ENVIRONMENTAL STATEMENT
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A13.1 GEOLOGY, CONTAMINATED LAND AND HYDROGEOLOGY – DETAILED ASSESSMENT

13.1 INTRODUCTION

This Appendix of the ES reviews the ground and groundwater conditions associated with the proposed scheme and, in particular, addresses the impact of the proposals on the existing geological and hydrogeological conditions, including sites of scientific interest or where ecological habitat is related to geology and/or groundwater. It also describes any impacts of the existing ground and groundwater conditions on the proposed scheme. Emphasis is placed on the impact of any areas of potentially contaminated ground on the scheme together with the effects that the scheme construction and operation would have on the presence and movement of any contaminants.

The impact of the ground conditions in the area of the existing fuel storage sites at Rupert's Bay and Rupert's Valley specifically has been addressed as it is considered that the potential for existing ground contamination is restricted to these areas. The bulk fuel storage areas are the only areas impacted by the scheme where there is a potential for ground contamination due to the history of potentially contaminative uses. The remainder of the area impacted by the new access road and the airport is located on land which previously has not been developed and hence has no potential for contamination.

The assessment has been carried out to inform the EIA of the proposed air access project. The project includes a proposed new wharf at Rupert's Bay and a new bulk fuel installation close to the power station in Rupert's Valley. The existing fuel storage tanks will be demolished and removed. A new access road to the proposed airport site will cross part of the existing fuel storage facility.

13.2 METHODOLOGY AND ASSESSMENT CRITERIA

13.2.1 Methodology

For the purpose of this assessment, it has been assumed that the principal receptors at risk from the development of the scheme would be human beings (site construction workers and end-users of the airport) in respect of potential ground contamination and controlled waters (groundwater and surface water) in respect of existing contamination and scheme construction and operations. An assessment of the potential impacts on surface water is considered in Chapter 14, Volume 2 and Appendix 15 of Volume 4 of the ES.

To assess the potential environmental impacts associated with the proposed St Helena access scheme in respect of ground contamination, a risk assessment has been undertaken using the source-pathway-receptor approach, promoted by the United Kingdom (UK) Department for Environment Food and Rural Affairs (DEFRA) and the UK Environment Agency (EA). For there to be an identifiable risk, not only must there be contaminants present on the site (source) i.e. contaminated ground, there must also be a receptor and a pathway which allows the source to impact on the receptor. All three elements must be present to form a pollutant linkage before there can be a potential risk to specific receptors. In accordance with standard practice, a conceptual model of the potential or actual pollutant linkages was developed for the proposed scheme, to evaluate the likely impacts.

To assess the potential impacts of the proposed scheme on groundwater and contaminated land, a desk study was carried out to characterise the geology and hydrogeology of the scheme area and to identify areas of contaminated land on and in the vicinity of the proposed scheme. The airport and the sites of associated development were visited and discussions were held with representatives of St Helena Government (SHG).

Based on the results of the walkover survey and desk study, an assessment was made of the likely presence of areas of contaminated ground. From the assessment, it was concluded that there was potential for ground contamination only associated with the area of existing bulk fuel storage in Rupert's Bay. It was concluded that the route of the access road and the airport site were undeveloped areas with no history of any potentially contaminative uses.

To investigate the ground conditions in the bulk fuel storage area, a ground investigation was undertaken in November 2006. The investigation involved the excavation of four trial pits and the collection of soil samples for subsequent laboratory analysis.

13.2.2 Assessment Criteria

Where available, Soil Guidelines Values (SGVs) published by DEFRA and the UK Environment Agency based on the Contaminated Land Exposure Assessment (CLEA) methodology, were used to indicate the potential chronic risks to human health presented by individual contaminants. As it is proposed to redevelop the site for a wharf facility, bulk fuel installation and an access road, the recorded concentrations of contaminants have been compared against the SGVs derived for a commercial land end-use, as this represents the most appropriate model for the CLEA assessment.

In the absence of an SGV for the majority of potential contaminants of concern, a detailed quantitative risk assessment has been undertaken to derive generic screening values for the majority of the remaining contaminants. These values have been derived using the SNIFFER methodology, amended to reflect "The Contaminated Land Exposure Assessment (CLEA) Model, CLR10" published by DEFRA and the Environment Agency together with the subsequent CLEA briefing notes.

The current SNIFFER methodology and CLEA model (CLR10) only assess the chronic risks to human health. Substances such as cyanide may also pose an acute risk to human health. Therefore, the Dutch Intervention Value (DIV) for free cyanide has been used as an initial screen for assessing total cyanide concentrations. The DIV are scientifically derived generic assessment criteria but are not authoritative to the UK. They are designed to be protective of human health and ecological systems for all land-uses. The UK Ministry of Agriculture, Fisheries and Food (MAFF), Maximum Permissible Concentrations of Potentially Toxic Elements (PTEs) have been used to assess risks associated with copper and zinc, as these contaminants may be phytotoxic but do not pose a risk to human health unless present in very high concentrations.

To assess the potential risks presented by any soluble contaminants in the made ground, the recorded leachable soil concentrations have been assessed in accordance with the Environment Agency “Technical Advice to third parties on Pollution of Controlled Waters for Part IIA of the Environmental Protection Act 1990, V.2”. As the island is surrounded by saltwater and very limited quantities of groundwater are abstracted for potable water supply, both Environmental Quality Standards (EQS) for saltwater and UK Drinking Water Standards (DWS) have been used to assess the significance of the leachable soil concentrations. The EQS are listed under the Surface Waters (Dangerous Substances) (Classification) Regulations (1989, 1997, and 1998) and the UK Drinking Water Standards are derived from (Water Supply (Water Quality) Regulations 1989 and 2000). For some substances, the EQS may be more stringent, while for other substances, the DWS is more stringent. The more stringent of the EQS and DWS for each substance has been used for comparative purposes.

