
Acute Toxicity HP6	≥22.5%	<1%	0.16003	0.84267	0.31267	0.11336	0.03594	0.01129	0.01129
Carcinogenic HP7	≥0.1%		0.04710	0.12200	0.36200	0.04410	0.00586	0.00323	0.00323
Carcinogenic HP7	≥0.1%		0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
Carcinogenic HP7	≥1%		0.00765	0.00600	0.00445	0.00516	0.00587	0.00303	0.00303
Carcinogenic HP7 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
pH Corrosive HP8 pH (soil or leachate)	H8 ≥11.5		7.99	7.89	8.02	8.46	8.67	8.34	8.34
pH Corrosive HP8 pH (soil or leachate)	H8 ≤2		7.99	7.89	8.02	8.46	8.67	8.34	8.34
Toxic for Reproduction HP10	≥0.3%		0.04710	0.12200	0.07000	0.02540	0.00586	0.00323	0.00323
Toxic for Reproduction HP10	≥3%		0.00826	0.03091	0.36200	0.04410	0.00587	0.00307	0.00307
Mutagenic HP11	≥0.1%		0.00826	0.03091	0.36200	0.04410	0.00576	0.00307	0.00307
Mutagenic HP11 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00



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Ref. 1
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Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%
Mutagenic HP11	≥1%
Produces Toxic Gases HP12 Sulphide	≥1,400mg/kg
Produces Toxic Gases HP12 Cyanide	≥1,200mg/kg
Produces Toxic Gases HP12 Thiocyanate	≥2,600mg/kg
HP13 Sensitising	≥10%

Ecotoxic HP14 amended v6	≥25%	<0.1%
---------------------------------	------	-------

initially display either "0.0000" or "#DIV/0!".
contributes to that Hazardous Property.

Please enter available data in the rows associated with that Hazardous Property.
If any calculation cells below state "0.0000",

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
0.01414	0.06121	0.01616	0.00727	0.00587	0.00323
0.0	0.0	0.0	0.0	0.0	0.0
1.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.01414	0.06121	0.01690	0.00727	0.00586	0.00323

0.24819	1.37684	0.70157	0.13747	0.03133	0.01336
---------	---------	---------	---------	---------	---------

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

Ecotoxic HP14 amended v6	≥25%	<0.1% (except Be, V, Te, Tl, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T- Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene , Xylene + BTEX 1%).	0.25657	1.38282	1.06825	0.18723	0.03835	0.01681
-----------------------------	------	--	---------	---------	---------	---------	---------	---------

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

Date _____

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

Ecotoxic HP14 amended v6	≥25%	<0.1% (except Be, V, Te, Tl, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T- Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene , Xylene + BTEX 1%).	24.90264	137.74360	73.82358	14.24474	3.20341	1.37004
Persistent Organic Pollutant (PCB, PBB or POP Pesticides)	>0.005%		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Persistent Organic Pollutant (Total Dioxins+Furans)	>0.0000015%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000



Haswaste, developed by Dr. Iain Haslock.

Ref. 1

Ref. 2

Date

Persistent Organic Pollutant
(Individual Dioxins+Furans)

>0.0000015%

initially display either "0.0000" or "#DIV/0!".
contributes to that Hazardous Property.

Please enter available data in the rows associated with this Hazardous Property.
If any calculation cells below state "0.0000" then this is a warning.

HP301	RBH403	RBH403	RBH403	RBH403	RBH403
0.50	0.50	3.50	6.00	9.90	10.20
20-Apr-23					

0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
--------------	--------------	--------------	--------------	--------------	--------------

Date _____

pH (leachate)

Arsenic
Cadmium
Copper
CrVI or Chromium
Lead
Mercury
Nickel
Selenium
Zinc

Barium
Beryllium
Vanadium

Cobalt
Manganese
Molybdenum

Antimony

Aluminium
Bismuth
CrIII
Iron
Strontium
Tellurium
Thallium

[illegible]

associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!". 000000", testing has NOT been undertaken that contributes to that Hazardous Property.

RBH401	RBH401	RBH401	RBH402	RBH402	RBH402
6.50	8.00	15.00	1.50	3.70	5.30

8.29	7.86	8.28	8.28	8.13	8.22
6	2	1	8	25	4
0.9	0.9	0.5	0.9	1.2	0.5
41	36	7	97	394	41
29	32	7	25	14	25
79	20	5	161	96	635
0.35	0.17	0.17	0.55	0.17	0.54
29	27	8	20	32	24
1	1	1	1	1	1
71	64	16	245	74	48
123.00	139.00	20.00	213.00	104.00	123.00
1.5	1.2	0.5	0.7	1.9	0.8
30	35	9	23	31	23
29.00	27.00	8.00	2.00	7.00	1.00
5	5	5	6	5	6

--

Date _____

Ammoniacal N	
ws Boron	

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(ghi)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(ah)anthracene
Fluoranthene
Fluorene
Indeno(123cd)pyrene
Naphthalene
Phenanthrene
Pyrene
Coronene
Total PAHs (16 or 17)

Petrol	
--------	--

mg/kg

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Table 3 of the CLP, CL Inventory, ATPs, IARC, Concawe, MSDSs, REACH + Pesticide Properties databases. Worst case REACH + MSDS's used for "" STOT + Acute Toxicity.



Haswaste, developed by Dr. Iain Haslock.



Ref. 1

Ref. 2

Date

Diesel

Lube Oil

Crude Oil

White Spirit / Kerosene

Creosote

Unknown TPH with ID

Unknown TPHCWG

Total Sulphide

Complex Cyanide

Free (or Total) Cyanide

Thiocyanate

Elemental/Free Sulphur

Phenols Input Total Phenols HPLC **OR** individual Phenol results.

Phenol

Cresols

Xylenols

Resourcinol

Phenols Total by HPLC

BTEX Input Total BTEX **OR** individual BTEX results.

Benzene

Toluene

Ethylbenzene

Xylenes

ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

RBH401	RBH401	RBH401	RBH402	RBH402	RBH402
6.50	8.00	15.00	1.50	3.70	5.30

101.0	0.0	0.0	293.0	93.0	0.0

--	--	--	--	--	--



Haswaste, developed by Dr. Iain Haslock.

Ref. 1

Ref. 2

Date

Total BTEX

PCBs (POPs)

PCBs Total (eg EC7/WHO12)

PBBs (POPs)

Hexabromobiphenyl (Total or PBB153; 2,2',4,4',5,5'- if only available)

ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!". 00000", testing has NOT been undertaken that contributes to that Hazardous Property.

	RBH401	RBH401	RBH401	RBH402	RBH402	RBH402
	6.50	8.00	15.00	1.50	3.70	5.30
mg/kg						
mg/kg						
mg/kg						



Haswaste, developed by Dr. Iain Haslock.

Ref. 1

Ref. 2

Date

ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

RBH401	RBH401	RBH401	RBH402	RBH402	RBH402
6.50	8.00	15.00	1.50	3.70	5.30

POPs Dioxins and Furans Input Total Dioxins and Furans
OR individual Dioxin and Furan results.

2,3,7,8-TeCDD
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
2,3,7,8-TeCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
Total Dioxins and Furans

mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg

Some Pesticides (POPs unless otherwise stated)

Aldrin

mg/kg

--	--	--	--	--	--

Date _____

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

RBH401	RBH401	RBH401	RBH402	RBH402	RBH402
6.50	8.00	15.00	1.50	3.70	5.30

[illegible]

Date _____

Toxaphene (camphechlor)

Tin (leave empty if Organotin and Tin excl Organotin results used)

Dibutyltin; DiBT

Tributyltin; TriBT

Triphenyltin; TriPT

Tetrabutyltin; TeBT

Tin excluding Organotin

Tin excl Organotin

associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!". 00000", testing has NOT been undertaken that contributes to that Hazardous Property.

[illegible]



Haswaste, developed by Dr. Iain Haslock.

Ref. 1

Ref. 2

Date

Asbestos in Soil	Thresholds
Asbestos detected in Soil (enter Y or N)	Y

Asbestos % Composition in Soil (Matrix Loose Fibres or Microscopic Identifiable Pieces only)	see "Carc HP7 % Asbestos in Soil (Fibres)" below
Carcinogenic HP7 % Asbestos in Soil (fibres or micro pieces) <i>Please be advised, if the calculation cell is "0.00000" DOES NOT MEAN asbestos testing has been undertaken and the result is zero.</i>	≥0.1%

Asbestos Identifiable Pieces visible with the naked eye detected in the Soil (enter Y or N)	Y
---	---

ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!". "00000", testing has NOT been undertaken that contributes to that Hazardous Property.

RBH401	RBH401	RBH401	RBH402	RBH402	RBH402
6.50	8.00	15.00	1.50	3.70	5.30

N	N	N	N	N	N
---	---	---	---	---	---

sbestos in Soil above is "Y", the soil is Hazardous Waste HP5 and HP7

0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

", the soil is Non Hazardous Waste. You can only use Asbestos % results where loose fibres or micro pieces are only present. You not use Asbestos % results when visual identifiable pieces are present.

N	N	N	N	N	N
---	---	---	---	---	---



Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!". "0.0000", testing has NOT been undertaken that contributes to that Hazardous Property.

RBH401	RBH401	RBH401	RBH402	RBH402	RBH402
6.50	8.00	15.00	1.50	3.70	5.30

ie Asbestos % results and the whole soil sample is Hazardous Waste HP5 and HP7 Construction material containing Asbestos 17 06 stos % above is "<0.1%", but the Asbestos Identifiable Pieces visible with the naked eye is "Y", the soil is Hazardous Waste.

are Cement, Fragments, Board, Rope etc. ie anything ACM that is not Loose Fibres.

fibres (or micro pieces) with an Asbestos % Composition in Soil result of <0.1% for the soil to become non-hazardous waste.

Hazardous Property	Thresholds	Cut Off Value	If the Asbestos % results and the whole soil sample is Hazardous Waste HP5 and HP7 Construction material containing Asbestos 17 06 stos % above is "<0.1%", but the Asbestos Identifiable Pieces visible with the naked eye is "Y", the soil is Hazardous Waste.					
Corrosive HP8	≥5%	<1%	0.01866	0.02031	0.00348	0.02716	0.01639	0.01763
Irritant HP4	≥10%	<1%	0.01077	0.01056	0.00253	0.01611	0.05334	0.00926
Irritant HP4	≥20%	<1%	0.01626	0.01413	0.00384	0.01688	0.05334	0.01000
Specific Target Organ Toxicity HP5	≥1%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specific Target Organ Toxicity HP5	≥20%		0.00534	0.00623	0.00160	0.00409	0.00552	0.00409
Specific Target Organ Toxicity HP5	≥1%		0.00586	0.00623	0.00162	0.00480	0.00646	0.00485
Specific Target Organ Toxicity HP5	≥10%		0.01010	0.00200	0.00050	0.02930	0.00960	0.06350
Aspiration Toxicity HP5	≥10%		0.01010	0.00000	0.00000	0.02930	0.00930	0.00000
Acute Toxicity HP6	≥0.1%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.25%	<0.1%	0.00083	0.00028	0.00015	0.00111	0.00332	0.00058
Acute Toxicity HP6	≥5%	<0.1%	0.01869	0.02073	0.00371	0.02656	0.01410	0.01761
Acute Toxicity HP6	≥25%	<1%	0.02516	0.01845	0.00517	0.03727	0.06726	0.07785
Acute Toxicity HP6	≥0.25%	<0.1%	0.00004	0.00002	0.00002	0.00006	0.00002	0.00005
Acute Toxicity HP6	≥2.5%	<0.1%	0.00557	0.00614	0.00134	0.00480	0.00269	0.00480



Haswaste, developed by Dr. Iain Haslock.



Ref. 1

Ref. 2

Date

ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

RBH401	RBH401	RBH401	RBH402	RBH402	RBH402
6.50	8.00	15.00	1.50	3.70	5.30

Acute Toxicity HP6	≥15%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥55%	<1%	0.00069	0.00069	0.00065	0.00081	0.00072	0.00077	0.00077
Acute Toxicity HP6	≥0.1%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.5%	<0.1%	0.00638	0.00680	0.00164	0.00526	0.00369	0.00527	0.00527
Acute Toxicity HP6	≥3.5%	<0.1%	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014
Acute Toxicity HP6	≥22.5%	<1%	0.03603	0.03165	0.00651	0.05650	0.07650	0.08938	0.08938
Carcinogenic HP7	≥0.1%		0.01010	0.00614	0.00162	0.02930	0.00960	0.06350	0.06350
Carcinogenic HP7	≥0.1%		0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
Carcinogenic HP7	≥1%		0.00534	0.00623	0.00160	0.00409	0.00552	0.00409	0.00409
Carcinogenic HP7 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
pH Corrosive HP8 pH (soil or leachate)	H8 ≥11.5		8.29	7.86	8.28	8.28	8.13	8.22	8.22
pH Corrosive HP8 pH (soil or leachate)	H8 ≤2		8.29	7.86	8.28	8.28	8.13	8.22	8.22
Toxic for Reproduction HP10	≥0.3%		0.00790	0.00545	0.00162	0.01610	0.00960	0.06350	0.06350
Toxic for Reproduction HP10	≥3%		0.01010	0.00623	0.00160	0.02930	0.00930	0.00480	0.00480
Mutagenic HP11	≥0.1%		0.01010	0.00614	0.00134	0.02930	0.00930	0.00480	0.00480
Mutagenic HP11 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00



Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%
Mutagenic HP11	≥1%
Produces Toxic Gases HP12 Sulphide	≥1,400mg/kg
Produces Toxic Gases HP12 Cyanide	≥1,200mg/kg
Produces Toxic Gases HP12 Thiocyanate	≥2,600mg/kg
HP13 Sensitising	≥10%

Ecotoxic HP14 amended v6	≥25%	<0.1%
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ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

RBH401	RBH401	RBH401	RBH402	RBH402	RBH402
6.50	8.00	15.00	1.50	3.70	5.30

#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
0.00586	0.00623	0.00162	0.00409	0.00646	0.00485
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.00586	0.00614	0.00162	0.00480	0.00646	0.00485

0.03463	0.02619	0.00660	0.06913	0.07654	0.08456
---------	---------	---------	---------	---------	---------

Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

RBH401	RBH401	RBH401	RBH402	RBH402	RBH402
6.50	8.00	15.00	1.50	3.70	5.30

Ecotoxic HP14 amended v6	≥25%	<0.1% (except Be, V, Te, Tl, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T- Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene , Xylene + BTEX 1%).	0.05076	0.03296	0.00843	0.10284	0.09222	0.08902
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Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

RBH401	RBH401	RBH401	RBH402	RBH402	RBH402
6.50	8.00	15.00	1.50	3.70	5.30

Ecotoxic HP14 amended v6	≥25%	<0.1% (except Be, V, Te, Tl, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T- Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene , Xylene + BTEX 1%).	3.62434	2.68637	0.67820	7.24993	7.81084	8.50079
Persistent Organic Pollutant (PCB, PBB or POP Pesticides)	>0.005%		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Persistent Organic Pollutant (Total Dioxins+Furans)	>0.0000015%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000



Haswaste, developed by Dr. Iain Haslock.



Ref. 1
Ref. 2
Date

Persistent Organic Pollutant (Individual Dioxins+Furans)	>0.0000015%
---	-------------

ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

RBH401	RBH401	RBH401	RBH402	RBH402	RBH402
6.50	8.00	15.00	1.50	3.70	5.30

0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
--------------	--------------	--------------	--------------	--------------	--------------

Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

% Moisture
pH (soil)
pH (leachate)

Arsenic
Cadmium
Copper
CrVI or Chromium
Lead
Mercury
Nickel
Selenium
Zinc

Barium
Beryllium
Vanadium
Cobalt
Manganese
Molybdenum
Antimony
Aluminium
Bismuth
CrIII
Iron
Strontium
Tellurium
Thallium

[illegible]

Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

Titanium
Tungsten
Ammoniacal N
ws Boron

1.0	1.0	1.8	1.0	1.0	1.0

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(ghi)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(ah)anthracene
Fluoranthene
Fluorene
Indeno(123cd)pyrene
Naphthalene
Phenanthrene
Pyrene
Coronene
Total PAHs (16 or 17)

21.00	14.90	18.90	3.39	47.00	56.60

TPH
Petrol

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Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

Diesel	mg/kg					
Lube Oil	mg/kg					
Crude Oil	mg/kg					
White Spirit / Kerosene	mg/kg					
Creosote	mg/kg					
Unknown TPH with ID	mg/kg					
Unknown TPHCWG	mg/kg			2,010.0	719.0	
Total Sulphide	mg/kg					
Complex Cyanide	mg/kg					
Free (or Total) Cyanide	mg/kg	9	11	1	1	2
Thiocyanate	mg/kg					
Elemental/Free Sulphur	mg/kg					

Phenol	mg/kg
Cresols	mg/kg
Xylenols	mg/kg
Resorcinol	mg/kg
Phenols Total by HPLC	mg/kg

0.2					

Benzene	mg/kg
Toluene	mg/kg
Ethylbenzene	mg/kg
Xylenes	mg/kg

		0.01		0.01	
		0.01		0.01	
		0.01		0.01	
		0.01		0.01	



Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

Please enter available data in the rows associated with the test (grey) cells. Calculation cells
 If any calculation cells below state "0.00000", testing has NOT been undertaken that cell

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

Total BTEX

mg/kg

--	--	--	--	--	--

PCBs (POPs)
PCBs Total (eg EC7/WHO12)

mg/kg

--	--	--	--	--	--

PBBs (POPs)
Hexabromobiphenyl (Total or PBB153; 2,2',4,4',5,5'- if only available)

mg/kg

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Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

2,3,7,8-TeCDD
1,2,3,7,8-PeCDD
1,2,3,4,7,8-HxCDD
1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD
2,3,7,8-TeCDF
1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF
1,2,3,4,7,8-HxCDF
1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF
1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF
OCDF
Total Dioxins and Furans

[illegible]

Aldrin

mg/kg

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Haswaste, developed by Dr. Iain Haslock.

Ref. 1
Ref. 2
Date

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

α Hexachlorocyclohexane (alpha-HCH) <i>(leave empty if total HCH results used)</i>	mg/kg					
β Hexachlorocyclohexane (beta-HCH) <i>(leave empty if total HCH results used)</i>	mg/kg					
α Cis-Chlordane (alpha) OR Total Chlordane	mg/kg					
δ Hexachlorocyclohexane (delta-HCH) <i>(leave empty if total HCH results used)</i>	mg/kg					
Dieldrin	mg/kg					
Endrin	mg/kg					
χ Hexachlorocyclohexane (gamma-HCH) (lindane) OR Total HCH	mg/kg					
Heptachlor	mg/kg					
Hexachlorobenzene	mg/kg					
o,p'-DDT <i>(leave empty if total DDT results used)</i>	mg/kg					
p,p'-DDT OR Total DDT	mg/kg					
χ Trans-Chlordane (gamma) <i>(leave empty if total Chlordane results used)</i>	mg/kg					
Chlordecone (kepone)	mg/kg					



Haswaste, developed by Dr. Iain Haslock.



Ref. 1

Ref. 2

Date

Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

Pentachlorobenzene
Mirex
Toxaphene (camphechlor)

mg/kg

mg/kg

mg/kg

Tin

Tin *(leave empty if Organotin and Tin excl Organotin results used)*

mg/kg

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Organotin

Dibutyltin; DiBT
Tributyltin; TriBT
Triphenyltin; TriPT
Tetrabutyltin; TeBT

mg/kg

mg/kg

mg/kg

mg/kg

Tin excluding Organotin

Tin excl Organotin

mg/kg

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Haswaste, developed by Dr. Iain Haslock.

Ref. 1
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Asbestos in Soil	Thresholds
Asbestos detected in Soil (enter Y or N)	Y

Asbestos % Composition in Soil (Matrix Loose Fibres or Microscopic Identifiable Pieces only)	see "Carc HP7 % Asbestos in Soil (Fibres)" below
Carcinogenic HP7 % Asbestos in Soil (fibres or micro pieces)	≥0.1%
<i>Please be advised, if the calculation cell is "0.00000" DOES NOT MEAN asbestos testing has been undertaken and the result is zero.</i>	

Asbestos Identifiable Pieces visible with the naked eye detected in the Soil (enter Y or N)	Y
---	---

Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

Y	N	N	N	N	N
---	---	---	---	---	---

If Asbestos in Soil above is "Y", the soil is Hazardous Waste HP5 and I

0.00700					
0.00700	0.00000	0.00000	0.00000	0.00000	0.00000

If Asbestos in Soil above is "Y", but Asbestos % above is "<0.1%", the soil is Non Hazardous Waste. You can only use Asbestos % cannot use Asbestos % results when visual identifiable pieces are pres

N		N	N	N	N
---	--	---	---	---	---



Haswaste, developed by Dr. Iain Haslock.



