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E1 INTRODUCTION

A site wide investigation of the Whitehaven site was undertaken by URS in 2005. A human health quantitative risk assessment (HHQRA) was undertaken as part of these works based on the site-wide data. URS derived Stage 3 site specific assessment criteria (SSAC) based on the findings from the investigation. A number of exceedences of the SSACs were identified indicating that potentially significant risks were present with regard to human health.

URS was further commissioned to undertake a detailed investigation of Plot D within the Whitehaven Site and to carry out risk assessment with regard to human health using relevant data gathered from previous investigations and data from the current 2007 investigation.

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 D investigation.

The HHQRA is based upon the UK Department of the Environment, Food and Rural Affairs (DEFRA) and Environment Agency (EA) guidance which is set out in the Contaminated Land Reports including:

- Environment Agency R&D Publication CLR7
- Environment Agency R&D Publication CLR10
- Environment Agency R&D Publication CLR11 (2004) *Model Procedures for the Management of Land Contamination* (referred to as CLR11) and
- The CLEA model.

E1.1 Outline of Structure of Assessment

A staged approach to risk assessment is detailed in CLR11 in specific reference to land contamination. In accordance with this guidance, the assessment of the significance of potential risks to human health from contamination identified within Plot D has been completed as follows:

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

- ***Stage 1: Preliminary Risk Assessment*** – Development of Conceptual Site/Exposure Model (CSM) comprising identification of Source-Pathway-Receptor pollutant linkages, and a qualitative assessment of the potential significance of those pollutant linkages.

- ***Stage 2: Generic Quantitative Risk Assessment (GQRA)*** – comprising the identification of representative contamination concentrations including, where appropriate, statistical analysis, selection of relevant and appropriate generic assessment criteria (GAC), followed by the screening of analytical data against the GAC, the interpretation of potential significance and the requirement for further detailed assessment.

- ***Stage 3: Detailed Quantitative Risk Assessment (DQRA)*** – comprising the refinement of the CSM, review of toxicological criteria and physical and chemical characteristics, calculation of site-specific assessment criteria (SSAC) where appropriate and the quantitative assessment of potentially significant pollutant linkages.

At each of the stages ***Risk Evaluation*** has been undertaken to identify whether there is the significant possibility of significant harm through assessment of the plausibility of the pollutant linkages identified.

At each stage, more information becomes available which facilitates refinement of the CSM and allows the assessor to make judgements which are less conservative, but at the same time remaining precautionary, whereby there is an acceptable level of protection afforded to the identified receptors. In this way, the decreasing conservatism at each stage is expected to provide further focus for the risk assessment. Therefore, at each stage an evaluation of the potential risk has been made to identify whether detected contaminated concentrations are significant and whether further assessment is necessary.

Stage 1 of the risk assessment is set out in Section 6.0 of the main body of the report. The human health risk assessment and rationale for Stage 2 and the requirement for further detailed assessment at Stage 3, if necessary, for Plot D is presented in full in this appendix.

E2 STAGE 2 - GENERIC QUANTITATIVE ASSESSMENT

E1.2 Methodology

The generic screening was undertaken by making a comparison of measured chemical concentrations in soil and shallow 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 human health.

E2.1 Receptors

From a human health perspective, the site is understood to be opened to the public for a general right-to-roam open space usage, with the minimum of site preparation expected (such as the removal of protruding trip hazards, but not cut and fill).

The principal potential receptors directly relevant to the proposed future scenario are therefore considered to be:

- visitors to the public open space.

The risks to potential future maintenance, remediation or redevelopment workers who may be involved in subsurface working are not specifically assessed as part of this assessment. The health and safety of workers in the UK is controlled under the Health and Safety at Work Act 1974 and associated regulations (such as the Control of Substances Hazardous to Health (COSHH) Regulations 2002 (as amended). URS does not therefore consider it appropriate to include these receptors in this assessment at present and advises that separate activity related risk assessments should be carried out as required to highlight the need for any preventative measures (such as the use of PPE) prior to such activities being carried out. The results of this assessment could, however, be used to inform decision-making on this issue.

E2.2 Stage 2 Generic Screening Criteria

Soil

Soils data have been compared with soil guideline values (SGVs) for a residential without plant uptake scenario. Where SGVs are not available, soils data have been compared with a hierarchy of screening criteria including:

- URS derived Generic Assessment Criteria (URS GAC);
- Dutch Serious Risk Concentrations (SRC);
- Corrected Dutch Intervention Values (cDIVs); and
- US EPA[1] Region 9 preliminary remediation goals (PRGs).

