PARAMETER	Residential						Commercial			Allotment			POS_{resi}	POS_{park}	Source
	With Plant uptake			Without Plant uptake											
SOM %	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	6% SOM		
Organics - mg/kg unless stated															
Acenaphthene	210	510	1100	3000	4700	6000	84000	97000	10000	34	85	200			LQM/S4USL
Acenaphthylene	170	420	920	2900	4600	6000	83000	97000	10000	28	69	160			
Anthracene	2400	5400	11000	31000	35000	37000	520000	540000	540000	380	950	2200			
Benzo(a)anthracene	7.2	11	13	11	14	15	170	170	180	2.9	6.5	13			
Benzo(a)pyrene C4SL			**5**			**5.3**			**77**			**5.7**	**10**	**21**	
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	44	44	45	0.99	2.1	3.9			
Benzo(g,h,i)perylene	320	340	350	360	360	360	3900	4000	4000	290	470	640			
Benzo(k)fluoranthene	77	93	100	110	110	110	1200	1200	1200	37	75	130			
Chrysene	15	22	27	30	31	32	350	350	350	4.1	9.4	19			
Dibenzo(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	3.5	3.6	3.6	0.14	0.27	0.43			
Fluoranthene	280	560	890	1500	1600	1600	23000	23000	23000	52	130	290			
Fluorene	170	480	860	2800	3800	4500	63000	68000	71000	27	67	160			
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	500	510	510	9.5	21	40			
Naphthalene C4SL	**15**	**36**	**85**	**15**	**36**	**85**	**1600**	**3700**	**8400**	**65**	**130**	**200**	**17000**	**1900**	
Phenanthrene	95	220	440	1300	1500	1500	22000	22000	23000	15	38	90			
Pyrene	620	1200	2000	3700	3800	3800	54000	54000	55000	110	270	620			
Phenol C4SL	**280**	**550**	**1100**	**750**	**1300**	**2300**	**760**	**1500**	**3200**	**66**	**140**	**280**	**3200**	**3200**	

Petroleum Hydrocarbons represent a complex situation being a mixture of a range of compounds, the relative concentrations of which may change over time.

As discussed above, Generic Assessment Criteria (GAC) for total petroleum hydrocarbons according to both their molecular weight and chemical structure and also for a range of soil organic matter (SOM) content values have been derived using CLEA software.

The ***LQM CIEH S4ULs*** are again presented according to their soil organic matter content and proposed end use of the land. The generic assessment criteria for a 1%, 2.5% and 6% SOM content are tabulated below and presented according to the proposed end use.

	LQM CIEH Generic Assessment Criteria (mg/kg dry weight soil)													
	Residential						Allotment Land Use			Commercial Land Use				
	With Plant Uptake			Without Plant Uptake										
SOM %	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6		
Aliphatic														
EC 5 – 6	42	78	160	42	78	160	730	1700	3900	3200	5900	12000		
EC > 6 – 8	100	230	530	100	230	530	2300	5600	13000	7800	17000	40000		
EC > 8 – 10	27	65	150	27	65	150	320	770	1700	2000	4800	11000		
EC > 10 – 12	130	330	760	130	330	760	2200	4400	7300	9700	23000	47000		
EC > 12 – 16	1100	2400	4300	1100	2400	4300	11000	13000	13000	59000	82000	90000		
EC > 16 – 35	65000	92000	110000	65000	92000	110000	260000	270000	270000	1600000	1700000	1800000		
EC > 35 – 44	65000	92000	110000	65000	92000	110000	260000	270000	270000	1600000	1700000	1800000		
Aromatic														
EC 5 – 7 (benzene)	70	140	300	370	690	1400	13	27	57	26000	46000	86000		
EC > 7 – 8 (toluene)	130	290	660	860	1800	3900	22	51	120	56000	110000	180000		
EC > 8 – 10	34	83	190	4	110	270	8.6	21	51	3500	8100	17000		
EC > 10 – 12	74	180	380	250	590	1200	13	31	74	16000	28000	34000		
EC > 12 – 16	140	330	660	1800	2300	2500	23	57	130	36000	37000	38000		
EC > 16 – 21	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000		
EC > 21 – 35	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000		
EC > 35 – 44	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000		
Ali &Aro EC>44-70	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000		
Benzene C4SL			0.87			3.3			0.18			98	POS_{resi} 140	POS_{park} 230
													6% SOM	
Toluene	130	290	660	880	1900	3900	22	51	120	56000	110000	180000		
Ethylbenzene	47	110	260	83	190	440	16	39	91	5700	13000	27000		
o-xylene	60	140	330	88	210	480	28	67	160	6600	15000	33000		
m-xylene	59	140	320	82	190	450	31	74	170	6200	14000	31000		
p-xylene	56	130	310	79	180	430	29	69	160	5900	14000	30000		

Inert Material

The limit values for inert waste are given in the EC Landfill Directive 1999/31/EC as applied under the Environmental Permitting (England and Wales) (Amendment) (EU Exit) Regulations 2019 (*SI 2019/39*) and as defined by the council decision establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC(2003/33/EC).