The assessment methodology used in determining the significance of impacts to groundwater resources during the construction and operation of the scheme is based on an assessment of the importance of the attributes and the magnitude of the potential impact to produce a qualitative assessment of the degree of impact (Table 13.1).

Table 13.1 Assessment of Development on Groundwater

<table>
<tr><th colspan="5">IMPORTANCE OF FEATURE</th></tr>
<tr><td rowspan="2">Scale</td><td colspan="4">Quality and rarity</td></tr>
<tr><td>High</td><td colspan="2">Medium</td><td>Low</td></tr>
<tr><td>Regional/national</td><td>VERY HIGH</td><td colspan="2">HIGH</td><td>MEDIUM</td></tr>
<tr><td>Local</td><td>HIGH</td><td colspan="2">MEDIUM</td><td>LOW</td></tr>
<tr><td colspan="5">Assumes all of limited substitutability and that quality and rarity of same grading</td></tr>
<tr><td colspan="5">Quality: High (e.g. important aquifer, potable public supply, high quality watercourse and fishery supported by groundwater discharge)

Medium (e.g. private potable water supply, good/medium quality watercourse and fishery supported by groundwater discharge)

Low (agricultural/industrial water supply, floodplain with limited development)</td></tr>
<tr><td colspan="5">Rarity (relative to scale of attribute): High (scarce), Medium or Low (commonplace)</td></tr>
<tr><td colspan="5">Scale: National, Regional or Local</td></tr>
<tr><th colspan="5">ASSESSMENT OF IMPACT</th></tr>
<tr><td rowspan="2">Magnitude</td><td colspan="4">Importance (from above)</td></tr>
<tr><td>Very high</td><td>High</td><td>Medium</td><td>Low</td></tr>
<tr><td>Major</td><td>VERY SIGNIFICANT</td><td>HIGHLY SIGNIFICANT</td><td>SIGNIFICANT</td><td>LOW SIGNIFICANCE</td></tr>
<tr><td>Moderate</td><td>HIGHLY SIGNIFICANT</td><td>SIGNIFICANT</td><td>LOW SIGNIFICANCE</td><td>INSIGNIFICANT</td></tr>
<tr><td>Minor</td><td>SIGNIFICANT</td><td>LOW SIGNIFICANCE</td><td>INSIGNIFICANT</td><td>INSIGNIFICANT</td></tr>
<tr><td>Negligible</td><td>LOW SIGNIFICANCE</td><td>INSIGNIFICANT</td><td>INSIGNIFICANT</td><td>INSIGNIFICANT</td></tr>
<tr><td colspan="5">Magnitude of effect:

Major: (loss of attribute e.g. high quality fishery, potable water supply borehole, contamination of groundwater, river grade reduction due to major reduction in groundwater discharge or deterioration in groundwater quality),

Moderate: (loss of part/reduction in integrity e.g. loss of fishery production, increase in effluent but no change in river grade; reduction in quality and/or quantity of baseflow discharge; contamination of groundwater in aquifer but no significant impact on water supplies).

Minor: (minor impact e.g. measurable change but limited in size/proportion)

Negligible: (impact but use/integrity unaffected e.g. reduction in discharges but no loss in quality, no increase in flood risk)</td></tr>
</table>

13.3 EXISTING CONDITIONS

13.3.1 Geology

Information on the geology of the island and, in particular Prosperous Bay Plain (PBP), the site of the proposed airport, has been taken from:

- A Guide to the Geology of Ascension Island and St Helena. B Weaver. University of Oklahoma, 1990.
- P and M Ashmole report, entitled 'The Invertebrates of Prosperous Bay Plain, St Helena', dated December 2004.

The island of St Helena is composed entirely of volcanic rocks derived from former volcanoes associated with the mid-Atlantic ridge, which is now located approximately 960 kilometre (km) west of the island.

St Helena has been the subject of two major volcanic events. The earlier phase was concentrated on the North Eastern Volcanic Centre, centred on the Flagstaff Hill – Knotty Ridge area in the north east of the island. Rocks associated with this phase of volcanic activity consist of submarine volcanic breccias and sub-aerial basaltic lava flows. The breccias form the lower part of the sequence and comprise approximately 400 metres (m) of highly altered and soft breccias of basalt and trachyte boulders in a fine-grained matrix. The lavas comprise up to 800 m of basalt flows, each flow typically 1 m to 3 m thick, which overlie the volcanic breccias. Rocks from the North Eastern Volcanic Centre outcrop across the northern part of the island and are exposed on the cliffs below PBP.

Rocks associated with the South Western Volcanic Centre cover the majority of the island. It is inferred that this area of volcanic activity was much more extensive than the North Eastern Volcanic Centre. The rocks associated with this phase of volcanic activity comprise approximately 1500 m of mainly basaltic lavas. The lavas have been divided into three intrusive phases – the Lower, Main and Upper Shield. In the PBP area lavas of the Upper and Main Shield phases overlie the basalt lavas of the North Eastern Volcanic Centre. Figure 1 shows the geology of the island.

The other elements of the scheme, including the access road, the new bulk fuel storage area and the proposed quarry in Rupert's Valley are underlain mainly by lava flows from the North Eastern Volcanic Centre.

The breccia and the basalt lavas have been intruded by a series of trachyte dykes, up to 20 m thick, which both pre-date and post-date the South Western Volcanic Centre activity.

In the PBP area, the bedrock has been weathered to form very friable, unconsolidated grit and dust, which in places is more than one metre thick. The volcanic breccia is much less resistant to erosion than the basaltic lavas and is exposed in the steep gullies which cut the PBP to the north and east. The later intrusive dykes are most resistant to weathering and form points of high relief.

