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G.1 INTRODUCTION

A site wide investigation of the Whitehaven site was undertaken by URS in 2005. A controlled waters quantitative risk assessment (CWQRA) was undertaken based on the site data using a mass balance model to assess risks to deep groundwater beneath the site. A number of areas of the site were identified that posed potential risks to controlled waters.

In March 2007 URS was commissioned to undertake a detailed investigation of Plot E within the Whitehaven Site and to carry out a detailed risk assessment with regard to controlled waters using relevant data gathered from previous investigations and data from investigations up to and including march 2007. This appendix presents the methodology and results of the CWQRA for Plot E.

The risk assessment is based upon the Mass Balance Model developed in Appendix D of the previous Phase II report (REF: 44319623/R2037, dated 23rd June 2005). This report recognised that the hydrogeological conditions between the site and the coast were complex, especially in areas underlying the St. Bees Evaporite Formation, which contained enhanced solution features created by acid spills, and as such, recognised that standard risk assessment tools (such as CONSIM) were not suitable for analysis of groundwater flow in this area of the site.

The risk assessment set out in this appendix is considered to be more rigorous and representative of site conditions than the previous risk assessment for the whole of the Whitehaven site as it incorporates additional geological and geochemical data obtained during the Plot E investigation and uses a more sophisticated modelling approach.

The CWQRA is based upon the UK Department of the Environment, Food and Rural Affairs (DEFRA) and Environment Agency (EA) guidance including:

- Environment Agency R&D Publication 20 (1999) Methodology for the Derivation of Remedial Targets for Soil and Groundwater to Protect Water Resources (referred to as R&D P-20); and
- Environment Agency R&D Publication CLR11 (2004) Model Procedures for the Management of Land Contamination (referred to as CLR11).

Using CLR 11 methodology, risk assessment is carried out in three stages:

Stage 1 – Preliminary Risk Assessment

Stage 2 - Generic Quantitative Risk Assessment; and

Stage 3 – Detailed Quantitative Risk Assessment.

Stage 1 involves the development of a conceptual understanding of the site and the surrounding environment's geology, hydrogeology, observed contamination (and its distribution), and potential receptors. From this conceptual understanding, potential



pollutant linkages (*source-pathway-receptor* relationships) are identified. This stage of the risk assessment is set out in Section 5 of the main body of the report.

Risk assessment at Stages 2 and 3 for Plot E is presented in full in this appendix.

G.2 CONCEPTUAL MODEL SUMMARY

G.2.1 Sources

In Plot E, generally isolated shallow soil, soil leachate, and groundwater contamination was encountered. The maximum value of each Stage 2 exceedance has been considered as individual source terms.

G.2.2 Pathways

The viable pathways applicable to these sources include the leaching and infiltration of soil contamination through the unsaturated zone followed by dilution and lateral migration within the underlying shallow groundwater. Contamination may enter solution-enhanced conduits of the generally low permeability St. Bees Evaporites from vertical migration through the limited thickness of made ground and drift within Plot E. Once within the evaporites, rapid migration towards the coast via complex subsurface pathways (solution enhanced pipes and fissures) before emerging at the surface at the Byerstead Spring.

Tracer testing has provided evidence to suggest that this pathway is rapid, with travel times often less than 10 hours.

Such short travel times suggest that groundwater flow may be via streams at the base of the solution features. Such migration will be characterised by limited dispersion/dilution effects (as compared to more standard groundwater migration within porous media). Therefore, it was considered appropriate to assume that infiltrating contaminated water entering this unit from within Plot E, would remain at this concentration until it reached the site boundary. Beyond this point the only dilution that it was likely to encounter before reaching the sea would be infiltration from overlying geological units (predominantly the St.Bees Sandstone).

G.2.3 Receptors

The compliance point that is deemed protective of the likely receptor (The Irish Sea) has been determined as the point at which groundwater emerges at the coastline immediately before entering the sea.



G.3 STAGE 2 - GENERIC QUANTITATIVE ASSESSMENT

G.3.1 Methodology

The generic screening was undertaken by making a comparison of measured chemical concentrations in soil, soil leachate, and groundwater against conservative screening criteria appropriate for a designated potential receptor. This initial screening is designed to identify Potential Contaminants of Concern (PCoC), which could pose a potential risk to controlled waters. At the generic screening stage, no consideration is given to pathways or potential attenuation factors such as dilution, dispersion or biodegradation.

For this assessment the receptor is considered to be the Byerstead Spring which feeds into the Irish Sea and the screening values that have been used are marine Environmental Quality Standards for soil leachate and shallow groundwater samples. Where published Marine EQS values for certain contaminants were not readily available, reference was made to published Freshwater EQS values. In the absence of Freshwater EQS values, United States Environmental Protection Agency (US EPA) Region 9 Pathway Specific EQS values were used for screening purposes. Where none of these values are available, then reference was made to UK/EU Drinking Water Standards and World Health Authority (WHO) guidelines.

VOC analysis was not carried out on soil leachates as the leaching methodology is unsuitable for VOCs, i.e. it allows VOCs to escape during the leaching process and thus results obtained would be unrealistically low. Thus, for soils samples, concentrations of VOCs have been compared to theoretical soil concentrations that are protective of marine EQS. The theoretical concentrations have been derived using partitioning equations, as outlined in EA R&D-P20 (EA, 1999).

The Stage 2 soils VOC screening values are derived using the following site-specific parameters:

- Total Organic Carbon 0.60%
- Soil Type Silty clay
- Total Porosity 38%
- Water filled Porosity 27%
- Air Filled Porosity 11%
- Dry bulk density 1.64g/cm³

Details of the sources of all Stage 2 screening criteria are given in Tables G1 (soil VOCs) and G2 (soil leachate and groundwater).

Where individual concentrations of contaminants exceeded the generic screening criteria, they have been evaluated further as part of the Stage 3 assessment.



In a limited number of cases, the method detection limit was higher than the screening value for the particular analyte. This occurred in the following analytes:

- Azobenzene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Bis(2-Chloroethyl)Ether
- Dibenz(a,h)anthracene
- Fluoranthene
- Hexachlorobenzene
- Hexachlorobutadiene
- N-Nitroso-Di-N-Propylamine
- 1,1,1,2-Tetrachloroethane
- 1,2,3-Trichloropropane
- 1,2-Dibromo-3-Chloropropane
- 1,2-Dibromoethane
- 1,2-Dichloropropane
- Bromomethane
- Chloroethane
- Chloroform
- Dichloromethane
- MTBE
- Vinyl Chloride

Standard practice where the MDL is greater than the Screening Value would be to include the analytes as sources at Stage 3, with concentrations at their MDL. It was considered reasonable to discount the majority of the above analytes as the samples taken within Plot E, provided no evidence to suggest that these analytes are present within Plot E.



However, this was not the case for Fluoranthene, which has been measured in soil leachate analysis in apparent isolated hotspots across Plot E, and has been modelled accordingly in the Stage 3.

G.3.2 Soil Contamination Generic Screening

With the exception of VOC's, generic screening was not performed on soils data. This is because the screening was done using leach test data, which is considered more representative of the potential risks to controlled waters.

A summary of the determinands whose concentrations exceeded the Stage 2 generic screening values is given in Table G3.

G.3.3 Soil Leachate Generic Screening

G.3.3.1 Metals, Anionic Surfactants, Phosphate

A summary of the determinands whose concentrations exceeded the Stage 2 generic screening values is given in Table G4.

Phosphate was detected in twenty-one of the fifty samples submitted for analysis, no screening criteria currently exists for phosphate. Anionic surfactant was detected at a concentration in exceedance of the respective Tier 1 criterion in only one sample. Remaining analytes were either present at concentrations below the method detection limit, or less than respective Tier 1 criteria.

G.3.3.2 Total Petroleum Hydrocarbons (TPH)

TPH fractions were not detected above the laboratory method detection limits in the samples submitted for leachate analysis.

G.3.3.3 Semi Volatile Organic Compounds (SVOC) and Polycyclic Aromatic Hydrocarbons (PAH)

A summary of the determinands whose concentrations exceeded the Stage 2 generic screening values is given in Table G5.

G.3.4 Groundwater Results Screening

Based on site investigations to date, it is thought that no continuous shallow groundwater body is considered to be present in Plot E. During the most recent investigation, four boreholes were installed across Plot E, of which two were found to be dry during sampling. Therefore, groundwater data available from Plot E is limited to the analysis of water from borehole ERMSB20, WS153 and the two boreholes from which water samples could be obtained.

The results are presented below.



