Envirnmental Statement

8 Soil Quality

8

8 Soil Quality

8.1 *Introduction*

This chapter of the Environmental Statement (ES) concerns soil quality. In particular, it addresses the potential impacts associated with contaminants in the made ground at the existing rubble tip and, as identified in the Scoping Opinion (Government of Gibraltar (GoG), 2005 - see Appendix A), describes protective measures during construction and proposals for removing and disposing of contaminants.

The reader should note that the information provided below does not constitute a contaminated land risk assessment and should not be used to inform any matters other than the EIA process for Eastside as set out in this ES.

8.2 *Assessment Methodology*

8.2.1 *Data Collection*

The following data were used to inform the EIA process:

- Scott Wilson (2002), Gibraltar East Side Reclamation – Geotechnical and Contamination Survey Report;
- Geocisa Geotechnia y Cimentios S.A (2002), Collecting Report about Fieldwork and Laboratory Tests, East Side Rubble Tip; and
- Macaulay Analytical Services (2005), Report on the Analysis of Sediment taken from Eastside Development Gibraltar (see Appendix E).

8.2.2 *Impact Assessment Methodology*

Impacts on human health have been assessed initially by comparing contaminant concentrations to Contaminated Land Exposure Assessment (CLEA) Generic Soil Guideline Values (SGVs).

The CLEA model provides SGVs for a number of different scenarios; for example, residential use, allotments and commercial / industrial areas. The CLEA model takes account of various exposure routes and targets the most sensitive human receptor for each impact scenario. The CLEA model also assumes exposure every day and thereby establishes conservative worst-case impact scenarios for assessment under the EIA process even though these scenarios do not necessarily represent more realistic impact scenarios for which exposure periods are more likely to be limited.

The CLEA SGV class of residential use without plant uptake has been chosen as the model scenario for impact assessment. Exposure has been estimated without a contribution from eating home-grown fruit or vegetables (as it is unlikely that these will be planted), which represents the key difference in potential exposure to contamination between those living in a house with a garden and those living in a house where no private garden area is available (note: some residences within Eastside will have managed landscaped grounds, but will not have allocated garden plots).

In the absence of CLEA SGVs for copper, zinc and polycyclic/poly nuclear aromatic hydrocarbons (PAHs), the Dutch intervention values have been used to determine a conservative assessment of impacts.

The Use of Sewage Sludge in Agriculture Regulations, Code of Good Agricultural Practice for the Protection of Soil has been used to assess the risk to planting from phytotoxic metals where the CLEA model does not provide guidance.

Groundwater, surface water and sea water samples have been assessed against Environmental Quality Systems (EQSs) for marine water established under the EC Dangerous Substances Directive. This is the most realistic impact assessment scenario because groundwater is assumed to be a mixture of fresh and saline waters and is not abstracted for use on the site. EQSs are set for the receiving waters and not for a discharge, effluent or leachate.

8.3 Baseline Conditions

8.3.1 *Background Information*

No geotechnical or geo-environmental surveys were undertaken specifically to inform the soil quality aspects of the EIA process for Eastside. Instead, the EIA process has used the survey data derived from previous studies, notably the ground investigations of the rubble tip undertaken by Geocisa Geotechnia y Cementios between November and December 2001 and the interpretive report produced by Scott Wilson in 2002, as referenced above. It is important to note that since the 2001 ground investigation, the rubble tip has been built up with significant quantities of material that has not yet been tested and therefore uncertainty exists in its content. This is discussed further in Section 8.9. However, GoG has confirmed that this is not a registered contaminated site and has only been allowed to receive inert building material and rubble.

The ground investigations consisted of:

- 5 rotary drilled boreholes (extending to 23.5m and 40.5m below existing ground level, generally 3m to 5m into rock); and
- 23 machine dug trial pits (3m deep).

Figure 8.1 (Source: Scott Wilson, 2002) provides a location plan of ground investigations carried out in 2002.

Contamination testing of the resulting samples was carried out by City Analytical Services Ltd in the UK under the instructions of Scott Wilson. In total, 60 samples of soil and 11 samples of water were tested for the following determinants:

- Soils: metals and metalloids (arsenic, boron, cadmium, total chromium, chromiumVI, copper, lead, mercury, nickel, selenium, and zinc), polynuclear aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH), BTEX (benzene, toluene, ethylbenzene, and xylene), polychlorinated biphenyls (PCBs), semi-volatile organic hydrocarbons, asbestos screening and pH; and
- Water: as for soil but including ammoniacal nitrogen, nitrate, biochemical oxygen demand (BOD), chemical oxygen demand (COD) and total organic carbon (TOC).