Ref. 1

Ref. 2

Date

Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

If visual identifiable pieces of asbestos are present, you cannot use Asbestos % results and the whole soil sample is Hazardous Was
05. Therefore, if Asbestos in Soil above is "Y", the Asbestos % above is "<0.1%", but the Asbestos Identifiable Pieces visib

Identifiable Pieces are Cement, Fragments, Board, Rope etc. ie anything ACM that is
All visual asbestos pieces need to be removed leaving only fibres (or micro pieces) with an Asbestos % Composition in Soil re

Hazardous Property	Thresholds	Cut Off Value	If cells below turn yellow and the text turns red, the samples should be classified a					
Corrosive HP8	≥5%	<1%	0.05746	0.09102	0.04235	0.03919	0.03588	0.03997
Irritant HP4	≥10%	<1%	0.14147	1.60754	0.08297	0.03853	0.04215	0.03603
Irritant HP4	≥20%	<1%	0.14017	1.58376	0.09078	0.03935	0.04493	0.03841
Specifc Target Organ Toxicity HP5	≥1%		0.00169	0.00207	0.00019	0.00019	0.00038	0.00019
Specifc Target Organ Toxicity HP5	≥20%		0.00694	0.03151	0.00605	0.00659	0.00470	0.00587
Specifc Target Organ Toxicity HP5	≥1%		0.00700	0.03151	0.01192	0.00828	0.00427	0.00606
Specifc Target Organ Toxicity HP5	≥10%		0.18400	1.81000	0.20100	0.05200	0.07190	0.09060
Aspiration Toxicity HP5	≥10%		0.00000	0.00000	0.20100	0.00000	0.07190	0.00000
Acute Toxicity HP6	≥0.1%	<0.1%	0.00169	0.00207	0.00019	0.00019	0.00038	0.00019
Acute Toxicity HP6	≥0.25%	<0.1%	0.00368	0.01720	0.00147	0.00218	0.00262	0.00493
Acute Toxicity HP6	≥5%	<0.1%	0.05463	0.07540	0.04149	0.03781	0.03388	0.03604
Acute Toxicity HP6	≥25%	<1%	0.33975	3.54973	0.13683	0.10146	0.09920	0.13621
Acute Toxicity HP6	≥0.25%	<0.1%	0.00194	0.00264	0.00034	0.00025	0.00048	0.00050
Acute Toxicity HP6	≥2.5%	<0.1%	0.00461	0.01459	0.00883	0.00538	0.00307	0.00365



Haswaste, developed by Dr. Iain Haslock.



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Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

Acute Toxicity HP6	≥15%	<0.1%	0.00002	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥55%	<1%	0.00955	0.12713	0.00197	0.00442	0.00362	0.00248
Acute Toxicity HP6	≥0.1%	<0.1%	0.00169	0.00207	0.00019	0.00019	0.00038	0.00019
Acute Toxicity HP6	≥0.5%	<0.1%	0.00562	0.01716	0.00959	0.00625	0.00368	0.00471
Acute Toxicity HP6	≥3.5%	<0.1%	0.00016	0.00014	0.00014	0.00014	0.00014	0.00014
Acute Toxicity HP6	≥22.5%	<1%	0.37748	3.48091	0.16517	0.12840	0.12118	0.15977
Carcinogenic HP7	≥0.1%		0.18400	1.81000	0.20100	0.05200	0.07190	0.09060
Carcinogenic HP7	≥0.1%		0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
Carcinogenic HP7	≥1%		0.00924	0.12600	0.00605	0.00659	0.00470	0.00587
Carcinogenic HP7 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00
Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
pH Corrosive HP8 pH (soil or leachate)	H8 ≥11.5		8.09	6.78	8.09	8.08	8.15	8.02
pH Corrosive HP8 pH (soil or leachate)	H8 ≤2		8.09	6.78	8.09	8.08	8.15	8.02
Toxic for Reproduction HP10	≥0.3%		0.18400	1.81000	0.03940	0.05200	0.04720	0.09060
Toxic for Reproduction HP10	≥3%		0.00694	0.03151	0.20100	0.00659	0.07190	0.00587
Mutagenic HP11	≥0.1%		0.00461	0.01459	0.20100	0.00538	0.07190	0.00566
Mutagenic HP11 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00



Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that cell

Haswaste, developed by Dr. Iain Haslock.



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Date

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%
Mutagenic HP11	≥1%
Produces Toxic Gases HP12 Sulphide	≥1,400mg/kg
Produces Toxic Gases HP12 Cyanide	≥1,200mg/kg
Produces Toxic Gases HP12 Thiocyanate	≥2,600mg/kg
HP13 Sensitising	≥10%

#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
0.00694	0.03151	0.01192	0.00828	0.00470	0.00606
0.0	0.0	0.0	0.0	0.0	0.0
9.0	11.0	1.0	1.0	2.0	1.0
0.0	0.0	0.0	0.0	0.0	0.0
0.00606	0.02020	0.01192	0.00828	0.00470	0.00606

Ecotoxic HP14 amended v6	≥25%	<0.1%
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0.58369	3.92372	0.25647	0.19331	0.12778	0.16572
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Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that c

Haswaste, developed by Dr. Iain Haslock.



Ref. 1
Ref. 2
Date

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

Ecotoxic HP14 amended v6	≥25%	<0.1% (except Be, V, Te, TI, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T- Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene , Xylene + BTEX 1%).	0.59109	3.95609	0.46385	0.20048	0.20432	0.17214
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Ref. 2
Date

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

Table 3 of the CLP, CL Inventory, ATPs, IARC, Concawe, MSDSs, REACH + Pesticide Properties databases. Worst case REACH + MSDS's used for "" STOT + Acute Toxicity.



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Date _____

Persistent Organic Pollutant (Individual Dioxins+Furans)

>0.0000015%

Please enter available data in the rows associated with the test (grey) cells. Calculation cells
If any calculation cells below state "0.00000", testing has NOT been undertaken that α

TP219	WS209	WS208	WS211	WS210	WS210
0.50	0.40	0.40	0.30	0.50	1.30
19-Jul-22	21-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22	22-Jul-22

0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
--------------	--------------	--------------	--------------	--------------	--------------

Date _____

pH (leachate)

Aluminium
Bismuth
CrIII
Iron
Strontium
Tellurium
Thallium

[illegible]

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		

8.21	8.14	7.81	7.99		
31	28	21	28		
1.6	1.3	1.5	1.9		
722	266	460	499		
31	20	18	21		
1,490	621	1,820	1,410		
2.40	1.51	0.70	0.54		
36	22	29	36		
1	1	1	1		
402	320	505	599		
787.00	351.00	259.00	250.00		
1.5	1.0	0.8	0.9		
51	35	39	44		
5.00	3.00	3.00	4.00		
110	15	55	42		

Date _____

Ammoniacal N	
ws Boron	

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(ghi)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(ah)anthracene
Fluoranthene
Fluorene
Indeno(123cd)pyrene
Naphthalene
Phenanthrene
Pyrene
Coronene
Total PAHs (16 or 17)

Petrol

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		

1.0	1.0	1.0	1.0		

16.50	14.00	10.70	137.00		

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Date _____

Lube Oil

Crude Oil

White Spirit / Kerosene

Creosote

Unknown TPH with ID

Unknown TPHCWG

Total Sulphide

Complex Cyanide

Free (or Total) Cyanide

Thiocyanate

Elemental/Free Sulphur

Phenols Input Total Phenols HPLC **OR** individual Phenol results.

Phenol

Cresols

Xylenols

Resourcinol

Phenols Total by HPLC	
1	0.0000
2	0.0000
3	0.0000
4	0.0000
5	0.0000
6	0.0000
7	0.0000
8	0.0000
9	0.0000
10	0.0000
11	0.0000
12	0.0000
13	0.0000
14	0.0000
15	0.0000
16	0.0000
17	0.0000
18	0.0000
19	0.0000
20	0.0000
21	0.0000
22	0.0000
23	0.0000
24	0.0000
25	0.0000
26	0.0000
27	0.0000
28	0.0000
29	0.0000
30	0.0000
31	0.0000
32	0.0000
33	0.0000
34	0.0000
35	0.0000
36	0.0000
37	0.0000
38	0.0000
39	0.0000
40	0.0000
41	0.0000
42	0.0000
43	0.0000
44	0.0000
45	0.0000
46	0.0000
47	0.0000
48	0.0000
49	0.0000
50	0.0000
51	0.0000
52	0.0000
53	0.0000
54	0.0000
55	0.0000
56	0.0000
57	0.0000
58	0.0000
59	0.0000
60	0.0000
61	0.0000
62	0.0000
63	0.0000
64	0.0000
65	0.0000
66	0.0000
67	0.0000
68	0.0000
69	0.0000
70	0.0000
71	0.0000
72	0.0000
73	0.0000
74	0.0000
75	0.0000
76	0.0000
77	0.0000
78	0.0000
79	0.0000
80	0.0000
81	0.0000
82	0.0000
83	0.0000
84	0.0000
85	0.0000
86	0.0000
87	0.0000
88	0.0000
89	0.0000
90	0.0000
91	0.0000
92	0.0000
93	0.0000
94	0.0000
95	0.0000
96	0.0000
97	0.0000
98	0.0000
99	0.0000
100	0.0000

BTEX Input Total BTEX **OR** individual BTEX results.

Benzene

Toluene

Ethylbenzene

Xylenes

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		

5	2	2	5		

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Haswaste, developed by Dr. Iain Haslock.

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Date

Total BTEX

PCBs (POPs)

PCBs Total (eg EC7/WHO12)

PBBs (POPs)

Hexabromobiphenyl (Total or PBB153; 2,2',4,4',5,5'- if only available)

initially display either "0.0000" or "#DIV/0!".
contributes to that Hazardous Property.

Please enter available data in the rows associated with that Hazardous Property.
If any calculation cells below state "0.0000", please check the data entered.

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		



Haswaste, developed by Dr. Iain Haslock.

Ref. 1

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Date

initially display either "0.0000" or "#DIV/0!".
contributes to that Hazardous Property.

Please enter available data in the rows associated with the Hazardous Property.
If any calculation cells below state "0.0000", it indicates that the value is zero.

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		

POPs Dioxins and Furans Input Total Dioxins and Furans
OR individual Dioxin and Furan results.

2,3,7,8-TeCDD

1,2,3,7,8-PeCDD

1,2,3,4,7,8-HxCDD

1,2,3,6,7,8-HxCDD

1,2,3,7,8,9-HxCDD

1,2,3,4,6,7,8-HpCDD

OCDD

2,3,7,8-TeCDF

1,2,3,7,8-PeCDF

2,3,4,7,8-PeCDF

1,2,3,4,7,8-HxCDF

1,2,3,6,7,8-HxCDF

2,3,4,6,7,8-HxCDF

1,2,3,7,8,9-HxCDF

1,2,3,4,6,7,8-HpCDF

1,2,3,4,7,8,9-HpCDF

OCDF

Total Dioxins and Furans

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

Some Pesticides (POPs unless otherwise stated)

Aldrin

mg/kg

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Date _____

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		

α Hexachlorocyclohexane (alpha-HCH) <i>(leave empty if total HCH results used)</i>	mg/kg					
β Hexachlorocyclohexane (beta-HCH) <i>(leave empty if total HCH results used)</i>	mg/kg					
α Cis-Chlordane (alpha) OR Total Chlordane	mg/kg					
δ Hexachlorocyclohexane (delta-HCH) <i>(leave empty if total HCH results used)</i>	mg/kg					
Dieldrin	mg/kg					
Endrin	mg/kg					
χ Hexachlorocyclohexane (gamma-HCH) (lindane) OR Total HCH	mg/kg					
Heptachlor	mg/kg					
Hexachlorobenzene	mg/kg					
o,p'-DDT <i>(leave empty if total DDT results used)</i>	mg/kg					
p,p'-DDT OR Total DDT	mg/kg					
χ Trans-Chlordane (gamma) <i>(leave empty if total Chlordane results used)</i>	mg/kg					
Chlordecone (kepone)	mg/kg					

Date _____

Toxaphene (camphechlor)

Tin (leave empty if Organotin and Tin excl Organotin results used)

Dibutyltin; DiBT

Tributyltin; TriBT

Triphenyltin; TriPT

Tetrabutyltin; TeBT

Tin excluding Organotin

Tin excl Organotin

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the cell.

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		

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--	--	--	--	--	--

--	--	--	--	--	--

Date _____

Asbestos detected in Soil (enter Y or N)
--

%

$\geq 0.1\%$

$\geq 0.1\%$

Y

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		

N	N	N	N		
---	---	---	---	--	--

If A:

0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

N	N	N	N		N
---	---	---	---	--	---



Haswaste, developed by Dr. Iain Haslock.

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initially display either "0.0000" or "#DIV/0!".
contributes to that Hazardous Property.

Please enter available data in the rows associated with that Hazardous Property.
If any calculation cells below state "0.0000", this indicates that the property does not contribute to that Hazardous Property.

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		

Asbestos in Soil: If visual identifiable pieces of asbestos are present, you cannot use the soil for agricultural purposes. If visual identifiable pieces of asbestos are present, you cannot use the soil for agricultural purposes. Therefore, if Asbestos in Soil above is "Y", the Asbestos in Soil is Hazardous Waste.

Asbestos in Soil: If visual identifiable pieces of asbestos are present, you cannot use the soil for agricultural purposes. If visual identifiable pieces of asbestos are present, you cannot use the soil for agricultural purposes. Therefore, if Asbestos in Soil above is "Y", the Asbestos in Soil is Hazardous Waste.

Hazardous Property	Thresholds	Cut Off Value	Asbestos in Soil Hazardous Waste.				If cells below turn yellow, the soil is Hazardous Waste.	
Corrosive HP8	≥5%	<1%	0.08874	0.04264	0.03213	0.03273	0.00000	0.00000
Irritant HP4	≥10%	<1%	0.09476	0.03998	0.06169	0.06792	0.00000	0.00000
Irritant HP4	≥20%	<1%	0.09194	0.03681	0.05972	0.07837	0.00000	0.00000
Specific Target Organ Toxicity HP5	≥1%		0.00094	0.00038	0.00038	0.00094	0.00000	0.00000
Specific Target Organ Toxicity HP5	≥20%		0.00908	0.00623	0.00694	0.01370	0.00000	0.00000
Specific Target Organ Toxicity HP5	≥1%		0.00908	0.00623	0.00694	0.00783	0.00000	0.00000
Specific Target Organ Toxicity HP5	≥10%		0.14900	0.06210	0.18200	0.14100	0.00000	0.00000
Aspiration Toxicity HP5	≥10%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.1%	<0.1%	0.00094	0.00038	0.00038	0.00094	0.00000	0.00000
Acute Toxicity HP6	≥0.25%	<0.1%	0.00433	0.00385	0.00284	0.00375	0.00000	0.00000
Acute Toxicity HP6	≥5%	<0.1%	0.08548	0.03954	0.02986	0.02958	0.00000	0.00000
Acute Toxicity HP6	≥25%	<1%	0.26195	0.10616	0.25460	0.23142	0.00000	0.00000
Acute Toxicity HP6	≥0.25%	<0.1%	0.00118	0.00053	0.00045	0.00099	0.00000	0.00000
Acute Toxicity HP6	≥2.5%	<0.1%	0.00595	0.00384	0.00346	0.00403	0.00000	0.00000

Table 3 of the CLP, CL Inventory, ATPs, IARC, Concawe, MSDSs, REACH + Pesticide Properties databases. Worst case REACH + MSDS's used for "STOT + Acute Toxicity".



Haswaste, developed by Dr. Iain Haslock.



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initially display either "0.0000" or "#DIV/0!".
contributes to that Hazardous Property.

Please enter available data in the rows associated with that Hazardous Property.
If any calculation cells below state "0.0000",

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		

Acute Toxicity HP6	≥15%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥55%	<1%	0.01336	0.00193	0.00675	0.00523	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.1%	<0.1%	0.00094	0.00038	0.00038	0.00094	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.5%	<0.1%	0.00704	0.00458	0.00404	0.00469	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥3.5%	<0.1%	0.00014	0.00014	0.00014	0.00014	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥22.5%	<1%	0.32564	0.13793	0.27268	0.23749	0.00000	0.00000	0.00000
Carcinogenic HP7	≥0.1%		0.14900	0.06210	0.18200	0.14100	0.00000	0.00000	0.00000
Carcinogenic HP7	≥0.1%		0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000	0.000000000
Carcinogenic HP7	≥1%		0.01320	0.00623	0.00694	0.01370	0.00000	0.00000	0.00000
Carcinogenic HP7 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
pH Corrosive HP8 pH (soil or leachate)	H8 ≥11.5		8.21	8.14	7.81	7.99	0.00	0.00	0.00
pH Corrosive HP8 pH (soil or leachate)	H8 ≤2		8.21	8.14	7.81	7.99	0.00	0.00	0.00
Toxic for Reproduction HP10	≥0.3%		0.14900	0.06210	0.18200	0.14100	0.00000	0.00000	0.00000
Toxic for Reproduction HP10	≥3%		0.00908	0.00623	0.00694	0.00783	0.00000	0.00000	0.00000
Mutagenic HP11	≥0.1%		0.00595	0.00384	0.00346	0.01370	0.00000	0.00000	0.00000
Mutagenic HP11 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00	0.00

Date _____

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%
Mutagenic HP11	≥1%
Produces Toxic Gases HP12 Sulphide	≥1,400mg/kg
Produces Toxic Gases HP12 Cyanide	≥1,200mg/kg
Produces Toxic Gases HP12 Thiocyanate	≥2,600mg/kg
HP13 Sensitising	≥10%

#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
0.00908	0.00623	0.00694	0.01370	0.00000	0.00000
0.0	0.0	0.0	0.0	0.0	0.0
5.0	2.0	2.0	5.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.00727	0.00444	0.00586	0.01370	0.00000	0.00000

Ecotoxic HP14 amended v6	≥25%	<0.1%	0.30128	0.14634	0.31100	0.30229	0.00000	0.00000
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Haswaste, developed by Dr. Iain Haslock.



Ref. 1
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Date

initially display either "0.0000" or "#DIV/0!".
contributes to that Hazardous Property.

Please enter available data in the rows associated with the Hazardous Property.
If any calculation cells below state "0.0000", it indicates that the property does not contribute to that Hazardous Property.

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		

Ecotoxic HP14 amended v6	≥25%	<0.1% (except Be, V, Te, Tl, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T- Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene , Xylene + BTEX 1%).	0.31105	0.15302	0.31830	0.31053	0.00000	0.00000
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Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		

Persistent Organic Pollutant (PCB, PBB or POP Pesticides)	>0.005%
Persistent Organic Pollutant (Total Dioxins+Furans)	>0.0000015%

Date _____

>0.0000015%

Please enter available data in the rows associated with the following categories.
If any calculation cells below state "0," please enter "0" in the corresponding cell.

TP306	TP304	TP304	TP304		
0.50	0.20	0.50	1.50		
13-Apr-23	13-Apr-23	13-Apr-23	13-Apr-23		

0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
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Date _____

pH (leachate)

Arsenic
Cadmium
Copper
CrVI or Chromium
Lead
Mercury
Nickel
Selenium
Zinc

Barium
Beryllium
Vanadium

Cobalt
Manganese
Molybdenum

Antimony
Aluminium
Bismuth
CrIII
Iron
Strontium
Tellurium
Thallium

%

mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg
mg/kg

[illegible]

associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!". 00000", testing has NOT been undertaken that contributes to that Hazardous Property.

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Date _____

Ammoniacal N	
ws Boron	

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(ghi)perylene
Benzo(k)fluoranthene
Chrysene
Dibenzo(ah)anthracene
Fluoranthene
Fluorene
Indeno(123cd)pyrene
Naphthalene
Phenanthrene
Pyrene
Coronene
Total PAHs (16 or 17)

Petrol

mg/kg

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Date

Diesel
Lube Oil

mg/kg

mg/kg

Crude Oil

mg/kg

White Spirit / Kerosene

mg/kg

Creosote

mg/kg

Unknown TPH with ID

mg/kg

Unknown TPHCWG

mg/kg

Total Sulphide

mg/kg

Complex Cyanide

mg/kg

Free (or Total) Cyanide

mg/kg

Thiocyanate

mg/kg

Elemental/Free Sulphur

mg/kg

Phenols Input Total Phenols HPLC **OR** individual Phenol results.

Phenol

mg/kg

Cresols

mg/kg

Xylenols

mg/kg

Resourcinol

mg/kg

Phenols Total by HPLC

mg/kg

BTEX Input Total BTEX **OR** individual BTEX results.

Benzene

mg/kg

Toluene

mg/kg

Ethylbenzene

mg/kg

Xylenes

mg/kg

ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

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Ref. 1

Ref. 2

Date _____

Total BTEX

PCBs (POPs)

PCBs Total (eg EC7/WHO12)	
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PBBs (POPs)

Hexabromobiphenyl (Total or PBB153; 2,2',4,4',5,5'- if only available)

associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!". "0.0000", testing has NOT been undertaken that contributes to that Hazardous Property.



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ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

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POPs Dioxins and Furans Input Total Dioxins and Furans
OR individual Dioxin and Furan results.