G.3.4.1 Metals, Anionic Surfactants, Phosphates, and Cyanide

Metals, Anionic Surfactants, Phosphates, and Cyanide were not detected in groundwater above the laboratory method detection limits in the samples submitted for analysis.

G.3.4.2 Total Petroleum Hydrocarbons (TPH)

TPH was not detected in groundwater.

G.3.4.3 Semi Volatile Organic Compounds (SVOC), Polycyclic Aromatic Hydrocarbons (PAH) and Volatile Organic Compounds (VOCs) in Groundwater

SVOC, PAH and VOC were not detected in groundwater

G.3.5 Summary of Identified Exceedances of Generic Screening Criteria

From the Stage 2 generic screening process the determinands in soils, soil leachate and shallow groundwater that exceeded the Stage 2 screening criteria are summarised in Table G6 below.

TABLE G3.1 – STAGE 2 ASSESSMENT – SUMMARY OF SCREENING CRITERIA EXCEEDANCES

Soil	Soil Leachate	Shallow Groundwater
	Chromium	
	Copper	
	Zinc	
Trichloroethene		
	Carbazole	
	Fluoranthene	
	Naphthalene	

There are a few analytes that exceed the Stage 2 screening criteria, but for reasons outlined below, were not taken forward to the Stage 3 assessment.

These are as follows:

- Trichloroethene was detected in soil at a depth of 1.0m in TP745E at a concentration marginally above the EQS. A calculation to predict trichlorethene pore water concentrations (parameters are presented in Table G9) generated a concentration (19.6µg/l) that was also above the controlled waters screening criteria (10µg/l). This concentration is expected to decrease to below the EQS as soon as there is dilution of the groundwater.
- Chromium was measured in two soil leachate samples. In the 0.4m sample from TP735E only 17 μ g/L of chromium was measured, which is 2 μ g/L above the Marine EQS for Chromium. This concentration is expected to drop below the EQS as soon as there is dilution. Further, the sample taken from 0.7m in the same trial



pit showed a chromium concentration of $2 \mu g/L$, which suggests that the chromium is not mobile in this area and therefore unlikely to present a risk to the receptor. A 0.8m thick layer of stiff, dry clay is present below the Made Ground, which would also impede the movement of chromium towards shallow groundwater.

• High soil concentrations of copper are measured across plot E, which is indicative of the natural background concentrations of copper in this area.

G.4 STAGE 3A QUANTITATIVE ASSESSMENT- ONSITE DILUTION MODELLING

Those determinands which exceeded the Stage 2 screening criteria have been taken forward to a Stage 3 detailed quantitative risk assessment. Stage 3 is divided into stages 3a and 3b. Stage 3a considers individual sources of contamination migrating into the fissures below the site, and the dilution that may occur between migration from the source zone and the point of entry to the evaporites. Stage 3b models the effect of a second dilution within the St Bees evaporites as the solute is transported towards the sea and is diluted by infiltrating groundwater. The two stages are described in further detail in the following sections.

G.4.1 Model Selection and Key Model Assumptions

The hydrogeological sequence within Plot E is complex. It has been further compounded by historic site activities, the most prevalent of which has been the deposition of acids into the ground, resulting in voids and channels being created in certain locations, some of which are likely to be in the vicinity of Plot E.

Given the complexity of the geology in Plot E, and the rapid travel times for migration sourced from Plot E, no standard model (e.g. CONSIM, which was used in Plots B and C) was considered to be appropriate. Instead, a mass balance approach was adopted in order to assess potential risks. The principal of the model requires an understanding of the following parameters:

- 1. Area of inferred "Contaminated" Zone
- 2. Area of inferred "Uncontaminated " Zone
- 3. Concentration identified within the source zone

The process for modelling is described below, using arsenic as an example and the conceptual understanding of the model is presented as Figures 7a and 7b of the main report.

Arsenic was measured at a concentration of 40μ g/L from soil leachate analysis in TP622A, which exceeds the Marine EQS Screening Value of 25μ g/l. In surrounding sample locations, measured concentrations of arsenic were less than the Marine EQS.





The likely contaminated and uncontaminated zones surrounding this sample point have been defined as follows:

- The likely extent of contamination is assumed to extend to the half way distance between the central point (which contains contamination in exceedance of the screening criteria) and the peripheral points (which have been deemed "uncontaminated", based on the screening of the current data set). The halfway distance is defined as "Point 1" on the above diagram. The area contained within the halfway points is assumed to represent the source area (diagonally hatched area).
- The *uncontaminated zone* is defined as the remaining area between the half way distance and the sample points where no exceedances have been measured (vertically hatched area).

The combined catchment areas (i.e. contaminated catchment zone + uncontaminated catchment zone) are then referred to as the "total catchment" for that source.

Precipitation falling on this area is assumed to be uniform, before infiltrating downwards through the Made Ground and Drift. Such infiltration is then assumed to be connected to a solution fissure within the evaporate sequence (thought to be only 3-4m below ground level in Plot E). The solution features and fissures effectively act as drains, collecting all water (contaminated and uncontaminated) within the "total catchment". Given that subsequent transport within the fissure system is rapid with limited dispersion, dilution or degradation, it has conservatively been assumed that an analyte concentration entering the St. Bees Evaporite Formation, directly underneath Plot E, could potentially represent the same concentration that emerges at the coastline. Thus, the calculated concentrations entering the fissures would be compared to the Marine EQS Screening Value.

The calculated concentration entering the fissure network has been estimated by diluting the leachable concentrations from identified contaminated areas by the volume of relatively clean water available from the uncontaminated zone of the catchment. For example, for arsenic:

- Percentage of Contaminated Catchment Infiltrating total catchment = 29%;
- Assumed concentration of arsenic in source zone = 40µg/L.
- Therefore, concentration of arsenic as it enters the fracture = 29% x40 μ g/L = 12 μ g/L.

The calculated concentrations at the compliance point (opening to the fissure system) were compared directly against the controlled waters screening criteria, in this instance, the simulated arsenic concentration was below the Screening Value ($25\mu g/L$), and therefore no longer considered to represent a potential risk.

G.4.2 Summary of Identified Exceedances (Stage 3a)

The results of the Stage 3a assessment are presented at the end of this report in Table G7. Only Fluoranthene, detected at 0.5m depth in TP749E, was found to be in exceedance of its EQS at the end of the Stage 3a assessment.

G.5 STAGE 3B QUANTITATIVE ASSESSMENT- OFFSITE DILUTION MODELLING

G.5.1 Review of Previous Modelling

In the Phase II Investigation conducted in 2005 (REF: 44319623: Phase II Investigations and Environmental Assessments at the Former Albright & Wilson Works, Whitehaven, 23 June 2005), a mass balance approach was adopted to model the contributions of various potential sources to the Byerstead Spring. URS considered that the most appropriate method to characterise the migration of contamination was to adopt a simple mass balance approach. Each contaminant and water mass flux term was characterised and



the overall mass/water balance used to establish the likely range of contaminant concentrations in water discharged via the Byerstead fault.

The mass balance approach had been adopted for a number of reasons, including:

- contaminant migration velocities between the site and the fault are known to be extremely fast, as a result of tracer experiments conducted by URS and, therefore, the majority of contaminant migration from the site drainage system will be through "conduits" within the sub-surface, where the primary attenuation mechanisms will be dilution with other waters within the conduits;
- a key question that the Environment Agency and URS has with regards to mass balance is that the sum of the known sources does not add up to the observed water discharging via the Byerstead Fault to the beach. Accounting for these uncertainties will form an integral part of this revised risk assessment; and
- the development of a mass balance approach is relatively simple and easily understood.

G.5.2 Stage 3b Methodology

The current model builds upon the previous 2005 modelling. Specifically, it recognises the potential for infiltration of clean water through the St. Bees Sandstone, and subsequent movement into the underlying units, including the St. Bees Evaporites, where the conduits containing the site derived waters are thought to exist.

As such, the model takes the Stage 3a assessment to the next step (through generating a second dilution), by considering rainfall, surface area of infiltration to the St. Bees Sandstone, likely infiltration rates through the Evaporites, and combines this with a mass of contamination (a concentration).

A conceptualisation of the Stage 3a and 3b model is presented in Figure 7b.

At Stage 3a, it is assumed that the concentration generated in the source area (following the dilution from the surrounding clean soil) enters the evaporites at Point 1 (on the diagram), and remains at this concentration as it passes towards the site boundary at Point 2.

Stage 3b then considers the dilution of this concentration once offsite, as the concentration reduces through dilution from Point 2 to Point 3 (the Byerstead Spring).