Details of all soil Stage 2 screening criteria are included in Table E1.

URS GAC are generic risk-based soil concentrations that are protective of chronic risks to human health and have been derived by URS for a list of common contaminants for which SGVs are not available. They have been generated by URS for a number of different generic land uses in accordance with technical guidance on contaminated land exposure assessment (CLEA) issued by the Environment Agency and Defra, and are designed to afford the same degree of protection an SGV would if published for these compounds. The selected generic soil types are similar to those adopted by Defra for the

[1] United States – Environmental Protection Agency

published SGVs for organic substances, toluene and ethylbenzene. The selected GAC have been chosen with due regard for soil organic matter[2] contents in the shallow soil.

The Dutch Intervention Values (DIVs) were developed in the Netherlands to protect the multi-functionality of soils and are based on human toxicological *and* ecotoxicological considerations. Some site-specific soil data collected during the site investigation were used to adjust DIVs appropriately for measured organic carbon and clay content. Further development in the Netherlands led to the production of Serious Risk Concentrations (SRC) for some contaminants using updated toxicological data and are related solely to human health. These SRC are adopted where available in preference of DIV. DIVs were corrected applying a conservative assumed clay content and with due regard for the carbon content of the upper soils.

Where a UK SGV, URS GAC or the DIV/SRC is not available for a substance, the preliminary remediation goals (PRGs) published by Region 9 of the US EPA for residential land-use have been adopted. These are derived for use in the US statutory contaminated land regime and are designed to afford adequate protection to receptors.

Groundwater

Groundwater data have been compared with a hierarchy of screening criteria including:

- URS derived Generic Assessment Criteria (URS GAC);
- UK Drinking Water Standards (DWS);
- WHO Drinking Water Guidelines (DWG); and
- US EPA Region 9 preliminary remediation goals (PRGs).

Details of all groundwater Stage 2 screening criteria are included in Table E2.

Groundwater data were reviewed against Water Target Values (WTVs), which are based on UK Drinking Water Standards (DWS). Where UK values were not available for a compound in water, the guidelines for drinking water quality issued by the WHO and US EPA values were used. Drinking water standards are considered to be very conservative as the underlying groundwater is not being extracted for human consumption at the site nor is likely to be in direct contact with visitors.

Screening Assessment

The URS GAC, DIVs/ SRCs and PRGs have no legal status in the UK. However, as they have been derived using internationally recognised risk assessment techniques, they are

[2] A conservative value of 0.67% TOC and was adopted from site data and a conservative assumed default value of 10% clay content used as representative of soils for generic screening .

considered to be consistent with current guidance and practice in the UK and acceptable as an initial screen in the absence of published UK values. The hierarchy of sources used is designed such that the contaminants of greatest concern are screened against the most relevant criteria for the UK.

In addition, a report[3] by the UK Environment Agency suggests that the risks from TPH should be assessed using a method where each speciated fraction should be considered additively. This approach has therefore been applied to the data in this investigation by deriving a Hazard Quotient[4] (HQ) for each reported fraction for each sample and summing these HQs to create a combined Hazard Index (HI) for each sample. Exposure is considered potentially unacceptable where the HI for a *sample* is greater than unity (HI > 1.0). Where TPH has been reported for fractions without an aliphatic/aromatic split, the most conservative GAC for that fraction has been applied to the data. In addition, where data has been reported as total DRO or total TPH an average of the appropriate fractions calculated from speciated data have been applied to these totals for screening purposes.

E2.3 Soil Contamination Generic Screening

All individual soil sample results from Plot D have been screened against the generic criteria as outlined in Section E2.2. A summary of those determinands whose concentrations exceeded the Stage 2 generic screening criteria are presented in Table E3 below.

E2.4 Stage 2 Exceedences

E2.4.1 Soil

Table E3 – Summary of Stage 2 Generic Soil Exceedences

Substance	***Screening Level (mg/kg)***	***Min (mg/kg)***	***Max (mg/kg)***	***Total No Samples Analysed***	***Number of Exceedences***
Arsenic	20	3	47	13	8
Nickel	75	23	130	13	1
Benzo(a)pyrene	1.1	<DL	4.5	24	3
Cyanide	35	<DL	350	12	1
Dibenz(a,h)anthracene	1.1	0.15	1.28	24	1
Total Petroleum hydrocarbons					
TPH *Additive – Hazard Index*	1.0	<DL	5,800	21	2*
Notes: NV : no generic screening value available *based on Hazard Index values exceeding unity (>1). Maximum HI for sample obtained from TP706, 2m bgl. <DL: reported concentration less than laboratory detection limit					

[3] Environment Agency (2005). The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils. Science Report P5-080/TR3.
[4] Hazard Quotient = Reported Concentration ÷ Screening Criteria
[5] This is most simply demonstrated for contaminants where detected concentrations fall below generic screening criteria.