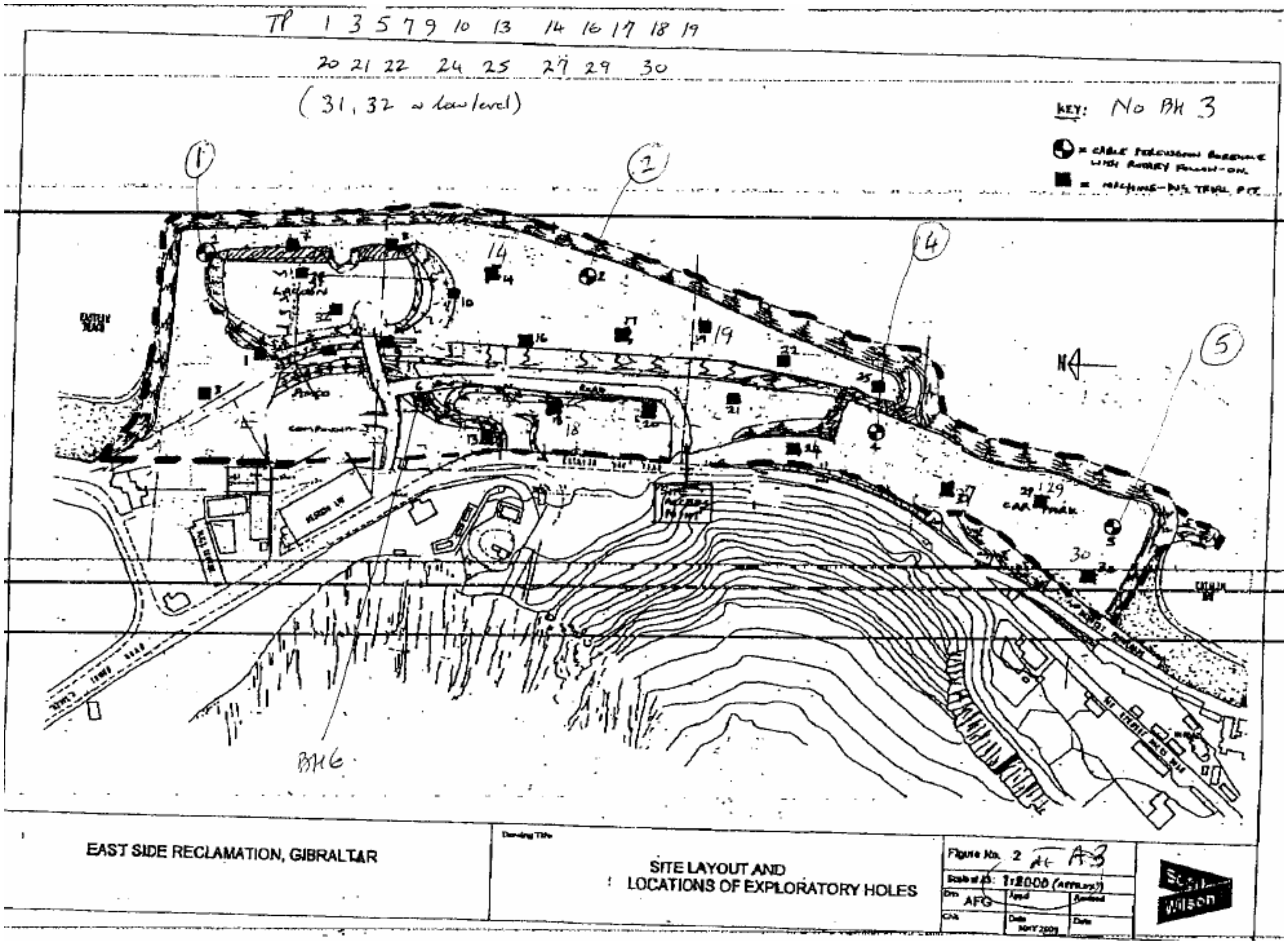
Some uncertainties exist in the available data from the original ground investigations. These are summarised at the end of this chapter in Section 8.9.

In addition, the findings of the baseline sediment quality survey (See Chapter 7 on Sediment Quality) are used to determine the quality of near shore sediment and to assess the potential for migration from the landfill. The sediments were analysed for metals, Gasoline Range Organics (GROs), Tributyltin (TBT), PAHs, PCBs, phenols, TOC and pH. Only sediment samples taken within the immediate footprint of the proposed Eastside development and in proximity to the rubble tip (see Table 8.1) have been used to inform this chapter of the ES. This approach has been taken to ensure that any correlations made between contaminants in the rubble tip and contaminants in the sediment are rigorous since elevated concentrations of contaminants from samples a large distance from the rubble tip may be statistically meaningless and could potentially be from other sources of contamination.

Table 8.1 Relevant Sediment Samples concerning the Rubble Tip

No.	Sample Type	Sampling Positions
3	Individual	11
4	Individual	13
5	Individual	14
6	Composite	9, 12, 16, 17 and 18

Figure 8.1 Locations of Exploratory Boreholes (BH) and Trial Pits (TP) for the 2002 Ground Investigation



8.3.2 *Rubble Tip Reclamation Area*

The rubble tip comprises an area of approximately six hectares of made ground extending into the sea between Eastern Beach and Catalan Bay (see Figure 8.2). It was first developed as a landfill reclamation in 1988 and was designed to take clean, inert building and demolition rubble with control of tipping exercised by GoG.

Over a four year period between 1992 and 1996 control of the site was less vigorous but after 1996 full Government control was again exercised.