2,3,7,8-TeCDD

1,2,3,7,8-PeCDD

1,2,3,4,7,8-HxCDD

1,2,3,6,7,8-HxCDD

1,2,3,7,8,9-HxCDD

1,2,3,4,6,7,8-HpCDD

OCDD

2,3,7,8-TeCDF

1,2,3,7,8-PeCDF

2,3,4,7,8-PeCDF

1,2,3,4,7,8-HxCDF

1,2,3,6,7,8-HxCDF

2,3,4,6,7,8-HxCDF

1,2,3,7,8,9-HxCDF

1,2,3,4,6,7,8-HpCDF

1,2,3,4,7,8,9-HpCDF

OCDF

Total Dioxins and Furans

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

Some Pesticides (POPs unless otherwise stated)

Aldrin

mg/kg

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Date

ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

α Hexachlorocyclohexane (alpha-HCH) <i>(leave empty if total HCH results used)</i>
β Hexachlorocyclohexane (beta-HCH) <i>(leave empty if total HCH results used)</i>
α Cis-Chlordane (alpha) OR Total Chlordane
δ Hexachlorocyclohexane (delta-HCH) <i>(leave empty if total HCH results used)</i>
Dieldrin
Endrin
χ Hexachlorocyclohexane (gamma-HCH) (lindane) OR Total HCH
Heptachlor
Hexachlorobenzene
o,p'-DDT <i>(leave empty if total DDT results used)</i>
p,p'-DDT OR Total DDT
χ Trans-Chlordane (gamma) <i>(leave empty if total Chlordane results used)</i>
Chlordecone (kepone)

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

mg/kg

Date _____

Toxaphene (camphechlor)

Tin (leave empty if Organotin and Tin excl Organotin results used)

Dibutyltin; DiBT

Tributyltin; TriBT

Triphenyltin; TriPT

Tetrabutyltin; TeBT

Tin excluding Organotin

Tin excl Organotin

associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!". 00000", testing has NOT been undertaken that contributes to that Hazardous Property.

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Asbestos in Soil	Thresholds
Asbestos detected in Soil (enter Y or N)	Y
Asbestos % Composition in Soil (Matrix Loose Fibres or Microscopic Identifiable Pieces only)	see "Carc HP7 % Asbestos in Soil (Fibres)" below
Carcinogenic HP7 % Asbestos in Soil (fibres or micro pieces) <i>Please be advised, if the calculation cell is "0.00000" DOES NOT MEAN asbestos testing has been undertaken and the result is zero.</i>	≥0.1%
Asbestos Identifiable Pieces visible with the naked eye detected in the Soil (enter Y or N)	Y

ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!". "00000", testing has NOT been undertaken that contributes to that Hazardous Property.

sbestos in Soil above is "Y", the soil is Hazardous Waste HP5 and HP7					
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
", the soil is Non Hazardous Waste. You can only use Asbestos % results where loose fibres or micro pieces are only present. You not use Asbestos % results when visual identifiable pieces are present.					

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Date _____

associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!". 00000", testing has NOT been undertaken that contributes to that Hazardous Property.

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/ fibres (or micro pieces) with an Asbestos % Composition in Soil result of <0.1% for the soil to become non-hazardous waste.

Hazardous Property	Thresholds	Cut Off Value	If the value is greater than or equal to the threshold, the text turns red, the samples should be classified as Hazardous Waste.					
Corrosive HP8	≥5%	<1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Irritant HP4	≥10%	<1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Irritant HP4	≥20%	<1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specific Target Organ Toxicity HP5	≥1%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specific Target Organ Toxicity HP5	≥20%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specific Target Organ Toxicity HP5	≥1%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Specific Target Organ Toxicity HP5	≥10%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Aspiration Toxicity HP5	≥10%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.1%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.25%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥5%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥25%	<1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.25%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥2.5%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

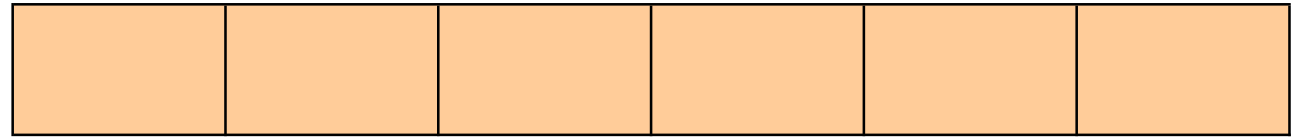


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ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.



Acute Toxicity HP6	≥15%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥55%	<1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.1%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥0.5%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥3.5%	<0.1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Acute Toxicity HP6	≥22.5%	<1%	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carcinogenic HP7	≥0.1%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carcinogenic HP7	≥0.1%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
Carcinogenic HP7	≥1%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Carcinogenic HP7 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00
Carcinogenic HP7 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%		#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
pH Corrosive HP8 pH (soil or leachate)	H8 ≥11.5		0.00	0.00	0.00	0.00	0.00	0.00
pH Corrosive HP8 pH (soil or leachate)	H8 ≤2		0.00	0.00	0.00	0.00	0.00	0.00
Toxic for Reproduction HP10	≥0.3%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Toxic for Reproduction HP10	≥3%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Mutagenic HP11	≥0.1%		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Mutagenic HP11 Unknown TPH with ID	≥1,000mg/kg		0.00	0.00	0.00	0.00	0.00	0.00



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Mutagenic HP11 b(a)p marker test (Unknown TPH with ID only) Cell only applicable if TPH >1,000mg/kg	≥0.01%
Mutagenic HP11	≥1%
Produces Toxic Gases HP12 Sulphide	≥1,400mg/kg
Produces Toxic Gases HP12 Cyanide	≥1,200mg/kg
Produces Toxic Gases HP12 Thiocyanate	≥2,600mg/kg
HP13 Sensitising	≥10%

Ecotoxic HP14 amended v6	≥25%	<0.1%
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associated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
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Ecotoxic HP14 amended v6	≥25%	<0.1% (except Be, V, Te, Tl, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T- Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene , Xylene + BTEX 1%).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000



ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

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Ref. 1
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Date

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Ecotoxic HP14 amended v6	≥25%	<0.1% (except Be, V, Te, Tl, Petrol, Diesel, Crude Oil, Kerosene, White Spirit, Crosote, TPH, TPHCWG, Phenol, Cresols, Xylenols, T- Phenols, CompCN, Thiocyanate, Toluene, Ethylbenzene , Xylene + BTEX 1%).	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Persistent Organic Pollutant (PCB, PBB or POP Pesticides)	>0.005%		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Persistent Organic Pollutant (Total Dioxins+Furans)	>0.0000015%		0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000



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Date

Persistent Organic Pollutant (Individual Dioxins+Furans)	>0.0000015%
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ociated with the test (grey) cells. Calculation cells initially display either "0.0000" or "#DIV/0!".
00000", testing has NOT been undertaken that contributes to that Hazardous Property.

0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
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COMPLEX CHALLENGES ...
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APPENDIX H – ENVIRONMENT AGENCY CORRESPONDENCE

Far East Consortium (FEC)
UK (London Office)
12 Stanhope Gate
London
W1K 1AW

Our ref:
SO/2023/122837/01-L01
Your ref:
Victoria North Phase 1 / Application 5 /
Plots NT02-NT04
Date:
09 March 2023

FAO: Linden Richardson / RoC Consulting (*acting on behalf of FEC*) / John Sherrington / SPC Limited (*acting on behalf of FEC*)

Dear Linden / John,

ENVPAC/1/GMC/00443 - ENVIRONMENT AGENCY / FAR EAST CONSORTIUM – VICTORIA NORTH DEVELOPMENT PROPOSALS - PHASE 1

PLOTS NT02, NT03, NT04 - LAND CONTAMINATION / GROUND INVESTIGATIONS REVIEW / RESPONSE LETTER FOR:

- I. Phase 1 Desktop Study. Plots NT02, NT03 & NT04 Dantzic Street. Prepared by RoC Consulting for Far East Consortium Limited. Report Ref: 4328-ROC-ZZ-XX-RP-ES-PH1DTS. Dated 12th January 2023.**
- II. Phase 2 Site Investigation. Plots NT02, NT03& NT04. Dantzic Street. Prepared by RoC Consulting for Far East Consortium Limited. Report Ref: 4328-ROC-ZZ-XX-RP-ES-PR-101. Dated 21st October 2022.**
- III. Site Investigation Proposal Design Note, Chlorinated Solvent Investigation, Plot NT02-NT04. Report Ref: LR/NK/4328/120123. Prepared by RoC Consulting. Dated 12th January 2023.**

LAND OFF DANTZIC STREET, DEVELOPMT PLOTS NT02, NT03 & NT04.

Thank you again for meeting with the Environment Agency (EA) on the 1st December 2022; to undertake preliminary discussions relating to desk/intrusive ground investigations undertaken to date and to discuss/agree subsequent further additional ground investigation requirements needed ensure the following:

- The comprehensive characterisation of underlying ground conditions for development plots NT02-NT04 is achieved.
- The effectual assessment of potential risks posed to controlled waters by any contamination identified and, in turn, associated remedial requirements.
- The ability of FEC project team to adequately address any pre-commencement conditions placed upon any subsequent planning approval granted for development plots NT02-NT04.

EA SO/2023/122837/01-L01 - Letter / Review Context

Environment Agency
Richard Fairclough House Knutsford Road, Warrington, WA4 1HT.
Customer services line: 03708 506 506
www.gov.uk/environment-agency
Cont/d..

As introduction to wider contents of this letter, as discussed during recent meeting with ROC (01/12/2022) and affirmed during wider subsequent conversations held with the FEC project team, it remains our current understanding that it is the intention of the FEC project team to submit shortly (~March 2023) to the local planning authority (LPA) / Manchester City Council, a full planning application covering development within plots NT02-NT04.

In virtue of the above intention, planning requirements/guidance and fact additional ground investigations (subject of this letter) have not yet occurred, we advise the FEC project team that at the point of planning submission, there will be a strong likelihood of the EA being required to recommend to the LPA (subject to wider environmental constraints having been adequately address through initial application submissions) the inclusion, on any subsequent planning approval granted, pre-commencement conditions governing the submission of additional ground investigation reporting and/where required remedial strategy/verification reporting.

Cognisant to the above and fact during our meeting held on the 1st December 2022 it was collectively identified that the current/finalised Phase 1 and Phase 2 ground investigation reporting produced by RoC would likely prove to be sufficient to enable the EA to offer to the LPA a pragmatic option of pre-commencement conditional approval (for matters relating to land contamination), we advise the further technical review/response below focuses primarily upon proposals/requirements for additional investigations subject of the proposal design note (LR/NK/4328/120123) listed above / submitted. However, please be assured that, where warranted our reviewing contaminated land specialist has also referred / made consideration to the contents of the updated Phase 1 desktop study report (4328-ROC-ZZ-XX-RP-ES-PH1DTS) and Phase 2 site investigation (4328-ROC-ZZ-XX-RP-ES-PR-101) supplied as part of this chargeable request.

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EA Land Contamination Review / Additional Ground Investigations Commentary

[Commentary below provided by EA Contaminated Land Specialist, Lee Beveridge]

Background Understanding / Land Contamination Risk

We are aware from the submissions to date that the site has a history of industrial land use which has introduced a contamination legacy issue. The ground investigation reporting that has been presented to the EA date indicates that the most significantly impacted area of the development site is development plot NT02 which is understood from mapping supplied to be located on the western extent of the development area.

The presence of Chlorinated Solvents in both possible extent and concentration is such that a likely risk to controlled waters is exists and which to address, as discussed and agreed during our meeting (01/12/2022), warrants the undertaking of additional ground investigations to clearly identify and confidently determine the significance of such a risk and, in turn, any subsequent remedial requirements to ensure development sustainability / environmental protection is achieved.

Environmental Setting / Geological Conditions

As we discussed during our meeting (01/12/2022), the bedrock geology within proximity of the development site (NT02-NT04) is known and has been extensively recorded, with such information available from the British Geologic Survey.

However, in essence, the geological sequence for this area of Manchester is one of upper Chester Pebble Bed Sandstone above a Manchester Marl which, in turn, is above the deeper Collyhurst sandstone. The sequence is known to be inclined to the west and impacted by a fault. On the western side of the fault, the Chester Pebble bed is known to subcrop whilst on the eastern side of the fault the subcrop is of Manchester Marl.

The EA considers the Chester Pebble bed sandstone and the Collyhurst Sandstone to be Principal Aquifers – important groundwater resources requiring protection and for both of which known abstractions exist. The Manchester Marls are considered by the EA to be a Secondary Aquifer, a groundwater of slightly less resource potential than the former aforementioned.

The above notwithstanding, it should continue to be recognised by the FEC development project team that all three of the geological units aforementioned are deemed to be controlled water resources and therefore, in following the guidance, policy and legislation against which the EA seeks to regulate new planning/development proposals (notably, the Water Framework Directive (England and Wales) Regulations 2017 and guidance set out within the National Planning Policy Framework (NPPF)) are required to be protected through new development efforts (via site remediation if proven appropriate).

Further to the above, given the proximity of the proposed development site to the River Irk and the wider topological gradient, we agree with the conclusion reached within the RoC reporting supplied that there is a further additional risk posed to surface waters. The River Irk is subject to the same guidance, policy and legislation as mentioned above and is required to be protected through new development efforts (via site remediation if proven appropriate).

Current ongoing EA engagement with a different development site within the Greater Manchester region (planning details of site in question available upon request), which has similar Chlorinated Solvent contamination, has identified that the chlorinated solvent sequence (PCE, TCE, 1,2 DCE and VC) are all likely to be considered as Hazardous Substances.

Work on this aforementioned other development site has shown there to be a good deal of literature available that describes and, in some cases, predicts, the de-chlorination sequence in detail. Such information may help establish the state of the degradation process and therefore offer assistance for the NT02-NT04 development site in considering the original source/origin of the chlorinated solvent contamination observed. However, a review of the information that has been collected already suggests that the source of this contamination is most likely to be located on-site and is resultant of its former industrial use.

Points of clarification

Within the contents of the site investigation proposal design note (LR/NK/4328/120123), we have been asked to consider the following bullet points, detailed below, and provide advice and guidance accordingly.

For ease of interpretation of the reader, the questions raised within the RoC design note (LR/NK/4328/120123) have been reiterated below within *blue italics*.

‘Any further information you may have on chlorinated solvent contamination, or potential sources of chlorinated solvent contamination, in the local area’

We have checked the wider ground investigation records we have held for the development area and for areas within more immediate vicinity of the development site. None of these records point to the indicated presence of chlorinated solvent contamination. However, a check of historical mapping records available to the EA has identified a historic map of the area dating from 1891, this mapping points to large extensive areas of residential dwellings surrounding the Rochdale Road gas works with only the on-site industrial activities being a notable potential source of the chlorinated solvent contamination observed. We would refer you to the desk study reports that have been previously published as well as established sources of historical information and mapping to support this consideration further.

‘Any further relevant policies or guidance relevant to such investigations’

As Chlorinated solvents are considered to be hazardous substances and have from initial investigations found to be present on site, we advise for water quality / controlled water protection related matters that the Water Framework Directive as well as the daughter, Groundwater Directive would apply in this instance. For the purpose of the assessment under planning regime, in offering position/determination to the governing LPA, we would expect that it demonstrated through relevant reporting submissions (at point of initial application submission or, where deemed appropriate, subsequent daughter discharge of conditions application(s)), that the development can achieve effective accordance to guidance outlined within the National Planning Policy Framework (NPPF); we note in particular the requirements of NPPF paragraphs 174 and 183.

Given their potential to cause detriment to WFD chemical and overall status classification (which to achieve accordance to Regulation 33 of the WFD (2017) regulations must not occur and/or prevent improvement of overall WFD status occurring), hazardous substances should be prevented from entering and impacting adversely upon groundwater bodies and/or surface water receptors (River Irk). Where such contamination is present, this should be controlled and where necessary, to reduce risk posed to the environment to being as low as reasonably practicable (ALARP) appropriately remediated. This is especially important whereby it found there is evidence of an expanding contaminant plume rather than a stable, non-expanding plume or reducing plume.

In virtue of the above, at this present time, we consider there is not enough evidence to decide upon the status of the plume underlying the proposed development site (NT02-NT04). As such we advise that it cannot be determined/concluded that the further investigations proposed to be undertaken by ROC (as per LR/NK/4328/120123) will result in a circumstance whereby there is confidence comprehensive characterisation of underlying site conditions/plume is achieved. For avoidance of doubt, there will remain the potential for further additional investigations to be required, should a significant ‘gap’ in understanding continue to exist.

In linkage to the above, we would additionally advise you to consider the classification of Chlorinated Solvents as a non-polar organic. Our understanding of these

contaminants is that, as non-polar organics, they have a negative effect on clays by causing them to breakdown and allow for greater penetration and permeation than could be normally expected. This is especially the case where this contaminant has been in contact with the clay strata for a prolonged period of time.

'The sufficiency of the schedule of laboratory testing determinands'

We are unable to provide direct narrative on the sufficiency of the laboratory testing suite. However, we can recommend that the testing suite(S) should reflect the likely/observed contaminants present; based on the previous historic uses of the development site. Additionally, we strongly advise field-based testing should be considered if you are to attempt to determine the state of the dichlorination process i.e. whether the plume is expanding, stable or reducing (potentially indicating active natural attenuation). For avoidance of doubt of this matter, given our role as regulator, the EA is unable to act as designer for any investigations/assessment work.

'That the number of boreholes (including existing wells) and rounds of testing will be sufficient, in your eyes, to robustly determine the presence or not of groundwater contamination across the site.'

Echoing the above, the sufficiency of the number and location of boreholes and rounds of testing is not a matter that we are not able to comment upon directly. We would refer you to the Land Contamination Risk Management (LCRM) guidance for further support on this matter.

However, we are to offer observation that the number and extent of investigation points should, in principle, be sufficient to develop a further comprehensive Conceptual Site Model (CSM), thereby aiding in the subsequent determination of remedial requirements. The CSM should be able to withstand thorough assessment and critique with the information collected being substantial enough to support the development of a Detailed Quantitative Risk Assessment (DQRA) thereafter.

Both the CSM and DQRA should be able to support an options appraisal and remediation strategy such that final validation and verification of any remedial activity is a straight forwards process and one that would, in turn, support the discharge of relevant planning conditions attached to any development planning permission subsequently granted by the governing LPA for the NT02-NT04 development site.

'That the scope of shallow investigation borehole within the warehouse will be sufficient, in your eyes, to robustly conclude whether contamination has an onsite or offsite source'

We would refer you to the original conceptual model(s) that have been developed for this site. We do not believe that shallow investigation boreholes alone are sufficient to determine whether the origin of a contaminant source is on or off-site.

The more accurate method of determining this is to consider the range of guidance documents that the EA and other environmental organisations have produced for Chlorinate Solvent contamination and identify if the subsequently collected data supports your chosen hypothesis.

'That the proposed programme of investigation, and control measures for reinstatement, do not, if carried out as specified, pose an unacceptable risk of causing further contamination – noting that previous drilling operations have already been undertaken in 2020 and 2022'

We are unable to provide a direct answer to this question. Adoption of safe drilling techniques and good practices for ground investigation should minimise the risk of cross-contamination. In turn, we would refer you to relevant technique guidance and British Standards for additional technical information on the matter of drill/investigation technique.

Wider to the above, we acknowledge potential for installation failure or other installation problems will exist and cannot be wholly removed but, in turn, advise that by adopting safe techniques / following relevant good practice, the likelihood of an adverse occurrence can be kept ALARP.

--

*** 11.5 hours of ENVPAC/1/GMC/00443 utilised in facilitating review/response ***

We trust that you find the contents of this letter beneficial to further the progression of investigations and land contamination assessment for proposed development / plots NT02-NT04. However, you should have any queries or questions regard the contents of this letter and/or wish to seek further advice, guidance or discussion regarding this topic matter following the completion of additional ground investigations, then please don't hesitate to get in contact.

Yours sincerely,

Mr Andy Davies
Green Growth Team Project Manager

Direct e-mail andy.davies1@environment-agency.gov.uk

Reece McGuinness

From: Mike Newman
Sent: 11 December 2023 09:08
To: Laura Miller
Cc: Reece McGuinness; Alex Smiles
Subject: RE: Environmental Health Soil Screening Criterial - Permission 136814/FO/2023

Thanks Laura

We will be completing our remediation strategy aligned with the below.

Re the soil for the 1200mm planters, this will be imported.

Kind regards,

Mike

From: Laura Miller <laura.miller@manchester.gov.uk>
Sent: Monday, November 27, 2023 9:27 AM
To: Mike Newman <mike.newman@roconsulting.com>
Cc: Reece McGuinness <reece.mcguinness@roconsulting.com>; Alex Smiles <ASmiles@rsk.co.uk>
Subject: Re: Environmental Health Soil Screening Criterial - Permission 136814/FO/2023

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Good morning Mike

Thank you for the added information.

I am happy with the approach to zone the site and use public open space criteria for reuse for the green areas and commercial reuse under the buildings and hardstanding areas.

For the Orange areas and planting on the podium areas will this all be imported soil or are there plans to reuse site won soils as part of the 1200mm depth of soil?

Kind Regards

Laura

Laura Miller (MRes, MA, BSc(Hons))

Please note that due to working compressed hours Wednesdays are a non-working day for me, I will respond to your email when I return to the office

Environmental Protection Officer
Environmental Protection Section
Environmental Health
Neighbourhoods Directorate
Manchester City Council

email: laura.miller@manchester.gov.uk

website: www.manchester.gov.uk

Telephone: 0161 234 1742
Internal: 31742

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From: Mike Newman <mike.newman@roconsulting.com>
Sent: 20 November 2023 09:27
To: Laura Miller <laura.miller@manchester.gov.uk>
Cc: Reece McGuinness <reece.mcguinness@roconsulting.com>; Alex Smiles <ASmiles@rsk.co.uk>
Subject: RE: Environmental Health Soil Screening Criterial - Permission 136814/FO/2023

Laura

Many thanks for your swift response, and apologies for the delay in reply.