PBP is designated as a National Protected Area under the St Helena Land Development Control Plan for its geological and ecological conditions. The surface layer of the Central Basin area within PBP is dominated by the weathered zone of dust and grit. This provides conditions conducive to endemic species of burrowing spiders and other ecologically important fauna. Under the terms of the designation, the area must be protected for the endemic and indigenous fauna and flora. The Central Basin area has the greatest need for protection. Impacts on PBP relating to terrestrial ecology are presented in detail in Chapter 9.

13.3.2 Hydrogeology and Water Supply

An interpretation of the hydrogeology of the scheme is taken from:

- W S Atkins report, entitled 'Department for International Development (DFID) – St Helena Access and Development. Study on alternatives for provision of raw water'. March 2006;
- W S Atkins draft report, entitled 'Report on Sharks Valley Water Resources and Quality' December 2006;
- W S Atkins draft report, entitled 'Review of demand for and supply of water for airport construction purposes' April 2007;
- Toens & Partners report 200241, entitled 'An assessment of the groundwater resources of St Helena Island' December 2000; and
- St Helena Water Plan 1990-2010. October 1990.

It is considered likely that the volcanic rocks of St Helena have a very low intergranular permeability but a low to moderate secondary permeability imparted by the presence of joints and fractures within the basalts and by thin weathered horizons on the surface of individual lava flows. It is likely that groundwater flow is almost exclusively through the fissures and fractures, resulting in rapid groundwater and potentially contaminant movement. However, groundwater storage within the aquifer is low.

There is limited information on the potential for groundwater development on the island. The majority of the existing water supply sources are from surface water reservoirs. Groundwater development either through the utilisation of permanent springs or through boreholes is limited and makes up only approximately 3% (1990) of the water use on the island. Due to the absence of any major developments in the PBP area, very little information is available in respect of the hydrogeology and the potential for groundwater development in this area.

In other parts of the island where borehole supplies have been developed, typical maximum borehole yields are in the order of 2.5 Litres per second (litres/sec) (approximately 200 Cubic metres per day (m^3/day)). Several springs have been exploited for public water supply, providing much higher yields.

Two boreholes have been drilled recently in the PBP area and these provide information on likely borehole yields. A borehole drilled at Willowbank to supplement the Longwood supply system is reported to have given a yield of approximately 100 m^3/day. A second borehole drilled in 2006 at Pinks Grove in Sharks Valley, as a potential water supply source for the airport, provided a yield of approximately 80 m^3/day. It is considered likely that such modest yields are typical for the volcanic rocks in the area.

The quality of the groundwater in the volcanic rocks is generally satisfactory, apart from elevated concentrations of iron and manganese. The results of the analysis of samples taken in March 2000 and reported in the Toens & Partners report show that iron levels frequently exceed the UK Drinking Water Standards, the standards used on St Helena, with concentrations of up to 7.8 milligrams per litre (mg/l), compared with the guidance value of 0.2 mg/l. Manganese levels of up to 0.3 mg/l were recorded compared with the guidance value of 0.05 mg/l.

Locally brackish waters have been recorded with high electrical conductivity and elevated concentrations of chloride and sodium. The highest levels were recorded for the samples from and below Hancock's Hole spring in Sharks Valley. These samples recorded chloride levels up to 312 mg/l, sodium 106 mg/l and an electrical conductivity of 1040 µS/cm. Field monitoring of the flow in, and quality of, Hancock's Hole spring and of the watercourse downstream of the spring has been carried out in December 2006, July 2007 and September 2007. It is proposed that the watercourse downstream of the spring is utilised as a source of potable water for the airport operations (Appendix 13). The typical electrical conductivity recorded during the monitoring was in the range 1200 µS/cm to 1400 µS/cm.

The water supply network for the island has been developed on the basis of 14 water distribution zones. The proposed airport development falls within the Hutt's Gate distribution zone. For the majority of the zones, available water resources are adequate to meet the demand. However, in the Hutt's Gate distribution zone, there are currently shortfalls in supply particularly during drought periods. The Hutt's Gate supply zone is fed by a combination of springs, the Willowbank borehole and from Grapevine Gut, with a total dry monthly supply of approximately 6,800 cubic metres (m^3). For the 2015 forecast a significant shortfall is predicted. The dry monthly supply of 6,800 m^3 compares with a forecasted peak monthly demand of 11,500 m^3, giving a maximum monthly shortfall in supply of approximately 4,700 m^3. Between January 2006 and June 2007 there was a deficit in the Hutt's Gate distribution zone of approximately 14,000 m^3.

Several options were considered to increase the available resources in the Hutt's Gate distribution zone. These comprise:

- Abstraction from the Hancock's Hole spring;
- Development of the new borehole supply at Pinks Grove; and
- Water transfer from Levelwood Reservoirs

Due to the scarcity of reliable water supplies on the island but with the recognition that groundwater abstractions are of only very local importance, it is considered that groundwater is an attribute of **high** importance, based on criteria in Table 13.1.

13.3.3 Contaminated Land

It is understood that the airport location on PBP is a previously undeveloped area and hence issues in respect of the presence of contaminated land on the airport development site are not anticipated. However, waste materials which have been fly tipped are evident in some areas of the plain. This issue is addressed in the Waste Management - Chapter 16 of the ES.

The proposed access route principally crosses previously undeveloped areas. The main access for this route is through Rupert's Bay, which contains the existing main bulk fuel storage facility for the island. The access road will cross part of the fuel storage area and it is proposed that the existing bulk fuel storage is relocated close to the power station in Rupert's Valley. Bulk fuel storage presents a risk of ground and groundwater contamination associated with the spillage and leakage of hydrocarbons. The construction of the new haul route and works associated with the decommissioning and removal of the existing bulk fuel storage area and the construction of the new bulk fuel storage facility may impact on areas of contaminated ground and groundwater.