This dilution occurs due to a volume of clean water entering the voids/conduits in the evaporite sequence sourced from infiltrating groundwater from the St. Bees Sandstone.

Potential Concentrations at the Byerstead Spring using the above discussion can be estimated as follows:



Concentration at Byerstead Spring = Concentration leaving site A × Df

Where: Df = Volume of water leaving site A Volume of water infiltrating St Bees Sandstone

G.5.3 Stage 3b Model Parameters

The generic parameters used for the model are presented below.

TABLE G5.1- STAGE 3 B MODEL PARAMETERS

Source Characterisation				
Source No.	Source	Assessment Method	Plausible Distribution	
1	Infiltration through defined source zone on the site	 Discharge (Q): Rainfall rate multiplied by an infiltration factor, Q=ARI Area (A): Total source catchment (defined source area and surrounding clean area). A source area of 1000m² for the worked example. Mean annual rainfall (R): 1070mm/annum or 0.00293 m/day (Meteorological Office) Infiltration Rate (I), Rainfall percolation into site catchment for individual analyte, maintained at the greenfield runoff rate, I = 7.5 - 22.5%, balancing potential additional losses at the drainage system with the reduced infiltration at buildings and roads. Likely to vary considerably with the impact of the drainage system and the large areas of concrete cover. The final infiltration rate will be dependent upon the state of the land cover once the site has been decommissioned. In the worked example, a volume of 440L was calculated to be flowing in the evaporites away from the source area towards the site boundary. 	Potential Distribution Min I=7.5% Most likely I=15% Max I=22.5% Range above accounts for potential variations in contributing area and infiltration rate. The most likely value of 15% has been used.	
2	Infiltration recharge through non- contaminated areas (St. Bees Sandstone)	Rainfall rate multiplied by an infiltration factor, Q=ARI Area (A): Width of the total onsite catchment (onsite source area and clean area) multiplied by an approximate length of clean source area extending from the western site boundary to the cliff line at the coast (approximately 300m). This results in a thin	Potential Distribution Min I=7.5% Most likely I=15% Max I=22.5% Range above accounts	



Source Characterisation				
Source No.	Source	Assessment Method	Plausible Distribution	
		rectangular strip of clean catchment. This is a conservative assumption. In reality the clean catchment area is likely to be substantially wider. For the worked example the area of St. Bees Catchment was 9486 (300m long x 31.62m ² wide).	for potential variations in contributing area and infiltration rate. Given the potential for water loss through coastline springs in the St. Bees	
		and the site boundary was not included in the model, as it was conservatively assumed to be contaminated, and therefore unable to contribute clean water.	Sandstone/St. Bees Shale boundary, the lowest value of 7.5% has been used.	
		Mean annual rainfall (R): 1070mm/annum or 0.00293 m/day (Meteorological Office)		
		Infiltration Rate (I): Rainfall percolation into St. Bees Sandstone: 7.5 – 22.5%, depending upon surface deposits. Lowest over areas containing boulder clay, highest where rockhead (St Bees Sandstone) is at the surface.		
		The volume of groundwater percolating vertically through the St. Bees Sandstone into the underlying St. Bees Shales will be reduced, as a proportion will migrate laterally at the boundary with the less permeable underlying St. Bees Shale, towards the cliffline at the coast, where it will emerge as springs. Once in the shales, the majority of the groundwater will migrate vertically into the underlying sequence that contains the conduits carrying site derived water. There may be some lateral migration, which will generate more springs on the cliff line.		
		In the worked example, a volume of 2086L was calculated to be flowing in the evaporites away from the source area towards the site boundary.		

Worked Example

The arsenic example above has been continued through to the 3b level to demonstrate the calculations required to generate the concentrations generated at the Byerstead Spring.

From the 3a model, it was determined that the concentration of arsenic as it enters the fracture/conduit was $11.6\mu g/L$. Once in this conduit, the contamination will move westwards towards the site boundary at the same concentration.



Beyond the site boundary, a volume of clean water that has infiltrated through the overlying St. Bees Sandstone will dilute this concentration, resulting in a reduced concentration as the water reaches the Byerstead Spring, as follows:

Concentration at Byerstead Spring = Concentration leaving site (e.g. 11.6µg/l) x Df

Where: Df = <u>Volume of water leaving site A (e.g. 440L)</u> Volume of water infiltrating St Bees Sandstone (e.g. 2086L)

Concentration at Byerstead Spring= 11.6μg/l x 0.2107= 2.45 μg/l

G.5.4 Summary of Identified Exceedances (Stage 3b)

For simulated contaminant concentrations at the adopted compliance point (in this case, the point at which the groundwater rises as a spring on the beach, the Byerstead Spring) to pose a potentially significant risk to controlled waters, they must be in excess of defined screening criteria. The results of the Stage 3b assessment are presented in Table G8. The pollutant identified in Stage 3a (Fluoranthene) as potentially posing a risk has been diluted to a concentration below its EQS before reaching the compliance point and thus is not considered to present a risk to the receptor.

G.5.5 Limitations and key model assumptions

Key model assumptions include;

- Given that site operations have ceased, it is assumed that the concentration of the individual analytes will not increase, as no fresh contamination inputs to ground will occur in the future. As such, contamination present in soils or groundwater represents residual contamination of a finite mass.
- No attenuation or biodegradation processes have been simulated to occur within the unsaturated zone.
- A component of the historical spillages and leachate infiltration of contaminants through the subsurface will be stored in the aquifers, mines and mine shafts and adits, and slowly released to the coast through seepage along the coast as well as the Byerstead fault, similar to the effect of baseflow on river flow. Similarly there will be some components of retardation and biological/chemical reactions within the pathway, although this may be limited to the to the component of contaminant mass stored within the subsurface, rather than the rapid movement from the site through the solution features, fractured geology and adits to the Byerstead fault.
- Overall, given the above assumptions and input parameters selected, the Stage 3 assessment is considered to be conservative in nature.



G.6 UNCERTAINTIES

It is acknowledged that there are uncertainties inherent in all risk assessment methodologies, particularly in relation to the assignment of assumed values for difficult to measure site specific variables, such as infiltration rate. However, a reasonable body of research exists such that these variables can be estimated with reasonable accuracy, and in a manner that is known to be conservative. It is therefore likely that risks are, if anything, overestimated, as a result of these assumptions (constant source terms, use of maximum concentrations), and so the results of the controlled waters risk assessment should be viewed in this context.

The assessment can only be undertaken on the data set available from site investigations, thus it is possible that higher concentrations of ground contaminants than observed during the recent site assessment works may exist. This uncertainty has been reduced as far as is reasonably practical with use of a relatively high sampling density and several phases of site investigation. It is also balanced by the inherent conservatism of the modelling process.

G.7 SUMMARY OF RISKS TO CONTROLLED WATERS

Modelling results indicate that Plot E is unlikely to contain potentially significant risks to controlled waters.

G.8 REFERENCES

- CLR-7 (2002) Assessment of Risks to Human Health from Land Contamination: An overview of the Development of Soil Guideline Values and Related Research. Department for the Environment, Food and Rural Affairs (DEFRA) and Environment Agency (EA), Appendix A.
- 2) CLR-11 (2004) Model Procedures for the Management of Land Contamination" (Environment Agency, 2004).
- Environment Agency (1999) Methodology for the Derivation of Remedial Targets for Soil and Groundwater to Protect Water Resources. Authors Marsland, P.A. and Carey, M.A. Environment Agency R&D Publication 20, 89pp.



