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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 June 2006 URS was commissioned to undertake a detailed investigation of Plot A 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 the 2006 investigation. This appendix presents the methodology and results of the CWQRA for Plot A.

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 A 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 A is presented in full in this appendix.

G.2 STAGE 2 - GENERIC QUANTITATIVE ASSESSMENT

G.2.1 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 any 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 0.57%, from site data;
- Soil Type Silty clay, principal soil type at source (made ground)
- 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;
- 1,2-Dibromo-3-chloropropane;
- 1,2-Dibromoethane;
- Dibenzo(a,h)anthracene;
- 1,3- Dichloropropane;
- Fluoranthene;
- Hexachlorobutadiene;
- N-nitrosodi-n-propylamine;
- 1,1,1,2-Tetrachloroethane;
- 1,1,2,2-Tetrachloroethane;
- 1,2,3-Trichloropropane;
- PCB (total); and
- 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 A provided no evidence to suggest that these analytes are present within Plot A.

However, this was not the case for Azobenzene, Benzo(a)anthracene, Benzo(a)pyrene, and Fluoranthene. These have been measured in soil leachate analysis in apparent isolated hotspots across Plot A, and have been modelled accordingly in the Stage 3.

G.2.2 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.2.3 Soil Leachate Generic Screening

G.2.3.1 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. Any remaining analytes were either present at concentrations below the method detection limit, or less than respective Tier 1 criteria.

G.2.3.2 Total Petroleum Hydrocarbons (TPH)

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

G.2.3.3 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 G6.

G.2.4 Groundwater Results Screening

No continuous shallow groundwater body is considered to be present in Plot A. During the most recent investigation, three boreholes were installed across Plot A and were all found to be dry during sampling. Therefore, groundwater data available from Plot A is limited to the analysis of water obtained from historic boreholes (that no longer exist on the site). These are WS115, located approximately 25m north east of the cathedral; WS124 situated close to the south western boundary of Plot A, SB13 located towards the centre of Plot A, and SB9 located 5m to the west of the cathedral.

The results are presented below.

G.2.4.1 Metals, Anionic Surfactants, Phosphates, and Cyanide

A summary of the determinands whose concentrations exceeded the Stage 2 generic screening values is given in Table G7.

G.2.4.2 Total Petroleum Hydrocarbons (TPH)

TPH (total) was not measured in groundwater above the laboratory method detection limits in the samples submitted for analysis.

G.2.4.3 Semi Volatile Organic Compounds (SVOC), Polycyclic Aromatic Hydrocarbons (PAH) and Volatile Organic Compounds (VOCs) in Groundwater

A summary of the determinands whose concentrations exceeded the Stage 2 generic screening values is given in Table G8.

G.2.5 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 G9 below.

Table G9 – Stage 2 Assessment – Summary of Screening Criteria Exceedances

Soil	Soil Leachate	Shallow Groundwater
	Arsenic	
	Azobenzene	
	Benzo(A)Anthracene	Benzo(A)Anthracene
	Benzo(A)Pyrene	Benzo(A)Pyrene
	Carbazole	
	Chromium	
	Copper	
	Fluoranthene	
	Phenanthrene	
	Sulphate	Sulphate
	Sum Of 4 PAHs	
M,P-Xylene, Toluene	TPH (Sum Aliphatics & Aromatics C5-C35)	
	TPH C16-C21 Aliphatic	
	TPH C16-C21 Aromatic	
	TPH C21-C35 Aliphatic	
	TPH Total Aliphatics (C5-C35)	
	TPH Total Aromatics (C6-C35)	
		Cyanide
		Zinc

G.3 STAGE 3 DETAILED QUANTITATIVE RISK ASSESSMENT

Those determinands whose concentrations exceeded the Stage 2 screening criteria have been taken forward to a Stage 3 detailed quantitative risk assessment.