The further SI has now been completed and we are in the process of compiling the updated SI to capture this. Lab results still pending.

On the private courtyard, a number of these are formed on podium structures with undercroft parking. Please see attached sketch indicating the building footprints, hard landscaping and other areas. The orange soil cells/green paving are part of the street scape and not private. The soil cells being a 1200mm deep crated system backfilled with planting medium and the green paving a mix of hard paving with intermediate grass/sedum strips.

As can be seen, significant portions of the site are in affect hard standing, meaning exposure to occupiers from contaminated soils is minimal. Would you accept an approach which targets public open space screening only to the marked green areas? Given their size, this should be manageable from a earthworks management perspective.

Kind regards,

Mike

From: Laura Miller <laura.miller@manchester.gov.uk>
Sent: Monday, November 13, 2023 3:09 PM
To: Mike Newman <mike.newman@roconsulting.com>
Cc: Reece McGuinness <reece.mcguinness@roconsulting.com>; Alex Smiles <ASmiles@rsk.co.uk>
Subject: Re: Environmental Health Soil Screening Criterial - Permission 136814/FO/2023

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Hi Mike,

I have been passed your email as I provided the contaminated land comments for this site.

I have looked back at my comments and there was further site investigation to be undertaken including delineating TCE impact and some more gas monitoring. Has this now been undertaken?

In terms of your proposals below I have looked at the drawings and there is a fairly large private courtyard associated with NT04, as such I am not sure if commercial/industrial re-use criteria will be sufficient, even with the 600mm clean cover. I will need further justification for your choice of criteria as POSresi may be more appropriate given no private gardens are proposed.

To support any change in the site classification you will need to provide an associated DQRA, I have no objections to the change in reuse criteria below buildings and hardstanding and any small areas of landscaping, it is only with respect to private court yard areas/terraces/any areas of public realm and as such the site may need to be zoned accordingly.

I am happy to discuss your proposals with you and we can do this via teams (or similar).

Kind Regards

Laura

Laura Miller (MRes, MA, BSc(Hons))

Please note that due to working compressed hours Wednesdays are a non-working day for me, I will respond to your email when I return to the office

Environmental Protection Officer
Environmental Protection Section
Environmental Health
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email: laura.miller@manchester.gov.uk

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Telephone: 0161 234 1742

Internal: 31742

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From: Mike Newman <mike.newman@roconconsulting.com>

Sent: Friday, November 10, 2023 10:23 AM

To: Graeme Souter <graeme.souter@manchester.gov.uk>; Sharon McAndrew
<sharon.mcandrew@manchester.gov.uk>

Cc: Reece McGuinness <reece.mcguinness@roconconsulting.com>; Alex Smiles <ASmiles@rsk.co.uk>

Subject: Environmental Health Soil Screening Criterial - Permission 136814/FO/2023

Some people who received this message don't often get email from mike.newman@roconconsulting.com. [Learn why this is important](#)

Morning Graeme/Sharon

I am hoping you can assist, or point me in the right direction. We are completing the remediation strategy for permission 136814/FO/2023 and we would like to discuss the screening criterial for contaminated soils.

Given the following considerations, we would like to make a case for Commercial/Industrial screening criteria for the development.

1. The proposed development for Plots NT02-04 comprises high rise apartment style residential development with limited soft landscaping in public realm
2. The proposed ground floor plans (ref RDB-HBA-2X-LG-DR-AR-080098, RDB-HBA-2X-IT-DR-AR-080099 and RDB-HBA-2X-UG-DR-AR-080100, attached for reference) submitted with the planning app indicate there are

no residential aspects to the scheme at GF level (NT02 and NT03), with internal space comprising either lobby areas, lift pits, stairwells or commercial end uses.

3. Given the absence of more sensitive development on GF level the adoption of less stringent "Commercial / Industrial" Human Health Soil Screening criteria (GAC's) would be an appropriate classification for the development.
4. In addition, any areas of soft landscaping would require a 600mm clean natural soil capping systems that would require the use of imported soil screened against the more stringent apartment style residential end use criteria.

The use of less stringent commercial end use criteria for the soil reuse within our detailed Phase 3a Rem Strat would seem to be an appropriate measure for the site given ground floor usages. The adoption would also allow the retention of more site won material and soils on site, thereby reducing associated environmental impacts of its disposal from site.

Would MCC EHO be acceptable to this approach?

Kind regards,

Mike

Mike Newman
BEng (Hons) CEng MIStructE
Projects Director
M 07432 708362
T 0161 2145390

www.rocconsulting.com



The banner features the ROC Consulting logo with the tagline "COMPLEX CHALLENGES ... MADE SIMPLE". To the right, a row of six colored icons represents different service areas: Earth Sciences, Civil Engineering, Structural Engineering, Special Projects, Strategic Land, and Compliance Monitoring. Below these icons, the text "civil | structural | geotechnical | geo-environmental | engineering services" is displayed. The bottom section of the banner is a collage of images, including a city street scene, a building facade, and a "Winner" award plaque for the "MEDIUM PROJECT & MOST SUSTAINABLE PROJECT" at the "MALMAISON HOTEL, PEARL ASSURANCE HOUSE".

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Far East Consortium (FEC)
UK (London Office)
12 Stanhope Gate
London
W1K 1AW

Our ref: SO/2023/123379/01-L01
Your ref: Application '5'
Date: 14 September 2023

FAO: Linden Richardson / RoC Consulting (acting on behalf of FEC) / John Sherrington / SPC Limited (acting on behalf of FEC)

ENVPAC/1/GMC/00443 – Written Preliminary Review Phase 2 Site Investigation

TECHNICAL WRITTEN REVIEW - ENVIRONMENT AGENCY / FAR EAST CONSORTIUM – VICTORIA NORTH DEVELOPMENT PROPOSALS - PHASE 1

PLOTS NT02, NT03, NT04 ('Application 5') - LAND CONTAMINATION REVIEW AND RESPONSE LETTER FOR:

- **Phase 2 Site Investigation Plots NT02, NT03 and NT04 Dantzic Street. Prepared by RoC Consulting. Ref: 4328-ROC-zz-XX-RP-ES-P2-101. Rev 03. Date: 17th July 2023.**
- **Controlled Waters Risk Assessment, Plot NT02 Dantzic Street. Repared by RSK Geosciences. Ref. 11847 R01 (00). Rev. 00. Date: 18th July 2023.**
- **Remediation Strategy Report (Outline), Plot NT02-NT04, Northern Gate Dantzic Street. Prepared by RSK Geosciences. Ref. 11834 R01 (00). Date: 18th August 2023.**

LAND OFF DANTZIC STREET, PLOTS NT02, NT03 & NT04

Thank you for requesting advice from the Environment Agency (EA) in relation to land contamination matters on the Victoria North Development Plots NT02-NT04 under chargeable agreement ENVPAC/1/GMC/00443.

EA Review Context

We note the NT02-NT04 site, as part of the Victoria North Phase 1 development, is subject to historic contamination as a result of previous industrial land use. From the EA's engagement with the FEC project team to date and understanding of the Phase 1 Desk Study (by RoC Consulting, dated 12th January 2023) and Phase 2 Site Investigation (by RoC Consulting, dated 21st October 2023) previously produced, the most significantly impacted area of the development site is plot NT02. It was highlighted and agreed that additional site investigation work is required to delineate and understand the extent of the chlorinated solvents present on site to confidently determine the risk and, subsequently, establish an appropriate remediation strategy (SO/2023/122837/01-L01, dated 9th March 2023).

We note approval for Plots NT02-NT04 (also named 'Application 5') is currently being sought through Manchester City Council (MCC) planning application ref. 136814/FO/2023. The EA acknowledge the project team's intention to phase both the 'enabling' and 'construction' works for plots NT02-NT04 under 136814/FO/2023. The

EA has no objections with this approach in principle and had highlighted through engagement with the project team and within our formal response to the LPA, that any intrusive works / below ground demolition / material extraction will need to be supported by a firm understanding of the characterisation of ground conditions; associated risks; and remedial works, if necessary (SO/2023/123166/01-L01, dated 18th August 2023). With regards to the 'enabling works' package / phase, such understanding will be required prior to the commencement of these works with the exception of above ground activities, including site set-up; vegetation clearance and above ground demolition, to ensure contamination risks are managed appropriately.

The ground conditions / land contamination information submitted in support of 136814/FO/2023 (as previously reviewed by the EA under our pre-application engagement with the project team) sufficiently demonstrated that the risks to 'controlled waters' can be appropriately managed. Acknowledging the additional work required to sufficiently characterise / assess ground conditions and subsequent production of a remediation strategy for the development site, the EA recommended a pre-commencement planning condition for details of the additional site investigation / assessment work; remedial strategy; and verification plan to be submitted prior to the commencement of any phase of development (excluding site set-up; vegetation clearance and above ground demolition) (SO/2023/123166/01-L01, dated 18th August 2023). Wider to this, and in relation to contaminated land matters, the EA also recommended planning conditions for the submission of a verification report to demonstrate the success of proposed remedial works (by phase); an assessment for proposals that include surface water infiltration drainage; a risk assessment for proposed piling / foundation works; and a scheme for the management / decommissioning of boreholes on site (by phase).

[The EA are awaiting confirmation of the intended final wording of the planning conditions on the Decision Notice for 136814/FO/2023 (email dated 25th August 2023)]

We note the site investigation work and remedial approach will establish the appropriateness of a phased approach to both the 'enabling' and 'construction' phases of the development. Based on the information submitted in support of 136814/FO/2023 and through direct engagement with the project team, there was recognition that a phased remedial approach may not be achievable but recognise this would be subject to the findings of the additional site investigation work / assessment and subsequent remedial approach proposed.

The EA are now in receipt of the updated Phase 2 site investigation report (17th July 2023); controlled waters risk assessment (for NT02 only) (18th July 2023); and outline remediation strategy for Plots NT02-NT04 to demonstrate the progress made since our previous review to address the contaminated land issues at Plots NT02-NT04 (18th August 2023). This is with recognition of the intention to phase the proposed development for both the 'enabling' and 'construction' works.

Therefore, in line with the above context, please see below the EA's commentary on the review of the aforementioned reporting for Plots NT02 to NT04.

EA Commentary on Contaminated Land Matters for Plots NT02-NT04

[Commentary below provided by EA Contaminated Land Advisor, Clay Durrant]

The reporting submitted to date provides confidence that the risks to controlled waters from historic contamination, including chlorinated solvents, can be mitigated. The site

has been subject to good degree of investigation, with results used in support of a Detailed Quantitative Risk Assessment. Based on these, a robust remedial options appraisal has been presented which has identified viable options. We note relevant sections of the reports have identified the remaining uncertainties and recommended further works to address these as summarised below:

- Requirements for further intrusive works to better delineate the extent of TCE contamination both within soils and groundwater.
- Further testing of the hydraulic conductivity and hydraulic gradient.
- Ongoing monitoring to ensure that ground conditions are accurately captured.
- Updating the relevant documents as part of finalising the remedial strategy.

The above listed works are generally consistent with our assessment of the site-specific circumstances. While this information is required to ensure that appropriate remedial criteria is developed and allow for the design of a detailed remedial strategy, it is considered unlikely that the results will impact upon the viability of the identified remedial options in principle.

To support the additional work the EA understand will be undertaken as above, we have the following detailed commentary for the project team's consideration:

Delineation of Chlorinated solvents

We note borehole logs from NT02 indicate that the surface of the Manchester Marls dips to the southwest, with thickness of the Chester Formation increasing down dip. BH305 encountered the base of the Chester Formation at 23.15m AOD, with the depth to base increasing (elevation decreasing) as shown by BH202, BH303 to 18m AOD at BH203, a drop of 5.15m. The same trend is shown between BH305 and BH201 (19.60m AOD), with the base of the Chester Formation encountered at 19.60m AOD, a drop of 3.55m. ROCRBH301, terminated at 15.00m bgl (16.41m AOD) and did not encounter the base of the Chester Formation.

While the lower permeability marls are likely to limit the vertical migration of DNAPL (if present), migration down dip at the base of the Chester Formation / top of the Manchester Marls could occur.

As recognised in the report, further works are required to delineate soil and groundwater chlorinated solvents, namely TCE in areas of the site which have not been accessible due to current site operations. We have the following comments in relation to the approach undertaken on the delineation of chlorinated solvents to date:

- Currently the down dip locations within plot NT02 lack sufficient depth (i.e., boreholes which extend to the base of the Chester Formation). Additional investigation in this area must be sufficient to refine this aspect of the CSM and bridge the current, perceived, information gap.
- It is noted that several boreholes are screened at depth within the Manchester Marls. Groundwater samples obtained from these may not accurately capture the presence of chlorinated solvents, due to the lower permeability of the marls limiting vertical migration.

- Groundwater data from ROCRBH203, ROCRBH303 and LK RBH3 have all detected TCE significantly above the relevant assessment criteria. Concentrations are generally higher during the rounds completed in late 2022 and early 2023. Drivers for these trends have not been discussed and their significance remains unclear. This, in our opinion, makes the information gaps more significant and will need to be addressed in future reporting.
- Ongoing monitoring should help to better identify any trends and analysis of the results should consider the points such as strata individual boreholes are screened in and sample depths from within the water column.

The EA would welcome an opportunity to review the additional works / assessment on the delineation of chlorinated solvents once available. We note, in particular, that the extent of this contamination plume will influence the intended phasing / sequencing of works for plots NT02-NT04.

Controlled Waters Risk Assessment

We note sensitivity analysis has identified key parameters which require further refinement, with this data to be collected via further investigation works which is welcomed. Based on the current Controlled Waters Risk Assessment, we have the following comments to make:

Hydraulic conductivity (K)

Site specific K values have been obtained for the Chester Formation (286.50m/d from BH203 10-15m bgl and 19.70m from BH301 4-10m bgl), with a final value of 1.025m/day selected. This is based on the geometric mean of the higher measured value and the geometric mean of the literature value for sandstone. It is noted that this value has been selected to be representative of the flow within the weathered sandstone and the more competent bedrock. From local knowledge, the higher value obtained is potentially realistic. Sensitivity analysis has shown the model to be sensitive to this parameter so the proposal to undertake further investigations to achieve better characterisation is welcomed.

With respect to chlorinated solvents migrating vertically into the marls and therefore use of a K value for the sandstone being overly conservative, the lower permeability marls could also act to significantly limit vertical migration, with any DNAPL migrating down dip and dissolved phase migration primarily in the Chester Formation. Ultimately the final selected K value will need to be supported by the CSM.

Hydraulic gradient (i)

Due to the differing hydraulic properties between the sandstones and the marls, care should be taken to ensure 'i' is calculated from boreholes screened in the same strata.

Degradation rates

Rates for aerobic (based on site conditions) and anaerobic conditions have been used in the model as part of the sensitivity analysis, with model being shown to be highly sensitive. Ongoing monitoring to better constrain conditions within the aquifer and support selection of an appropriate rate are welcomed.

Calibration

While model calibration is useful, care should be taken to ensure that down gradient locations used are representative ie. wells screened in the same strata, samples are appropriate depths within the water column, temporal fluctuations in groundwater flow direction have been considered.

The EA would welcome an opportunity to review the revised Controlled Waters Risk Assessment once supplementary information from the additional investigation works has been considered to refine this assessment.

Outline Remediation Strategy - Remedial options

While further investigation works are required to better refine the CSM and develop a detailed remedial strategy, we agree with the conclusion that it is very unlikely the results will materially alter the identified remedial options.

Of the 2 preferred options with respect to groundwater, the EA considers option 1 (hydraulic containment and MNA) is the least suitable. Current levels of information are not sufficient to support MNA and time frames for implementing such a strategy are unlikely to be compatible with those of the development.

Option 2 (in situ chemical reduction) would be the preferable option. This will more likely achieve remedial objectives in an appropriate time frame. Post completion, MNA has been identified as a polishing off option. The EA would be supportive of this approach provided it is supported by the post in-situ works monitoring data. It is noted the option of undertaking additional in-situ works has been included if required.

As previously mentioned, the EA is concerned that DNAPL may be present, having migrated down dip. Currently, there is no inclusion of a strategy to deal with any recoverable DNAPL. However, from experience it is known that options exist which should be implementable on the site in the case of recoverable DNAPL being discovered.

Retaining Wall

It is understood that the enabling works will include a bored piled retaining wall to provide support to the railway line as part of the 'enabling works' phase. This wall will require piled foundations and it is likely this work will need to be completed as part of the remedial works. From the information available, it would seem that the piled works will be located close to but outside the areas of soil and groundwater contamination, however, we would welcome confirmation on this matter. From engagement with the project team, we welcome the intention to produce a Piling Risk Assessment, given the potential for mobilisation of contamination and creation of new contamination pathways. We would welcome further discussions on how these works will be managed.

Enabling Works Phasing

It is understood the ground remediation works are to be undertaken as part of the 'enabling works'. It is the EA's understanding that additional investigation and remedial works will potentially run concurrently to an 'enabling works' phase. In principle, phasing works in this manner could be acceptable provided there are sufficient controls in place to ensure such enabling works will not increase risk to 'controlled waters' and prejudice requirements for further investigation or implementation of the remedial strategy. As in

the above context of this review, it is critical the 'enabling works' are cognisant of contamination risks and ensures that these are appropriately managed.

Whilst it is potentially feasible to combine the additional works required with the enabling phases of the development, this is dependent upon receiving satisfactory information demonstrating how each phase of the enabling works will be managed so as not to jeopardise further investigation and remediation, whilst ensuring no adverse impacts on contamination as a result of such works (i.e. where intrusive works are undertaken prior to remedial works). If the project team intend to progress with this approach, the EA would welcome an opportunity to undertake an initial review (or discussion) on the phasing plan for the 'enabling works' (as currently required by planning condition under 136814/FO/2023) which includes narrative that is cognisant to these matters and inclusion of the intended sequencing of such works per phase.

--

We trust that you find the contents of this letter beneficial to further the progression of land contamination matters for proposed development / plots NT02-NT04. However, should you have any queries or questions regard the contents of this letter and/or wish to seek further advice, guidance or discussion regarding this topic matter following the completion of additional ground investigations, then please don't hesitate to get in contact.

Yours faithfully

Ms Anne-Marie McLaughlin
Planning Advisor

Direct e-mail anne-marie.mclaughlin@environment-agency.gov.uk

Far East Consortium (FEC)
UK (London Office)
12 Stanhope Gate
London
W1K 1AW

Our ref: SO/2023/123379/01-L01
Your ref: Application '5'
Date: 14 September 2023

FAO: Linden Richardson / RoC Consulting (acting on behalf of FEC) / John Sherrington / SPC Limited (acting on behalf of FEC)

ENVPAC/1/GMC/00443 – Written Preliminary Review Phase 2 Site Investigation

TECHNICAL WRITTEN REVIEW - ENVIRONMENT AGENCY / FAR EAST CONSORTIUM – VICTORIA NORTH DEVELOPMENT PROPOSALS - PHASE 1

PLOTS NT02, NT03, NT04 ('Application 5') - LAND CONTAMINATION REVIEW AND RESPONSE LETTER FOR:

- **Phase 2 Site Investigation Plots NT02, NT03 and NT04 Dantzic Street. Prepared by RoC Consulting. Ref: 4328-ROC-zz-XX-RP-ES-P2-101. Rev 03. Date: 17th July 2023.**
- **Controlled Waters Risk Assessment, Plot NT02 Dantzic Street. Repared by RSK Geosciences. Ref. 11847 R01 (00). Rev. 00. Date: 18th July 2023.**
- **Remediation Strategy Report (Outline), Plot NT02-NT04, Northern Gate Dantzic Street. Prepared by RSK Geosciences. Ref. 11834 R01 (00). Date: 18th August 2023.**

LAND OFF DANTZIC STREET, PLOTS NT02, NT03 & NT04

Thank you for requesting advice from the Environment Agency (EA) in relation to land contamination matters on the Victoria North Development Plots NT02-NT04 under chargeable agreement ENVPAC/1/GMC/00443.

EA Review Context

We note the NT02-NT04 site, as part of the Victoria North Phase 1 development, is subject to historic contamination as a result of previous industrial land use. From the EA's engagement with the FEC project team to date and understanding of the Phase 1 Desk Study (by RoC Consulting, dated 12th January 2023) and Phase 2 Site Investigation (by RoC Consulting, dated 21st October 2023) previously produced, the most significantly impacted area of the development site is plot NT02. It was highlighted and agreed that additional site investigation work is required to delineate and understand the extent of the chlorinated solvents present on site to confidently determine the risk and, subsequently, establish an appropriate remediation strategy (SO/2023/122837/01-L01, dated 9th March 2023).