Figure 8.2 Stockpiled Material at the Rubble Tip

Although material deposited at the rubble tip was considered to be essentially inert waste, such waste is known to contain materials that are potentially harmful to people or the environment. These materials include asbestos cement (usually in the form of chrysotile or white asbestos), plasterboard (which can contain high levels of sulphate), ashes (which may contain heavy metals) and asphalt (which may contain PAHs), and waste blasted sand (which may contain heavy metals). In addition, paper, cardboard and wood may be mixed in with the waste, the degradation of which can give rise to landfill gases and leachate.

Although many of the materials deposited at the rubble tip in the past were considered to be inert, a revised definition of 'inert' may mean that some of the deposited materials do not meet this definition. The current definition of inert waste in Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste states that waste is inert if it:

- Will not undergo any significant physical, chemical or biological transformations;
- Will not dissolve;
- Will not burn;
- Will not physically or chemically react;
- Will not biodegrade;
- Will not adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or to harm human health;
- Has insignificant total leachability and pollutant content; and

- Produces a leachate with an ecotoxicity that is insignificant (if it produces a leachate).

8.3.3 *Geology*

Generally, the geology within Eastside's area comprises the Catalan Bay Shale Formation of the Gebel Tariq Group which consists of inter-bedded mudstones, marls, limestones and cherts. It is stratigraphically higher than the Gibraltar Limestone Formation (which makes up the majority of Gibraltar's Rock), but occurs beneath the Gibraltar Limestone within the study area due to overturning of the whole sequence.

The ground investigation for the rubble tip (Scott Wilson, 2002) reveals that the made ground at the Eastside site overlies sands to a maximum depth of 29m. Bedrock, consisting of marls, marly clays and limestone lies below the sands.

8.3.4 *Made Ground*

The ground investigation for the rubble tip (Scott Wilson, 2002) reveals that most of the made ground consisted of demolition rubble, principally soil (mainly silt, sand and gravel) together with fragments and blocks of concrete, brick, rock, tiles, reinforcing mesh, etc.

Minor constituents comprised tarmac, wood, paper, cardboard, cloth, glass, tin cans, aluminium, wiring and cables, mixed plastics and asphalt.

In a number of trial pits asbestos cement was visually presumed with samples being taken for laboratory analysis, none however were confirmed to be positive for asbestos fibres.

Indications of contamination were noted in a number of exploratory holes, as shown in Table 8.2.

Table 8.2 Contaminant Indicators

Exploratory Hole Number	Contaminant Indicator
BH1, TP18, TP21, TP22	Asphalt
BH2	Slight smell of hydrocarbons,
BH4	Solvent smell, strong smell of solvent, smell of hydrocarbons
BH5	Slight smell of hydrocarbons, black staining
TP8	Solvent smell
TP9, TP24	Asbestos
TP16	Smell of hydrocarbons
TP19	Sandblast sand
TP25	Incinerator ash
TP30	Asbestos and asphalt

8.3.5 *Soil Contamination*

In general the degree of the contamination of the made ground is relatively low which reflects the mainly inert material that has been placed at the site. However several areas of the site have significantly elevated levels of metals and several trial pits had elevated concentrations of hydrocarbons. A statistical analysis of water contamination is provided within Section 8.3.8.

A summary of specific contamination is outlined below. Samples from a number of exploratory holes across the site recorded elevated levels of some contaminants. The main instances are as follows:

- Arsenic – mean 14mg/kg, maximum 220mg/kg and the following locations exceeding CLEA SGV levels (20 mg/kg) - TP19, 21, and 29;
- Copper – mean 506mg/kg, maximum 6,700mg/kg and the following locations exceeding the Dutch intervention level (190mg/kg) - BH2, and 4; TP 19, 20, 21, 22, 24, 25 and 29;
- Lead – mean 314mg/kg, maximum 2,700mg/kg and the following locations exceeding CLEA SGV levels (450mg/kg) - BH4; TP1, 19, 20, 21, 22, 24, 25 and 29;
- Zinc – mean 703mg/kg, maximum 13,000mg/kg and the following locations exceeding Dutch intervention level (720mg/kg) - BH4, TP19, 20, 21, 22, 24 and 29; and
- PAHs – mean 23mg/kg, maximum of 170mg/kg and the following locations exceeding Dutch intervention level (40mg/kg) - TP14 and 18.

8.3.6 *Water Contamination*

Water from boreholes and surface water contained ammonia and TOC at levels slightly elevated above normal background levels, indicating that there may be small amounts of organic and decaying matter within the made ground. This is consistent with the fact that paper, wood and cardboard were found within the disposed materials and is indicated by slightly elevated BOD levels in TP32 and 34. COD in BH1 and BH2 was elevated with respect to the adjacent seawater.

On site water tests including pH and conductivity indicated that the water is slightly alkaline, with a high conductivity value suggesting high concentration of salts and inferring the presence of sea water infiltration into the landfill materials.

Groundwater tests indicated that copper, zinc and ammoniacal nitrogen are present in concentrations exceeding the EQS for salt water as applied under the EU Dangerous Substances Directive.