E2.4.2 Groundwater

Individual groundwater sample results from Plot D have been screened against the generic criteria as outlined in Section E2.2. No Exceedances of Stage 2 Generic assessment criteria were identified for the detected contaminant concentrations in groundwater.

E2.5 Stage 2 Risk Evaluation

In evaluating the significance of the identified contamination following the Stage 2 assessment a judgement needs to be made whether there is the significant possibility of significant harm from the contamination to the identified receptors. Should the detected concentrations be considered acceptable then no further assessment will be required[5]. However, should the assessment identify contaminant concentrations to be unacceptable then further work may be necessary, and may comprise further assessment at Stage 3 comprising Detailed Quantitative Risk Assessment (DQRA) or, depending on the significance of the findings, may proceed directly to recommendations for site management and/or remedial options appraisal.

Although compound concentrations may exceed Stage 2 criteria it should be noted that this does not necessarily mean that there is the significant possibility of significant harm. Further assessment can be completed at Stage 2 prior to proceeding to the next stage(s) and is based upon reviewing the plausibility of the potential pollutant linkages identified. In addition to understanding the nature and extent of the identified contamination, consideration needs to be made of other factors such as contaminant location, inherent toxicological and physchem properties of the contaminant, receptor behaviour, underlying geology and hydrogeology, condition and circumstances of the land and other factors which may prevent or enhance potential exposure. It should also be considered that the generic assessment criteria for the Stage 2 assessment are based upon a conceptual exposure model[6] which is highly conservative for the 'right to roam' end use designed to be suitably protective of future site users.

Therefore for the exceedences identified at Stage 2 further assessment has been completed and the significance for potential harm identified. Where appropriate, assessment has also included the use of simple statistical tests in accordance with CLR7 to derive averaging concentrations for the area to which a receptor could potentially be exposed while occupying the site.

There are no indoor air pathways at the site and the significance of the contribution from the outdoor air pathway to total exposure is low in comparison to direct contact pathways. It is therefore considered that the ingestion and dermal pathways dominate the potential exposure pathways at the site. The other variable which also has a high sensitivity effect is receptor behaviour. An evaluation of receptor exposure duration and frequency (likelihood and magnitude of repeated exposure) for a chronic assessment assists in

[6] Residential without gardens

determining the overall significance of potential exposure. These factors are discussed on a case by case basis and are summarised in the attached appendix Tables E4 and E5.

It should be noted that data relating to the adjacent Plot A has also been reviewed in addition to the data for Plot D in completing the risk evaluation process.

E2.6 Summary of Risks to Human Health

In summary, it is considered that there are no contaminant concentrations detected in this area of the site which are considered to represent a significant possibility of significant harm to the identified receptors based on the proposed end-use of the site.

Therefore, should the current condition and layout of Plot D be maintained, it is considered that potentially significant risks to human health would be unlikely for a public open space scenario. Plot D is considered suitable for use as public open space without the requirement for further action, with the exception of addressing Health and Safety issues (such as the removal of protruding trip hazards etc).

The risks to potential future maintenance, remediation or redevelopment workers who may be involved in subsurface working are not specifically assessed as part of this report. URS advises that separate activity related risk assessments should be carried out as required to comply with the necessary legislation and guidance, which identifies the need for any preventative measures (such as the use of PPE) to be completed prior to such activities being carried out. The results of this human health assessment however could be used to inform decision-making on this issue.