From the desk study of the proposed scheme, it was considered that the existing bulk fuel storage area was the only part of the scheme subject to potentially contaminative use and where there was potential for contaminated ground.

A ground investigation of the bulk fuel storage area was arranged and carried out by Atkins on 23rd November 2006. The investigation comprised the collection of 10 soil and leachate samples taken from trial pits excavated at three locations immediately adjacent to the existing bulk fuel storage compounds at Rupert's Bay and Rupert's Valley, and from one trial pit excavated at the location of the proposed bulk fuel storage compound (Figure 2). The samples were stored in suitable containers and sent to an United Kingdom Accreditation Service (UKAS)/ MCERTS accredited laboratory (Alcontrol Geochem, Chester, UK) for chemical testing.

Potential contaminants had been identified that may be present on site, typically associated with the historical use of the area for fuel storage. A total of seven soil samples were analysed for the suites of determinands listed in Table 13.1. Four samples were submitted for leachate testing using the NRA R&D 301 approach and the eluate was analysed for the suite of determinands in Table 13.2. The laboratory data sheets are provided at Table B1 at the end of this Appendix.

Table 13.2 : Analytical testing suite

Arsenic, born, cadmium, chromium, copper, lead, mercury, nickel, selenium, zinc, vanadium, total phenols, sulphide, total cyanide, PCBs (7 congeners), total petroleum hydrocarbons, speciated in accordance with the TPHCWG, PAH (16), volatile organic compounds, pH and asbestos (soils only)

The soil samples did not record any determinands present at concentrations above the human health assessment criteria (see Table A1 at the end of this Appendix). The most likely soil contaminants, if there was ground contamination, were anticipated to be hydrocarbons, associated with the fuel storage. The total petroleum hydrocarbon (TPH) concentration, in the range C_5-C_{35}, varied between 9.3 milligrams per kilogram (mg/kg) in trial pit TP/R4 at 0.30 m depth, located within the existing bulk fuel storage area, and a maximum 47.0 mg/kg in trial pit TP/R1 located at Rupert's Bay. The maximum TPH level is below the Dutch guidance value of 50mg/kg, which is considered consistent with uncontaminated soils.

None of the soil samples tested recorded benzene, toluene, ethylbenzene or xylene (BTEX) or Methyl tertiary-butyl ether (MTBE), substances characteristic of fuels, above the limit of detection of 10 microgram per kilogram (µg/kg). Total polycyclic aromatic hydrocarbons (PAH16) were recorded at concentrations between 0.82 mg/kg and 19.9 mg/kg, with the maximum level again recorded in trial pit TP/R1.

The majority of samples did not record soluble contaminants at concentrations above the controlled waters assessment criteria (see Table A2 at the end of this Appendix). However, as shown in Table 13.3 copper was recorded at elevated concentrations in the eluate from all four samples tested.

Table 13.3 Summary of elevated leachable concentrations

Elevated Determinand	Sample Identity	Concentration (microgram per litre (µg/l))	Assessment Criteria (µg/l)
Copper (Dissolved)	TP/R1	13.0	5.0
	TP/R2	10.0	5.0
	TP/R4	79.0	5.0
	TP/R5	35.0	5.0

Elevated concentrations of copper above the EQS for saltwater (5 µg/l) were recorded in all the leachate samples. The report by Toens and Partners of December 2000, includes test results for copper for groundwater and surface water samples. However, the detection limit is 0.05 mg/l (50 µg/l) ten times the EQS value. Of the 30 test results, three exceed the detection limit. In the absence of an obvious source of the copper at the sites, it is considered likely that copper may occur naturally in the local geology. Therefore the elevated levels of copper are considered to be background levels that are unlikely to pose a significant risk to controlled water receptors.

None of the leachate samples recorded concentrations of copper above the UK Drinking Water Standard of 2,000 µg/l. Therefore copper is considered not to pose a risk to human health.

13.3.4 Summary

Soil samples have been recovered and tested for potential contaminants as part of a preliminary investigation of the ground conditions at the existing and proposed bulk fuel storage compounds at locations at Rupert's Bay and in Rupert's Valley. The chemical testing results have been compared against generic assessment criteria to determine if they pose a risk to current and future human health, controlled waters and ecological receptors.

None of the soils contained potential contaminants at concentrations above the human health assessment criteria. Hydrocarbons were reported at very low concentrations. Therefore, it is considered that the soils do not pose a risk to human receptors. The phytotoxic compounds copper and zinc were also present at levels significantly below the guidance limits and hence do not pose an ecological risk.

The majority of the soluble determinands did not exceed controlled water assessment criteria, with the exception of copper which was elevated above the EQS for saltwater. It is likely that copper occurs naturally in the local geology and that elevated levels of copper are considered to be background levels that are unlikely to pose a significant risk to controlled water receptors. Therefore, it is considered that the soils, which may be disturbed by the construction of the access road across the fuel storage area, do not pose a significant risk to controlled water receptors. None of the leachate samples recorded copper concentrations above the UK Drinking Water Standard.

13.4 CONSTRUCTION IMPACTS

13.4.1 Geology

The construction of the airport runway and the access road will necessitate the excavation and movement of a substantial volume of materials. However, it is considered unlikely that the materials to be moved have any significant importance in respect of their geological characteristics or that the geological conditions are unique to the footprint of the access road and the proposed quarry in Rupert's Valley.

Accordingly, it is considered that the construction works will not result in any adverse impacts on the geological conditions along the route of the access road. As it is likely that similar geological conditions extend over a wide area of this part of the island, the disturbance caused by the construction works will have no significant impacts on the geological features in these areas.