A statistical analysis of water contamination is provided within Section 8.3.8. It should be noted that mercury and cadmium had detection limits during the analysis that were set higher than EQS limits. Therefore there is an uncertainty in the data as to whether it represents an accurate picture of ground water contamination or not. Only reliable data with detection limits below EQS have been analysed for the purposes of the EIA.

8.3.7 *Landfill Gases*

Gas monitoring data indicates that minor amounts of landfill gases are present on the site; low concentrations of hydrogen sulphide and methane were detected in the in-situ testing.

The carbon dioxide content exceeded the short-term exposure limit; however the range found (0-1.7ppm) is within the normal limits found in soils. The concentration found in the in-situ borehole drilling revealed that no methane, hydrogen sulphide or carbon dioxide is present.

8.3.8 *Statistical Analysis of Ground Investigation Data*

The ground investigation data for the made ground at the rubble tip have been statistically analysed to provide upper confidence level of the mean concentrations. This procedure uses the spread of point data to estimate to within a stated certainty that the population mean will be below the given level. As a standard, the confidence level used is 95%. Tables 8.3 and 8.4 show the statistical analysis of contaminant testing carried out of the made ground materials.

Table 8.3 Statistical Analysis of Soil Samples (all results expressed as mg/kg)

Statistic	Arsenic	Cadmium	Chromium (Total)	Chromium (Hex)	Copper	Lead	Mercury	Nickel	Zinc	PAH	PCB	TPH	pH	Boron	Selenium
No. Samples	52	53	53	53	50	52	52	52	52	24	4	12	14	51	53
Min	3	1	0	0	6	15	0	5	14	10	0	50	8	0	0
Max	**220**	**7**	190	1	**6700**	**2700**	1	**100**	**13000**	**170**	1	330	11	4	0
Mean	14	1	27	0	**506**	314	0	28	**703**	**24**	0	161	9	1	0
Std dev.	31	1	28	0	1223	**487**	0	18	1891	36	0	107	1	1	0
CV	2	1	1	1	2	2	1	1	3	1	0	1	0	1	0
T	2	2	2	2	2	2	2	2	2	2	0	2	2	2	2
UCL US95%	**227**	**7**	196	1	**6990**	**2813**	1	**104**	**13439**	183	1	386	12	4	0
CLEA Res.	**20**	**30**	**200**		**-**	**450**	**15**	**75**	**-**	**-**	**-**	**-**		**-**	**260**
Dutch IV	**55**	**12**	**380**		**190**	**530**	**10**	**210**	**720**	**40**	**1**	**5000**	**-**	**-**	**-**
Sewage Sludge in Agriculture Regulations	**50**	**2**	**600**		**330**	**300**	**1.5**	**180**	**700**						**5**

Statistic	Benzene	Toluene	Ethylbenzene	mp-xylene	o-xylene	Naphthalene	Acenapththylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Dibenzo(ah)anthracene	Benzo(ghi)perylene	Indeno(123-cd)pyrene
No. samples	9.0	9.0	9.0	9.0	9.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Min	0.1	0.1	0.1	0.1	0.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Max	0.1	0.1	0.1	0.1	0.1	4.2	1.0	20.0	1.6	16.0	5.8	15.0	16.0	4.7	4.5	5.6	2.5	6.3	1.0	3.5	11.0
Mean	0.1	0.1	0.1	0.1	0.1	1.3	1.0	3.0	1.1	2.8	1.5	3.4	3.6	1.6	1.6	2.1	1.2	2.3	1.0	1.6	2.7
Std dev.	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	4.7	1.5	4.2	4.5	1.2	1.1	1.7	0.5	2.0	0.0	1.0	3.2
CV	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.7	1.0	1.3	1.3	0.7	0.7	0.8	0.4	0.9	0.0	0.6	1.2
t	1.9	1.9	1.9	1.9	1.9	0.0	1.0	1.8	0.0	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
UCL US95%	0.1	0.1	0.1	0.1	0.1	4.2	1.3	20.0	1.6	18.7	6.7	17.5	18.6	5.4	5.1	6.6	2.8	7.4	1.0	4.1	12.8
CLEA Res.	-	**3**	**9**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
Dutch IV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-