Tables

Table E1 – Human Health Stage 2 Screening Criteria –Soils

Target Compound	Human Health (mg/kg)	Source
1,1,1,2-Tetrachloroethane	0.34	URS GAC
1,1,1-Trichloroethane	3.0	cDIV
1,1,2,2-Tetrachloroethane	6.2	URS GAC
1,1,2-Trichloroethane	2.0	cDIV
1,1-Dichloroethane	3.0	cDIV
1,1-Dichloroethene	0.24	URS GAC
1,1-Dichloropropene	NV	No Criterion
1,2,3-Trichlorobenzene	8.0	Dutch SRC: NB based on Res with Gardens
1,2,3-Trichloropropane	0.03	US EPA Region 9 PRG
1,2,4-Trichlorobenzene	11	Dutch SRC: NB based on Res with Gardens
1,2,4-Trimethylbenzene	52	US EPA Region 9 PRG
1,2-Dibromo-3-Chloropropane	0.46	US EPA Region 9 PRG
1,2-Dibromoethane	0.03	US EPA Region 9 PRG
1,2-Dichlorobenzene	84	Dutch SRC: NB based on Res with Gardens
1,2-Dichloroethane	0.01	URS GAC
1,2-Dichloropropane	0.34	US EPA Region 9 PRG
1,3,5-Trimethylbenzene	21	US EPA Region 9 PRG
1,3-Dichlorobenzene	531	US EPA Region 9 PRG
1,3-Dichloropropane	105	US EPA Region 9 PRG
1,4-Dichlorobenzene	72	Dutch SRC: NB based on Res with Gardens
1-Methylnaphthalene	NV	No Criterion
2,2-Dichloropropane	NV	No Criterion
2,4,5-Trichlorophenol	80	Dutch SRC
2,4,6-Trichlorophenol	111	Dutch SRC
2,4-Dichlorophenol	21	Dutch SRC
2,4-Dimethylphenol	1,222	US EPA Region 9 PRG
2,4-Dinitrotoluene	122	US EPA Region 9 PRG
2,6-Dinitrotoluene	61	US EPA Region 9 PRG
2-Chloronaphthalene	12	Dutch SRC
2-Chlorophenol	47	Dutch SRC
2-Chlorotoluene	158	US EPA Region 9 PRG
2-Methylnaphthalene	1,564	US EPA Region 3
2-Methylphenol	160	Dutch SRC
2-Nitroaniline	183	US EPA Region 9 PRG
2-Nitrophenol	NV	No Criterion
3-Nitroaniline	18	US EPA Region 9 PRG
4-Bromophenyl Phenyl Ether	NV	No Criterion
4-Chloro-3-Methylphenol	3.0	Dutch indicative Intervention Value
4-Chloroaniline	244	US EPA Region 9 PRG
4-Chlorophenyl Phenyl Ether	NV	No Criterion
4-Chlorotoluene	NV	No Criterion
4-Methylphenol	306	US EPA Region 9 PRG
4-Nitroaniline	23	US EPA Region 9 PRG

Target Compound	Human Health (mg/kg)	Source
4-Nitrophenol	626	US EPA Region 3
Acenaphthene	910	URS GAC
Acenaphthylene	60	URS GAC
Ammoniacal Nitrogen	NV	No Criterion
Anionic surfactant/MBAS	NV	No Criterion
Anthracene	16,000	URS GAC
Arsenic	20	UK SGV
Azobenzene	4.4	US EPA Region 9 PRG
Benzene	0.03	URS GAC
Benzo(A)Anthracene	11	URS GAC
Benzo(A)Pyrene	1.1	URS GAC
Benzo(B)Fluoranthene	11	URS GAC
Benzo(G,H,I)Perylene	1,600	URS GAC
Benzo(K)Fluoranthene	11	URS GAC
Benzyl alcohol	18,331	US EPA Region 9 PRG
Biphenyl	3,014	US EPA Region 9 PRG
Bis(2-Chloroethoxy)Methane	NV	No Criterion
Bis(2-Chloroethyl)Ether	0.22	US EPA Region 9 PRG
Bis(2-Ethylhexyl)Phthalate	35	US EPA Region 9 PRG
Boron	7,560	URS GAC
Bromobenzene	28	US EPA Region 9 PRG
Bromochloromethane	NV	No Criterion
Bromodichloromethane	0.82	US EPA Region 9 PRG
Bromoform	62	US EPA Region 9 PRG
Bromomethane	3.9	US EPA Region 9 PRG
Butylbenzylphthalate	12,221	US EPA Region 9 PRG
Cadmium	30	UK SGV
Calcium	NV	No Criterion
Carbazole	24	US EPA Region 9 PRG
Carbon Disulfide	355	US EPA Region 9 PRG
Carbon Tetrachloride	0.20	cDIV
Chloride Soluble	NV	No Criterion
Chlorobenzene	NV	No Criterion
Chloroethane	3.0	US EPA Region 9 PRG
Chloroform	0.60	Dutch SRC
Chloromethane	47	US EPA Region 9 PRG
Chromium	200	UK SGV
Chrysene	110	URS GAC
Cis-1,2-Dichloroethene	0.17	URS GAC
Cis-1,3-Dichloropropene	0.78	US EPA Region 9 PRG
Copper	32,000	URS GAC
Dibenz(a,h)Anthracene	1.1	URS GAC
Dibenzofuran	145	US EPA Region 9 PRG
Dibromochloromethane	1.1	US EPA Region 9 PRG
Dibromomethane	67	US EPA Region 9 PRG