Construction of the runway on PBP necessitates the excavation of materials from a ridge on the eastern edge of the Central Basin, along the footprint of the proposed runway. The ridge will be reduced in height by up to 25 m, principally as a source of material for infilling Dry Gut. There are no proposals to remove any of the surface layer of the ecologically-important dust and grit from the Central Basin. However, the lowering of the ridge may expose the unconsolidated weathered materials to enhanced wind erosion which could adversely impact on the local ecological conditions. The significant of this potential impact is addressed in the terrestrial ecology section (Chapter 9).

As there will be no excavations in the ecologically-sensitive area of unconsolidated weathered materials, it is considered that the airport construction will not impact directly on the sensitive geological area of the Central Basin. Mitigation measures to address the increased risk of wind erosion of the weathered materials and the ecological impacts are discussed in Chapter 9.

13.4.2 Hydrogeology and Water Supply

The principal hydrogeological impact associated with the construction of the airport is related to the provision of a water supply for the construction works and for the operation of the airport.

The airport development is within the Hutt's Gate distribution zone, which currently suffers from shortfalls in supply. The average demand from the Hutt's Gate system in 2005 was approximately 164 m^3/day, which is predicted to increase to approximately 210 m^3/day in 2015. It is estimated that during the operation of the airport, an additional water supply for potable use of 6 m^3/day will be required. In addition, water will be required for fire fighting and training, which could create an additional intermittent requirement of up to 90 m^3. (W S Atkins report March 2006)

An earlier proposal was to develop a new borehole to provide potable water to the airport and as a supply for fire fighting and training. However, following subsequent appraisals of the available water supplies in the area, it is now proposed that the permanent water supply to the airport will be obtained from an impoundment on the stream in Sharks Valley downstream of Hancock's Hole spring. An assessment of the impact of the proposed abstraction in Sharks Valley is presented in Appendix 15.

In addition, it is estimated that during the construction period there will be a greater water requirement. Good quality water will be required for the potable supply and for concrete batching, with poorer quality water being acceptable for the earthworks and for dust suppression, etc. It is estimated that the peak demand may reach 80 m^3/day for potable water and up to 562 m^3/day for poorer quality water. (W S Atkins report April 2007)

Several potential sources have been considered to meet the demand for water during the construction period. These are identified and the potential impacts of their use discussed in Appendix 15.

As there is no longer any proposal to utilise groundwater as a temporary water supply source for the construction phase of the scheme or as a permanent potable supply to the airport, it is concluded based on the impact assessment criteria in Table 13.1 that the airport construction and operation will have an insignificant impact on groundwater.

13.4.3 Contaminated Land

As it is considered that the PBP area has not been previously developed, it is concluded that impacts in respect of contaminated ground will not arise during the airport construction phase. Measures to minimise contamination during the construction phase from activities such as fuel and chemical storage and wastes management have been included in the Environmental Management Plan (EMP).

The construction of the access road will impact on the existing bulk fuel storage facility at Rupert's Bay. There is a possibility that the works would disturb areas of contaminated ground, which may be affected by the construction. Based on the results of the ground contamination investigation carried out at the bulk fuel storage facility, there is no evidence of contaminated ground and hence it is considered unlikely that construction of the access road and relocation of the bulk fuel storage area into Rupert's Valley will pose a risk to either human health or to groundwater and surface water quality. However, the presence of localised areas of contaminated ground cannot be discounted. Measures will be included in the EMP for the management of any areas of contaminated ground identified during the access road and airport construction.

13.4.4 Possible Mitigation

13.4.4.1 Geology

In the absence of any predicted adverse impacts on the geological conditions from the construction of the airport and associated works, it is considered that no mitigation measures are required. Mitigation measures to address the increased risk of wind erosion of the weathered, unconsolidated surface materials, which could impact on the local ecology, as a result of the removal of the eastern ridge, are discussed in Chapter 7 and Chapter 9.

13.4.4.2 Hydrogeology and Water Supply

A shortfall in the available water resources in the Hutt's Gate distribution zone has been identified both in the long-term and during the construction period of the scheme. Whilst the predicted requirement for water at the operational airport is small (6 m^3/day), there are significantly higher water requirements during the construction phase. The estimated peak water demand during construction could reach 80 m^3/day for good quality water and 562 m^3/day for poorer quality water. These demands are significantly in excess of the currently available water resources in the area.

There is no proposal to utilise groundwater either as a permanent source of potable water for the airport or as a temporary supply during the construction works. Accordingly, it is concluded that there would be no impacts on the hydrogeological conditions during the construction phase of the scheme and hence that no mitigation measures would be required. To minimise any impacts on groundwater quality, it would be necessary to ensure that appropriate measures are implemented to minimise contamination of groundwater during construction from spillages and leakages of fuels and chemical used in the construction phase. This will be ensured by adoption of best practice for materials storage and handling.

13.4.4.3 Contaminated Land

Other than the area of the existing bulk fuel storage in Rupert's Valley, there is no evidence that any other area of the scheme has the potential for contamination to be present. An investigation of the existing bulk fuel storage facility was carried out. No areas of contaminated ground were identified and it is considered unlikely that there are extensive areas of contaminated ground at the existing fuel storage facility.

In the absence of any ground contamination, it is concluded that no mitigation measures will be necessary. However, the ground investigation could only assess a limited part of the fuel storage area and hence there is a potential that localised areas of contaminated ground may be disturbed during the construction of the access road. Contingency measures will be included within the EMP to deal with any areas of contaminated ground in the unlikely event that these areas are disturbed during the construction of the scheme.

13.5 OPERATIONAL EFFECTS

13.5.1 Geology

Following the construction of the access road and the airport, in particular the runway, both of which involve the excavation and movement of substantial volumes of rock, the operation of the airport would have no impacts on the geological conditions as there will be no further disturbance of the ground, in particular the ecologically-sensitive, unconsolidated materials in the Central Basin during the operational phase.