TABLES

TABLE G1 - STAGE 2 SCREENING CRITERIA - VOCS IN SOILS

Determinand	Controlled Waters Tier 1 Soil Screening Criteria (mg/kg)	Source
Benzene	2.94E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)
1-Butanol	6.77E-01	USEPA Region 9 (pathway specific)
2-Butanone (MEK = methyl ethyl ketone)	2.47E+00	USEPA Region 9 (pathway specific)
Butyl benzyl phthalate (BBP)	2.52E+03	USEPA Region 9 (pathway specific)
n-Butylbenzene	1.67E+00	USEPA Region 9 (pathway specific)
sec-Butylbenzene	4.18E+00	USEPA Region 9 (pathway specific)
tert-Butylbenzene	5.03E+00	USEPA Region 9 (pathway specific)
Carbon Disulphide (Carbon Bisulphide)	5.07E-01	USEPA Region 9 (pathway specific)
Carbon Tetrachloride (tetrachloromethane)	2.52E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 86/280/EEC
1-Chlorobutane	2.59E+00	USEPA Region 9 (pathway specific)
Chloroethane (ethly chloride)	9.97E-04	USEPA Region 9 (pathway specific)
Chloroform (trichloromethane)	4.96E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 88/347/EEC
Chloromethane (methyl chloride)	3.18E-02	USEPA Region 9 (pathway specific)
1-Chloronaphthalene	No Criterion	No Criterion
2-Chloronaphthalene	1.85E+01	USEPA Region 9 (pathway specific)
1,2-Dichlorobenzene	3.87E+00	WHO DWG
1,3-Dichlorobenzene	2.20E+00	USEPA Region 9 (pathway specific)
1,4-Dichlorobenzene	1.16E+00	WHO DWG
Dichlorodifluoromethane	1.77E+00	USEPA Region 9 (pathway specific)
1,1-Dichloroethane (EDC)	3.00E-01	USEPA Region 9 (pathway specific)
1,2-Dichloroethane(EDC)	5.39E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1992 No 337 (Water Resources, England & Wales)
1,1-Dichloroethene	1.77E-02	WHO DWG
1,2-Dichloroethene (cis + trans) total	1.94E-02	WHO DWG
1,2-Dichloroethene (cis)	2.36E-02	USEPA Region 9 (pathway specific)
1,2-Dichloroethene (trans)	6.14E-02	USEPA Region 9 (pathway specific)
Dichloromethane (see methylene chloride)	6.35E-03	WHO DWG
1,2-Dichloropropane (1,2-DCP)	4.54E-05	UK DWS (2000)
1,3-Dichloropropane	Missing Physchem	UK DWS (2000)
2,2-Dichloropropane	No Criterion	No Criterion
1,3-Dichloropropene	7.50E-03	WHO DWG



Plot E Soil and Groundwater Investigation Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Tier 1 Soil Screening Criteria (mg/kg)	Source
2,4-Dinitrophenol	1.20E-02	USEPA Region 9 (pathway specific)
2,4-Dinitrotoluene	3.30E-02	USEPA Region 9 (pathway specific)
2,6-Dinitrotoluene	5.07E-02	USEPA Region 9 (pathway specific)
Hexachlorobenzene	9.91E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 88/347/EEC
Hexachlorobutadiene	3.22E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 88/347/EEC
Hexachlorocyclopentadiene	2.63E+02	USEPA Region 9 (pathway specific)
Hexachloroethane	5.21E-02	USEPA Region 9 (pathway specific)
Iso-Propylbenzene (cumene)	2.14E+00	USEPA Region 9 (pathway specific)
Lindane (HCH-gamma)	1.32E-04	UK Marine / Estuarine EQS
Methanol	3.06E+00	USEPA Region 9 (pathway specific)
Methyl chloride (Chloromethane)	4.02E-03	WHO DWG
Methyl Isobutyl ketone (4-methyl-2-pentanone) MIBK	5.56E-01	USEPA Region 9 (pathway specific)
Methyl tert butyle ether (MTBE)	2.31E-03	USEPA Region 9 (pathway specific)
Methylene chloride (Dichloromethane)	6.35E-03	WHO DWG
Monochlorobenzene	6.61E-01	WHO DWG
Nitrobenzene	1.58E-03	USEPA Region 9 (pathway specific)
m-Nitrotoluene	3.61E-01	USEPA Region 9 (pathway specific)
o-Nitrotoluene	1.33E-04	USEPA Region 9 (pathway specific)
p-Nitrotoluene	9.29E-04	USEPA Region 9 (pathway specific)
Pentachlorobenzene	6.92E+01	USEPA Region 9 (pathway specific)
Pentachlorophenol (PCP)	7.43E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales)
1,2,4,5-Tetrachlorobenzene	4.44E+00	USEPA Region 9 (pathway specific)
1,1,1,2-Tetrachloroethane	3.74E-04	USEPA Region 9 (pathway specific)
1,1,2,2-Tetrachloroethane (PCA)	6.96E-05	USEPA Region 9 (pathway specific)
Tetrachloroethene (Tetrachloroethylene) (PCE)	1.54E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1992 No 337 (Water Resources, England & Wales)
Tetrachloroethene and Trichloroethene (sum of PCE and TCE)	1.16E-02	UK DWS (2000)
Tetrachloromethane (carbon tetrachloride)	2.52E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC



Plot E Soil and Groundwater Investigation Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Tier 1 Soil Screening Criteria (mg/kg)	Source
Toluene (Methyl benzene)	4.09E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	2.12E+02	USEPA Region 9 (pathway specific)
1,2,3-Trichlorobenzene	No Criterion	No Criterion
1,2,4-Trichlorobenzene	7.76E-02	USEPA Region 9 (pathway specific)
1,1,1-Trichloroethane (TCA)	1.41E-01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)
1,1,2-Trichloroethane	1.76E-01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)
Trichloroethene (Trichloroethylene) (TCE)	1.16E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1992 No 337 (Water Resources, England & Wales)
Trichlorofluoromethane (Freon 11)	1.89E+00	USEPA Region 9 (pathway specific)
Trichloromethane (chloroform)	4.96E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Trihalomethanes	4.13E-02	UK DWS (2000)
1,2,4-Trimethylbenzene	1.02E-01	USEPA Region 9 (pathway specific)
1,3,5-Trimethylbenzene	1.02E-01	USEPA Region 9 (pathway specific)
Vinyl Chloride	2.98E-04	UK DWS (2000)
o-Xylene	Sum o-xylene and m,p-xylene and use criteria for "Xylenes"	UK Marine / Estuarine EQS
m-Xylene	Sum o-xylene and m,p-xylene and use criteria for "Xylenes"	UK Marine / Estuarine EQS
p-Xylene	Sum o-xylene and m,p-xylene and use criteria for "Xylenes"	UK Marine / Estuarine EQS
Xylenes	8.17E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC

TABLE G2 – STAGE 2 SCREENING CRITERIA – SOIL LEACHATE AND SHALLOW GROUNDWATER

Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (μg/l)	Source
Acenaphthene	3.65E+02	USEPA Region 9 (pathway specific)
Acenaphthylene	1.00E+01	UK DWS (2000)
Acephate	1.00E-01	UK DWS (2000)
Acetaldehyde	1.75E+00	USEPA Region 9 (pathway specific)
Acetamide	No Criterion	No Criterion
Acetochlor	1.00E-01	UK DWS (2000)
Acetone	5.48E+03	USEPA Region 9 (pathway specific)
Acetonitrile	1.03E+02	USEPA Region 9 (pathway specific)
Acetylchloride	No Criterion	No Criterion
Acrolein	4.16E-02	USEPA Region 9 (pathway specific)
Acrylamide	1.00E-01	UK DWS (2000)
Acrylic Acid	1.82E+04	USEPA Region 9 (pathway specific)
Acrylonitryle	3.89E-02	USEPA Region 9 (pathway specific)
Alachlor	1.00E-01	UK DWS (2000)
Aldicarb	1.00E-01	UK DWS (2000)
Aldrin	1.00E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 88/34/EEC
Aldrin+Dieldrin	3.00E-02	WHO DWG
Aldrin+Dieldrin+Endrin+Isodrin	3.00E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Aluminium	2.00E+02	UK DWS (2000)
Ammonia (undissociate NH3 only)	2.10E+01	UK Marine / Estuarine EQS Surface Waters (Fishlife) (Classification) Regulations 1997 No 1331 (Water Resources, England & Wales) 78/659/EEC
Ammonium NH4 (total)	1.00E+03	UK Freshwater EQS Surface Waters (Fishlife) (Classification) Regulations 1997 No 1331 (Water Resources, England & Wales) 78/659/EEC
Aniline	1.18E+01	USEPA Region 9 (pathway specific)
Anthracene	1.83E+03	USEPA Region 9 (pathway specific)
Antimony	5.00E+00	UK DWS (2000)
Arsenic	2.50E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1997 No 2560 (Water Resources, England & Wales)
Atrazine	2.00E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Azinphos-methyl (Guthion)	1.00E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1997 No 2560 (Water Resources, England & Wales)