G.3.1 Model Selection and Key Model Assumptions

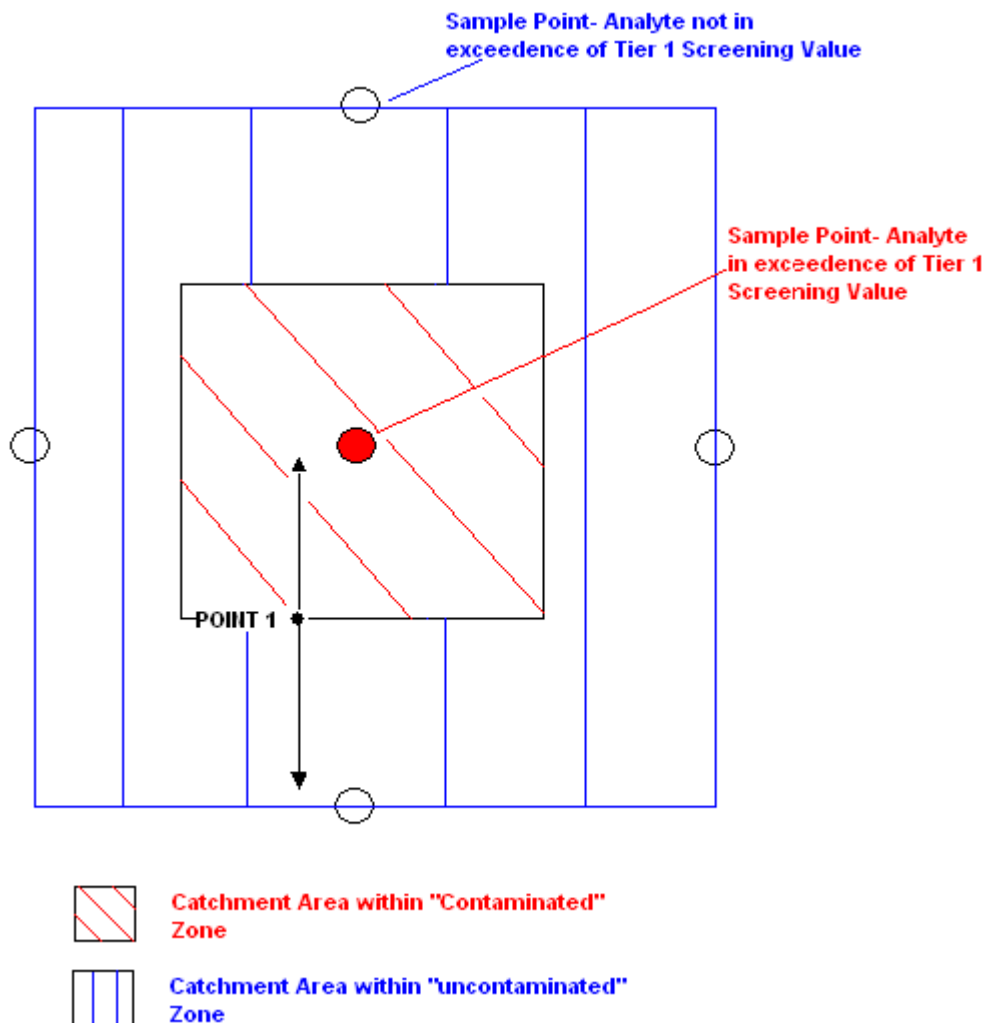
The hydrogeological sequence within Plot A is complex. It has been further compounded by historic site activities, the most prevalent of which has been the deposition of acids into the ground, resulting in voids and channels being created in certain locations, some of which are likely to be in Plot A.

Given the complexity of the geology in Plot A, and the rapid travel times for migration sourced from Plot A, 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 Figure 7 of the main report.

Arsenic was measured at a concentration of 40µg/L from soil leachate analysis in TP622A, which exceeds the Marine EQS Screening Value of 25µg/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 evaporite sequence (thought to be only 3-4m below ground level in Plot A). 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 A, 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 = $29\% \times 40\mu\text{g/L} = 12\mu\text{g/L}$.

The calculated concentrations at the compliance point (opening to the fissure system) were compared directly against the Tier 1 screening criteria, in this instance, the simulated arsenic concentration was below the Screening Value (25µg/L), and therefore no longer considered to represent a potential risk.

G.3.2 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 worsen, as no fresh contamination inputs to ground will occur in the future. As such, any 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.
- No groundwater flow and associated attenuation processes within the evaporite sequence has been simulated.

Overall, given the above assumptions and input parameters selected, the Stage 3 assessment is considered to be conservative in nature.

G.3.3 Sources

In Plot A, generally isolated shallow soil and groundwater contamination was encountered. The maximum value of each Stage 2 exceedance has been used as an individual source term. For toluene and xylene, which exceed the Stage 2 soil criteria, sources have been modelled via soil leachate.

G.3.4 Pathways

The viable pathways applicable to this source 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 zones of the generally low permeability St. Bees Evaporites from vertical migration through the limited thickness of made ground and drift within Plot A. 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 any infiltrating contaminated water entering this unit from within Plot A, would remain at this concentration until it reached the coast.

G.3.5 Receptors

Given the rapid transport time within the dissolution features, the compliance point that is deemed protective of the ultimate receptor (Irish Sea) has been determined as the point at which groundwater enters the St. Bees Evaporites beneath Plot A.

The Byerstead Spring emerges on Saltom Beach and drains immediately into The Irish Sea. The pollutant linkage to these receptors appears to be complex (and is discussed in detail the previous Phase II Investigation, REF: 44319623/R2037, dated 23rd June 2005). For this reason, the Stage 3 assessment criteria are those also used at Stage 2, i.e. Marine EQS values.