13.5.2 Hydrogeology and Water Supply

The operation of the airport would have no significant impacts on the hydrogeological conditions. Locally the airport operations have the potential to impact on groundwater quality and recharge to the basalt aquifer.

The storage of aviation and other fuels at the airport and the new bulk fuel storage area in Rupert's Valley are potential sources of groundwater contamination. In addition, fire training exercises on the fire training ground (FTG) at the airport involving the use of fire fighting foam present a risk to groundwater quality. The fuel storage facilities and the FTG will be designed in accordance with current UK EA guidelines to minimise risks to both groundwater and surface water quality. All drainage from the fuel storage areas and hardstanding areas will pass through oil interceptors to prevent the off-site movement of hydrocarbons. Drainage from the FTG, containing foam will be directed to a sealed chamber to prevent foam contamination of surface watercourses.

The airport runway and the apron area will have a low permeability cover, which will reduce infiltration to the aquifer and encourage surface water runoff. Runoff from the runway and from the apron area will pass to stormwater attenuation ponds via oil interceptors. The attenuation ponds will outfall to new ditches which will convey the water to Fisher's Valley and Dry Gut. Infiltration through the drainage ditches will provide recharge to the aquifer and it is concluded that the construction of areas with a low surface permeability will not cause a significant reduction in groundwater recharge and hence no major change to groundwater resources.

13.5.3 Contaminated Land

The operation of the airport will not result in contaminated land provided that any sources of potential contaminants, principally hydrocarbons, are managed in accordance with appropriate guidance to minimise the potential for spillages and leakages. In this event it is considered that there would be no impacts in respect of contaminated land associated with the operation of the airport.

13.5.4 Mitigation

It is concluded that no measures would be needed to mitigate against impacts in respect of geology, hydrogeology and contaminated land associated with the operation of the airport. Any potential impacts, particularly on groundwater, would be minimised through compliance with standard guidance procedures on fuel storage and dispensing and by the appropriate management of effluent from fire training exercises.

13.6 CONCLUSIONS

Based on the results of the assessments of the potential impacts on geology, hydrogeology and contaminated land, the following conclusions can be drawn:-

- The island of St Helena is composed of volcanic rocks with thin soils derived from the weathering of these rocks.
- The volcanic rocks comprise principally basalt lavas and volcanic breccias.
- PBP is designated as a National Protected Area on geological and ecological grounds, principally due to the development of a surface layer of unconsolidated weathered deposits of dust and grit.
- Groundwater has not been exploited for any significant use on the island. Borehole yields are typically low.
- Apart from the area of the existing bulk fuel storage in Rupert's Valley on the route of the proposed access road, it is concluded that no part of the scheme would be located on land which has been the subject of potentially contaminative use.
- A ground investigation of the existing bulk fuel storage area showed no evidence of any significant contamination. No elevated hydrocarbon concentrations were recorded.
- Based on the findings of the desk study of the scheme and the intrusive investigation, it is concluded that there is no evidence of ground contamination which would be affected by the proposal.
- There are no geologically important or unique features along the route of the access road or at the proposed quarry. Accordingly, it is concluded that the construction and operation of these parts of the scheme will have no substantial or adverse impacts on the geological environment.
- The geological conditions in the Central Basin area of PBP support a sensitive ecological environment in areas of deep weathered materials. Whilst it is concluded that the construction of the airport will not directly affect the sensitive geological conditions, there is potential for increased wind erosion as a result of the removal of a ridge along the eastern side of the Central Basin, these are considered in more detail in Chapter 9 in Volume 2 of the ES.
- The current proposals for the provision of potable water for the airport and for temporary supplies during the construction works exclude the use of groundwater. Accordingly, it is concluded that the scheme would have no impact on groundwater resources.
- The operation of the airport will not result in ground contamination provided that standard procedures are adopted for the storage and use of fuels and chemicals.
- The storage of fuels at the airport and the new bulk fuel storage facility are potential sources of groundwater contamination. The use of fire fighting foam in fire training exercises also presents a risk to groundwater quality. Provided that fuel storage and effluent disposal from the FTG are carried out in accordance with current guidance, it is concluded that the operation of the airport will have no adverse impacts on groundwater quality.
- In summary, it is concluded that no measures would be needed to mitigate against impacts in respect of geology, hydrogeology or contaminated land associated with the construction and operation of the scheme.

Figures

Figure 1: A generalised geological map of St Helena (adapted from Baker 1968)