Statistic	n-nitrosodibutylamine	n-nitrosodimethylamine	n-nitrosodiphenylamine	n-nitrodi-n-propylamine	n-nitrosopiperidine	pentachlorophenol	Phenacetin	Phenanthrene	Phenol	2-picoline	Pyrene	1245-tetrachlorobenzene	2346-tetrachlorophenol	124-trichlorobenzene	245-trichlorophenol	246-trichlorophenol	Ancenaphthene	Acenaphthylene	Acetophenome	4-aminobiphenyl	Aniline	Anthracene	Benzidinine
No. samples	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Min	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Max	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Mean	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Std dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CV	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
t	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
UCL US95%	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
CLEA Res.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dutch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistic	Diphenylamine	12-diphenylhydrazine	di-n-octyl phthalate	Fluroanthene	Flourene	Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopenta dien	Hexachloroethane	Indeno(123cd)pyrene	Isophorone	3-methylchloroanthrene	2-methylnaphthalene	2-methylphenol	4-methylphenol	Naphthalene	1-napthylamine	2-napthylamine	2-nitroaniline	3-nitroaniline	4-nitroaniline	Nitrobenzene	2-nitrophenol	4-nitrophenol
No. samples	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Min	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Max	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Mean	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Std dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CV	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
t	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
UCL US95%	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
CLEA Res.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dutch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistic	Benzoic acid	Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(ghi)perylene	Benzo(a)pyrene	Benzyl alcohol	Bis(2chloroethoxy)methan	Bis(2-chloroethyl)ether	Bis(2chloroisopropyl)eth	Bis(2ethylhexyl)phthalat	4bromophenylphenyl ether	Butyl benzyl phthalate	4-chloroaniline	4-chloro-3-methylphenol	2-chloroapthalene	2-chlorophenol	4chlorophenylphenylether	Chrysene	Dibenzo(ah)anthracene
No. samples	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Min	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Max	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Mean	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Std dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CV	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
t	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
UCL US95%	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
CLEA Res.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dutch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistic	Dibenzofuran	Di-n-butyl phthalate	12-dichlorobenzene	13-dichlorobenzene	14-dichlorobenzene	33-dichlorobenzidine	24-dichlorophenol	26-dichlorophenol	Diethyl phthalate	Dimethylaminoazobenzene	7,12-dimethylbenz(a)anth	24-dimethylphenol	Dimethyl phthalate	2-methyl-46-ditropheno	24-dinitrophenol	24-dinitrotoluene	26-dinitrotoluene
No. samples	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Min	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Max	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Mean	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Std dev.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CV	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
t	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
UCL US95%	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
CLEA Res.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dutch	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 8.4 Statistical Analysis of Water Samples (µg/l)

Statistic	Nickel	Chromium	Cadmium	Copper	Lead	Zinc	Arsenic	Boron	COD	BOD	TOC	pH	Mercury	Selenium	Ammoniacal Nitrogen	Nitrate	PAH
No. samples	All below detection levels of 10 ug/l/kg	All below detection levels of 10 ug/l	Detection limits are 5 ug/l this is above EQS therefore no confidence in data.	11.00	11.00	11.00	All below detection levels of 10 ug/l	11.00	11.00	11.00	11.00	11.00	Detection levels are 1 ug/l this is above EQS therefore no confidence in data.	11.00	11.00	11.00	11.00
Min				**15.00**	11.00	11.00		0.70	28.00	1.20	0.61	7.50		0.00	**0.71**	0.31	0.00
Max				**22.00**	11.00	**49.00**		3.70	4200.00	9.40	11.00	8.60		0.00	**1.20**	3.70	0.00
Mean				**18.50**	11.00	21.33		1.92	977.45	3.87	4.82	7.95		0.00	**0.99**	2.01	
Std dev.				4.95	0.00	12.66		1.24	1213.47	2.83	3.51	0.32		0.00	**0.21**	2.40	
EQS (Saltwater)	**30**	**15**	**2.5**	**5**	**25**	**40**	**25**	**7**	**-**	**-**	**-**	**6 - 8.5**	**0.3**	**-**	**0.022**	**-**	**-**

Statistic	Naphthalene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Dibenzo(ah)anthracene	Benzo(ghi)perylene	Indeno(123-cd)pyrene	Diphenylamine	12-diphenylhydrazine	di-n-octyl phthalate	Fluroanthene	Flourene	Hexachlorobenzene	Hexachlorobutadiene	dien	Hexachloroethane	Indeno(123cd)pyrene	Isophorone	methylchloroanthrene	2-methylnaphthalene
No. samples	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Min	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	1.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Std dev.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EQS (Saltwater)	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistic	2-methylphenol	4-methylphenol	3-nitroaniline	Naphthalene	1-napthylamine	2-napthylamine	2-nitroaniline	4-nitroaniline	Nitrobenzene	2-nitrophenol	4-nitrophenol	n-nitrosodibutylamine	n-nitrosodimethylamine	n-nitrosodiphenylamine	n-nitrodi-n-propylamine	n-nitrosopiperidine	pentachlorophenol	Phenacetin	Phenanthrene	Phenol	2-picoline	Pyrene	2346-tetrachlorophenol	124-trichlorobenzene
No. samples	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Min	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.70	1.00	1.00	1.00	1.00	1.00
Mean	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.16	1.00	1.00	1.00	1.00	1.00
Std dev.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.51	0.00	0.00	0.00	0.00	0.00
EQS (Saltwater)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistic	1245-tetrachlorobenzene	Ancenaphthene	Acenaphthylene	Acetophenome	4-aminobiphenyl	Aniline	Anthracene	Benzidinine	Benzoic acid	Benzo(a)anthracene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(ghi)perylene	Benzo(a)pyrene	Benzyl alcohol	Bis(2chloroethoxy)methan	Bis(2-chloroethyl)ether	Bis(2chloroisopropyl)eth	Bis(2ethylhexyl)phthalat	4bromophenylphenyl ether	Butyl benzyl phthalate	4-chloroaniline	4-chloro-3-methylphenol	2-chloroapthalene	2-chlorophenol	4chlorophenylphenylether
No. samples	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Min	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Std dev.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EQS (Saltwater)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistic	**Chrysene**	**Dibenzo(ah)anthracene**	**Dibenzofuran**	**Di-n-butyl phthalate**	**12-dichlorobenzene**	**13-dichlorobenzene**	**14-dichlorobenzene**	**33-dichlorobenzidine**	**24-dichlorophenol**	**26-dichlorophenol**	**Diethyl phthalate**	**Dimethylaminoazobenz ene**	**7,12-dimethylbenz(a)anth**	**24-dimethylphenol**	**Dimetthyl phthalate**	**2-methyl-46-ditropheno**	**24-dinitrophenol**	**24-dinitrotoluene**	**26-dinitrotoluene**
No. samples	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Min	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Mean	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Std dev.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EQS (Saltwater)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