G.3.6 Summary of Model Results

The model results are presented in Table G10 and are summarised in Figure 9 of the main report. For simulated contaminant concentrations at the adopted compliance point (in this case, the point directly below the source, where the analyte enters the evaporite sequence) to pose a potentially significant risk to shallow controlled waters, they must be in excess of defined Stage 3 screening criteria (EQS). It can be seen from table G10 that a number of exceedances of the Stage 3 assessment criteria have been identified.

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Appendix G– Controlled Waters Quantitative Risk Assessment,

Table G10 – Stage 3 Assessment – Summary

Analyte	Measured Concentration (mg/L)	Marine EQS Screening Value (mg/L)	Type of contamination	Location	Infiltration	Estimated catchment area of contamination (m ²)	Estimated catchment area of clean water (m ²)	Total catchment (m ²)	Percentage of Contaminated Catchment Infiltrating Total Catchment	Resultant simulated concentration as analyte enters Evaporites (mg/L)	Marine EQS Screening Value Exceeded
TPH Aliphatic C21-35	73	10	Soil leachate hotspot	TP619A	5.48E-04	6875	6875	10975	17850	38.52%	Yes
Fluoranthene	1	0.2	Soil leachate hotspot	TP602A	5.48E-04	1500	1500	0	1500	100.00%	Yes
Azobenzene	4	0.61119	Soil leachate hotspot	TP606A	5.48E-04	1575	1575	2975	4550	34.62%	Yes
Benzo (a) anthracene	6	0.092	Soil leachate hotspot	TP606A	5.48E-04	1575	1575	2975	4550	34.62%	Yes
Benzo (a) pyrene	2	0.01	Soil leachate hotspot	TP606A	5.48E-04	1575	1575	2975	4550	34.62%	Yes
Carbazole	8	3.36	Soil leachate hotspot	TP606A	5.48E-04	1575	1575	2975	4550	34.62%	No
Fluoranthene	20	0.2	Soil leachate hotspot	TP606A	5.48E-04	1575	1575	2975	4550	34.62%	Yes
Phenanthrene	24	10	Soil leachate hotspot	TP606A	5.48E-04	1575	1575	2975	4550	34.62%	No
Sum of 4 PAHs	89	0.1	Soil leachate hotspot	TP606A	5.48E-04	1575	1575	2975	4550	34.62%	Yes
Copper	64	5	Soil leachate hotspot	TP608A	5.48E-04	900	900	2700	3600	25.00%	Yes
Fluoranthene	2	0.2	Soil leachate hotspot	TP619A	5.48E-04	500	500	725	1225	40.82%	Yes
Chromium	16	15	Soil leachate hotspot	TP621A	5.48E-04	1050	1050	2200	3250	32.31%	No
Arsenic	40	25	Soil leachate hotspot	TP622A	5.48E-04	1225	1225	2975	4200	29.17%	No
Copper	34	5	Soil leachate hotspot	TP623A	5.48E-04	437.5	437.5	1312.5	1750	25.00%	Yes
Fluoranthene	2	0.2	Soil leachate hotspot	TP623A	5.48E-04	437.5	437.5	1312.5	1750	25.00%	Yes
TPH Aliphatic C16-21	22	10	Soil leachate hotspot	TP624A	5.48E-04	1800	1800	1975	3775	47.68%	Yes
TPH Aromatic C16-21	38	10	Soil leachate hotspot	TP624A	5.48E-04	1800	1800	1975	3775	47.68%	Yes

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TPH Aliphatic C21-35	100	10	Soil leachate hotspot	TP624A, 628A, 630A	5.48E-04	6100	6100	3425	9525	64.04%	Yes
Copper	39	5	Soil leachate hotspot	TP627A	5.48E-04	600	600	1900	2500	24.00%	Yes
Anionic Surfactant	260	200	Soil leachate hotspot	TP630A	5.48E-04	400	400	800	1200	33.33%	No
Benzo (a) anthracene	0.108	0.092	Groundwater hotspot	WS115	5.48E-04	1500	1500	0	1500	100.00%	Yes
Benzo (a) pyrene	0.021	0.01	Groundwater hotspot	WS115	5.48E-04	1500	1500	0	1500	100.00%	Yes
Cyanide	1670	50	Groundwater hotspot	WS115	5.48E-04	1500	1500	0	1500	100.00%	Yes
Fluoranthene	0.7	0.2	Groundwater hotspot	WS115	5.48E-04	1500	1500	0	1500	100.00%	Yes
Naphthalene	49	5	Groundwater hotspot	WS115	5.48E-04	1500	1500	0	1500	100.00%	Yes
Sulphate	313000	250000	Groundwater hotspot	WS115	5.48E-04	1500	1500	0	1500	100.00%	Yes
Thiocyanate	500	50	Groundwater Hotspot	WS115	5.48E-04	1500	1500	0	1500	100.00%	Yes
Zinc	83	40	Groundwater hotspot	WS115	5.48E-04	1500	1500	0	1500	100.00%	Yes
Zinc	110	40	Groundwater hotspot	WS124	5.48E-04	200	200	325	525	38.10%	Yes