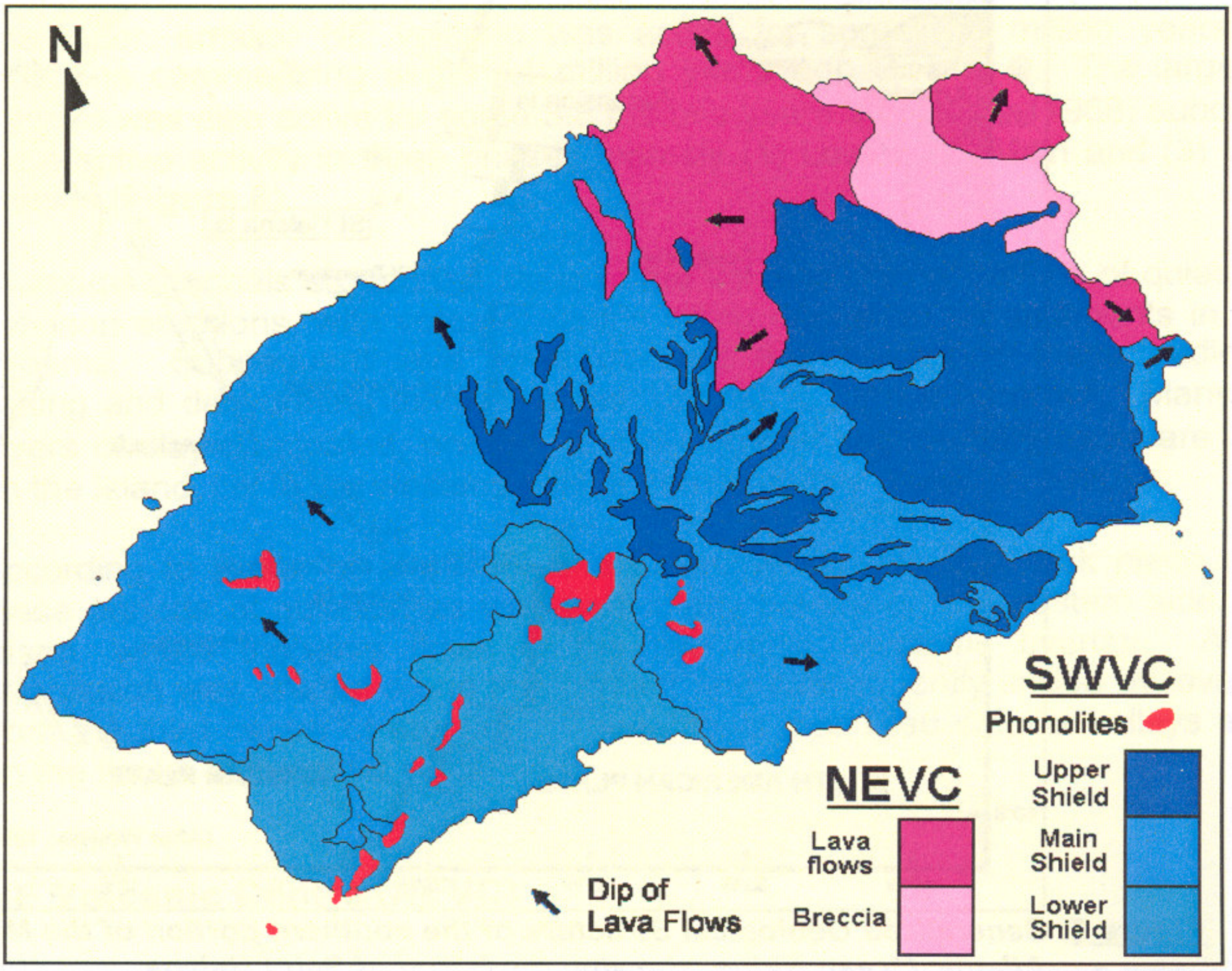
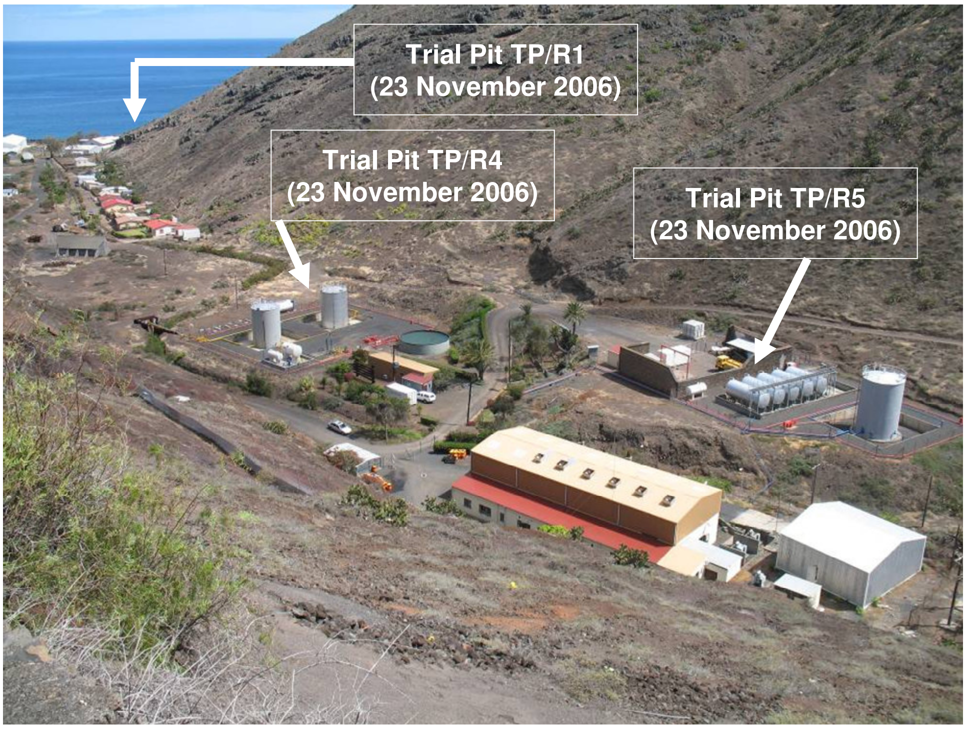