8.4 Predicted Impacts

8.4.1 *Construction Phase: Impact on Human Health owing to Exposure to Contaminants in the Rubble Tip*

Analysis of the soil and water contaminant concentrations (see Tables 8.3. and 8.4) indicates that the health of site construction workers could be affected through dermal contact with and/or ingestion of arsenic, lead, nickel, PAH, copper, and zinc in the deposited materials and to copper, zinc and ammoniacal nitrogen in the groundwater. It is considered that the source of these contaminants could potentially be point sources of mixed metal waste, sandblast sand, and ashes within the rubble tip. It is possible that hotspots of metal contamination exist where metals are chemically bound within the bands of clay or ash within the made ground.

In addition, the health of site construction workers could be affected through inhalation of asbestos. Asbestos has not been confirmed by laboratory analysis, however, it is likely to be present within the rubble tip, most likely in the form of cement bound asbestos sheeting and other building materials. However, the presence of other asbestos forms cannot be ruled out and a worse-case scenario must be adopted considering that the rubble tip consists of demolition materials of an unknown history. The worse-case scenario presumes that asbestos containing materials could potentially contain crocidolite (blue) and amosite (brown) fibres. However, considering the outdoor environment of the construction of Eastside, the impact on construction workers is likely to be small so long as appropriate mitigation measures are taken.

Risks to site workers, visitors to the site and adjacent neighbours could also occur from contact with dust borne contaminants mobilised during the on site remediation works.

8.4.2 *Construction Phase: Impact on Groundwater and Sea Water Quality due to Migration of Contaminants from the Rubble Tip*

Copper, zinc and ammoniacal nitrogen in the groundwater exceed EQSs under the EU Dangerous Substances Directive and thus migration from the rubble tip to the sea may adversely affect sea water quality. These contaminants appear to be reasonably well contained within the rubble tip itself and no contaminants are present at significant concentrations within seawater samples. However, the laboratory detection levels used in the analyses were in excess of the EQSs for cadmium and mercury. This may therefore represent an inaccurate picture of the type and level of contaminants that are migrating to seawater and the rubble tip may therefore pose more of a pollution risk than is realised at present.

Low concentrations of contaminants were detected in sea water. Irrespective of the degree of contamination in groundwater migrating from the rubble tip, the low concentrations may be due to the high dilution factors that occur once the groundwater migrates from the rubble tip and mixes with the large seawater mass.

The assumptions regarding contaminant migration and the effect of dilution are potentially confirmed by sediment samples taken from the seabed within close proximity to the existing landfill which show concentrations of copper and zinc which are significantly below CEFAS Action Levels for the Disposal of Dredged Material at Sea (See Chapter 7 on Sediment Quality). Furthermore, while contaminants migrating from the rubble tip may be causing pollution of the seawater, construction works for Eastside are not likely to materially worsen the existing situation

It is recommended that the risk of migration of contaminants within groundwater towards seawaters or offsite requires further assessment to support a definitive opinion on the need for mitigation measures. However, the data presented in the original ground investigation report suggests that mitigation measures against groundwater migration are unlikely, especially given the use of clean fill material at the seaward side to form the new land mass and construction of the revetment.

8.4.3 *Operation Phase: Impact on Human Health owing to Exposure to Contaminants in the Madeground Materials*

The potential impact upon site visitors and residents of the site is considered to be negligible if contaminant screening and provision of a clean capping layer and hardstanding, as described in section 8.5.1, is employed during the construction phase.

8.4.4 *Operation Phase: Impacts on Human Health owing to Migration of Gases from the Rubble Tip*

It is suggested that the original ground investigation provides insufficient information to fully assess and quantify the risk of migration of ground gases (landfill gases and volatile components of hydrocarbons), both to buildings onsite and offsite, and to therefore effectively design mitigation measures. However, based on the information available it is unlikely that this pathway will have material impact though the impacts should be considered further.

8.4.5 *Operation Phase: Impact on Groundwater and Sea Water Quality due to Migration of Contaminants from the Rubble Tip*

Impacts are considered to be negligible post mitigation as described in Section 8.5.2.

8.4.6 *Operation Phase: Impact on Landscape Planting owing to Exposure to Contaminants*

Concentrations of phytotoxic metals (especially copper, lead and zinc) within the rubble tip materials have potential to affect planting incorporated into the public and private landscaped areas in Eastside. Plants may uptake contaminants from the rubble tip via their roots. The potential for this impact is considered to be negligible, due to the fact that a suitable layer of imported clean capping will be spread over the rubble tip where planting will occur at ground level.