We note approval for Plots NT02-NT04 (also named 'Application 5') is currently being sought through Manchester City Council (MCC) planning application ref. 136814/FO/2023. The EA acknowledge the project team's intention to phase both the 'enabling' and 'construction' works for plots NT02-NT04 under 136814/FO/2023. The

EA has no objections with this approach in principle and had highlighted through engagement with the project team and within our formal response to the LPA, that any intrusive works / below ground demolition / material extraction will need to be supported by a firm understanding of the characterisation of ground conditions; associated risks; and remedial works, if necessary (SO/2023/123166/01-L01, dated 18th August 2023). With regards to the 'enabling works' package / phase, such understanding will be required prior to the commencement of these works with the exception of above ground activities, including site set-up; vegetation clearance and above ground demolition, to ensure contamination risks are managed appropriately.

The ground conditions / land contamination information submitted in support of 136814/FO/2023 (as previously reviewed by the EA under our pre-application engagement with the project team) sufficiently demonstrated that the risks to 'controlled waters' can be appropriately managed. Acknowledging the additional work required to sufficiently characterise / assess ground conditions and subsequent production of a remediation strategy for the development site, the EA recommended a pre-commencement planning condition for details of the additional site investigation / assessment work; remedial strategy; and verification plan to be submitted prior to the commencement of any phase of development (excluding site set-up; vegetation clearance and above ground demolition) (SO/2023/123166/01-L01, dated 18th August 2023). Wider to this, and in relation to contaminated land matters, the EA also recommended planning conditions for the submission of a verification report to demonstrate the success of proposed remedial works (by phase); an assessment for proposals that include surface water infiltration drainage; a risk assessment for proposed piling / foundation works; and a scheme for the management / decommissioning of boreholes on site (by phase).

[The EA are awaiting confirmation of the intended final wording of the planning conditions on the Decision Notice for 136814/FO/2023 (email dated 25th August 2023)]

We note the site investigation work and remedial approach will establish the appropriateness of a phased approach to both the 'enabling' and 'construction' phases of the development. Based on the information submitted in support of 136814/FO/2023 and through direct engagement with the project team, there was recognition that a phased remedial approach may not be achievable but recognise this would be subject to the findings of the additional site investigation work / assessment and subsequent remedial approach proposed.

The EA are now in receipt of the updated Phase 2 site investigation report (17th July 2023); controlled waters risk assessment (for NT02 only) (18th July 2023); and outline remediation strategy for Plots NT02-NT04 to demonstrate the progress made since our previous review to address the contaminated land issues at Plots NT02-NT04 (18th August 2023). This is with recognition of the intention to phase the proposed development for both the 'enabling' and 'construction' works.

Therefore, in line with the above context, please see below the EA's commentary on the review of the aforementioned reporting for Plots NT02 to NT04.

EA Commentary on Contaminated Land Matters for Plots NT02-NT04

[Commentary below provided by EA Contaminated Land Advisor, Clay Durrant]

The reporting submitted to date provides confidence that the risks to controlled waters from historic contamination, including chlorinated solvents, can be mitigated. The site

has been subject to good degree of investigation, with results used in support of a Detailed Quantitative Risk Assessment. Based on these, a robust remedial options appraisal has been presented which has identified viable options. We note relevant sections of the reports have identified the remaining uncertainties and recommended further works to address these as summarised below:

- Requirements for further intrusive works to better delineate the extent of TCE contamination both within soils and groundwater.
- Further testing of the hydraulic conductivity and hydraulic gradient.
- Ongoing monitoring to ensure that ground conditions are accurately captured.
- Updating the relevant documents as part of finalising the remedial strategy.

The above listed works are generally consistent with our assessment of the site-specific circumstances. While this information is required to ensure that appropriate remedial criteria is developed and allow for the design of a detailed remedial strategy, it is considered unlikely that the results will impact upon the viability of the identified remedial options in principle.

To support the additional work the EA understand will be undertaken as above, we have the following detailed commentary for the project team's consideration:

Delineation of Chlorinated solvents

We note borehole logs from NT02 indicate that the surface of the Manchester Marls dips to the southwest, with thickness of the Chester Formation increasing down dip. BH305 encountered the base of the Chester Formation at 23.15m AOD, with the depth to base increasing (elevation decreasing) as shown by BH202, BH303 to 18m AOD at BH203, a drop of 5.15m. The same trend is shown between BH305 and BH201 (19.60m AOD), with the base of the Chester Formation encountered at 19.60m AOD, a drop of 3.55m. ROCRBH301, terminated at 15.00m bgl (16.41m AOD) and did not encounter the base of the Chester Formation.

While the lower permeability marls are likely to limit the vertical migration of DNAPL (if present), migration down dip at the base of the Chester Formation / top of the Manchester Marls could occur.

As recognised in the report, further works are required to delineate soil and groundwater chlorinated solvents, namely TCE in areas of the site which have not been accessible due to current site operations. We have the following comments in relation to the approach undertaken on the delineation of chlorinated solvents to date:

- Currently the down dip locations within plot NT02 lack sufficient depth (i.e., boreholes which extend to the base of the Chester Formation). Additional investigation in this area must be sufficient to refine this aspect of the CSM and bridge the current, perceived, information gap.
- It is noted that several boreholes are screened at depth within the Manchester Marls. Groundwater samples obtained from these may not accurately capture the presence of chlorinated solvents, due to the lower permeability of the marls limiting vertical migration.

- Groundwater data from ROCRBH203, ROCRBH303 and LK RBH3 have all detected TCE significantly above the relevant assessment criteria. Concentrations are generally higher during the rounds completed in late 2022 and early 2023. Drivers for these trends have not been discussed and their significance remains unclear. This, in our opinion, makes the information gaps more significant and will need to be addressed in future reporting.
- Ongoing monitoring should help to better identify any trends and analysis of the results should consider the points such as strata individual boreholes are screened in and sample depths from within the water column.

The EA would welcome an opportunity to review the additional works / assessment on the delineation of chlorinated solvents once available. We note, in particular, that the extent of this contamination plume will influence the intended phasing / sequencing of works for plots NT02-NT04.

Controlled Waters Risk Assessment

We note sensitivity analysis has identified key parameters which require further refinement, with this data to be collected via further investigation works which is welcomed. Based on the current Controlled Waters Risk Assessment, we have the following comments to make:

Hydraulic conductivity (K)

Site specific K values have been obtained for the Chester Formation (286.50m/d from BH203 10-15m bgl and 19.70m from BH301 4-10m bgl), with a final value of 1.025m/day selected. This is based on the geometric mean of the higher measured value and the geometric mean of the literature value for sandstone. It is noted that this value has been selected to be representative of the flow within the weathered sandstone and the more competent bedrock. From local knowledge, the higher value obtained is potentially realistic. Sensitivity analysis has shown the model to be sensitive to this parameter so the proposal to undertake further investigations to achieve better characterisation is welcomed.

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The EA would welcome an opportunity to review the revised Controlled Waters Risk Assessment once supplementary information from the additional investigation works has been considered to refine this assessment.

Outline Remediation Strategy - Remedial options

While further investigation works are required to better refine the CSM and develop a detailed remedial strategy, we agree with the conclusion that it is very unlikely the results will materially alter the identified remedial options.

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the above context of this review, it is critical the 'enabling works' are cognisant of contamination risks and ensures that these are appropriately managed.

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--

We trust that you find the contents of this letter beneficial to further the progression of land contamination matters for proposed development / plots NT02-NT04. However, should you have any queries or questions regard the contents of this letter and/or wish to seek further advice, guidance or discussion regarding this topic matter following the completion of additional ground investigations, then please don't hesitate to get in contact.

Yours faithfully

Ms Anne-Marie McLaughlin
Planning Advisor

Direct e-mail anne-marie.mclaughlin@environment-agency.gov.uk

Reece McGuinness

From: Reece McGuinness
Sent: 15 December 2023 15:07
To: Reece McGuinness
Subject: FW: ENVPAC/1/GMC/00443 - VN FEC + EA - NT02-NT04 Remedial Strategy Approach Discussion

From: McLaughlin, Anne-Marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>
Sent: Friday, November 24, 2023 12:33 PM
To: Mike Newman <mike.newman@roconsulting.com>
Cc: Appleton, Shannon <Shannon.Appleton@environment-agency.gov.uk>; Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>; Alex Smiles <ASmiles@rsk.co.uk>; Davies, Andy <Andy.Davies1@environment-agency.gov.uk>; John Sherrington <john.sherrington@spclimited.co.uk>; Durrant, Clay <Clay.Durrant@environment-agency.gov.uk>
Subject: RE: ENVPAC/1/GMC/00443 - VN FEC + EA - NT02-NT04 Remedial Strategy Approach Discussion

CAUTION: This email originated from outside the Organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Afternoon Mike,

Many thanks for the below and confirmation of timescales / updates, I can confirm receipt of the remediation strategy (soils only) and look forward to the additional submission at a later date. Please see below some initial advice / queries from the correspondence below to aid in our forthcoming review:

Screening Criteria

Appreciate discussions are ongoing with Laura (MCC EH) around agreeing the screening criteria for soils. As initial comments from Clay on this matter, we note in the Phase 2 Site Investigation & DQRA (by ROC, dated 23rd August 2023) that the table under 6.4.4 includes leachate testing which reported exceedances when compared to DWS for a range of substances (organics, heavy metals) whilst Table 6.4.8 summarises the results in groundwater where GACs have been exceeded. Whilst it is common for leachate testing to overestimate, this acts as an important sense check. For example, leachate testing reports leachable lead max at 2970ug/l but no groundwater samples are reported to exceed the GAC of 10ug/l (DWS).

Whilst we are comfortable with human health considerations being the main driver to determine screening criteria in this instance, as soil quality needs to be protective of all receptors where a pathway exists we advise that once this has been agreed it is documented and also demonstrates that the level of risk to 'controlled waters' is acceptable.

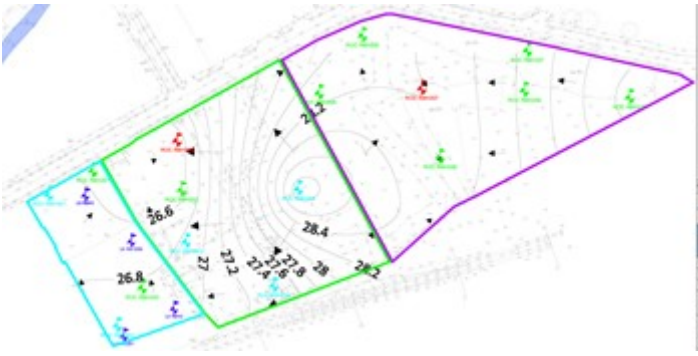
Contingency Plan

Thanks for the update and noted work is progressing with regards to the contingency plan between the soil remediation and groundwater remediation. We would advise this element is covered in detail within the remediation strategy for the soil remediation (currently submitted) in addition to the intended narrative to be presented within the Phasing Plan for the Enabling Works. We can continue with our review of the remediation strategy for soils only at this time, on the understanding the 'contingency plan' element will be provided at a later date.

NT02-NT04 Construction boundaries

As an initial comment on the boundaries presented for plots NT02-NT04 on drawings within the Phase 2 / Phase 3 reporting and for the context of our understanding on the subsequent construction phases (connection being with verification requirements for groundwater remediation), can you confirm at this time drawing (1) below is the current understanding of boundaries for plots NT02-NT04 and not (2)? Cross checks with proposed plans would indicate Drawing (1) reflects the separate plots.

(1)



(2)



Any queries, please feel free to contact me.

Many thanks,
Anne-Marie

Anne-Marie McLaughlin
Planning Advisor, Green Growth Team & Sustainable Places Team | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT
SP Team Email: SPPlanning.RFH@environment-agency.gov.uk
Mobile: **07717344174**
Pronouns: she/her



From: Mike Newman <mike.newman@roconconsulting.com>
Sent: Thursday, November 23, 2023 4:38 PM
To: McLaughlin, Anne-Marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>
Cc: Appleton, Shannon <Shannon.Appleton@environment-agency.gov.uk>; Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>; Alex Smiles <ASmiles@rsk.co.uk>; Davies, Andy

<Andy.Davies1@environment-agency.gov.uk>; John Sherrington <john.sherrington@spclimited.co.uk>; Durrant, Clay <Clay.Durrant@environment-agency.gov.uk>

Subject: RE: ENVPAC/1/GMC/00443 - VN FEC + EA - NT02-NT04 Remedial Strategy Approach Discussion

Afternoon Anne-Marie

Please find below link to remediation strategy (for soils outside of the TCE plume). The updated Phase 2 reporting including the mound will follow tomorrow.

The intent is to update this remediation strategy as we incorporate further requirements for dealing with the TCE soils and Ground Water. These updates will obviously include borehole protection/decommissioning and other items discussed previously.

<https://we.tl/t-vkMmVI3sU4>

In response to your queries below.

- The Phase 2 including mound and raw data will be issued tomorrow.
- Previous ground water monitoring was included in our Phase 2 issued in June and reviewed previously. Water monitoring of the current phase is ongoing.
- The phasing plan will provide overarching information on the strategy phasing as well as contingency plan. We are in the process of coordinating this with the contractor and we will share once agreed.

Mike

From: McLaughlin, Anne-Marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>

Sent: Thursday, November 23, 2023 12:14 PM

To: Mike Newman <mike.newman@roconconsulting.com>

Cc: Appleton, Shannon <Shannon.Appleton@environment-agency.gov.uk>; Beveridge, Lee

<lee.beveridge@environment-agency.gov.uk>; Alex Smiles <ASmiles@rsk.co.uk>; Davies, Andy

<Andy.Davies1@environment-agency.gov.uk>; John Sherrington <john.sherrington@spclimited.co.uk>; Durrant,

Clay <Clay.Durrant@environment-agency.gov.uk>

Subject: RE: ENVPAC/1/GMC/00443 - VN FEC + EA - NT02-NT04 Remedial Strategy Approach Discussion

CAUTION: This email originated from outside the Organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Mike,

No problem at all and thanks for the update. Just a few queries for clarity so we can touch base with Clay on the incoming review request:

- Is a revised Phase 2 report, including mound and raw data, alongside the remediation strategy for soils only intended to be issued by the end of the week?
- Does the raw data intended to be included as part of the submission include any early groundwater monitoring results at this time?
- Does the remediation strategy for soils provide overarching context to the remedial approach to the site (phasing of soil and groundwater remediation) and include a contingency plan for groundwater remediation (point III in Andy's email)?

Any queries, let us know.

Many thanks,
Anne-Marie

Anne-Marie McLaughlin

Planning Advisor, Green Growth Team & Sustainable Places Team | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT

SP Team Email: SPPlanning.RFH@environment-agency.gov.uk

Mobile: **07717344174**

Pronouns: she/her



From: Mike Newman <mike.newman@roconconsulting.com>

Sent: Thursday, November 23, 2023 10:59 AM

To: McLaughlin, Anne-Marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>

Cc: Appleton, Shannon <Shannon.Appleton@environment-agency.gov.uk>; Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>; Alex Smiles <ASmiles@rsk.co.uk>; Davies, Andy <Andy.Davies1@environment-agency.gov.uk>; John Sherrington <john.sherrington@spclimited.co.uk>; Durrant, Clay <Clay.Durrant@environment-agency.gov.uk>

Subject: RE: ENVPAC/1/GMC/00443 - VN FEC + EA - NT02-NT04 Remedial Strategy Approach Discussion

Morning Anne-Marie

Apologies for now getting back to you, but as the remediation strategy (for soils) and Phase 2 report including mound we not far off, we held on sending the raw data. This are complete and under internal review, so should be issued shortly.

We are in discussion with Laura at EH about screening criteria, the current strategy works on the basis of Residential end use without plant uptake, we will report further is relaxation is deemed acceptable under areas of hardstanding and building footprints.

Kind regards,

Mike

From: McLaughlin, Anne-Marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>

Sent: Thursday, November 23, 2023 10:34 AM

To: Mike Newman <mike.newman@roconconsulting.com>

Cc: Appleton, Shannon <Shannon.Appleton@environment-agency.gov.uk>; Beveridge, Lee <lee.beveridge@environment-agency.gov.uk>; Alex Smiles <ASmiles@rsk.co.uk>; Davies, Andy <Andy.Davies1@environment-agency.gov.uk>; John Sherrington <john.sherrington@spclimited.co.uk>; Durrant, Clay <Clay.Durrant@environment-agency.gov.uk>

Subject: RE: ENVPAC/1/GMC/00443 - VN FEC + EA - NT02-NT04 Remedial Strategy Approach Discussion

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Morning Mike,

Hope you are well,

Just checking-in on the submission of information to the EA as highlighted in yellow within Andy's email below. Happy to receive updated timescales on when this will be issued to us if anything has changed since our discussion last Thursday.

Many thanks,
Anne-Marie

Anne-Marie McLaughlin

Planning Advisor, Green Growth Team & Sustainable Places Team | Greater Manchester, Merseyside, Cheshire
Environment Agency | Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT

SP Team Email: SPPlanning.RFH@environment-agency.gov.uk

Mobile: **07717344174**

Pronouns: she/her



From: Davies, Andy <Andy.Davies1@environment-agency.gov.uk>

Sent: Thursday, November 16, 2023 2:53 PM

To: John Sherrington <john.sherrington@spclimited.co.uk>; Mike Newman <mike.newman@roconconsulting.com>;
Durrant, Clay <Clay.Durrant@environment-agency.gov.uk>; McLaughlin, Anne-Marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>

Cc: Appleton, Shannon <Shannon.Appleton@environment-agency.gov.uk>; Beveridge, Lee
<lee.beveridge@environment-agency.gov.uk>; Alex Smiles <ASmiles@rsk.co.uk>

Subject: RE: ENVPAC/1/GMC/00443 - VN FEC + EA - NT02-NT04 Remedial Strategy Approach Discussion

Afternoon John / Mike,

Thanks again for your time this morning to discuss considerations toward the phased remediation of Victoria North Plots NT02-NT04 / Application 5. As follow-on to this, please see below our summary of key discussion points/actions arising from the meeting:

- I. In the interim to further groundwater monitoring result (full suite anticipated mid-Dec) ROC will be seeking to progress the development an outline remedial strategy/approach.
- II. It is currently the anticipated the phased remediation approach for the site will be taken forward in two 'enabling works' phases . These phases of remediation are broadly (1) a site wide soils remediation, (2) a site wide groundwater remediation (extent of TCE plume determining). However, it is recognised that confirmation of the final suitability of this remedial approach will be subject to the outcome of further investigations.
- III. In relation to (II) above, noting the inability at this present moment to confidently determine the likely timescale which will lapse between remedial phases (1) and (2) and present ongoing efforts to achieve an effectual characterisation of the TCE Plume, it will be important that the phase (1) remediation (utilising active groundwater monitoring) includes a 'contingency plan' element . The aim of this contingency plan element is to ensure that any potential adverse risks to controlled waters known and/or further identified can be appropriately managed (utilising a groundwater monitoring network which will need to be protected for the duration of relevant site works). We anticipate the extent and importance of this contingency plan will hopefully become clearer upon the obtainable of results from additional groundwater monitoring undertaken.

In terms of the contingency plan, the key questions for the EA surrounding the appropriateness of this will be:

- How will effectual monitoring of the site 'interim' condition be achieved? – Borehole network.
- Soil remediation works notwithstanding, if an adverse groundwater situation is identified what are the actions/measures intended to be taken to mitigate and address this risk? E.g. evidence the TCE has begun to expand in response to Phase 1 works.

- Subject to groundwater risk to be further quantified, if it identified upon the breaking out of hard standing/floor slabs the potential exists for this to be the 'status-quo' of the site for a prolonged period of time or it is deemed there is a potential significant risk exists of contaminant mobilisation from exposure to the elements (rainfall), what actions are intended to be take to mitigate and address this risk. E.g. reduction in infiltration potential.
- III. Further to III above, for the purpose of remedial phase (2) it will be critical that there is confidence that the remedial strategy proposed is appropriate/reflective to 'present' site conditions at that enabling works stage i.e. fully reflective of the interim remedial status of the site. We consider that the contingency plan element of phase (1) discussed above could potentially play a key role in achieving this subject to the level of risk associated with groundwater contamination. For example, if mobilisation of the contaminant plume is identified a significant potential risk, then contingency plan measures can act to prevent this occurring and help to maintain the 'status quo' of groundwater conditions, wider to protection of the environment. This understandably will have a benefit for ensuring prior ground investigation and risk assessment remain valid and beneficial.
- IV. Irrespective of the final remedial strategy approach taken forward for the development site, it will be critical that the 'Enabling Works' phase plan submitted for the purpose of condition (4) is fully reflective and harmonious to the intended remedial strategy approach. We note complications could occur if there is an intention to try progress the 'construction phase(s)' of the development ahead of site remedial strategy completion. We consider this risk of complication is amplified if uncertainty remains regarding the extent of contamination present e.g. extent of TCE plume.
- V. In terms of post-meeting actions:
- Noting interrelation to VN HIF funding, [@John Sherrington](#) will seek to further understand the level of confidence in remedial strategy required at this stage in proceedings to progress relevant contractual arrangements and revert back to the EA as appropriate.
 - W/c 20th Nov [@Mike Newman](#) / ROC will seek to send to the [@Durrant, Clay/](#) EA for review/comment the results of additional ground investigations undertaken on the NR mound, any useful early groundwater monitoring results and an outline of the remedial strategy intended for the site. Upon receipt EA will advise further on review timescales.