The regulations and associated guidance provide waste acceptance criteria, which set the limits of contaminants permitted in various waste categories going to landfill.

Inert waste is defined as waste which contains insignificant potential for pollution and does not endanger the quality of surface water or groundwater. The Landfill Directive states that inert waste will not adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm human health.

For risk assessment purposes we would consider that any materials (soils) containing concentrations of potential contaminants that would result in them being classified as inert would be considered as uncontaminated and therefore representing a low risk to human health.
Similarly, such material would not be considered to represent a significant risk to water resources.

However, with regard to Planning and proposed re-development, limit values for inert waste would not be considered appropriate to determine the risks posed to people where any open contaminant to receptor pathway remained intact.

Selected inert waste acceptance criteria as given in Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills for the Landfill Directive are given below.

Landfill acceptance criteria for inert waste (mg/kg)	
Total organic carbon (TOC)	30,000
Mineral oils (C10 – C40)	500
PCBs	1
PAH	100

Risks to Plants

The CLEA framework does not provide a method for the assessment of phytotoxic risks to plants. However maximum permissible concentrations have been published in the Sludge (Use in Agriculture) Regulations 1989 (SI 1989, No. 1263). This legislation enforces the provisions of the EC Directive 86/278/EEC for potentially toxic elements (PTEs) on soils for agricultural use where sewage sludge has been applied (see table below). These limits relate to the potential risk to plants and not human health for which CLEA is the overriding risk assessment model. The limit value from the British topsoil and subsoil standards may also apply.

Maximum permissible concentration in agricultural soils following sewage sludge application (mg/kg).				
	pH 5.0<5.5	**pH 5.5<6.0**	**pH 6.0-7.0**	**pH >7.0**
Zinc	200	250	300	450
Copper	80	100	135	200
Nickel	50	60	75	110

Risks to buried concrete

The potential risks to buried concrete can be assessed by reference to the BRE Special Digest 1 (SD1) entitled 'Concrete in Aggressive Ground'. This document provides a methodology for the specification of concrete based on the ground conditions encountered and is based upon chemical analysis and associated factors (e.g. groundwater). The guidance provides a Design Sulphate Class (DS) based upon the ground conditions and it is considered that a low concentration of sulphate and pH (i.e. DS – 1 and DS – 2) is considered to represent a low risk to buildings.

Risks to buried services

In addition, where water is supplied in plastic pipes which could come into contact with contaminated ground then this can lead to premature failures, resulting in leakage and loss of water quality. Risks to water supply pipes are assessed using guidance published by the UK Water Industry Research (UKWIR) entitled '*Guidance for the Selection of Water Pipes to be used in Brownfield Sites'* (Report Ref. No. 10/WM/03/21). This is known as the UKWIR guidance.

Previous guidance from WRAS has been withdrawn but may still be in use by certain water supply companies. In general water companies have adopted a common set of guidelines as given in the ***Contaminated Land Assessment Guidance from January 2014.*** Additional threshold values for determining pipe material have also been published by certain water supply companies. If these threshold values are exceeded then consideration should be given to the selection of pipe material or to the use of barrier pipes. The UKWIR threshold values, together with those of certain water supply companies are presented in the table below for a range of potential hazards.

Substance[1]	Water UK Guidance	Thames Water
Total VOC	0.5	-
Total BTEX & MTBE	0.1	0.1 or either
Total SVOC	2	-
EC5-EC10 aliphatic and aromatic hydrocarbons	2	-
EC5-EC12 aliphatic hydrocarbons		0.5
EC5-EC12 aromatic hydrocarbons		0.5
EC10-EC16 aliphatic and aromatic hydrocarbons	10	-
EC12-EC21 aliphatic hydrocarbons		10
EC12-EC21 aromatic hydrocarbons		10
EC16-EC40 aliphatic and aromatic hydrocarbons	500	-
EC21-EC35 aliphatic hydrocarbons		500
EC21-EC35 aromatic hydrocarbons		500
Phenols	2	5*
Cresols and chlorinated phenols	2	2
Naphthalene	-	**5**
Ethers	0.5	-
Nitrobenzene	0.5	-
Ketones	0.5	-
Aldehydes	0.5	-
Amines	0	-
Corrosives pH and EC	# ##	

All units mg kg-1 in soil;
pH <7 for wrapped steel, pH <5 wrapped ductile iron and copper and ##EC >400µS/cm;
*Phenol limit at 2mg/kg in presence of BTEX.