Target Compound	Human Health (mg/kg)	Source
Dichlorodifluoromethane	94	US EPA Region 9 PRG
Dichloromethane	1.2	URS GAC
Diethylphthalate	48,882	US EPA Region 9 PRG
Dimethylphthalate	100,000	US EPA Region 9 PRG
Di-N-Butylphthalate	NV	No Criterion
Di-N-Octylphthalate	2,444	US EPA Region 9 PRG
Ethylbenzene	16	UK SGV
Fluoranthene	110	URS GAC
Fluorene	2,000	URS GAC
Fluoride Soluble	NV	No Criterion
Free Cyanide	NV	No Criterion
Hexachlorobenzene	0.40	Dutch SRC: NB based on Res with Gardens
Hexachlorobutadiene	6.2	US EPA Region 9 PRG
Hexachlorocyclopentadiene	365	US EPA Region 9 PRG
Hexachloroethane	35	US EPA Region 9 PRG
Indeno(1,2,3-cd)Pyrene	11	URS GAC
Iron	23,463	US EPA Region 9 PRG
Isophorone	512	US EPA Region 9 PRG
Isopropylbenzene	572	US EPA Region 9 PRG
Lead	450	UK SGV
Magnesium	NV	No Criterion
Mercury	7.8	cDIV
Methyl T-Butyl Ether (MTBE)	38	URS GAC
Naphthalene	6.3	URS GAC
N-Butylbenzene	240	US EPA Region 9 PRG
Nickel	75	UK SGV
Nitrate As N	NV	No Criterion
Nitrobenzene	20	US EPA Region 9 PRG
N-Nitroso-Di-N-Propylamine	0.07	US EPA Region 9 PRG
PCB Congener 101	NV	No Criterion
PCB Congener 118	NV	No Criterion
PCB Congener 138	NV	No Criterion
PCB Congener 153	NV	No Criterion
PCB Congener 180	NV	No Criterion
PCB Congener 28	NV	No Criterion
PCB Congener 52	NV	No Criterion
Pentachlorophenol	4.0	Dutch SRC: NB based on Res with Gardens
pH	NV	No Criterion
Phenanthrene	1,000	URS GAC
Phenol	21,900	UK SGV
Phosphate (Ortho as PO4)	NV	No Criterion
Phosphorous	NV	No Criterion
P-Isopropyltoluene	NV	No Criterion
Potassium	NV	No Criterion
Propylbenzene	240	US EPA Region 3

Target Compound	Human Health (mg/kg)	Source
Pyrene	1,100	URS GAC
Sec-Butylbenzene	3,129	US EPA Region 3
Selenium	260	UK SGV
Sodium	NV	No Criterion
Styrene	74	Dutch SRC: NB based on Res with Gardens
Sulphate Water Soluble	NV	No Criterion
Tert-Butylbenzene	390	US EPA Region 9 PRG
Tetrachloroethene	1.0	URS GAC
Toluene	3.0	UK SGV
Trans-1,2-Dichloroethene	69	US EPA Region 9 PRG
Trans-1,3-Dichloropropene	0.78	US EPA Region 9 PRG
Trichloroethene	0.14	URS GAC
Trichlorofluoromethane	386	US EPA Region 9 PRG
Vinyl Chloride	0.001	URS GAC
M,P-Xylene	NV	see total xylene
O-Xylene	NV	see total xylene
Total Xylene	7.2	URS GAC
Zinc	14,600	URS GAC
Total Cyanide	35	URS GAC
Total Hydrocarbons	NV	See individual fractions
Total Organic Carbon	NV	No Criterion
Total PAH (sum of 4)	NV	No Criterion
Total PCBs	0.53	URS GAC
Total Sulphate	NV	No Criterion
TPH (>EC5-6) Aliphatic	8.1	URS GAC
TPH (>EC6-8) Aliphatic	16	URS GAC
TPH (>EC8-10) Aliphatic	3.2	URS GAC
TPH (>EC10-12) Aliphatic	16	URS GAC
TPH (>EC12-16) Aliphatic	600	URS GAC
TPH (>EC16-21) Aliphatic	110,000	URS GAC
TPH (>EC21-35) Aliphatic	1,600	No Criterion
Total Aliphatics (C5-C35)	NV	See individual fractions
Total Aliphatics >C6-C40 (Min Oil)	NV	No Criterion
TPH (>EC6-7) Aromatic	14	URS GAC
TPH (>EC7-8) Aromatic	14	URS GAC
TPH (>EC8-10) Aromatic	5.1	URS GAC
TPH (>EC10-12) Aromatic	27	URS GAC
TPH (>EC12-16) Aromatic	130	URS GAC
TPH (>EC16-21) Aromatic	1600	URS GAC
TPH (>EC21-35) Aromatic	1700	URS GAC
Total Aromatics (C6-C35)	NV	See individual fractions
Total Aromatics >C6-C40	NV	No Criterion
TPH (C5-C35)	NV	See individual fractions
TPH-PRO (C4-C12)	NV	See VOC/individual fractions
TPH-DRO	NV	See individual fractions