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source
Azobenzene	6.11E-01	USEPA Region 9 (pathway specific)
Barium	7.00E+02	WHO DWG
Bentazon	5.00E+02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 389 (Water Resources, England & Wales)
Benzaldehyde	3.65E+03	USEPA Region 9 (pathway specific)
Benzene	3.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)
Benz[a]anthracene	9.21E-02	USEPA Region 9 (pathway specific)
Benzo[a]pyrene	1.00E-02	UK DWS (2000)
Benzo[b]fluoranthene	See PAHs	UK DWS (2000)
Benzo[g,h,i]perylene	See PAHs	UK DWS (2000)
Benzo[k]fluoranthene	See PAHs	UK DWS (2000)
Benzoic Acid	1.46E+05	USEPA Region 9 (pathway specific)
Benzyl alcohol	1.09E+04	USEPA Region 9 (pathway specific)
Beryllium	7.30E+01	USEPA Region 9 (pathway specific)
1,1-Biphenyl	2.50E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 389 (Water Resources, England & Wales)
bis(2-chloroethoxy)methane	No Criterion	No Criterion
bis(2-chloroethyl)ether	1.02E-02	USEPA Region 9 (pathway specific)
bis(2-chloroisopropyl)ether	2.74E-01	USEPA Region 9 (pathway specific)
bis(2-ethylhexyl)phthalate (di(2- ethylhexyl)phthalate)(DEHP)	8.00E+00	WHO DWG
bis(chloromethyl)ether	5.15E-05	USEPA Region 9 (pathway specific)
BOD (cyprinid fisheries)	6.00E+03	UK Freshwater EQS Surface Waters (Fishlife) (Classification) Regulations 1997 No 1331 (Water Resources, England & Wales) 78/659/EEC
BOD (salmonid fisheries)	3.00E+03	UK Freshwater EQS Surface Waters (Fishlife) (Classification) Regulations 1997 No 1331 (Water Resources, England & Wales) 78/659/EEC
Boron	7.00E+03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Bromate	1.00E+01	UK DWS (2000)
Bromobenzene	2.03E+01	USEPA Region 9 (pathway specific)
Bromochloromethane	No Criterion	No Criterion
Bromodichloromethane	See note (ix)	UK DWS (2000)
Bromoform (tribromomethane)	See note (ix)	UK DWS (2000)
Bromomethane (methyl bromide)	8.66E+00	USEPA Region 9 (pathway specific)
4-Bromophenyl-phenylether	No Criterion	No Criterion
Bromoxynil	1.00E+02	UK Marine / Estuarine EQS WRc Report DoE 36271/1 1995
1-Butanol	3.65E+03	USEPA Region 9 (pathway specific)



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source
2-Butanone (MEK = methyl ethyl ketone)	6.97E+03	USEPA Region 9 (pathway specific)
Butyl benzyl phthalate (BBP)	7.30E+03	USEPA Region 9 (pathway specific)
n-Butylbenzene	2.43E+02	USEPA Region 9 (pathway specific)
sec-Butylbenzene	2.43E+02	USEPA Region 9 (pathway specific)
tert-Butylbenzene	2.43E+02	USEPA Region 9 (pathway specific)
Cadmium	2.50E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Calcium	2.50E+05	UK DWS (2000)
Carbazole	3.36E+00	USEPA Region 9 (pathway specific)
Carbofuran	1.00E-01	UK DWS (2000)
Carbon Disulphide (Carbon Bisulphide)	1.04E+03	USEPA Region 9 (pathway specific)
Carbon Tetrachloride (tetrachloromethane)	1.20E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 86/280/EEC
Chlofenvinphos	1.00E-02	UK Marine / Estuarine EQS Environment Agency Research & Development (R&D) Report P12 1996 [NRA R&D Note 216(1993)]
Chlorate	7.00E+02	WHO DWG
Chlordane	1.00E-01	UK DWS (2000)
Chloride	2.50E+05	UK Freshwater EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Chlorine	1.00E+01	UK Marine / Estuarine EQS Surface Waters (Fishlife) (Classification) Regulations 1997 No 1331 (Water Resources, England & Wales) 78/659/EEC
Chlorite	7.00E+02	WHO DWG
4-Chloro-3-methylphenol	4.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
4-Chloroaniline	1.46E+02	USEPA Region 9 (pathway specific)
Chlorobenzenes (sum of mono- to hexa-)	No Criterion	No Criterion
1-Chlorobutane	2.43E+03	USEPA Region 9 (pathway specific)
Chloroethane (ethly chloride)	4.64E+00	USEPA Region 9 (pathway specific)
Chloroform (trichloromethane)	1.20E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 88/347/EEC
Chloromethane (methyl chloride)	1.58E+02	USEPA Region 9 (pathway specific)
1-Chloronaphthalene	No Criterion	No Criterion
2-Chloronaphthalene	4.87E+02	USEPA Region 9 (pathway specific)



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source
Chloronitrotoluenes (CNT)	1.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
2-Chlorophenol (o-chlorophenol)	5.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
3-Chlorophenol (m-chlorophenol)	No Criterion	No Criterion
4-Chlorophenol (p-chlorophenol)	No Criterion	No Criterion
4-Chlorophenyl-phenylether	No Criterion	No Criterion
2-Chlorotoluene	1.22E+02	USEPA Region 9 (pathway specific)
4-Chlorotoluene	No Criterion	No Criterion
Chlorotoluron	2.00E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Chlorphenylid	5.00E-02	UK Marine / Estuarine EQS Environment Agency Research & Development (R&D) Report P12 1996
Chromium	1.50E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Chromium III	1.50E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Chromium VI	1.50E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Chrysene	9.21E+00	USEPA Region 9 (pathway specific)
Cobalt	7.30E+02	USEPA Region 9 (pathway specific)
Copper	5.00E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Coumaphos	4.00E-02	UK Marine / Estuarine EQS Environment Agency Research & Development (R&D) Report P12 1996 [NRA R&D) Note 216 (1993)]
o or 2-Cresol (2-methylphenol)	1.82E+03	USEPA Region 9 (pathway specific)
m or 3-Cresol (3-methylphenol)	1.82E+03	USEPA Region 9 (pathway specific)
p or 4-Cresol (4-methylphenol)	1.82E+02	USEPA Region 9 (pathway specific)
Cresoles (sum)	No Criterion	No Criterion
Cyanazine	1.00E-01	UK DWS (2000)
Cyanides complex (pH<5)	No Criterion	No Criterion
Cyanides complex (pH>=5)	No Criterion	No Criterion
Cyanide (free)	5.00E+01	UK DWS (2000)



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source			
Cyfluthrin	1.00E-03	UK Marine / Estuarine EQS Department of the Environment (now DETR) Circular 7/89, Environment Agency Research & Development(R&D) Report 12 1996			
2,4-D (Dichlorophenoxyacetic acid)	1.00E-01	UK DWS (2000)			
2,4-D (ester) (Dichlorophenoxyacetic acid)	1.00E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)			
2,4-D (non-ester) (Dichlorophenoxyacetic acid)	4.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)			
2,4-DB	1.00E-01	UK DWS (2000)			
4,4`DDD (1,1-dichloro-2,2-bis(4- chlorophenyl)ethane)	1.00E-01	UK DWS (2000)			
4,4`DDE (1,1-dichloro-2,2-bis(4- chlorophenyl)ethylene)	1.00E-01	UK DWS (2000)			
DDT (1,1,1-trichloro-2,2- bis(4chlorophenyl)ethane)	1.00E-01	UK DWS (2000)			
p`p`-DDT (1,1,1-trichloro-2,2- bis(4chlorophenyl)ethane)	1.00E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 86/280/EEC			
DDT(all isomers) (1,1,1-trichloro-2,2- bis(4chlorophenyl)ethane)	2.50E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 86/280/EEC			
DDT/DDE/DDD (sum)	1.00E-01	UK DWS (2000)			
Decachlorobiphenyls	No Criterion	No Criterion			
Demetons (total)	5.00E-01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 389 (Water Resources, England & Wales)			
Di(2-ethylhexyl)adipate	8.00E+01	WHO DWG			
Diazinon	1.50E-02	UK Marine / Estuarine EQS Environment Agency Research & Development (R&D) Report P12 1996 [NRA R&D) Note 216 (1993)]			
Dibenzo[a,h]anthracene	9.21E-03	USEPA Region 9 (pathway specific)			
Dibenzofuran	1.22E+01	USEPA Region 9 (pathway specific)			
Dibromoacetonitrile	7.00E+01	WHO DWG			
1,2-Dibromo-3-chloropropane	1.00E-01	UK DWS (2000)			
Dibromochloromethane	See note (ix)	UK DWS (2000)			
1,2-Dibromoethane	1.00E-01	UK DWS (2000)			
Dibromomethane 6.08E+01		USEPA Region 9 (pathway specific)			
Dibutyl phthalate (DBP)	3.65E+03	USEPA Region 9 (pathway specific)			
Dichloroacetate	5.00E+01	WHO DWG			
Dichloroacetonitrile	2.00E+01	WHO DWG			
1,2-Dichlorobenzene	1.00E+03	WHO DWG			
1,3-Dichlorobenzene	1.83E+02	USEPA Region 9 (pathway specific)			