8.5 Mitigation Measures

8.5.1 *Construction Phase: Impact on Human Health owing to Exposure to Contaminants in the Rubble Tip*

The degree of contamination within (some areas of) the rubble tip can present an unacceptable risk of health impacts to construction workers, site visitors, and neighbours. Impact potential from dermal contact, ingestion or inhalation of contaminants can be mitigated through the following measures:

- Use of suitable personal protective equipment (PPE);
- Provision of washing facilities;
- Prohibition on smoking and eating on site;
- Dust suppression procedures;
- Minimising manual handling of any materials; and
- Practices to ensure that there is no unnecessary risk to construction workers from the presence of asbestos (e.g. the presence of asbestos within the rubble tip may preclude the use of dynamic compaction and will require special measures to be taken if bored piling is necessary in, and when collecting and disposing of, the waste material that may contain asbestos).

At present the client's proposed remediation approach for the site is:

- To remove the tip mound and any other material on site down to a level of approximately 4.5mAOD.
- The excavated material will be screened for suitability with clean material being retained for use on site and any contaminated material being treated/disposed as appropriate.
- Provide a suitable "capping" layer of max 1.5m to bring the development platform to 6mAOD. The capping layer to consist of clean fill and hard standing. The placement of the proposed clean cover layer effectively breaks the linkage between non-volatile contaminants (e.g. metals and asbestos) in the landfill below and potential receptors in the development above. A marker layer may be considered prudent to warn future

site users of potentially contaminated ground conditions below. The design, specification and thickness of the clean cover layer should consider guidance contained in "Cover Systems for Land Regeneration - Thickness Design of Cover Systems for Contaminated Land, BRE, 2004".
- Construction of a revetment to the seaward side, backfilled with clean fill.

During these phases a contaminated land watching brief should be in place to identify any materials (sizeable sections of metal or metal piping, plasterboard, deposits of ashes, blasted sand, etc) that could potentially affect the health of construction staff and future users of the site.

As identified in Section 4.6, it is anticipated that the land remediation works may include the deployment of an on-site laboratory to screen potential fill materials for significant contamination. It is recommended that, where published, the CLEA Generic SGV thresholds for residential land-use without plant uptake be used as on-site contaminant thresholds in the material screening process. However where published generic SGVs do not exist for species such as: copper, zinc, PAH and TPH then it is recommended, to inform the screening process, that a Site Specific CLEA risk assessment model be run to determine Site Specific Action Criteria (SSAC) for these contaminants. Made ground materials with contaminants exceeding these SGVs or SSACs would not be suitable for re-use on the scheme.

It is also recommended that an asbestos watching brief be carried out by a P402 or similar qualified asbestos surveyor to identify asbestos in accordance with the principles set out by British Occupational Hygiene Society, P402: Buildings Surveys and Bulk Sampling for Asbestos (including Risk Assessment and Risk Management Strategies).

Any potentially contaminated materials when identified should be stored separately for characterisation and disposal to a suitably licensed facility under current Landfill Regulations for Gibraltar or elsewhere in Europe under EC Landfill Directive (Council Directive 1999/31/EC).

8.5.2 *Construction Phase: Impact on Groundwater and Sea Water Quality due to Migration of Contaminants from the Rubble Tip*

Further site investigation and risk assessment should be undertaken using methodology such as UK Environment Agency publication, "Remedial Targets Methodology - Hydrogeological Risk Assessment for Land Contamination, 2006" or similar methodologies such as Risk Based Corrective Action (ASTM, Standard Provisional Guide for Risk-Based Corrective Action, 1998) to confirm that mitigation measures are not required.

8.5.3 *Operation Phase: Impacts on Human Health owing to Migration of Gases from the Rubble Tip*

Migration of ground gases requires assessment and the design of suitable mitigation measures using methodology such as CIRIA report C659 – Assessing Risks Posed by Hazardous Ground Gases to Buildings (currently being revised and will be republished as Report C665). It is likely that mitigation measures against migration of gases will be required in the form of passive gas management.

8.5.4 *Operation Phase: Impact on Groundwater and Sea Water Quality due to Migration of Contaminants from the Rubble Tip*

See section 8.5.2 above.

8.5.5 *Operation Phase: Impact on Landscape Planting owing to Exposure to Contaminants*

The potential impact upon landscaping will be mitigated by carrying out construction contaminant screening as prescribed in Section 8.5.1 and incorporating a suitable layer of imported clean capping soil over the rubble tip where planting will occur at ground level. A suitably qualified landscape architect or soil scientist should advise on the thickness of capping required.

8.6 *Residual Impacts*

8.6.1 *Construction Phase*

None have been identified

8.6.2 *Operation Phase*

None have been identified

8.7 *Cumulative Effects*

None have been identified.

8.8 *Transboundary Effects*

Potential transboundary effects include the impact of mobilised contaminated dust and migration of contaminated groundwater as described in sections 8.4.1 and 8.4.2 respectively.