G.4 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.5 SUMMARY OF RISKS TO CONTROLLED WATERS

The results of the modelling have indicated that potentially significant risks may be present with regard to controlled waters. Three areas of the site: an area extending from TP628A to TP630A; the area around TP624A; and the area around WS115 and TP602A will require further investigation and assessment to determine whether or not remedial action may be required.

The following outline scope of works is recommended to assess the necessity for remedial action.

Area 1- The area in the vicinity of TP628A to TP630A

It is proposed that up to 7 trial pits are advanced to 5mbgl (or bedrock, if shallower) and up to 2 groundwater monitoring wells are installed in the vicinity of TP628A to TP630A. Soil samples shall be taken at approximately 0.5m intervals for subsequent on site headspace analysis. Up to two samples shall be scheduled for analysis from each location; one shallow sample within the made ground and one deeper sample within the underlying strata, where possible). If a significant presence of contamination is detected, additional samples may be scheduled for analysis. Soil analysis shall include total soil and soil leachate tests for the presence of TPH. Groundwater, where present, shall be scheduled for TPH analysis.

Area 2- The area in the vicinity of TP624A

It is proposed that up to 4 trial pits are advanced to 5mbgl (or bedrock, if shallower) and 1 groundwater monitoring well is installed in the vicinity of TP624. Soil samples shall be taken at approximately 0.5m intervals for subsequent on site headspace analysis. Up to two samples shall be scheduled for analysis from each location; one shallow sample within the made ground and one deeper sample within the underlying strata, where possible). If a significant presence of contamination is detected, additional samples may be scheduled for analysis. Soil analysis shall include total soil and soil leachate tests for the presence of TPH. Groundwater, where present, shall be scheduled for TPH analysis.

Area 3- The area in the vicinity of WS115 and TP602A

It is proposed that up to 3 trial pits are advanced to 5mbgl (or bedrock, if shallower) and up to three groundwater monitoring wells are installed in the vicinity of WS115 and TP602A. Soil samples shall be taken at approximately 0.5m intervals for subsequent on site headspace analysis. Up to two samples shall be scheduled for analysis from each location; one shallow sample within the made ground and one deeper sample within the underlying strata, where possible). If a significant presence of contamination is detected, additional samples may be scheduled for analysis. Soil analysis shall include total soil and soil leachate tests for the presence of PAH's, zinc and cyanide. Groundwater, where present, shall be scheduled for PAHs, zinc and cyanide analysis.

Following completion of the investigation, the Stage 3 risk assessment will be updated and the pollutant linkage assessment refined accordingly.

G.6 REFERENCES

- 1) 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).
- 3) 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	2.82E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)
1-Butanol	6.74E-01	USEPA Region 9 (pathway specific)
2-Butanone (MEK = methyl ethyl ketone)	Missing Physchem	USEPA Region 9 (pathway specific)
Butyl benzyl phthalate (BBP)	2.39E+03	USEPA Region 9 (pathway specific)
n-Butylbenzene	1.59E+00	USEPA Region 9 (pathway specific)
sec-Butylbenzene	No Criterion	No Criterion
tert-Butylbenzene	4.78E+00	USEPA Region 9 (pathway specific)
Carbon Disulphide (Carbon Bisulphide)	4.92E-01	USEPA Region 9 (pathway specific)
Carbon Tetrachloride (tetrachloromethane)	2.41E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 86/280/EEC
1-Chlorobutane	2.49E+00	USEPA Region 9 (pathway specific)
Chloroethane (ethyl chloride)	9.90E-04	USEPA Region 9 (pathway specific)
Chloroform (trichloromethane)	4.81E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 88/347/EEC
Chloromethane (methyl chloride)	3.17E-02	USEPA Region 9 (pathway specific)
2-Chloronaphthalene	1.76E+01	USEPA Region 9 (pathway specific)
2-Chlorophenol (o-chlorophenol)	1.19E-01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
1,2-Dichlorobenzene	3.68E+00	WHO DWG
1,3-Dichlorobenzene	2.09E+00	USEPA Region 9 (pathway specific)
1,4-Dichlorobenzene	1.11E+00	WHO DWG
Dichlorodifluoromethane	1.73E+00	USEPA Region 9 (pathway specific)
1,1-Dichloroethane (EDC)	2.92E-01	USEPA Region 9 (pathway specific)
1,2-Dichloroethane(EDC)	5.21E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1992 No 337 (Water Resources, England & Wales)
1,1-Dichloroethene	1.72E-02	WHO DWG
1,2-Dichloroethene (cis + trans) total	1.89E-02	WHO DWG
1,2-Dichloroethene (cis)	2.30E-02	USEPA Region 9 (pathway specific)
1,2-Dichloroethene (trans)	5.95E-02	USEPA Region 9 (pathway specific)
Dichloromethane (see methylene chloride)	6.21E-03	WHO DWG
1,2-Dichloropropane (1,2-DCP)	4.40E-05	UK DWS (2000)
1,3-Dichloropropane	Missing Physchem	UK DWS (2000)
2,2-Dichloropropane	No Criterion	No Criterion
1,3-Dichloropropene	7.34E-03	WHO DWG
2,4-Dinitrophenol	1.20E-02	USEPA Region 9 (pathway specific)
2,4-Dinitrotoluene	3.19E-02	USEPA Region 9 (pathway specific)
2,6-Dinitrotoluene	4.85E-02	USEPA Region 9 (pathway specific)
Hexachlorobenzene	9.41E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 88/347/EEC
Hexachlorobutadiene	3.06E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 88/347/EEC
Hexachlorocyclopentadiene	2.50E+02	USEPA Region 9 (pathway specific)

Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Tier 1 Soil Screening Criteria (mg/kg)	Source
Hexachloroethane	4.96E-02	USEPA Region 9 (pathway specific)
Iso-Propylbenzene (cumene)	2.04E+00	USEPA Region 9 (pathway specific)
Lindane (HCH-gamma)	1.25E-04	UK Marine / Estuarine EQS
Methanol	3.06E+00	USEPA Region 9 (pathway specific)
Methyl chloride (Chloromethane)	4.01E-03	WHO DWG
Methyl Isobutyl ketone (4-methyl-2-pentanone) MIBK	5.44E-01	USEPA Region 9 (pathway specific)
Methyl tert butyle ether (MTBE)	2.28E-03	USEPA Region 9 (pathway specific)
Methylene chloride (Dichloromethane)	6.21E-03	WHO DWG
Monochlorobenzene	6.30E-01	WHO DWG
Nitrobenzene	1.53E-03	USEPA Region 9 (pathway specific)
m-Nitrotoluene	3.44E-01	USEPA Region 9 (pathway specific)
o-Nitrotoluene	1.26E-04	USEPA Region 9 (pathway specific)
p-Nitrotoluene	8.88E-04	USEPA Region 9 (pathway specific)
Pentachlorobenzene	6.57E+01	USEPA Region 9 (pathway specific)
Pentachlorophenol (PCP)	7.08E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales)
1,2,4,5-Tetrachlorobenzene	4.22E+00	USEPA Region 9 (pathway specific)
1,1,1,2-Tetrachloroethane	3.59E-04	USEPA Region 9 (pathway specific)
1,1,2,2-Tetrachloroethane (PCA)	6.66E-05	USEPA Region 9 (pathway specific)
Tetrachloroethene (Tetrachloroethylene) (PCE)	1.47E-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)	1.12E-02	UK DWS (2000)
Tetrachloromethane (carbon tetrachloride)	2.41E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Toluene (Methyl benzene)	3.92E-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)	2.05E+02	USEPA Region 9 (pathway specific)
1,2,3-Trichlorobenzene	No Criterion	No Criterion
1,2,4-Trichlorobenzene	7.38E-02	USEPA Region 9 (pathway specific)
1,1,1-Trichloroethane (TCA)	1.35E-01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)
1,1,2-Trichloroethane	1.70E-01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)
Trichloroethene (Trichloroethylene) (TCE)	1.12E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1992 No 337 (Water Resources, England & Wales)
Trichlorofluoromethane (Freon 11)	1.83E+00	USEPA Region 9 (pathway specific)
Trichloromethane (chloroform)	4.81E-03	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Trihalomethanes (sum of, specified note ix)	4.01E-02	UK DWS (2000)
1,2,4-Trimethylbenzene	9.71E-02	USEPA Region 9 (pathway specific)
1,3,5-Trimethylbenzene	9.71E-02	USEPA Region 9 (pathway specific)
Vinyl Chloride	2.88E-04	UK DWS (2000)
o-Xylene	Sum o-xylene and m,p-xylene and use criteria for "Xylenes"	UK Marine / Estuarine EQS

Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Tier 1 Soil Screening Criteria (mg/kg)	Source
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	7.78E-02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC

Appendix G– Controlled Waters Quantitative Risk Assessment,

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

Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
pH	6 - 8.5	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
1,1,1,2-Tetrachloroethane	4.32E-01	USEPA Region 9 (pathway specific)
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)
1,1,2,2-Tetrachloroethane (PCA)	5.53E-02	USEPA Region 9 (pathway specific)
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	5.92E+04	USEPA Region 9 (pathway specific)
1,1,2-Trichloroethane	3.00E+02	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)
1,1-Biphenyl	2.50E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 389 (Water Resources, England & Wales)
1,1-Dichloroethane (EDC)	8.11E+02	USEPA Region 9 (pathway specific)
1,1-Dichloroethene	3.00E+01	WHO DWG
1,2,3-Trichloropropane	5.60E-03	USEPA Region 9 (pathway specific)
1,2,3-Trichloropropene	2.18E+00	USEPA Region 9 (pathway specific)
1,2,4,5-Tetrachlorobenzene	1.09E+01	USEPA Region 9 (pathway specific)
1,2,4-Trichlorobenzene	7.16E+00	USEPA Region 9 (pathway specific)
1,2,4-Trimethylbenzene	1.23E+01	USEPA Region 9 (pathway specific)
1,2-Dibromo-3-chloropropane	1.00E-01	UK DWS (2000)
1,2-Dibromoethane	1.00E-01	UK DWS (2000)
1,2-Dichlorobenzene	1.00E+03	WHO DWG
1,2-Dichloroethane(EDC)	1.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1992 No 337 (Water Resources, England & Wales)
1,2-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)
1,2-Dichloropropane (1,2-DCP)	1.00E-01	UK DWS (2000)
1,3,5-Trichlorobenzene	0.00E+00	UK Freshwater EQS
1,3,5-Trimethylbenzene	1.23E+01	USEPA Region 9 (pathway specific)
1,3-Dichlorobenzene	1.83E+02	USEPA Region 9 (pathway specific)
1,3-Dichloropropane	1.00E-01	UK DWS (2000)
1,3-Dichloropropene	2.00E+01	WHO DWG
1,4-Dichlorobenzene	3.00E+02	WHO DWG
1-Butanol	3.65E+03	USEPA Region 9 (pathway specific)
1-Chlorobutane	2.43E+03	USEPA Region 9 (pathway specific)
2,3,4,6-Tetrachlorophenol	1.09E+03	USEPA Region 9 (pathway specific)

Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
2,3,7,8-TCDD (Tetrachlorodibenzodioxin)	4.48E-07	USEPA Region 9 (pathway specific)
2,3-Dichlorophenol	0.00E+00	UK Freshwater EQS
2,4,5-Trichlorophenol	9.00E+00	WHO DWG
2,4,6-Trichlorophenol	2.00E+02	WHO DWG
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)
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
2,4-Dimethylphenol (DMP)	7.30E+02	USEPA Region 9 (pathway specific)
2,4-Dinitrophenol	7.30E+01	USEPA Region 9 (pathway specific)
2,4-Dinitrotoluene	7.30E+01	USEPA Region 9 (pathway specific)
2,6-Dimethylphenol (DMP)	2.19E+01	USEPA Region 9 (pathway specific)
2,6-Dinitrotoluene	3.65E+01	USEPA Region 9 (pathway specific)
2-Butanone (MEK = methyl ethyl ketone)	6.97E+03	USEPA Region 9 (pathway specific)
2-Chloronaphthalene	4.87E+02	USEPA Region 9 (pathway specific)
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
2-Chlorotoluene	1.22E+02	USEPA Region 9 (pathway specific)
2-Nitroaniline	1.09E+02	USEPA Region 9 (pathway specific)
3,3'-Dichlorobenzidine	1.49E-01	USEPA Region 9 (pathway specific)
3,4-Dimethylphenol (DMP)	3.65E+01	USEPA Region 9 (pathway specific)
3-Nitroaniline	3.20E+00	USEPA Region 9 (pathway specific)
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)
4,6-Dinitro-2-methylphenol	3.65E+00	USEPA Region 9 (pathway specific)
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)
4-Methylphenol	1.82E+02	USEPA Region 9 (pathway specific)
4-Nitroaniline	3.20E+00	USEPA Region 9 (pathway specific)
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)

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Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
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)
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)
Acrylonitrile	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)
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)
Benz[a]anthracene	9.21E-02	USEPA Region 9 (pathway specific)
Benzaldehyde	3.65E+03	USEPA Region 9 (pathway specific)

Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
Benzene	3.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1998 No 389 (Water Resources, England & Wales)
Benzo[a]pyrene	1.00E-02	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)
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)
Bromomethane (methyl bromide)	8.66E+00	USEPA Region 9 (pathway specific)
Bromoxynil	1.00E+02	UK Marine / Estuarine EQS WRC Report DoE 36271/1 1995
Butyl benzyl phthalate (BBP)	7.30E+03	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

Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
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
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)
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
Chlorotoluron	2.00E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
Chlorophenylid	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	5.47E+04	USEPA Region 9 (pathway specific)
Chromium VI	1.09E+02	USEPA Region 9 (pathway specific)
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)]
Cyanazine	1.00E-01	UK DWS (2000)
Cyanide (free)	5.00E+01	UK DWS (2000)
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
DDT (1,1,1-trichloro-2,2-bis(4chlorophenyl)ethane)	1.00E-01	UK DWS (2000)
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)

Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
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
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
Dichlorobiphenyls	1.00E-01	UK DWS (2000)
Dichlorodifluoromethane	3.95E+02	USEPA Region 9 (pathway specific)
Dichloromethane (see methylene chloride)	2.00E+01	WHO DWG
Dichloroprop	1.00E-01	UK DWS (2000)
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)
Dimethylphthalate	3.65E+05	USEPA Region 9 (pathway specific)
Di-n-octylphthalate	1.46E+03	USEPA Region 9 (pathway specific)
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
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

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Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
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)
Flucufuron	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)
Heptachlor epoxide	1.00E-01	UK DWS (2000)
Heptachlorobiphenyls	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
Ioxynil	1.00E+01	UK Marine / Estuarine EQS Environment Agency Research & Development (R&D) Report P12 1996

Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
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)
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
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)
m or 3-Cresol (3-methylphenol)	1.82E+03	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)
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
Mecoprop	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)

Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
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
Metolachlor	1.00E-01	UK DWS (2000)
Mevinphos	2.00E-02	UK Freshwater EQS UK EQS
m-Nitrotoluene	1.22E+02	USEPA Region 9 (pathway specific)
Molinate	1.00E-01	UK DWS (2000)
Molybdenum	7.00E+01	WHO DWG
Monochloramine	3.00E+03	WHO DWG
Monochloroacetate	2.00E+01	WHO DWG
Monochlorobenzene	3.00E+02	WHO DWG
Monochlorobiphenyls	1.00E-01	UK DWS (2000)
Naphthalene	5.00E+00	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1989 No 2286 (Water Resources, England & Wales) 83/513/EEC
n-Butylbenzene	2.43E+02	USEPA Region 9 (pathway specific)
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 (NO ₃)	5.00E+04	UK DWS (2000)
Nitritotriacetic acid	2.00E+02	WHO DWG
Nitrite - consumers taps (NO ₂)	0.01 - 0.03	UK Freshwater EQS Surface Waters (Fishlife) (Classification) Regulations 1997 No 1331 (Water Resources, England & Wales) 78/659/EEC
Nitrite - ex works (NO ₂)	0.01 - 0.03	UK Freshwater EQS Surface Waters (Fishlife) (Classification) Regulations 1997 No 1331 (Water Resources, England & Wales) 78/659/EEC
Nitrobenzene	3.40E+00	USEPA Region 9 (pathway specific)
n-Nitroso-di-n-propylamine	9.60E-03	USEPA Region 9 (pathway specific)
n-Nitrosodiphenylamine	1.37E+01	USEPA Region 9 (pathway specific)
Nonachlorobiphenyls	1.00E-01	UK DWS (2000)
n-Propylbenzene	2.43E+02	USEPA Region 9 (pathway specific)
o or 2-Cresol (2-methylphenol)	1.82E+03	USEPA Region 9 (pathway specific)
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)
o-Nitrotoluene	4.87E-02	USEPA Region 9 (pathway specific)

Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
Oxidizability (permanganate value) (O2)	5.00E+03	UK DWS (2000)
p or 4-Cresol (4-methylphenol)	1.82E+02	USEPA Region 9 (pathway specific)
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
PAHs (sum of 4, specified note (vii))	1.00E-01	UK DWS (2000)
PCB (total)	5.00E-01	UK DWS (2000)
PCB 101	1.00E-01	UK DWS (2000)
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 28	1.00E-01	UK DWS (2000)
PCB 52	1.00E-01	UK DWS (2000)
PCB 77	1.00E-01	UK DWS (2000)
PCB 81	1.00E-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)	1.00E-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

Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
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)
Phenanthrene	1.00E+01	UK DWS (2000)
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)
p-Nitrotoluene	6.59E-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
Pyrene	1.83E+02	USEPA Region 9 (pathway specific)
Pyridine	3.65E+01	USEPA Region 9 (pathway specific)
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)
Tecnazene	1.00E+00	UK Marine / Estuarine EQS Environment Agency Research & Development (R&D) Report P12 1996
Terbutylazine	1.00E-01	UK DWS (2000)
Terbutryn	1.00E-01	UK DWS (2000)
tert-Butylbenzene	2.43E+02	USEPA Region 9 (pathway specific)
Tetrachlorobiphenyls	1.00E-01	UK DWS (2000)
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)

Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
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
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 (>EC10-12) aliphatic	1.00E+01	UK DWS (2000)
TPH (>EC10-12) aromatic	1.00E+01	UK DWS (2000)
TPH (>EC12-16) aliphatic	1.00E+01	UK DWS (2000)
TPH (>EC12-16) aromatic	1.00E+01	UK DWS (2000)
TPH (>EC16-21) aliphatic	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 (>EC5-7) aromatic	1.00E+01	UK DWS (2000)
TPH (>EC6-7) aromatic	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 (>EC7-8) aromatic	1.00E+01	UK DWS (2000)
TPH (>EC8-10) aliphatic	1.00E+01	UK DWS (2000)
TPH (>EC8-10) aromatic	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)
Tributyl 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
Trichloroacetaldehyde (Chloral Hydrate)	1.00E+01	WHO DWG
Trichloroacetate	2.00E+02	WHO DWG
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)
Trichloroethene (Trichloroethylene) (TCE)	1.00E+01	UK Marine / Estuarine EQS Surface Waters (Dangerous Substances)(Classification) Regulations 1992 No 337 (Water Resources, England & Wales)

Appendix G– Controlled Waters Quantitative Risk Assessment,

Determinand	Controlled Waters Generic Screening Criteria UK Marine/Estuarine EQS (µg/l)	Source
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
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)
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
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)
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

Appendix G– Controlled Waters Quantitative Risk Assessment,

Table G3 – Stage 2 Assessment – VOCs in Soils

Target Compound	Generic Controlled Waters Screening Criteria (mg/kg)	Statistical Analysis					Number of Samples Exceeding Generic Screen
		Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	US95 (mg/kg)	Number Analysed	
M,P-Xylene	0.126	0.014	0.12	0.042	0.061	23	1
Toluene (Methyl benzene)	0.0591	0.002	0.056	0.014	0.018	23	1

Table G4 – Stage 2 Assessment – Leachable Metals & Surfactant

Target Compound	Tier 1 Controlled Waters (µg/L)	Statistical Analysis						Number of Samples Exceeding Tier 1
		Minimum	Maximum	Geomean	Mean	US95	Number Analysed	
ARSENIC	25	nd	40	11	16	21	20	1
COPPER	5	nd	64	24	35	45	20	3
CHROMIUM	15	nd	16	5	7	9	20	1
ANIONIC SURFACTANT	200	nd	16	79	60	103	60	1

Table G5 – Stage 2 Assessment – Leachable TPH

Target Compound	Tier 1 Controlled Waters (µg/L)	Statistical Analysis						Number of Samples Exceeding Tier 1
		Minimum	Maximum	Geomean	Mean	US95	Number Analysed	
TPH C16-C21 ALIPHATIC	10	nd	22	-	-	-	30	1
TPH C21-C35 ALIPHATIC	10	nd	100	60	65	73	30	4
TPH C16-C21 AROMATIC	10	nd	38	-	-	-	30	1

Table G6 – Stage 2 Assessment – Leachable SVOC and PAH

Target Compound	Tier 1 Controlled Waters (µg/L)	Statistical Analysis						Number of Samples Exceeding Tier 1
		Minimum	Maximum	Geomean	Mean	US95	Number Analysed	
AZOBENZENE	0.61	nd	4	-	-	-	61	1
BENZO(A)ANTHRACENE	0.092	nd	6	-	-	-	61	1
BENZO(A)PYRENE	0.01	nd	2	-	-	-	61	1
CARBAZOLE	3.36	nd	8	4	5	5.93	61	1
FLUORANTHENE	0.2	nd	20	2.99	6.25	8.27	61	4
SUM OF 4 PAHs	1	nd	4	-	-	-	61	1

Appendix G– Controlled Waters Quantitative Risk Assessment,

Table G7 – Stage 2 Assessment –Shallow Groundwater Metals & Inorganic Compounds

Target Compound	Tier 1 Controlled Waters (µg/L)	Statistical Analysis						Number of Samples Exceeding Tier 1
		Minimum	Maximum	Geomean	Mean	US95	Number Analysed	
ZINC	40	nd	83	-	45	52	22	2
CYANIDE	50	nd	1670	-	-	-	2	1
SULPHATE	250000	313000	928000	-	-	-	2	2

Table G8 – Stage 2 Assessment –Shallow Groundwater VOCs and SVOCs

Target Compound	Tier 1 Controlled Waters (ug/L)	Statistical Analysis						Number of Samples Exceeding Tier 1
		Minimum	Maximum	Geomean	Mean	US95	Number Analysed	
BENZO(A)ANTHRACENE	0.092	nd	0.11	-	-	-	2	1
BENZO(A)PYRENE	0.01	nd	0.021	-	-	-	2	1
FLUORANTHENE	0.2	nd	0.7	-	-	-	2	1

All exceedances came from one location, WS115.