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source
1,4-Dichlorobenzene	3.00E+02	WHO DWG
3,3`-Dichlorobenzidine	1.49E-01	USEPA Region 9 (pathway specific)
Dichlorobiphenyls	1.00E-01	UK DWS (2000)
Dichlorodifluoromethane	3.95E+02	USEPA Region 9 (pathway specific)
1,1-Dichloroethane (EDC)	8.11E+02	USEPA Region 9 (pathway specific)
1,2-Dichloroethane(EDC)	1.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1992 No 337 (Water Resources, England & Wales)
1,1-Dichloroethene	3.00E+01	WHO DWG
1,2-Dichloroethene (cis + trans) total	5.00E+01	WHO DWG
1,2-Dichloroethene (cis)	6.08E+01	USEPA Region 9 (pathway specific)
1,2-Dichloroethene (trans)	1.22E+02	USEPA Region 9 (pathway specific)
Dichloromethane (see methylene chloride)	2.00E+01	WHO DWG
2,3-Dichlorophenol	0.00E+00	UK Freshwater EQS
2,4-Dichlorophenol	2.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
2,5-Dichlorophenol	No Criterion	No Criterion
2,6-Dichlorophenol	No Criterion	No Criterion
3,4-Dichlorophenol	No Criterion	No Criterion
3,5-Dichlorophenol	No Criterion	No Criterion
Dichlorprop	1.00E-01	UK DWS (2000)
1,2-Dichloropropane (1,2-DCP)	1.00E-01	UK DWS (2000)
1,3-Dichloropropane	1.00E-01	UK DWS (2000)
2,2-Dichloropropane	No Criterion	No Criterion
1,3-Dichloropropene	2.00E+01	WHO DWG
Dichlorvos	4.00E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1997 No 2560 (Water Resources, England & Wales)
Dieldrin	1.00E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 88/34/EEC
Diethylphthalate (DEP)	2.92E+04	USEPA Region 9 (pathway specific)
Dimethoate	1.00E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 389 (Water Resources, England & Wales)
2,4-Dimethylphenol (DMP)	7.30E+02	USEPA Region 9 (pathway specific)
2,6-Dimethylphenol (DMP)	2.19E+01	USEPA Region 9 (pathway specific)
3,4-Dimethylphenol (DMP)	3.65E+01	USEPA Region 9 (pathway specific)
Dimethylphthalate	3.65E+05	USEPA Region 9 (pathway specific)
4,6-Dinitro-2-methylphenol	3.65E+00	USEPA Region 9 (pathway specific)



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source		
2,4-Dinitrophenol	7.30E+01	USEPA Region 9 (pathway specific)		
2,4-Dinitrotoluene	7.30E+01	USEPA Region 9 (pathway specific)		
2,6-Dinitrotoluene	3.65E+01	USEPA Region 9 (pathway specific)		
Di-n-octylphthalate	1.46E+03	USEPA Region 9 (pathway specific)		
Diphenyl ether	No Criterion	No Criterion		
Diuron	1.00E-01	UK DWS (2000)		
DO2 (cyprinid fisheries)	5.00E+03	UK Freshwater EQS Surface Waters (Fishlife) (Classification) Regulations 1997 No 1331 (Water Resources, England & Wales) 78/659/EEC		
DO2 (salmonid fisheries)	7.00E+03	UK Freshwater EQS Surface Waters (Fishlife) (Classification) Regulations 1997 No 1331 (Water Resources, England & Wales) 78/659/EEC		
DO2 (shellfisheries)	No Criterion	No Criterion		
Edetic acid (EDTA)	6.00E+02	WHO DWG		
Endosulfan	3.00E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1997 No 2560 (Water Resources, England & Wales)		
Endrin	5.00E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 88/347/EEC		
Epichlorohydrin	1.00E-01	UK DWS (2000)		
Ethyl chloride (chloroethane)	4.64E+00	USEPA Region 9 (pathway specific)		
Ethylbenzene	3.00E+02	WHO DWG		
Fenchlorphos	1.00E-02	UK Marine / Estuarine EQS Environment Agency Research & Development (R&D) Report P12 1996		
Fenitrothion	1.00E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1997 No 2560 (Water Resources, England & Wales)		
Fenoprop	1.00E-01	UK DWS (2000)		
Flucofuron	1.00E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC		
Fluoranthene	2.00E-01	UK DWS (2000)		
Fluorene	2.43E+02	USEPA Region 9 (pathway specific)		
Fluoride	1.50E+03	UK DWS (2000)		
Formaldehyde	5.00E+00	UK Freshwater EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC		
HCH-alpha	1.00E-01	UK DWS (2000)		
HCH-beta	1.00E-01	UK DWS (2000)		
HCH-gamma (Lindane)	1.00E-01	UK DWS (2000)		
Heptachlor	3.00E-02	UK DWS (2000)		
Heptachlor and heptachlor epoxide	3.00E-02	UK DWS (2000)		



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source			
Heptachlorobiphenyls	1.00E-01	UK DWS (2000)			
Heptachlor epoxide	1.00E-01	UK DWS (2000)			
Hexachlorobenzene	3.00E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 88/347/EEC			
Hexachlorobiphenyls	1.00E-01	UK DWS (2000)			
Hexachlorobutadiene	1.00E-01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 88/347/EEC			
Hexachlorocyclohexane	2.00E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 84/491/EEC			
Hexachlorocyclopentadiene	2.19E+02	USEPA Region 9 (pathway specific)			
Hexachloroethane	4.80E+00	USEPA Region 9 (pathway specific)			
Hydrogen sulphide	1.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC			
Hydroquinone	No Criterion	No Criterion			
Indeno[1,2,3-cd]pyrene	See PAHs	UK DWS (2000)			
loxynil	1.00E+01	UK Marine / Estuarine EQS Environment Agency Research & Development (R&D) Report P12 1996			
Iron	1.00E+03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC			
Isodrin	5.00E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales)			
Isophorone	7.08E+01	USEPA Region 9 (pathway specific)			
Iso-Propylbenzene (cumene)	6.58E+02	USEPA Region 9 (pathway specific)			
p-Isopropyltoluene	No Criterion	No Criterion			
Isoproturon	2-20	UK Freshwater EQS Environment Agency Research & Development (R&D) Technical Summary 173(xi) 1999			
Kjeldahl nitrogen/Total Organic Nitrogen (N)	1.00E+03	UK DWS (2000)			
Lead	2.50E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC			
Lead (tetraethyl)	3.65E-03	USEPA Region 9 (pathway specific)			
Lindane (HCH-gamma)	2.00E-02	UK Marine / Estuarine EQS			



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source		
Linuron	2.00E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)		
Lithium	7.30E+02	USEPA Region 9 (pathway specific)		
Magnesium	5.00E+04	UK DWS (2000)		
Malachite Green	5.00E-01	UK Freshwater EQS Environment Agency Research & Development (R&D) Report P12 1996		
Malathion	2.00E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1997 No 2560 (Water Resources, England & Wales)		
Manganese	5.00E+01	UK DWS (2000)		
Manganese and compounds	No Criterion	No Criterion		
MCPA (2-methyl-4-chlorophenoxy acetic acid)	2.00E+00	UK Marine / Estuarine EQS DETR (1997) National EQSs for Dangerous Substances in Water; Draft Regulations and Compliance Cost Assessment		
Месоргор	2.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources England & Wales)		
Mercury (elemental)	1.00E+00	UK DWS (2000)		
Mercury (inorganic compounds)	3.00E-01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC		
Mercury (methyl)	3.65E+00	USEPA Region 9 (pathway specific)		
Mercury and compounds	3.00E-01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC		
Methanol	1.82E+04	USEPA Region 9 (pathway specific)		
Methoxychlor	1.00E-01	UK DWS (2000)		
Methyl chloride (Chloromethane)	2.00E+01	WHO DWG		
Methyl ethyl ketone (MEK) (2-Butanone)	6.97E+03	USEPA Region 9 (pathway specific)		
Methyl Isobutyl ketone (4-methyl-2- pentanone) MIBK	1.99E+03	USEPA Region 9 (pathway specific)		
Methyl tert butyle ether (MTBE)	1.10E+01	USEPA Region 9 (pathway specific)		
Methylcyclohexane	5.22E+03	USEPA Region 9 (pathway specific)		
Methylene chloride (Dichloromethane)	2.00E+01	WHO DWG		
2-Methylnaphthalene	No Criterion	No Criterion		
1-Methylnaphthalene	No Criterion	No Criterion		
4-Methylphenol	1.82E+02	USEPA Region 9 (pathway specific)		
Metolachlor	1.00E-01	UK DWS (2000)		
Mevinphos	2.00E-02	UK Freshwater EQS UK EQS		