Target Compound	Human Health (mg/kg)	Source

Key:
NV - No value available
UK SGV - UK Soil Guideline Value
URS GAC - URS Generic Assessment Criteria
cDIV - corrected Dutch Intervention Value
Dutch SRC - Dutch Serious Risk Concentration
USEPA Region 9 PRG - United States Environment Protection Agency Region 9 Preliminary Remediation Goal
USEPA Region 3 PRG - United States Environment Protection Agency Region 3 Preliminary Remediation Goal
'Sat - unacceptable risk to receptor cannot be achieved due to calculated saturation of vapour pathway'

Note :
- Values based on Residential without gardens scenario
- Acute value used to assess Cyanide
- sum of cyanides and compared against criteria
- sum of m,p,o - xylene compared against criteria

Table E2 – Human Health Stage 2 Screening Criteria –Groundwater

Target Compound	Human Health (µg/L)	Source
1,1,1,2-Tetrachloroethane	2,210	URS GAC
1,1,1-Trichloroethane	2,000	WHO DWG
1,1,2,2-Tetrachloroethane	10,300	URS GAC
1,1,2-Trichloroethane	0.20	USEPA Region 9 (pathway specific)
1,1-Dichloroethane	811	USEPA Region 9 (pathway specific)
1,1-Dichloroethene	825	URS GAC
1,1-Dichloropropene	NV	No Criterion
1,2,3-Trichlorobenzene	NV	No Criterion
1,2,3-Trichloropropane	0.01	USEPA Region 9 (pathway specific)
1,2,4-Trichlorobenzene	7.2	USEPA Region 9 (pathway specific)
1,2,4-Trimethylbenzene	12	USEPA Region 9 (pathway specific)
1,2-Dibromo-3-Chloropropane	0.10	UK DWS (2000)
1,2-Dibromoethane	0.10	UK DWS (2000)
1,2-Dichlorobenzene	1,000	WHO DWG
1,2-Dichloroethane	44	URS GAC
1,2-Dichloropropane	0.10	UK DWS (2000)
1,3,5-Trimethylbenzene	12	USEPA Region 9 (pathway specific)
1,3-Dichlorobenzene	183	USEPA Region 9 (pathway specific)
1,3-Dichloropropane	0.10	UK DWS (2000)
1,4-Dichlorobenzene	300	WHO DWG
2,2-Dichloropropane	NV	No Criterion
2,4,5-Trichlorophenol	9.0	WHO DWG
2,4,6-Trichlorophenol	200	WHO DWG
2,4-Dichlorophenol	0.3 - 40	WHO DWG
2,4-Dimethylphenol	730	USEPA Region 9 (pathway specific)
2,4-Dinitrotoluene	73	USEPA Region 9 (pathway specific)
2,6-Dinitrotoluene	36	USEPA Region 9 (pathway specific)
2-Chloronaphthalene	487	USEPA Region 9 (pathway specific)
2-Chlorophenol	0.1 - 10	UK DWS (2000)
2-Chlorotoluene	122	USEPA Region 9 (pathway specific)
2-Methylnaphthalene	NV	No Criterion
2-Methylphenol	1,825	USEPA Region 9 (pathway specific)
2-Nitroaniline	109	USEPA Region 9 (pathway specific)
2-Nitrophenol	NV	No Criterion
3-Nitroaniline	3.2	USEPA Region 9 (pathway specific)
4-Bromophenyl Phenyl Ether	NV	No Criterion
4-Chloro-3-Methylphenol	NV	No Criterion
4-Chloroaniline	146	USEPA Region 9 (pathway specific)
4-Chlorophenyl Phenyl Ether	NV	No Criterion
4-Chlorotoluene	NV	No Criterion
4-Methylphenol	182	USEPA Region 9 (pathway specific)
4-Nitroaniline	3.2	USEPA Region 9 (pathway specific)
4-Nitrophenol	NV	No Criterion