[@John Sherrington](#) / [@Mike Newman](#) – Further to the above, as post-meeting note, whilst it possible to envisage that the remedial strategy approach proposed / discussed today (undertaking in singular phase of work above ground soils remediation) should hopefully avoid the potential of complications whereby the protection of human health is concerned. It would be advisable to also share early for review/commentary and outline remedial strategy/approach with our Environmental Health counterparts at MCC. In the instance of Application 5 as suspect this will be Environmental Health Officer, Laura Miller - laura.miller@manchester.gov.uk.

**

Any queries or questions regarding any of the above, then please don't hesitate to get in contact.

Kind regards,
Andy

Andy Davies

Project Manager, Green Growth Team & Sustainable Places Team | Greater Manchester, Merseyside, Cheshire
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-----Original Appointment-----

From: Davies, Andy

Sent: Monday, November 13, 2023 1:20 PM

To: Davies, Andy; Durrant, Clay; McLaughlin, Anne-Marie; John Sherrington; Mike Newman

Cc: Appleton, Shannon; Beveridge, Lee

Subject: ENVPAC/1/GMC/00443 - VN FEC + EA - NT02-NT04 Remedial Strategy Approach Discussion

When: 16 November 2023 10:00-11:30 (UTC+00:00) Dublin, Edinburgh, Lisbon, London.

Where: Microsoft Teams Meeting

All,

Further to recent email correspondence, please accept and forward as appropriate this MS Teams invite. This meeting with the EA is being facilitated under chargeable agreement ENVPAC/1/GMC/00443.

The primary intention of this meeting is discuss remedial strategy/enabling phase requirements for the purpose of further progressing Victoria North 'Application 5' / 136814/FO/2023.

Outline Meeting Agenda

- Introductions
- Collective agreement to meeting agenda/scope.
- FEC Strategic Update
 - *Status of Application 5 Determination*
 - *Decision Notice / Condition Wording*
 - *Timescale and programme of further works / investigations intended.*
- ROC / FEC presentation of remedial approaches being considered and associated rationale.
- Collective discussion regarding remedial approaches.
- Agreement of post-meeting actions.
- AOB

Any queries or questions the please don't hesitate to get in contact.

Kind regards,

Andy

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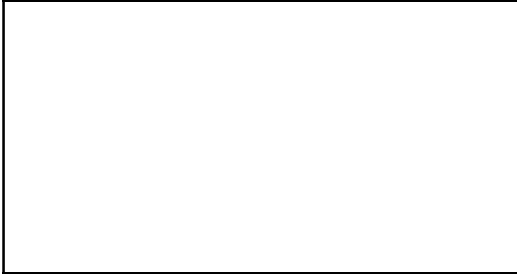
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Reece McGuinness

From: Durrant, Clay <Clay.Durrant@environment-agency.gov.uk>
Sent: 13 December 2023 18:21
To: Emma Hobbs
Cc: Mike Newman; Alex Smiles; Laura Aspinall; Reece McGuinness; john.sherrington@spclimited.co.uk; McLaughlin, Anne-Marie; Davies, Andy
Subject: RE: NVPAC/1/GMC/00443 - EA / FEC - VN 'Application 5' (Plots NT02-NT04) Enabling Works and Remedial Approaches

CAUTION: This email originated from outside the Organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Emma,

I would agree that the general lack of benzene in the Chester formation is strange- as you have stated it would be likely that an on-site source would result on an impact on the sandstone and the marls.

In terms of going forward the suggestion to carry on dealing with the TCE issue and provide a further commentary re the hydrocarbons in the marls makes sense.

While I appreciate the data from the new locations is limited, my initial impressions are as follows:

Following up with lab re benzene makes sense. Have there been any further monitoring rounds in 500 series yet?

BH502- this has reported the highest concentrations of TPH in the principal aquifer. The fractions reported have a low to very low mobility which, when considering the groundwater flow direction in the sandstone suggests an off site/localised source. I think the current lack of any down gradient concentrations supports the conclusion that these present a low risk.

Has the Lod benzene changed? I note that for some locations 1ug/l is highlighted yellow indicating a detection while for some rounds the result is given as <1ug/l (taken as Lod).

BH503- was benzene recorded in the sandstone (result of 19ug/l)?

Groundwater flow in the marls is suggestive of the plots NT03 and NT04 being upgradient- there might be a source located here which is able to reach the marls but if memory serves there are cohesive till deposits which would limit migration. Again, from memory it looks like upgradient bores in the marls are not reporting benzene? It would perhaps be useful to look at the elevations these are screened and compare to the 500 series bores and see if they are monitoring the same section of the aquifer.

I think looking at the groundwater elevations in the marls and the sandstones along the elevations of the top of the marls is interesting- it looks like as the marls dip to the west groundwater elevation in the marls is greater than the top of the marls so is there a degree of confinement? This could be a useful line of evidence re lack of pathway into the marls from the site.

So far, on the balance of things I am not seeing any reason to consider that benzene is a risk driver, although some additional groundwater monitoring would be useful to allow for the issue to be bottomed out. Happy to discuss further,

Kind regards

Clay Durrant

Groundwater and Land Quality Technical Specialist

[Green Growth and Delivery](#) ← Visit our SPOL site

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From: Emma Hobbs <EHobbs@rsk.co.uk>

Sent: Monday, December 11, 2023 9:53 AM

To: Durrant, Clay <Clay.Durrant@environment-agency.gov.uk>

Cc: Mike Newman <mike.newman@roconconsulting.com>; Alex Smiles <ASmiles@rsk.co.uk>; Laura Aspinall <laspinall@rsk.co.uk>; Reece McGuinness <reece.mcguinness@roconconsulting.com>;

john.sherrington@spclimited.co.uk; McLaughlin, Anne-Marie <Anne-Marie.McLaughlin@environment-agency.gov.uk>; Davies, Andy <Andy.Davies1@environment-agency.gov.uk>

Subject: NVPAC/1/GMC/00443 - EA / FEC - VN 'Application 5' (Plots NT02-NT04) Enabling Works and Remedial Approaches

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Hi Clay,

It was lovely to meet you on the call on Tuesday. We'd very much like to take you up on the offer you made towards the end of the call, about reviewing raw data ahead of our formalised submission. If this offer is still available, we would like to query some recent data with you and gauge your opinion.

Our risk assessor has reviewed the most recent round of groundwater sampling data (sampled in November 2023). Lighter end aromatic and aliphatic hydrocarbon bands were detected in groundwater samples from the following boreholes as shown in the screenshot below.

- ROC RBH502 P1 (Chester sandstone) and P2 (top of Manchester Marl) located along the southwest boundary
- ROC RBH505 P2 (top of Manchester Marl) located along the northwestern site boundary

This is in addition to the previous benzene detections in the northwest of the site at

- RBH301 (Chester sandstone)
- LKBH01 (installed across the Chester sandstone and into the top of the Manchester Marl)

We note that we only have one sample collected from the 500 BH series and we are asking the lab to double check the result for benzene particularly in RBH502 P2 is correct.

Benzene	<1	<1	Ali >C12-C16
Ali >C12-C16	<5	<5	Aro >C5-C7
Aro >C5-C7	<1	<1	Aro >C12-C16
Aro >C12-C16	<5	<5	TPH (Ali & Aro >C5-C35)
TPH (Ali & Aro >C5-C35)	<10	<10	

TPH

	RBH301	RBH301
Date	04/05/2023	10/05/2023
Benzene	12	13
Ali >C12-C16	<5	<5
Aro >C5-C7	12	11
Aro >C12-C16	<5	<5
TPH (Ali & Aro >C5-C35)	17	17

	RBH505 P1	RBH505 P2
Date	13/11/2023	13/11/2023
Benzene	<1	137
Ali >C12-C16	<5	<5
Aro >C5-C7	<1	126
Aro >C12-C16	<5	<5
TPH (Ali & Aro >C5-C35)	<10	128

	LKBH01	LKBH01 Duplicate	LKBH01
Date	27/09/2022	27/09/2022	19/01/2023
Benzene	258	186	27
Ali >C12-C16	<5	<5	<5
Aro >C5-C7	247	180	27
Aro >C12-C16	7	6	5
TPH (Ali & Aro >C5-C35)	263	204	41

	RBH502 P1	RBH502 P2
Date	13/11/2023	20/11/2023
Benzene	<1	385
Ali >C12-C16	1080	559
Aro >C5-C7	<1	300
Aro >C12-C16	340	130
TPH (Ali & Aro >C5-C35)	1640	1100

	RBH203	RBH203	RBH203	RBH203	RBH203	RBH203
Date	27/09/2022	04/10/2022	19/01/2023	04/05/2023	10/05/2023	13/11/2023
Benzene	<1	<1	<1	<1	<1	1
Ali >C12-C16	<5	<5	<5	<5	<5	<5
Aro >C5-C7	<1	<1	<1	<1	<1	1
Aro >C12-C16	<5	<5	<5	<5	5	<5
TPH (Ali & Aro >C5-C35)	<10	18	<10	10	15	<10

	RBH302	RBH302	RBH302
Date	04/05/2023	10/05/2023	13/11/2023
Benzene	<1	<1	<1
Ali >C12-C16	<5	<5	<5
Aro >C5-C7	<1	<1	<1

Localised elevated TPH concentrations predominantly aromatic fractions C10 – C35 were detected in soils at locations across the site, but no significant concentrations of benzene were detected, indicating the source is either located in an area of the site not sampled or is potentially migrating via groundwater from an off-site source.

We note that it is unusual that the lighter TPH fractions/benzene appear to be primarily within the deeper marl rather than the overlying sandstone which may indicate it is more likely to be due to an off-site source such as the historic rubber works to the west and/or the gas works to the south and north. This is supported by the distribution of the TCE groundwater plume which is from a known on-site source and which has remained predominantly in the sandstone aquifer and has not significantly penetrated into the marl. However, given the groundwater in the marl is indicated to flow east to west in line with the dip in the marl across the site and since we do not have other nearby upgradient groundwater quality information from the shallow marl, it is not possible to rule out an on-site source, although no obvious source such as tanks etc are shown in this area of the site on the available historic mapping and no detectable levels of benzene reported in made ground.

As the contamination is in the deeper marl (secondary B aquifer) and not in the overlying principal sandstone aquifer, the benzene is still not considered to be a primary risk driver for site remediation.

We would propose to submit the DQRA for TCE and remediation strategy within the planned time scales along with further commentary on the hydrocarbons in marls from a potential off-site source. However, we would appreciate your feedback on the above and welcome any comments on this emerging issue.

We have attached the following for information.

- Factual GQRA screening sheets for soil and groundwater
- Groundwater contour plots for the CHES and MM
- The MM surface contour plot

Kind regards,
Emma

Emma Hobbs
BSc(hons) MSc CSci FGS

Principal Environmental Consultant



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Please note I work flexible hours Monday to Friday with my core hours being between 10am and 4pm.

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COMPLEX CHALLENGES ...
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APPENDIX I – DETAILED QUANTITATIVE RISK ASSESSMENT REPORT



RoC Consulting

Plot NT02 Dantzic Street

Controlled Waters Risk Assessment

Project No. 11847 R01 (00)



JULY 2023

RSK GENERAL NOTES

Project No.: 11847 R01 (00)

Title: Controlled Waters Risk Assessment, Plots NT02 Dantzic Street

Client: RoC Consulting

Date: 18 July 2023

Office: RSK Environment Limited, Fourways House, 57 Hilton Street, Manchester, M1 2EJ

Status: Draft

Author	<u>Ulisse Pizzi / Laura Aspinall</u>	Technical reviewer	<u>Alex Smiles/ Laura Aspinall</u>
---------------	--------------------------------------	---------------------------	------------------------------------

Date:	<u>July 2023</u>	Date:	<u>July 2023</u>
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Project manager	<u>Alex Smiles</u>	Quality reviewer	<u>Joyce Saddington</u>
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Date:	<u>July 2023</u>	Date:	<u>July 2023</u>
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Revision control sheet

Revision reference	Date	Reason for revision
Rev 00	18/07/2023	First issue

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Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK Environment Ltd.

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FIGURES

Figures refer to those presented within Phase 2 site investigation report, completed by RoC Consulting in October 2022 (ref. 4328-ROC-ZZXX-RP-ES-P2-101 Rev01) to which this report forms an appendix.

APPENDICES

Appendix A	Service constraints
Appendix B	Hydraulic conductivity data
Appendix C	Controlled waters generic assessment criteria
Appendix D	Model input parameters
Appendix E	Quantitative modelling results
Appendix F	Sensitivity analysis results
Appendix G	Model calibration
Appendix H	RTV soils and groundwater screening

EXECUTIVE SUMMARY

Objective	RSK Geosciences have been instructed by RoC Consulting to complete a Detailed Quantitative Risk Assessment (DQRA) associated with the “Plot NT02” development parcel of the Plot NT02-04 residential led development henceforth known as “The site”). Ground investigation works across the site have revealed an area of Trichloroethylene contamination in soils and groundwater that have been deemed to pose a risk to controlled waters at the Generic Risk Assessment screening stage. The following DQRA has been completed to further assess the significance of this area of contamination in terms of risks posed to identified receptors and also support the development of a wider Phase 3a Remediation Strategy. The modelling assessment is being completed in tandem with a program of desk based and intrusive ground investigation works completed by RoC Consulting the findings of which are described in the below referenced documents. RoC Consulting, Phase 1 Desktop Study, January 2023 (ref: 4328-ROC-ZZ-XX-RP-ES-PH1DTS) RoC Consulting, Phase 2 Site Investigation Plot NT02, NT03 & NT04 dated July 2023 (ref: 4328-ROC-ZZ-XX-RP-ES-P2-101) It is recommended the above reports are reviewed in tandem with the current assessment
Site details	The site termed “Plot NT02” covers a roughly rectangular parcel of land within the wider Plot NT03 & 04 development master plan area. The site is bounded by Dantzic Street to the north beyond which lies a Travellers site and the River Irk (flowing roughly NE to SW); an electrified railway line on a viaduct to the south with car repair garages; the wider Plot NT0X site to the east (comprising a former waste management operator); and the Victoria Riverside high rise apartment scheme to the west. Topographically a fall in site levels is noted across the site in a roughly south to north orientation toward the River Irk, with levels varying between 34.80 mAOD and 31.20 mAOD across the Plot NT02 site. The site is to be developed for high rise residential led end uses comprising the construction of a 34-storey tower with associated public realm space, limited soft landscaping and hard standing. A planning application for this development has been lodge with the local authority (Manchester City Council, ref: 136814/FO/2023) for which this report and assessment has been collated to support with the associated discharge of pre-commencement conditions pertaining to ground contamination risks.

SITE CONCEPTUALISATION	
Previous works	A number of rounds of ground investigation have been completed across the Plot NT02 site, these include the aforementioned Phase 1 & 2 report collated by RoC Consulting in 2023 which capture the findings of previous works completed by LK Consult Ltd. The investigations have been completed to inform both design and planning requirements and are subdivided within the RoC Phase 2 SI report into plot specific ground conditions and risks. Controlled waters have been considered for the whole planning application boundary, noting the effects of soil borne contamination on one plot may manifest as ground water impacts on another. The design and layout of ground investigations was based on the findings of the Phase 1 Desktop study and works previously completed by LK Consult to characterise geological and geo-environmental conditions beneath the site, support the design of new building foundations / structures, inform waste disposal requirements and identify any contamination issues warranting remediation treatment. The recent RoC ground investigations were completed in two phases, an initial phase of exploratory works was undertaken in September and October 2022 to establish ground conditions across the Plot NT02 site. Along with identifying baseline ground conditions across the site the 2022 works revealed the presence of the Trichloroethylene (TCE) contamination plume beneath a warehouse to the south of the Plot NT02 site. The plume, which is believed to relate to former metal work operations on this portion of the site (degreasing agents) was subject to further investigations in April 2023 to further assess its spatial extent and significance. The findings of this most recent round of ground investigations have been used to form the basis for this DQRA assessment.
Ground conditions	Ground conditions generally comprise tarmac or concrete over made ground and a variable thickness of cohesive Till over the Chester sandstone formation (principal aquifer) and the Manchester Marl formation (secondary aquifer). Groundwater was encountered within the underlying weathered bedrock and based on groundwater contours is anticipated to flow in a north-northwest direction towards the River Irk.
Extent of soil contamination	A diffuse TCE soil plume is reported to cover the southern area of the site covering approximately the full width of the site within the footprint of an historic metal works.
Extent of groundwater contamination	A dissolved phase plume of TCE was detected in the south underlying the soil source extending northeast onto the adjacent Plot NT03. TCE daughter products were detected in groundwater in the north of the site
Potentially complete contaminant linkages	The following pollution linkages have been identified as being of relevance to the DQRA process:

	- Vertical migration of leachable contaminants from impacted soils present in the unsaturated zone to the underlying Chester formation and Manchester Marl formation aquifers. - Vertical and lateral migration of dissolved phase contaminants through the Chester sandstone aquifer to identified controlled water receptors including the wider Chester formation and Manchester Marl formation aquifers.
GENERIC QUANTITATIVE RISK ASSESSMENT	
GQRA conclusions	The RoC Phase 2 report concluded that the TCE and carbon tetrachloride detected in soil and groundwater and the TCE daughter products DCE and VC detected in groundwater in the north of the site required further assessment by DQRA.
DETAILED QUANTITATIVE RISK ASSESSMENT	
DQRA results	Modelling of the soil source in the south of the site indicates a marginal exceedance of the target concentration for TCE at the 50.00 m compliance with concentrations falling below the DWS at a distance of 75.00 m. For the groundwater source the predicted concentrations of trichloroethene and dichloroethane at the 50.00 m compliance point exceed the target concentration by an order of magnitude and vinyl chloride is predicted to be at a concentration marginally under the DWS. The predicted concentrations of trichloroethene and dichloroethene fall below the DWS at a distance of 125 m. Sensitivity analysis demonstrated that the model is particularly sensitive to hydraulic conductivity, hydraulic gradient and degradation rates for which there is currently limited site-specific data available, and it is recommended that additional monitoring works are undertaken to address these uncertainties. However, it is noted that model calibration against TCE concentrations detected at down gradient borehole LKBH01 indicates that the current model setup is likely to be highly conservative.
CONCLUSIONS AND RECOMMENDATIONS	
Conclusions	Modelling indicates that the TCE detected in unsaturated soils and the existing TCE dissolved phase plume, and its daughter products pose a potential risk to the wider principal aquifer. Screening of soil and groundwater data against the modelled RTV indicates that remediation of soils and groundwater at the site is required. Whilst it is acknowledged that there is some degree of uncertainty in the current model, a calibration check of the model demonstrated that it is likely highly conservative and therefore it is considered that the proposed RTV are suitably protective of controlled waters receptors and will provide a significant degree of betterment at the site.

Recommendations	• Copies of this report, along with the RoC Consulting Phase 2 Site Investigation should be provided to the regulatory authorities to review and provide comment. Any comments received from these regulators should be taken into account when completing any further model runs. • On going groundwater monitoring of wells installed during all phases of ground investigations should be continued so that a more reflective indication of groundwater levels and flow gradients can be obtained • Further hydraulic conductivity testing should be completed on wells installed into the Manchester Marls formation to allow the use of site-specific values within the RTM model • At such a time when the site is in vacant possession, or access is more readily available, further sampling of site soils should be completed to confirm the full spatial extent of the plume. Alternatively, advice should be sought from regulatory authorities to confirm they agree with the current assumed plume extents. • This report and associated RTM model should be revisited and updated to reflect new data obtained from site with a view to reducing the conservative nature of some assumptions made and allow more appropriate site specific RTV's to be derived for soils and groundwaters. • Copies of this report, along with the wider RoC Consulting Phase 1 & 2 site investigations should be provided to remediation specialists to consider and advise comment.
Key assumptions and limitations	It is noted monitoring works are on going on site and, as outlined in conclusions above, the content of this report and modelling assessment will require revision once additional site data is available. Similarly, and as a result of access limitations during the most recent round of ground investigations by RoC, the precise extent of the TCE plume is not fully defined. As such a “worst” case value of the highest concentrations of contaminants have been used when defining the plume in the model, which will lead to more conservative resultant outputs.
The information given in this summary is necessarily incomplete and is provided for initial briefing purposes only. The summary must not be used as a substitute for the full text of the report.	

1 INTRODUCTION

RSK Environment Limited (RSK) was commissioned by RoC Consulting (RoC), the Client, to prepare a controlled waters detailed quantitative risk assessment (DQRA) for the land at Plots NT02-04 Dantzic Street ('the site'). The site is proposed to be developed as with a mixture of high and medium rise residential buildings to heights of between 20 and 35 stories with smaller buildings varying in heights of between 4 and 8 storeys. The development is also anticipated to include small areas of soft landscaping, and a new access road. The project was carried out to an agreed brief as set out in RSK's proposal (Ref. 11847 TL01 (00), dated June 2023).

This report is subject to the RSK service constraints given in **Appendix A**.

1.1 Background

The site is located at Manchester, at approximate National Grid reference E384690 N399470.

The site has historically been divided into three plots for planning purposes – Plot NT02 in the west, Plot NT03 in the centre and Plot NT04 in the east. Each of these has distinct land uses, as follows:

- Plot NT02 occupies the western portion of the site and comprises a light industrial building with several smaller buildings, associated access road and areas of hardstanding.
- Plot NT03 occupies the centre of the site. It is understood that a portion of the south of Plot NT03 is owned by Network Rail. The north of the plot is largely covered with hardstanding while the southern part and Network Rail land are occupied by two large earth mounds which likely overlap somewhat.
- Plot NT04 is comprised of semi vegetated disused land.