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source			
Molinate	1.00E-01	UK DWS (2000)			
Molybdenum	7.00E+01	WHO DWG			
Monochloroacetate	2.00E+01	WHO DWG			
Monochlorobenzene	3.00E+02	WHO DWG			
Monochlorobiphenyls	1.00E-01	UK DWS (2000)			
Monochloramine	3.00E+03	WHO DWG			
Naphthalene	5.00E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC			
Nickel	3.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC			
Nitrate (NO3)	5.00E+04	UK DWS (2000)			
Nitrite - consumers taps (NO2)	0.01 - 0.03	UK Freshwater EQS Surface Waters (Fishlife (Classification) Regulations 1997 No 1331 (Wa Resources, England & Wales) 78/659/EEC			
Nitrite - ex works (NO2)	0.01 - 0.03	UK Freshwater EQS Surface Waters (Fishlife) (Classification) Regulations 1997 No 1331 (Wat Resources, England & Wales) 78/659/EEC			
Nitrilotriacetic acid	2.00E+02	WHO DWG			
2-Nitroaniline	1.09E+02	USEPA Region 9 (pathway specific)			
3-Nitroaniline	3.20E+00	USEPA Region 9 (pathway specific)			
4-Nitroaniline	3.20E+00	USEPA Region 9 (pathway specific)			
Nitrobenzene	3.40E+00	USEPA Region 9 (pathway specific)			
2-Nitrophenol	No Criterion	No Criterion			
4-Nitrophenol	No Criterion	No Criterion			
n-Nitroso-di-n-propylamine	9.60E-03	USEPA Region 9 (pathway specific)			
n-Nitrosodiphenylamine	1.37E+01	USEPA Region 9 (pathway specific)			
m-Nitrotoluene	1.22E+02	USEPA Region 9 (pathway specific)			
o-Nitrotoluene	4.87E-02	USEPA Region 9 (pathway specific)			
p-Nitrotoluene	6.59E-01	USEPA Region 9 (pathway specific)			
Nonachlorobiphenyls	1.00E-01	UK DWS (2000)			
Octachlorobiphenyls	1.00E-01	UK DWS (2000)			
Omethoate	1.00E-02	UK Freshwater EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)			
Organotin compounds	No Criterion	No Criterion			
Oxidizability (permanganate value) (O2)	5.00E+03	UK DWS (2000)			
PAHs (sum of 4, specified note (vii))	1.00E-01	UK DWS (2000)			
PAHs (sum of 10)	No Criterion	No Criterion			
PCB 28	1.00E-01	UK DWS (2000)			
PCB 52	1.00E-01	UK DWS (2000)			
РСВ 77	1.00E-01	UK DWS (2000)			
PCB 81	1.00E-01	UK DWS (2000)			
PCB 101	1.00E-01	UK DWS (2000)			



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source			
PCB 105	1.00E-01	UK DWS (2000)			
PCB 114	1.00E-01	UK DWS (2000)			
PCB 118	1.00E-01	UK DWS (2000)			
PCB 123	1.00E-01	UK DWS (2000)			
PCB 126	1.00E-01	UK DWS (2000)			
PCB 138	1.00E-01	UK DWS (2000)			
PCB 153	1.00E-01	UK DWS (2000)			
PCB 156	1.00E-01	UK DWS (2000)			
PCB 157	1.00E-01	UK DWS (2000)			
PCB 167	1.00E-01	UK DWS (2000)			
PCB 169	1.00E-01	UK DWS (2000)			
PCB 180	1.00E-01	UK DWS (2000)			
PCB 189	1.00E-01	UK DWS (2000)			
PCB (total)	5.00E-01	UK DWS (2000)			
PCB Aroclor-1016 (42% Cl)	1.00E-01	UK DWS (2000)			
PCB Aroclor-1221	1.00E-01	UK DWS (2000)			
PCB Aroclor-1232	1.00E-01	UK DWS (2000)			
PCB Aroclor-1242	1.00E-01	UK DWS (2000)			
PCB Aroclor-1248	1.00E-01	UK DWS (2000)			
PCB Aroclor-1254	1.00E-01	UK DWS (2000)			
PCB Aroclor-1260	1.00E-01	UK DWS (2000)			
PCBs (sum of 7 - see comment)	5.00E-01	UK DWS (2000)			
PCSDs	5.00E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC			
Pendimethalin	1.00E-01	UK DWS (2000)			
Pentachlorobenzene	2.92E+01	USEPA Region 9 (pathway specific)			
Pentachlorophenol (PCP)	2.00E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales)			
Perchlorethylene (refer to PCE)	1.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC			
Permethrin	1.00E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC			
Pesticides: Total substances (sum)	5.00E-01	UK DWS (2000)			
рН	6 - 8.5	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC			
Phenanthrene	1.00E+01	UK DWS (2000)			



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source		
Phenol	3.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC		
Phenols (phenol index)	2.20E+03	UK DWS (2000)		
Phosphorus	2.20E+03	UK DWS (2000)		
Phosphorus (white)	7.30E-01	USEPA Region 9 (pathway specific)		
Potassium	1.20E+04	UK DWS (2000)		
Propazine	1.00E-01	UK DWS (2000)		
Propetamphos	1.00E-02	UK Marine / Estuarine EQS Environment Agency Research & Development (R&D) Report P12 1996		
n-Propylbenzene	2.43E+02	USEPA Region 9 (pathway specific)		
Pyrene	1.83E+02	USEPA Region 9 (pathway specific)		
Pyridine	3.65E+01	USEPA Region 9 (pathway specific)		
Resorcinol	No Criterion	No Criterion		
Selenium	1.00E+01	UK DWS (2000)		
Silver	5.00E-01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC		
Simazine	2.00E+00	UK Marine / Estuarine EQS UK EQS		
Sodium	0.00E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC		
Styrene	5.00E+01	UK Marine / Estuarine EQS UK EQS		
Sulcofuron (Sulcofuron-sodium)	2.50E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC		
Sulphate	2.50E+05	UK DWS (2000)		
Surfactants (as lauryl sulphate)	2.00E+02	UK DWS (2000)		
2,3,7,8-TCDD (Tetrachlorodibenzodioxin)	4.48E-07	USEPA Region 9 (pathway specific)		
Tecnazene	1.00E+00	UK Marine / Estuarine EQS Environment Agency Research & Development (R&D) Report P12 1996		
Terbuthylazine	1.00E-01	UK DWS (2000)		
Terbutryn	1.00E-01	UK DWS (2000)		
1,2,3,4-Tetrachlorobenzene	No Criterion	No Criterion		
1,2,3,5-Tetrachlorobenzene	No Criterion	No Criterion		
1,2,4,5-Tetrachlorobenzene	1.09E+01	USEPA Region 9 (pathway specific)		
Tetrachlorobiphenyls	1.00E-01	UK DWS (2000)		
1,1,1,2-Tetrachloroethane	4.32E-01	USEPA Region 9 (pathway specific)		
1,1,2,2-Tetrachloroethane (PCA)	5.53E-02	USEPA Region 9 (pathway specific)		