Target Compound	Human Health (µg/L)	Source
Acenaphthene	sat	URS GAC
Acenaphthylene	17,700	URS GAC
Ammoniacal Nitrogen	NV	No Criterion
Anionic surfactant/MBAS	NV	No Criterion
Anthracene	sat	URS GAC
Arsenic	no pathway	UK DWS (2000)
Azobenzene	0.61	USEPA Region 9 (pathway specific)
Benzene	76	URS GAC
Benzo(A)Anthracene	sat	URS GAC
Benzo(A)Pyrene	164	URS GAC
Benzo(B)Fluoranthene	sat	URS GAC
Benzo(G,H,I)Perylene	sat	URS GAC
Benzo(K)Fluoranthene	sat	URS GAC
Bicarbonate Alkalinity	NV	No Criterion
Bis(2-Chloroethoxy)Methane	NV	No Criterion
Bis(2-Chloroethyl)Ether	0.01	USEPA Region 9 (pathway specific)
Bis(2-Ethylhexyl)Phthalate	8.0	WHO DWG
Boron	no pathway	UK DWS (2000)
Bromobenzene	20	USEPA Region 9 (pathway specific)
Bromochloromethane	NV	No Criterion
Bromodichloromethane	See note (i)	No Criterion
Bromoform	See note (i)	No Criterion
Bromomethane	8.7	USEPA Region 9 (pathway specific)
Butylbenzylphthalate	7,300	USEPA Region 9 (pathway specific)
Cadmium	no pathway	UK DWS (2000)
Calcium	250,000	UK DWS (2000)
Carbazole	3.4	USEPA Region 9 (pathway specific)
Carbon Disulfide	1,043	USEPA Region 9 (pathway specific)
Carbon Tetrachloride	3.0	UK DWS (2000)
Chloride	250,000	UK DWS (2000)
Chlorobenzene	NV	No Criterion
Chloroethane	4.6	USEPA Region 9 (pathway specific)
Chloroform	See note (i)	No Criterion
Chloromethane	158	USEPA Region 9 (pathway specific)
Chromium	no pathway	UK DWS (2000)
Chrysene	sat	URS GAC
Cis-1,2-Dichloroethene	2,090	URS GAC
Cis-1,3-Dichloropropene	NV	No Criterion
Copper	no pathway	UK DWS (2000)
Dibenz(a,h)Anthracene	sat	URS GAC
Dibenzofuran	12	USEPA Region 9 (pathway specific)
Dibromochloromethane	See note (i)	no criterion
Dibromomethane	61	USEPA Region 9 (pathway specific)
Dichlorodifluoromethane	395	USEPA Region 9 (pathway specific)

Target Compound	Human Health (µg/L)	Source
Dichloromethane	21,100	URS GAC
Diethylphthalate	29,199	USEPA Region 9 (pathway specific)
Dimethylphthalate	364,867	USEPA Region 9 (pathway specific)
Di-N-Butylphthalate	NV	No Criterion
Di-N-Octylphthalate	1,460	USEPA Region 9 (pathway specific)
Electrical Conductivity	NV	No Criterion
Ethylbenzene	15,900	URS GAC
Fluoranthene	sat	URS GAC
Fluorene	sat	URS GAC
Fluoride	1,500	UK DWS (2000)
Hexachlorobenzene	1.0	WHO DWG
Hexachlorobutadiene	0.60	WHO DWG
Hexachlorocyclopentadiene	219	USEPA Region 9 (pathway specific)
Hexachloroethane	4.8	USEPA Region 9 (pathway specific)
Indeno(1,2,3-cd)Pyrene	sat	URS GAC
Iron	no pathway	UK DWS (2000)
Isophorone	71	USEPA Region 9 (pathway specific)
Isopropylbenzene	658	USEPA Region 9 (pathway specific)
Lead	no pathway	UK DWS (2000)
Magnesium	no pathway	UK DWS (2000)
Mercury	no pathway	USEPA Region 9 (pathway specific)
Methyl T-Butyl Ether (MTBE)	511,000	URS GAC
Naphthalene	1,590	URS GAC
N-Butylbenzene	243	USEPA Region 9 (pathway specific)
Nickel	no pathway	UK DWS (2000)
Nitrate As N	50,000	UK DWS (2000)
Nitrobenzene	3.4	USEPA Region 9 (pathway specific)
N-Nitroso-Di-N-Propylamine	0.01	USEPA Region 9 (pathway specific)
PCB Congener 101	0.10	UK DWS (2000)
PCB Congener 118	0.10	UK DWS (2000)
PCB Congener 138	0.10	UK DWS (2000)
PCB Congener 153	0.10	UK DWS (2000)
PCB Congener 180	0.10	UK DWS (2000)
PCB Congener 28	0.10	UK DWS (2000)
PCB Congener 52	0.10	UK DWS (2000)
Pentachlorophenol	9.0	WHO DWG
pH	NV	No Criterion
Phenanthrene	sat	URS GAC
Phenol	371,000,000	URS GAC
Phosphate	NV	No Criterion
Phosphorous	NV	No Criterion
P-Isopropyltoluene	NV	No Criterion
Potassium	12,000	UK DWS (2000)
Propylbenzene	NV	No Criterion