Historically the site was occupied by residential housing, a smithy, Victoria Screw & Bolt Works, Victoria Paint Works, printing works, a foundry, tripe works, and a warehouse.

Further details regarding the site are presented in **Section 2**.

There have been a number of geo-environmental site investigations previously undertaken at the site, including:

- Phase 2 site investigation report, completed by RoC Consulting in October 2022 (ref. 4328-ROC-ZZXX-RP-ES-P2-101 Rev01), updated following completion of supplementary SI works in June 2023.
- RoC Consulting, January 2023. Technical Note on Plot NT03 Network Rail Mound (ref. 4328-ROCZZ-XX-TN-ES-TN2)
- RoC Consulting, January 2023. Phase 1 Desktop Study (ref: 4328-ROC-ZZ-XX-RP-ES-PH1DTS)
- LK, March 2020. Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy, at Plot NT02 only (ref: CL-602-LKC 20 1060-01)
- Allied Exploration & Geotechnics Ltd, March 2019. Northern Gateway Final Factual Report (Contract Number: NW1580)

- Hydrock, December 2015. Ground Conditions Desk Study (ref: R/151819/G001)

This controlled waters DQRA report has been completed in order to support the refinement of risks posed by Trichloroethylene contaminants noted beneath the site to the southern and western extent and the associated chlorinated VOC groundwater plume. It is envisaged the outputs from this modelling assessment will be used to revise the refined conceptual site model postulated in recent the RoC Consulting Phase 2 site investigation report and support the design of remediation works moving forward. The overarching aim of all works will be to support planning condition discharge for the development and associated engagement with the regulatory authorities (namely Manchester City Council and the Environment Agency).

1.2 Objective and aims

The objective of this report was to evaluate risks to controlled waters receptors at Plot NT02. The aims of this report are to:

- carry out a controlled waters DQRA for the site in accordance with development of the site for high rise residential housing, using historical data and more recently obtained soil and groundwater data;
- derive site-specific targets for comparison to groundwater quality data;
- derive remedial targets to inform remediation of the site;
- provide initial recommendations for future work.

1.3 Scope

The scope of the investigation and layout of this report has been designed with consideration of Land Contamination Risk Management (LCRM) (Environment Agency, 2020) – which supersedes CLR11 Model Procedures for Land Contamination, and BS 10175: 2011 + A2 2017 (BSI, 2017) and guidance on groundwater protection issued by the EA (2017a) and includes:

- a review of previous reports;
- interpretation of recently acquired hydraulic conductivity field tests data;
- refinement of the hydrogeological assessment of the site;
- preparation of a controlled waters DQRA.

1.4 Existing reports

The following reports detailing previous works at the site were made available for review:

- Phase 2 site investigation report, completed by RoC Consulting in October 2022 (ref. 4328-ROC-ZZXX-RP-ES-P2-101 Rev01), updated following completion of supplementary SI works in June 2023.
- RoC Consulting, January 2023. Phase 1 Desktop Study (ref: 4328-ROC-ZZ-XX-RP-ES-PH1DTS).

Pertinent information from these reports has been summarised in **Section 3**. For ease of reference hereafter, the above Phase 2 report will be referenced as “RoC Phase 2” report.

1.5 Limitations

The comments given in this report and the opinions expressed are primarily based on third party data and investigations, while RSK will undertake a critical review of the information provided we cannot be held liable for the quality of the data provided. There may be conditions pertaining to the site that have not been disclosed by the investigations and therefore could not be taken into account. In particular, it should be noted that there may be areas of made ground not detected due to the limited nature of the investigations or the thickness and quality of made ground across the site may be variable. In addition, groundwater levels and groundwater concentrations may vary from those reported due to seasonal, or other, effects.

2 SITE DETAILS

2.1 Site location

Site location details are presented in **Table 1**.

Table 1: Site location details

Site name	Plots NT02-04, Dantzic Street, Manchester
Full site address and postcode	M4 4NL
National Grid reference (centre of site)	E384690, N399470

2.2 Site description

The site covers an area of circa 2.30 hectares. It is currently occupied by the land uses detailed in **Section 1.1**.

2.3 Development plans

The proposed layout of the site, at the time of preparing this report, is shown in RDB-MLA-00-XX-DR-AR-01110000 in Appendix A of the RoC Phase 2 report.

It is understood that the site is to be developed with a mixture of high and medium rise residential

buildings, with the former to heights of between 20 and 35 stories and the latter to heights of between 4 and 8 storeys. The development is also anticipated to include small areas of soft landscaping, and a new access road passing between NT02 and NT03 and continuing to the east along the southern site boundary.

No information on service routes or details of any changes planned in site levels have been provided. As such, for the purpose of this report it has been assumed that the current levels will remain unchanged. In addition, it is assumed a basement structure will not be constructed as part of the new development phases.

2.4 Surrounding land uses

The site is located in Manchester city centre, nearby Victoria Station, within a predominantly residential / car parking setting. Immediate surrounding land uses are described in **Table 2** overleaf.

Table 2: Surrounding land uses

North	Dantzic Street to the north with an area occupied by caravans and warehousing beyond, and the River Irk beyond.
East	Dalton Street and residential housing.
South	Network Rail viaduct.
West	Victoria Riverside development.

2.5 Site history/operations

Based on the site's historical use a number of potentially contaminative activities/land uses were undertaken in the southern area of the site. These included the Victoria Screw and Bolt works from before 1891, the Victoria Paint Works from circa 1908, the Collyhurst Foundry from circa 1948, Asphalt Works and Tripe Works from circa 1958 and a rubber works from circa 1989.

More recently a waste management company known as Farlam Waste Management is known to have operated in the eastern portion of this plot, only having ceased operation within the past decade; anecdotal evidence from discussions on site with excavator operatives indicate the southern portion of the Plot NT02 was also used as a yard for construction plant.

The northern area of the site was occupied by terraced residential properties between the late 19th and mid-20th centuries before the entire area was turned over to commercial industrial / warehousing operations during the 1970's and 1980s.

The site is also surrounded by potential historic sources of contamination that may have impacted the site via migration of contaminated groundwater including a gasworks to the south, a rubber works to the west and gas holders to the north.

3 PREVIOUS REPORTS

A summary of pertinent information from previous investigations is included below in **Table 3**. Relevant information relating to the identified ground and groundwater conditions has not been included within the table below but has been incorporated into **Section 4**.

Table 3: Summary of previous investigation reports

Report 1	
Report details	LK, March 2020. Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy, at Plot NT02 only (ref: CL-602-LKC 20 1060-01) Summary based on review of report presented within the RoC 2023 GI report.
Site coverage	Whole site
Summary scope of works	The LK investigation comprises 7 window sample locations to a maximum depth of 4.45 m bgl and 2 rotary borehole locations to a maximum depth of 20.0 m bgl covering the whole of Plot NT02.
Does the client have reliance upon the report?	Yes
Key findings relevant for controlled waters	Results from chemical testing undertaken by LK Consult revealed the following issues in the Plot NT02 regarding contamination: - Elevated levels of Heavy Metals (Lead) in soil at WS104, SP1 and SP2 (Likely associated with ash, clinker and coal noted within made ground deposits) - Elevated levels of PAHs - Benzo(a)pyrene and Naphthalene in soil at WS102, WS103, WS105, TP103, TP105 SP1 and WS205 (Likely associated with ash, clinker and coal noted within made ground deposits) - Elevated levels of TPH – Aliphatic C12-C16, Aromatic C8-C10 and Aromatic C10-C12 in soil at WS205 (beneath the light industrial building and likely associated with the numerous historic industrial activities in this area of the site) - Elevated levels of VOCs/SVOCs – Benzene and Trichloroethene in made ground and superficial deposits at WS205, WS201, WS202 and WS204. PID readings in the southwest of the plot also indicate the presence of volatile contamination with readings between 4.3ppm and

	207ppm (Likely associated with the historic industrial activity in this area of the site); Elevated concentrations of contaminants in groundwater including Vinyl chloride at RBH101 and Trichloroethene in RBH103. The report hypothesizes these may be linked to historic industrial activity on site or a result of historic industry across the wider area, such as the former gasworks.
Report 2	
Report details	Phase 2 site investigation report, completed by RoC Consulting in October 2022 (ref. 4328-ROC-ZZXX-RP-ES-P2-101 Rev01), updated following completion of supplementary SI works in June 2023.
Site coverage	The 2022 RoC site investigation covered the whole of NT02 whilst the 2023 supplementary focused primarily in the south of the site
Summary scope of works	The scope of the 2022 SI comprised 4 window sample locations, 2 trial pits and 2 rotary borehole locations to a maximum depth of 25m bgl spread across the whole of Plot NT02. The scope of the 2023 SI comprised 9 window sample locations in the south of the site and 2 rotary boreholes to a maximum depth of 18.00 mbgl. Several additional boreholes were also drilled on the adjacent NT03 site to the east.
Does the client have reliance upon the report?	Yes
Key findings relevant for controlled waters	Numerous contaminants were detected in unsaturated soils at the soils at the site. Namely heavy metals/inorganics including arsenic and lead, TPH fractions, PAH and VOC/SVOC including TCE, hexachloroethane and low levels of numerous other chlorinated compounds, BTEX and phenol derivatives. Highest concentrations and frequency of TPH and VOC were detected in Plot NT02, primarily in the southern area where historic industrial activities including the bolt works and foundry were located. Soil leachate results indicated the potential for the DWS to be exceeded in the underlying groundwater particularly at Plot NT02 where numerous exceedances were reported for metals/inorganics, PAH, TPH fractions and TCE Trichloroethene exceedances of the DWS were reported in groundwater in the shallow sandstone in LK BH03 and RBH203 located in the south of Plot NT02 and extending over the eastern

site boundary to RBH303 located in Plot NT03. Carbon tetrachloride was also reported to exceed the DWS in LK BH01, LK BH03, RBH 203, RBH302

Benzene and TCE daughter compounds cis-1,2-dichloroethene, trans 1,2-dichloroethene, vinyl chloride were reported to exceed the DWS in the shallow sandstone in the north of the site.

It was noted that the metals, PAH compounds and TPH fractions detected in leachate testing and the other SVOC detected in soils testing were not reported at concentrations exceeding the GAC in groundwater likely due to degradation in the unsaturated zone given and/or more preferential sorption to soils.

The report concluded that a potentially complete pollutant linkage for the migration of chlorinated VOC to the wider principal and secondary aquifers and recommended further assessment of potential risks to controlled waters via DQRA specifically for TCE, carbon tetrachloride, cis and trans-1,2-dichloroethene and vinyl chloride.

Due to the localised nature of the detection of benzene in the northwest of the site and the absence of benzene detection in soils and soil leachate at the site it was concluded that the benzene detected in groundwater was more likely due to an off-site source and benzene was not considered a risk driving compound for the site and thus was not proposed for inclusion within the recommended DQRA.

4 SITE CONCEPTUALISATION

Information presented in this section has been mainly obtained from the previous RoC GIR updated report (June 2023) mentioned in **Section 1.4**.

4.1 Geology

The borehole records from the RoC (June 2023) report have been used to summarise the encountered geology and the results are given in **Table 4**. The historical investigations confirm the Published geological records for the site area (British Geological Survey, Sheet 85). Geology is summarised for Plots NT03 and NT04 in addition to NT02 to provide information about the wider geological setting.

Table 4: Geology at the site

Geological unit	Description	Historically encountered thickness (m)
Made Ground	In Plot NT02 there is a surface covering of concrete and tarmac within and outside of buildings which is typically underlain by Made Ground of demolition fill type material. Typically, this is a gravelly sand or sandy gravel containing whole and half bricks and chunks of concrete; gravel of brick fragments, slate, clinker, and slag. Other anthropogenic inclusions included wire, metal, glass, plastic, metal pipes and beams, clay pipes, fabric, rubber, and timber.	2.50 (m)
	In Plot NT03 there is a surface covering of concrete and tarmac within and outside of buildings which is typically underlain by Made Ground of demolition fill type material.	3.10 (m)
	The southern part of NT04 is surfaced with a concrete slab while the remainder comprises overgrown vegetation and weeds. Made ground was generally encountered as a gravelly sand or gravelly clay containing clinker, concrete, brick, slag, slate, coal, and ceramics.	8.40 (m)

Geological unit	Description	Historically encountered thickness (m)
Superficial deposits – River Terrace Deposits (Plot NT03 only)	Encountered in PlotNT03 located adjacent to the east of Plot NTO2 in one location (RBH304) beneath Made Ground, as rounded sandy gravel of sandstone, quartzite and siltstone from a depth of 3.60 m to termination at a depth of 9.45 m. It is also feasible these soils may extend further to the east into Plot NT04.	5.85 (m) not fully proven by drilling
Superficial deposits – Till (Devensian)	Underneath PlotNT02, the Till is often thin and sometimes comprises granular soils. Most typically Devensian Till was encountered as brown sandy gravelly clay ranging in consistency from very soft to stiff but generally becoming stiff with depth.	2.50 (m)
	Underneath PlotNT03, the Till was encountered as a firm to stiff slightly gravelly slightly sandy clay.	5.80 (m)
	Underneath PlotNT04, the Till was typically encountered as a stiff brown or blueish grey clay, slightly gravelly in places. The Till is thickening progressively from West to East.	7.80 (m)
Bedrock – Chester Formation (Lower Triassic sandstones)	PlotNT02 Bedrock of the Chester Formation (CHES) was encountered beneath Devensian Till deposits in all locations in NT02. The upper horizons of the Chester Formation were encountered to be significantly weathered and are effectively sand for up to the first 8.00 m. Deeper horizons of the bedrock also show weaknesses and may be affected by faulting (Section 2.2).	15.07 (m)
	PlotNT03 Bedrock of the Chester Formation was encountered beneath Devensian Till deposits in all locations in NT03; the upper horizons of the Chester Formation are significantly weathered and are effectively sand for up to the first 6m. Deeper horizons of the bedrock also show weaknesses and may be affected by faulting.	1.0 (RBH306) – 6.32 (RBH206, Plot04 west)

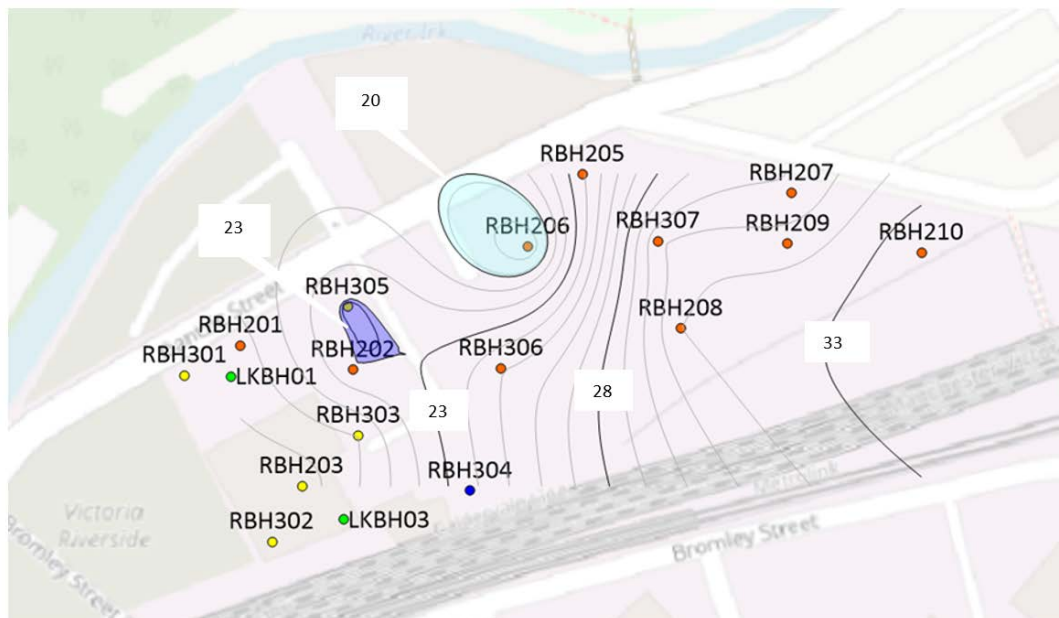
Geological unit	Description	Historically encountered thickness (m)
	Plot NT04 Bedrock of the Chester Formation was encountered in only one location at the western edge of NT04, RBH206. The upper horizons of the Chester Formation are significantly weathered. The Chester Formation is thinning progressively from West to East.	Absent
Bedrock – Manchester Marls Formation (Upper Permian mudstones)	Plot NT02 Reddish brown MUDSTONE recovered as clay when weathered, with interbedded siltstone laminated layers and layers of weak reddish brown fine grained SANDSTONE, up to ~3.00 m thick.	MM was proven by drilling up to a depth of 25.00 mbgl.
	Plot NT03 Reddish brown MUDSTONE and fine to medium grained reddish brown SANDSTONE in layers up to 1.50 m thick.	
	Plot NT04 Reddish brown MUDSTONE and weak reddish brown fine grained SANDSTONE and siltstone thin layers < 1.00 m.	
Source: On-site exploratory hole records presented in ROC Phase 2 report.		

The historic exploratory hole locations are shown on Figures presented in Appendix A of the RoC Phase 2 report.

It is considered that the top weathered portion of the Manchester Marls (MM) formation forms an aquifer connected with the CHES Formation. However, being less permeable than the CHES, and the MM underlying the weathered CHES on Plot NTO2 may represent a point of TCE accumulation on the vertical ground profile.

Manchester Marl surface contours

A map of the top of the MM is presented below, showing in the PlotNT02/NT03 area, a depression around RBH305 and RBH202, and a high point at RBH206 in the north of PlotNT03 (levels are shown in mAOD). As discussed in the following sections, the above depression is consistent with an area with lower hydraulic heads, thickest bedrock, and the general direction of the development of the dissolved TCE plume, originating from the TCE source area located in the south of PlotNT02.



A wider discussion of the hydrogeological implications of the bedrock structural setting is provided in the **Section 4.3** (Hydrogeology) of the RoC Consulting Phase 2 Site Investigation report.

4.2 Hydrology

A summary of the hydrology within the site area is presented in **Table 5**.

Table 5: Summary of hydrology in site area

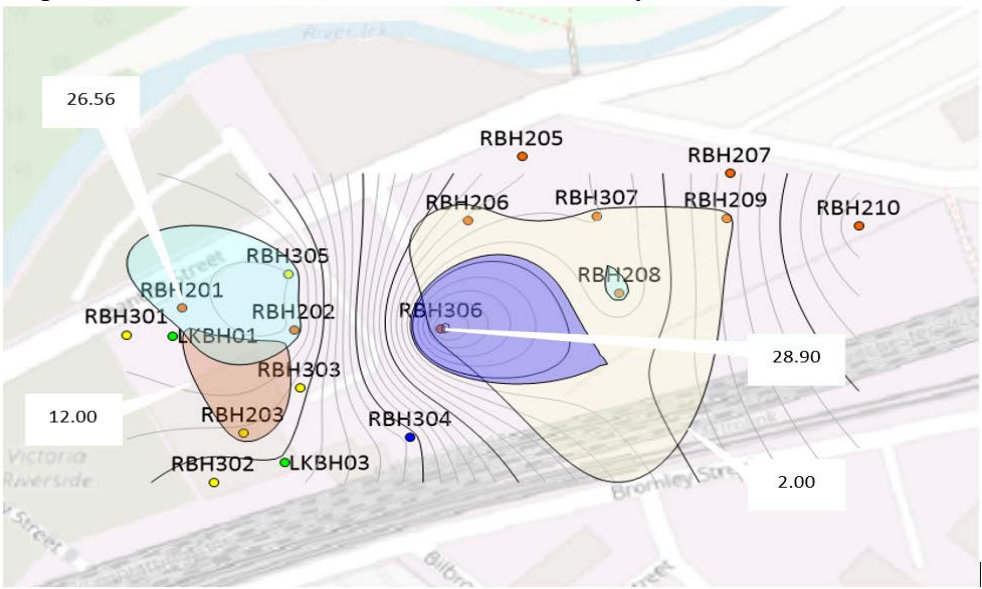
Condition	Description
Surface watercourses/features	The nearest surface water feature is indicated 21.00 m to the north in the form of the River Irk. Water quality of this receptor indicates a GQA Grade of "E" (Poor) and a flow rate of less than 2.5 cumecs. The riverbed level is approximately at 26.30 mAOD and the surface water level at 26.90 mAOD in proximity of the site (as confirmed by RoC Consulting who have completed site level and earthworks appraisals).