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source
Tetrachloroethene (Tetrachloroethylene) (PCE)	1.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1992 No 337 (Water Resources, England & Wales)
Tetrachloroethene and Trichloroethene (sum of PCE and TCE)	1.00E+01	UK DWS (2000)
Tetrachloromethane (carbon tetrachloride)	1.20E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
2,3,4,5-Tetrachlorophenol	No Criterion	No Criterion
2,3,4,6-Tetrachlorophenol	1.09E+03	USEPA Region 9 (pathway specific)
2,3,5,6-Tetrachlorophenol	No Criterion	No Criterion
Tin	1.00E+01	UK Marine / Estuarine EQS Environment Agency Research & Development (R&D) Report P12 1996
Toluene (Methyl benzene)	4.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)
TPH (>EC5-7) aromatic	1.00E+01	UK DWS (2000)
TPH (>EC6-7) aromatic	1.00E+01	UK DWS (2000)
TPH (>EC7-8) aromatic	1.00E+01	UK DWS (2000)
TPH (>EC8-10) aromatic	1.00E+01	UK DWS (2000)
TPH (>EC10-12) aromatic	1.00E+01	UK DWS (2000)
TPH (>EC12-16) aromatic	1.00E+01	UK DWS (2000)
TPH (>EC16-21) aromatic	1.00E+01	UK DWS (2000)
TPH (>EC21-35) aromatic	1.00E+01	UK DWS (2000)
TPH (>EC5-6) aliphatic	1.00E+01	UK DWS (2000)
TPH (>EC6-8) aliphatic	1.00E+01	UK DWS (2000)
TPH (>EC7-8) aliphatic	1.00E+01	UK DWS (2000)
TPH (>EC8-10) aliphatic	1.00E+01	UK DWS (2000)
TPH (>EC10-12) aliphatic	1.00E+01	UK DWS (2000)
TPH (>EC12-16) aliphatic	1.00E+01	UK DWS (2000)
TPH (>EC16-21) aliphatic	1.00E+01	UK DWS (2000)
TPH (EC21-35) aliphatic	1.00E+01	UK DWS (2000)
TPH (Total)	1.00E+01	UK DWS (2000)
Triazaphos	5.00E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)
Tributly tin	2.00E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Tributyl tin oxide (TBTO)	2.00E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	5.92E+04	USEPA Region 9 (pathway specific)



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source			
Trichloroacetate	2.00E+02	WHO DWG			
Trichloroacetaldehyde (Chloral Hydrate)	1.00E+01	WHO DWG			
1,2,3-Trichlorobenzene	No Criterion	No Criterion			
1,2,4-Trichlorobenzene	7.16E+00	USEPA Region 9 (pathway specific)			
1,3,5-Trichlorobenzene	0.00E+00	UK Freshwater EQS			
Trichlorobenzenes (total)	4.00E-01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC			
Trichlorobiphenyls	1.00E-01	UK DWS (2000)			
1,1,1-Trichloroethane (TCA)	1.00E+02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)			
1,1,2-Trichloroethane	3.00E+02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)			
Trichloroethene (Trichloroethylene) (TCE)	1.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1992 No 337 (Water Resources, England & Wales)			
Trichlorofluoromethane (Freon 11)	1.29E+03	USEPA Region 9 (pathway specific)			
Trichloromethane (chloroform)	1.20E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC			
2,3,4-Trichlorophenol	No Criterion	No Criterion			
2,3,5-Trichlorophenol	No Criterion	No Criterion			
2,3,6-Trichlorophenol	No Criterion	No Criterion			
2,4,5-Trichlorophenol	9.00E+00	WHO DWG			
2,4,6-Trichlorophenol	2.00E+02	WHO DWG			
3,4,5-Trichlorophenol	No Criterion	No Criterion			
1,2,3-Trichloropropane	5.60E-03	USEPA Region 9 (pathway specific)			
1,2,3-Trichloropropene	2.18E+00	USEPA Region 9 (pathway specific)			
Trifluralin	1.00E-01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1997 No 2560 (Water Resources, England & Wales)			
Trihalomethanes (sum of, specified note ix)	1.00E+02	UK DWS (2000)			
1,2,4-Trimethylbenzene	1.23E+01	USEPA Region 9 (pathway specific)			
1,3,5-Trimethylbenzene	1.23E+01	USEPA Region 9 (pathway specific)			
Triphenyl tin	8.00E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1997 No 2560 (Water Resources, England & Wales)			
Uranium	1.50E+01	WHO DWG			



Determinand	Controlled Waters Generic Screening Criteria - Groundwater: UK Marine/Estuarine EQS (µg/l)	Source		
Vanadium	1.00E+02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC		
Vinyl Chloride	5.00E-01	UK DWS (2000)		
o-Xylene	Sum o-xylene and m,p-xylene and use criteria for "Xylenes"	UK Marine / Estuarine EQS		
m-Xylene	Sum o-xylene and m,p-xylene and use criteria for "Xylenes"	UK Marine / Estuarine EQS		
p-Xylene	Sum o-xylene and m,p-xylene and use criteria for "Xylenes"	UK Marine / Estuarine EQS		
Xylenes	3.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC		
Zinc	4.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC		



TABLE G3 - STAGE 2 ASSESSMENT - VOCS IN SOILS

		Statistical Analysis				Number of	
Target Compound	Generic Controlled Waters Screening Criteria (mg/kg)	Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	US95 (mg/kg)	Number Analysed	Samples Exceeding Generic Screen
TRICHLOROETHENE	0.0116	0.016	0.016	-	*	38	1
Not possible to calculate LIS05 because only one measurement above method detection limit							

* Not possible to calculate US95 because only one measurement above method detection limit

TABLE G4 - STAGE 2 ASSESSMENT - LEACHABLE METALS & SURFACTANT

Target Compound	Tier 1 Controlled Waters (μg/L)	Minimum	Maximum	Geomean	Mean	US95	Number Analysed	Number of Samples Exceeding Tier 1
CHROMIUM	15	<mdl< td=""><td>25</td><td>3.23</td><td>5.31</td><td>8.24</td><td>36</td><td>2</td></mdl<>	25	3.23	5.31	8.24	36	2
COPPER	5	7	30	11.95	12.5	13.70	36	36
ZINC	40	<mdl< td=""><td>55</td><td>24.04</td><td>26.30</td><td>28.66</td><td>36</td><td>1</td></mdl<>	55	24.04	26.30	28.66	36	1

TABLE G5 - STAGE 2 ASSESSMENT - LEACHABLE SVOC AND PAH

	Statistical Analysis							
Target Compound	Tier 1 Controlled Waters (µg/L)	Minimum	Maximum	Geomean	Mean	US95	Number Analysed	Number of Samples Exceeding Tier 1
CARBAZOLE	3.36	<mdl< td=""><td>7</td><td>4.38</td><td>5</td><td>5.46</td><td>31</td><td>2</td></mdl<>	7	4.38	5	5.46	31	2
FLUORANTHENE	0.2	<mdl< td=""><td>1</td><td>1</td><td>1</td><td>1</td><td>31</td><td>3</td></mdl<>	1	1	1	1	31	3
NAPHTHALENE	5	<mdl< td=""><td>8</td><td>6.32</td><td>6.50</td><td>15.97</td><td>31</td><td>2</td></mdl<>	8	6.32	6.50	15.97	31	2



Analyte	Measured Concentration (µg/L)	Marine EQS Screening Value (mg/L)	Type of contamination	Location	Estimated catchment area of contamination (m ²)	Estimated catchment area of clean water (m ²)	Total catchment (m²)	Percentage of Contaminated Catchment Infiltrating Total Catchment	Resultant simulated concentration as analyte enters Evaporites (mg/L)	Marine EQS Screening Value Exceeded
Chromium	25	15	Soil leachate hotspot	TP736E	350	1150	1500	23.33%	5.83	NO
Zinc	55	40	Soil leachate hotspot	TP737E	350	950	1300	27%	14.81	NO
Fluoranthene	1	0.2	Soil leachate hotspot	TP749E	950	1350	2300	41%	0.41	YES
Carbazole	7	3.36	Soil leachate hotspot	TP748E	500	1000	1500	33%	2.33	NO
Naphthalene	8	5	Soil leachate hotspot	TP748E	500	1000	1500	33.33%	2.67	NO

TABLE G7 – STAGE 3 A ASSESSMENT

TABLE G8 – STAGE 3 B ASSESSMENT

Analyte	Resultant simulated concentration as analyte enters Evaporites (µg/L)	Rainfall (m/day)	Infiltration into Source Zone and Clean Zone around Source (%)	Effective Rainfall (m/day)	Area of Source and Clean Zone Around Source (m2)	Discharge Contribution from onsite source zone and dilution zone (L/day)	Infiltration into St. Bees Sandstone (%)	Effective Rainfall (m/day)	Length of St. Bees Dilution Zone (m)	Width of St. Bees Dilution Zone (m)	Discharge Contribution from St. Bees Dilution Zone (L/day)	Dilution Factor	Concentration after Dilution with Clean St. Bees Water (μg/L)	Marine EQS Screening Value (µg/L)
Fluoranthene	0.41	0.0029	15%	0.0004	2300	1011	7.5%	0.0002	300	48	3163	0.32	0.132	0.20



Table G9 – Pore Water Concentration Calculation Parameters

Contaminant	Soil Concentration (mg/Kg)	K _d (l/Kg)	H' (-)	ρ (g/cm ³)	θ _w (-)	θ _a (-)	Calculated Pore Water Concentration (mg/l)
Trichloroethene	0.016	93.3	0.42	1.64	0.27	0.11	0.0196