Target Compound	Human Health (µg/L)	Source
Pyrene	sat	URS GAC
Sec-Butylbenzene	243	USEPA Region 9 (pathway specific)
Selenium	no pathway	UK DWS (2000)
Sodium	200,000	UK DWS (2000)
Styrene	20	WHO DWG
Sulphate Soluble	NV	No Criterion
Tert-Butylbenzene	243	USEPA Region 9 (pathway specific)
Tetrachloroethene	NV	No Criterion, See note (ii)
Toluene	5,260	URS GAC
Trans-1,2-Dichloroethene	122	USEPA Region 9 (pathway specific)
Trans-1,3-Dichloropropene	NV	No Criterion
Trichloroethene	258	URS GAC, See note (ii)
Trichlorofluoromethane	1,288	USEPA Region 9 (pathway specific)
Vinyl Chloride	3.8	URS GAC
M,P-Xylene	NV	see sum of xylenes
O-Xylene	NV	see sum of xylenes
Total Xylene	5,400	URS GAC
Zinc	no pathway	WHO DWG
Total Cyanide	NV	No Criterion
Total PAH	NV	No Criterion
Total PAH (sum of 4)	NV	No Criterion
Total PCBs	0.10	UK DWS (2000)
TPH (>EC5-6) Aliphatic	2,190	URS GAC
TPH (>EC6-8) Aliphatic	1,550	URS GAC
TPH (>EC8-10) Aliphatic	59	URS GAC
TPH (>EC10-12) Aliphatic	43	URS GAC
TPH (>EC12-16) Aliphatic	sat	URS GAC
TPH (>EC16-21) Aliphatic	sat	URS GAC
TPH (>EC21-35) Aliphatic	sat	no criterion
Total Aliphatics (C5-C35)	NV	See individual fractions
TPH (>EC6-7) Aromatic	7,540	URS GAC
TPH (>EC7-8) Aromatic	6,290	URS GAC
TPH (>EC8-10) Aromatic	1,950	URS GAC
TPH (>EC10-12) Aromatic	7,320	URS GAC
TPH (>EC12-16) Aromatic	sat	URS GAC
TPH (>EC16-21) Aromatic	sat	URS GAC
TPH (>EC21-35) Aromatic	sat	URS GAC
Total Aromatics (C6-C35)	NV	See individual fractions
TPH (C5-C35)	NV	See individual fractions
TPH-PRO (C4-C12)	NV	See individual fractions
TPH-DRO	NV	See individual fractions

Key:
NV: No value available

Target Compound	Human Health (µg/L)	Source

URS GAC- URS Generic Assessment Criteria

USEPA Region 9 PRG- United States Environment Protection Agency Region 9 Preliminary Remediation Goal

WHO DWG - World Health Organisation Drinking Water Guidelines

UK DWS (2000) - United Kingdom Drinking Water Standards

Note:

Acute value used to assess Cyanides

Sum of m,p,o- xylene compared against criteria

Phenols assessed against the value for 2,6-dimthylphenol

Note (i)	The specified compounds are: chloroform, bromoform, dibromochloromethane, bromodichloromethane. The parametric value, 100µg/l, applies to the sum of the concentrations of individual compounds detected and quantified in the monitoring process.
Note (ii)	The parametric value, 10µg/l, applies to the sum of the concentrations of the individual compounds Tetrachloroethene (Tetrachloroethylene) (PCE) and Trichloroethene (Trichloroethylene) (TCE), detected and quantified in the monitoring process.