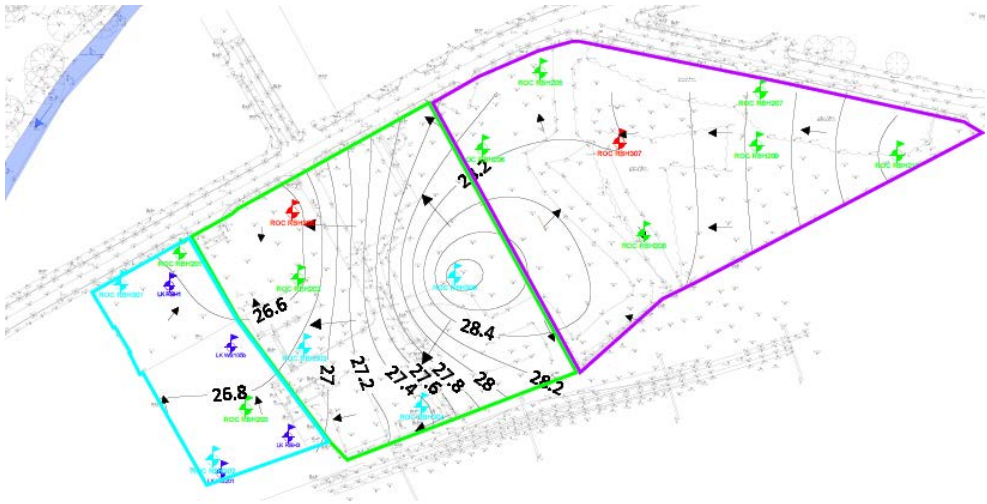
Condition	Description
Surface water abstractions	There are no active surface water abstractions at the site or within 500 m of the site boundary. The nearest active discharge consent is indicated 73.00 m to the northwest and held by United Utilities for the release of storm sewage overflow into the River Irk.
Site drainage	Surface drainage from the site appears to discharge into a local network to an outfall point into the existing adopted sewer network. Any areas of open ground or broken hard standing across the site (or damaged drainage runs) allow surface water to infiltrate into underlying soils and likely provide inputs into the underlying groundwater table, although quantification of these inputs is not possible at time. That being said, as the majority of the Plot NT02 site comprises either building or hardstand cover it is unlikely such flows provide a significant component to groundwater flows.
Preliminary flood risk assessment	The indicative floodplain map for the area, shows that the site lies within the designated floodplain of the River Irk, with a long-term flood risk classified as 'medium', according to latest info on gov.uk website. Medium risk means that this area has a chance of flooding of between 1% and 3.3% each year. This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail A flood risk assessment (FRA) is outside the scope of this report.

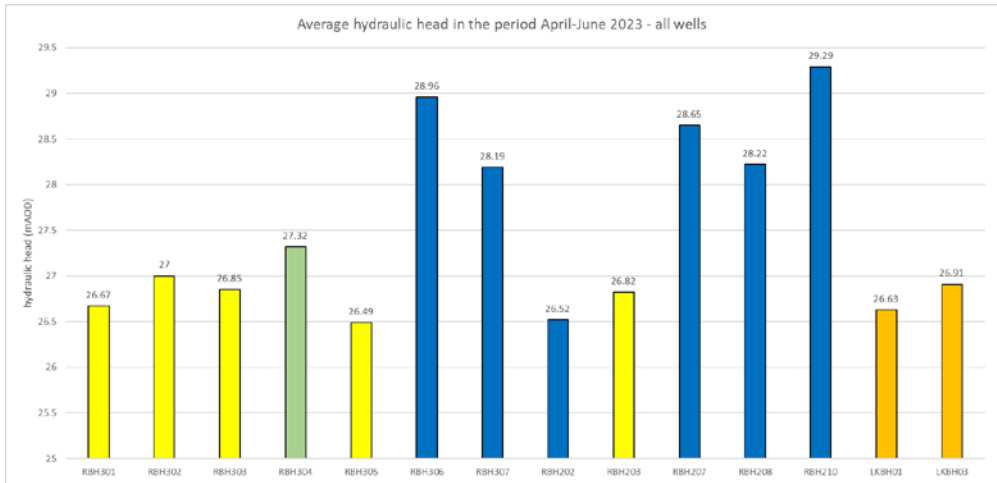
4.3 Hydrogeology

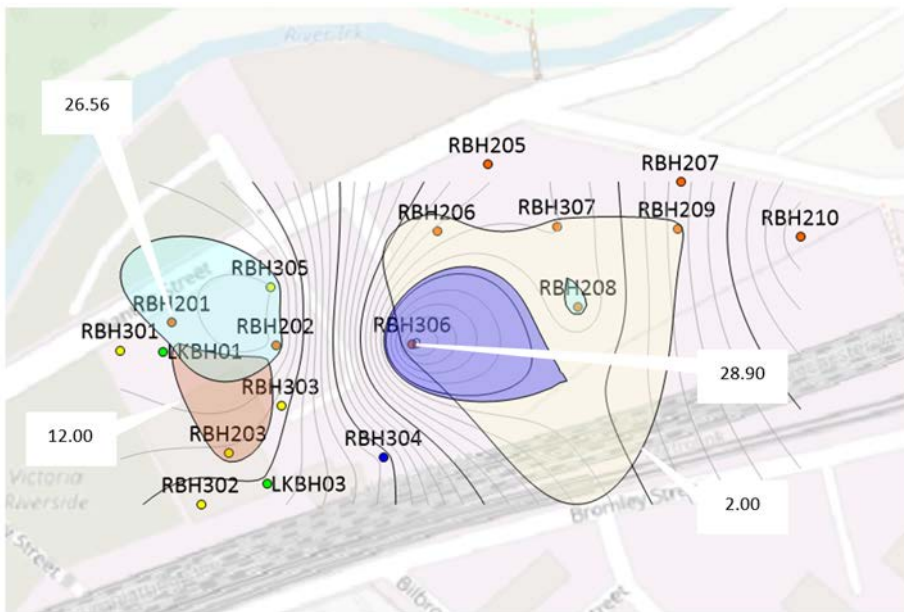
Hydrogeology is summarised for Plots NT03 and NT04 in addition to NT02 to provide information about the wider hydrogeological setting in **Table 6** overleaf.

Table 6: Summary of hydrogeological setting

Condition	Description
Aquifer characteristics	The central-western part of the wider site (approximately Plots NT02 and 03) is underlain by a principal aquifer relating to the Chester sandstone Formation (CHES). The eastern part of the wider site (approximately Plot NT04) is underlain by a secondary aquifer relating to the Manchester Marls Formation (MM). Given the variability in the bedrock geology encountered beneath the site, groundwater movement (vertical and lateral) via fracture flow and pore flow may be active processes beneath the site. However, it is likely that the majority of the groundwater flow is occurring in the upper weathered portion of the bedrock. The thickness of the weathered CHES is between approximately 2.60 m and 12.70 m, the thicker part is located mostly within Plot NT02 and extending into Plot NT03, among holes RBH201, RBH202 and RBH203, see Image 1 (Weathered Chester formation thickness map) below; Image 1: Weathered Chester formation thickness (levels shown are in mAOD) 
	The thickness of the weathered MM is between approximately 2.00 m and 7.50 m, the thinner part is located within Plot NT04 and extending in Plot NT03, delimited by holes RBH209, RBH307 and RBH208. Globally, including both Formations, the thickness of weathered bedrock illustrated in the map below shows a peak (i.e., thicker weathered bedrock area) mostly within Plot NT02, and a (much larger) depression (i.e., thinner weathered bedrock area) mostly within Plot NT04, extending off-site to the south up to Bromley street, see Image 1 (Weathered Chester formation thickness map) below. This structural setting of the bedrock has implications on the groundwater flow, described in the following section of this table.

Condition	Description
Depth to groundwater and flow	The description of the groundwater levels in the water bearing Formations (bedrock and superficial) and the flow field in the bedrock aquifers is included in ROC (June 2023) and summarised below. The groundwater level monitoring carried out in the period September 2022 to June 2023 generally indicates the following: The hydraulic head of the only well screened in the River Deposits (RD) (RBH304) located in the centre south of site ranges from 27.25 (April 2023) to 27.43 mAOD (June 2023). Resting groundwater in the June 2023 monitoring round was recorded at depths of 4.78 to 13.78 m bgl. The hydraulic head of the wells screened both in the Chester Formation (CHES) and the MM (only two holes have screens in both Formations, LKBH01 and LKBH03) ranges from 26.63 mAOD (LKBH01 nearby the river in the northwest of site, in June 2023) to 27.13 mAOD (LKBH03 in the southwest of the site, in January 2023). The hydraulic head of the wells screened in the Chester Formation ranges from 26.44 mAOD (RBH305 nearby the river in the centre-north of site, in June 2023) to 27.06 mAOD (RBH302 in the southwest of the site, in April 2023). The hydraulic head of the wells screened in the MM Formation ranges from 25.78 mAOD (RBH205 nearby the river in the NE of site, in September 2022) to 29.74 mAOD (RBH306 in the centre of the site, in April 2023). For the purpose on this DQRA, the representative hydraulic head map (Image 2 Groundwater contours map) is the one obtained with the April-June 2023 data, with the June monitoring being the only monitoring round carried out on all monitoring wells on site, both those installed in the 1st and 2nd phases of GIs, see also Chart 1 Average hydraulic head below. This map (taken from ROC drawing n. 4328-ROC-ZZ-XX-DR-ES-ES205a Rev.01) is shown below, and, together with the whole monitoring dataset, indicates the following: Image 2: Groundwater contours 

Condition	Description
	Chart 1: Average hydraulic head  The chart above shows the hydraulic head in all the monitoring wells. The heads monitored in the RBH3XX holes show a more pronounced difference in piezometry between the CHES (yellow in chart) and MM (blue in chart) aquifers, with the CHES heads ranging from 26.49 to 27.00 mAOD and the MM heads ranging from 28.19 to 29.29 mAOD. In this respect, the LK wells (orange in the chart) more closely represent the CHES piezometry, with LKBH01 possibly also in connectivity with the river, whilst RBH304 screened in the RD and the most uphill of all wells, has a piezometry which is intermediate between the MM and the CHES. This piezometric distribution implies the existence of two laterally connected aquifers with different hydraulic conductivities and hydraulic heads, this fact is reflected by the ground profile beneath the site. In the eastern area of the site (Plot NT04 and NT03), between wells RBH201 (east) and RBH306 (west), the bedrock consists of the MM aquifer, which has hydraulic heads between approximately 29.00 mAOD and 28.00 mAOD. In the western area of the site (Plot NT02), to the west of well LKBH03, the bedrock consists of the CHES aquifer, which has hydraulic heads between approximately 26.50 mAOD and 27.00 mAOD. Between these two areas, based on the ground profile, the CHES Formation (with a higher conductivity) is thinning abruptly, up to the contact with the MM aquifer (with a lower conductivity). This is reflected in the above-mentioned differences in hydraulic heads. Also, the Till acting as a confining layer across the whole site, but thicker in the east, and the presence of a fault underneath the site (which position is undetermined and not proven by the GIs) likely acting as a hydraulic barrier corroborate this evidence. The groundwater flow is generally directed from east to west towards the River Irk, in hydraulic contact with both aquifers in their respective area of existence; the river is a gaining river. The area between the above piezometric anomalies shows an abrupt increase in the groundwater contour spacing, and associated increase in the hydraulic gradient, which is thought to be the effect of the contact between the two aquifers with different hydraulic conductivities, and possibly of the fault zone with low permeability.

Condition	Description
	The piezometric distribution shows monitoring anomalies at RBH306 (high point) and in the RBH202 / RBH305 area (low point). Whilst further monitoring will be needed to refine the groundwater flow field in these zones, the groundwater levels can be correlated with the thickness of the weathered bedrock (described above), highlighting the following (as illustrated in Image 3: Groundwater contours and anomalies). Image 3: Groundwater contours and anomalies (levels in mAOD)  • The area with highest heads located in PlotNT03/04 (dark blue) is roughly located in the area of thinner bedrock (light brown). • The area with lower heads located on PlotNT02 (light blue) is roughly located in the area of thickest bedrock (dark brown). The piezometry in the Plot NT02 area is controlled by the low hydraulic head points at RBH202 and RBH305; however, the western part of the plot is less affected by this feature and is considered to be representative of the general NNW groundwater flow direction towards the River Irk.
Rising groundwater levels	Not applicable
Historical implications for hydrogeology	Not applicable
Licensed groundwater abstractions	The site is not located within close proximity to any sensitive groundwater abstraction points (e.g., for a potable water supply well). The nearest water abstraction point is indicated 533m to the west relating to Joseph Hold Ltd. Water is abstracted from groundwater for use in breweries/wine process water, it is not clear if the permit is still valid (ROC 2023 Phase 2 SI Report).
Source protection zones	The site does not lie within a currently designated groundwater Source Protection Zone (SPZ), (ROC GIR 2023).

4.3.1 Hydraulic conductivity

Hydraulic conductivity tests were carried out on the CHES formation at the site in boreholes BH203 and BH301 in April 2023. The resulting tests were analysed using AQTESOLV. The graphical analysis outputs are given in **Appendix B** and the results are summarised in **Table 7**.

The tests indicate hydraulic conductivities for these deposits ranging between 19.70 m/day and 286.50 m/day, which falls above the literature range for sandstone in the Consim database of 2.59E-05 and 5.18E-01 m/day but within the Consim range for a coarse sand of 7.78E-02 to 5.18E+02 which likely represents the weathered sandstone.

Table 7: Summary of hydraulic conductivity test analysis at Plot NT02 for the CHES formation

Monitoring well location/lithology screened	Response zone (m bgl)	Hydraulic conductivity (m/d)
BH203 Very weak reddish brown fine grained SANDSTONE	10 to 15	286.50
BH301 Fine to medium grained SANDSTONE (no description of weathering given on log)	4 to 10	19.70

A value of 1.025 m/day has been selected for modelling based on the geometric mean of the higher of the two conductivity values measured on site (286.50 m/day) and the geometric mean of the literature value for sandstone (0.3663 m/day) in order to represent groundwater flow within the weathered sandstone and underlying competent bedrock.

It is noted that TCE the main contaminant of concern is a DNAPL and as such will migrate vertically to the deeper bedrock deposits, namely the underlying lower permeability Manchester Marl deposits and thus the use of a hydraulic conductivity values only representing the sandstone may be overly conservative. The effect of reducing the hydraulic conductivity to represent groundwater flow within the MM will be assessed as part of the sensitivity analysis.

4.3.2 Hydraulic gradient and infiltration

4.3.2.1 Hydraulic gradient

The hydraulic gradient for Plot NT02 is calculated as 0.004 from the average hydraulic head in the period April-June 2023 at boreholes LKBH03 (26.91 mAOD) and borehole LKBH01 (26.63mAOD) over a distance of 67.00 m.

The piezometry in the Plot NT02 area is controlled by the low hydraulic head points at RBH202 and RBH205; however, the western part of the plot is less affected by this feature and is considered to be representative of the general NNW groundwater flow direction towards the River Irk.

4.3.2.2 Infiltration

An infiltration rate of 173mm/year for the site is presented in Section 5.3 of the RoC Phase 2 report, based on data for the climate period 1991-2000, the annual rainfall at the Woodford station is estimated 864.40mm/year, The UK average evapo-transpiration losses are typically 40%. Approximately 95% of the site is anticipated to be hardstanding and / or covered by buildings, thus increasing runoff; conservatively the overall infiltration (aquifer recharge) has been estimated to be approximately 20% of the total rainfall (~173 mm/year).

4.3.3 Aquifer conditions and biodegradation

Groundwater quality parameters were measured in-situ during the groundwater sampling. A summary of results is presented in **Table 8**.

Table 8: In-situ groundwater quality results

Monitoring well location	Dissolved oxygen (DO) (mg/l)	Indicative Aquifer Conditions (based on DO)	Redox (mV)	Indicative Aquifer Conditions (based on Redox)	Electrical Conductivity (µS/cm)
Date					
TCE plume core shallow sandstone/ unconfined by marl					
RBH303 10/05/2023	2.73	Aerobic	419.4	Aerobic	731.9
RBH203 10/05/2023	0.95	Mildly anaerobic	392.0	Aerobic	905.3
RBH203 27/09/2022	1.32	Aerobic	602.9	Aerobic	1109.9
LKBH03 10/05/2023	4.86	Aerobic	397.6	Aerobic	838.1
RBH302 10/05/2023	4.34	Aerobic	385.4	Aerobic	891.71
TCE plume fringes shallow sandstone					
LKBH01 27/09/2022	0.13	Mildly anaerobic	602.1	Aerobic	1620.8
RBH301 10/05/2023	0.31	Mildly anaerobic	141.5	Mildly anaerobic	1582.4
RBH305 11/05/2023	1.94	Aerobic	395.6	Aerobic	1245.3
Deeper sandstone and marl					
RBH201 27/09/2022	0.51	Mildly anaerobic	602.1	Aerobic	1699.9
RBH202 27/09/2022	0.44	Mildly anaerobic	602.94	Aerobic	2150.3

Based upon in-situ field measurements of DO and REDOX potential measurements, aquifer conditions are considered to be generally aerobic within the TCE plume and mildly anaerobic to aerobic outside of the plume.

4.4 Potential controlled waters pollutant linkages

4.4.1 Sources

The main contaminants of concern identified at the site are TCE detected as a diffuse source within the unsaturated soils in the south of the site within the footprint of the historic bolt works and TCE, its daughter products, cis and trans-1,2-dichloroethene (DCE) and vinyl chloride (VC) and carbon tetrachloride present as a dissolved phase plume within the underlying Chester Formation.

TCE follows the anaerobic degradation sequence below:



The presence of TCE daughter compounds DCE and vinyl chloride detected in the shallow sandstone at LK BH01 and RBH301 in the north of the site are consistent with the down gradient portion of the TCE plume undergoing some degree of anaerobic degradation and supports the proposed groundwater flow direction towards the north-northwest in this area of the site as shown on groundwater contours discussed in **Section 4.3**.

However, the TCE detections as presented on Drawing 4328-ROC-ZZ-XX-DR-ES-ES109 in Appendix A of the RoC Phase 2 report indicate that there may be some degree of migration of TCE impacted groundwater in the south of Plot NT02 towards the northeast as evidenced by TCE detections in the shallow sandstone at RBH303 (up to 277µg/l) and RBH305 (up to 3µg/l) close to the northern boundary of Plot NT03, and in the deeper sandstone and marl at RBH202 (up to 4µg/l) located between RBH303 and RBH305. Although it is noted that the extent of the TCE soil source to the east is currently uncertain, and the TCE in groundwater at RBH303 and RBH202 may be due to groundwater flow from the eastern end of the soil source that may extend into Plot NT03.

4.4.2 Controlled water pathways

The following have been identified as plausible potential pollutant pathways in relation to sensitive controlled waters:

- migration of leachable contaminants from impacted soils present in the unsaturated zone
- vertical and lateral migration of dissolved phase contaminants within the CHES and MM aquifers.

4.4.3 Controlled water receptors

The nearest down gradient surface water receptor is the River Irk located approximately 21.00 m to the north of the site and is reported to be of low water quality (Grade E). Due to the already poor surface water quality reported in the River Irk due to the long industrial past of the wider surrounding area, the river is considered to be of low sensitivity from the site.

The most sensitive controlled water receptor is considered to be groundwater within the Chester Sandstone Formation (principal aquifer) and the Manchester Marl Formation (secondary aquifer).

4.4.4 Potential linkages

The potentially complete controlled waters pollutant linkages identified in relation to the site are:

- vertical migration of leachable contaminants from impacted soils present in the unsaturated zone to the underlying CHES and MM aquifers.
- vertical and lateral migration of dissolved phase contaminants through the CHES aquifer to identified controlled water receptors including the wider CHES and MM aquifers.

5 QUANTITATIVE MODELLING

5.1 Assessment methodology and model parametrisation

The DQRA for controlled waters has been undertaken in line with the EA publication titled 'Remedial Targets Methodology: Hydrogeological Risk Assessment for Land Contamination' (RTM).

RTM considers two pathways, predominantly:

- leaching of COPC from impacted soil to groundwater beneath the site and the subsequent migration in groundwater to specified distances from the impacted soil;
- migration of dissolved phase COPC in groundwater to specified distances from the groundwater source.

With respect to the leaching pathway, there are three levels of assessment termed Levels 1 to 3. Although more site-specific data is needed with each increase in level, the modelling results typically become less conservative as additional processes are considered. Level 1 uses partitioning equations to theoretically predict how much of a constituent could pass from the solid to liquid phase. This theoretical concentration is then compared to a screening value, termed the target concentration. Alternatively, the results of leachate test data and perched water can be compared directly to the target concentration. Level 2 considers the dilution of this liquid with groundwater flowing beneath a site and Level 3 predicts concentrations at specified distances when the processes of attenuation are considered.

With respect to the dissolved phase migration pathway, there are two levels of assessment termed Levels 2 and 3. Level 2 is the comparison of the groundwater data with the target concentration, which is undertaken as part of a Generic Quantitative Risk Assessment (GQRA). Level 3 predicts concentrations at specific distances when the processes of attenuation are considered in the same manner as the leaching pathway.

A Level 3 groundwater dissolved phase and soil leaching assessment has been undertaken and is documented in this report.

5.2 Model selection

The EA's RTM excel based spreadsheet tool software package was used to model the controlled water linkages. The RTM model is well established and considered by RSK to be appropriate for this site for the following reasons:

- the site conceptual model is consistent with the assumptions of the RTM model (including intergranular flow);
- the RTM model considers a single source area;
- the RTM model allows the prediction of breakthrough concentrations as well as calculating suitably protective site-specific acceptance criteria (SSAC).