8.9 *Uncertainty*

The initial ground investigations were carried out by Geocisa Geotechnia y Cementios between November and December 2001 and the interpretive report produced by Scott Wilson in 2002, as referenced earlier.

Since the 2001 initial ground investigation, the rubble tip has been built up with significant quantities of material that have been intermittently monitored by the Government, but which have not yet been tested. Uncertainty therefore exists in its content, assumptions about which have been made in Section 8.4.

The Applicant's preferred method of working is to carry out tests in situ during bulk excavation works at the commencement of land remediation and to deal with the materials that are found in accordance with appropriate methods and best practice guidance. Due to this preferred method, the Applicant's decision has been not to undertake further soil testing until the site is in his possession and the tip has closed.

It is considered prudent that further site investigation is undertaken to provide information relating to ground gases, migration of contaminants within groundwater and overall distribution of contaminants within the rubble mound. The following are considered to be necessary and would be carried out, as stated above, during bulk excavation works and in accordance with appropriate methods and best practice guidance:

- Leaching tests of made ground materials (either to BSEN 12457 or using a sea water extract) to include metals and PAHs to a suitable level of detection (salt water EQS is recommended). This is required to better understand the interactions between sea water and the made ground materials in the landfill environment;
- Further gas monitoring to build upon previous monitoring data; and
- Determination of groundwater levels and quality testing with suitable detection limits applicable to EQS.

The following would be carried out, as stated above, as part of the bulk excavation works and in accordance with appropriate methods and best practice guidance:

- Sulphate testing in accordance with Building Research Establishment (BRE) Special Digest 1 of the made ground materials to determine the sulphate class required for in-situ cement and concrete.
- Further made ground testing of metals, PAH, and TPH;
- Further asbestos screening of both made ground materials and samples of any suspected asbestos containing materials.

Once these supplementary ground investigations are completed the contaminant data could be combined with those from 2002 to produce a formal contaminated land risk assessment if required. This would provide a more accurate characterisation of contamination within the made ground materials and determine the risk from re-using materials on site.

8.10 *Summary*

No geotechnical or geo-environmental surveys were undertaken specifically to inform the soil quality aspects of the EIA process for Eastside. Instead, the EIA process has used the survey data derived from previous studies.

It is important to note that since the 2001 ground investigation, the rubble tip has been built up with significant quantities of material that has not yet been tested and therefore a measure of uncertainty exists in its content; however, GoG has confirmed that this is not a registered contaminated site and has only been allowed to receive inert building material and rubble.

In general the degree of the contamination in the pre-2001 made ground is relatively low which reflects the mainly inert material that has been placed at the site. However several areas of the site have significantly elevated levels of metals and several trial pits had elevated concentrations of hydrocarbons.

Water from boreholes and surface water contained ammonia and TOC at levels slightly elevated above normal background levels, indicating that there may be small amounts of organic and decaying matter within the made ground.

Groundwater tests indicated that copper, zinc and ammoniacal nitrogen are present in concentrations exceeding the EQS for salt water as applied under the EU Dangerous Substances Directive. Low concentrations of contaminants were detected in sea water. Irrespective of the degree of contamination in groundwater migrating from the rubble tip, the low concentrations may be due to the high dilution factors that occur once the groundwater migrates from the rubble tip and mixes with the large seawater mass. Furthermore, while contaminants migrating from the rubble tip may be causing pollution of the seawater, construction works for Eastside is not likely to materially worsen the existing situation.

The risk from migration of contaminants within groundwater towards seawaters or off site requires further assessment to support a definitive opinion on the need for mitigation measures. However, the data presented in the original ground investigation report suggests that mitigation measures against groundwater migration are unlikely, especially given the proposal for the construction of a revetment backfilled with clean fill.

The predominate impacts associated with the development relate to the risk posed to construction workers through dermal contact with and/or ingestion of arsenic, lead, nickel, PAH, copper, zinc and asbestos in the deposited materials and to copper, zinc and ammoniacal nitrogen in the groundwater. The provision of PPE and suitable site working practices are considered to mitigate this risk during construction.

The potential risk to site visitors and residents during the operation phase from residual contamination will be sufficiently mitigated by the deployment of an on-site laboratory during the construction phase to screen re-use materials for significant contamination. Employing a clean capping layer will also isolate any residual contamination left after construction from future site users.

The original ground investigation provides insufficient information to fully assess and quantify the risk of migration of ground gases (landfill gases and volatile components of hydrocarbons), both to buildings onsite and offsite, and to therefore effectively design mitigation measures. However, based on the information available it is unlikely that this pathway will have material impact though the impacts should be considered further.

The potential impact upon landscaping from the presence of contamination will be mitigated by carrying out construction contaminant screening and incorporating a suitable layer of imported clean capping soil over the rubble tip where planting will occur at ground level.

It is considered prudent that further site investigation is undertaken to provide information relating to ground gases, migration of contaminants within groundwater and overall distribution of contaminants within the rubble mound. Such site investigations would serve to increase confidence in the understanding and management of any risks

All residual impacts after implemented mitigation are considered to be negligible.