Figure 2: Trial Pit Locations



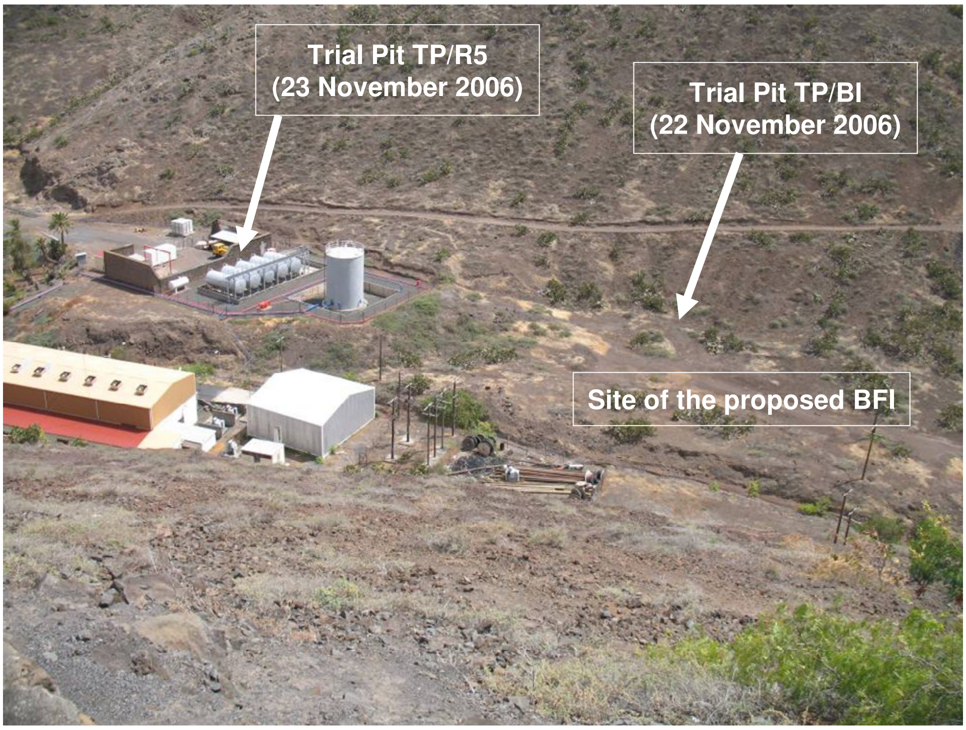


Table A.1: Human Health Assessment Criteria

Total Soils Analytical Suite	Assessment Criteria (mg/kg)	Source
Arsenic	500	1
Cadmium	1400	1
Chromium	5000	1
Copper	80-200*	3
Lead	750	1
Mercury	480	1
Nickel	5000	1
Selenium	8000	1
Zinc	200-300*	3
Phenol (Total)	21900	1
Cyanide (total)	50	4
PCBs (7 Congeners)	1	4
TPH Aliphatic >C05-C06	162	2
TPH Aliphatic >C06-C08	320	2
TPH Aliphatic >C08-C10	66	2
TPH Aliphatic >C10-C12	324	2
TPH Aliphatic >C12-C16	1404	2
TPH Aliphatic >C16-C21	449669	2
TPH Aliphatic >C21-C35	449669	2
TPH Aromatic >C05-C07	27	2
TPH Aromatic >C07-C08	63	2
TPH Aromatic >C08-C10	103	2
TPH Aromatic >C10-C12	537	2
TPH Aromatic >C12-C16	2209	2
TPH Aromatic >C16-C21	6744	2
TPH Aromatic >C21-C35	6744	2
Benzene	2.1	2
Toluene	150	1
Ethyl benzene	48000	1
Xylene	279	2
Naphthalene	167	2
Acenaphthylene	1684	2
Acenaphthene	27803	2
Fluorene	30525	2
Phenanthrene	30144	2
Anthracene	303445	2
Fluoranthene	44948	2
Pyrene	33718	2
Benzo(a)anthracene	225	2
Chrysene	22491	2
Benzo(b)fluoranthene	225	2
Benzon(k)fluoranthene	2249	2
Benzo9a)pyrene	22	2
Indeno(123cd)pyrene	225	2
Dibenzo(ah)anthracene	22	2
Benzo(ghi)perylene	33721	2
pH	N/A	N/A
Asbestos	Presence**	N/A

Notes:

1. CLEA SGV commercial/industrial (SOM 1%)
2. Derived by FM based on 'SNIFFER' methodology for residential with plant uptake (SOM 1%)
3. MAFF Maximum Permissible Concentration of PTE's
4. Dutch Intervention values

* pH dependent
** Should asbestos fibres be present then material is not acceptable

Table A.2: Leachate Assessment Criteria

Leachate Analytical Suite	Assessment Criteria (µg/l)	Source
Arsenic	10	2
Boron	1000	2
Cadmium	3	1
Chromium	15	1
Copper	5	1
Lead	10	2
Mercury	0.3	1
Nickel	30	1
Selenium	10	2
Zinc	5000	2
Vanadium	100	1
Phenols (Total) by HPLC with low DL	1	2
PCBs (7 Congeners)	0.01	3
TPHCWG (C5-C35)	10	2
Benzene	1	2
Toluene	40	1
Ethyl benzene	30	1
Xylene	30	1
PAH (sum of 4 USEPA)**	0.1	2
pH	0.01pH units	N/A

Notes:

1. Environmental Quality Standards (EQS) Saltwater
2. UK Drinking Water Standards [taken from the Water Supply (Water Quality) Regulations 1989 (as amended), and the Water Supply (Water Quality) Regulations 2000 (as amended)]
3. Dutch Intervention Value for Groundwater

* EQS for Freshwater, dependent on hardness. Where the hardness of the receiving waters is unknown, use the most stringent value.
** 4 PAH: benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(123cd)pyrene, benzo(ghi)perylene.

LABORATORY DATA SHEETS

Incoming Docs 43968IALE/002

ALcontrol Geochem

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Faber Maunsell
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Church Street
Altringham
Cheshire
WA14 4DZ

ATTN: Emily Godsiffe

Job No. 43968IALE
31 JAN 2007
FaberMaunsell
Reviewed by
EG
AM AMo
Actioned by:
Date:
Copy to:
Filing Location:
4·0 Incoming Docs./002

CERTIFICATE OF ANALYSIS

Date:	25 January, 2007
Our Reference:	06/21506/02/01
Your Reference:	
Location:	ST.HELENA

A total of 30 samples was received for analysis on Saturday, 02 December 2006 and completed on Wednesday, 10 January 2007. Accredited laboratory tests are defined in the log sheet, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation. We are pleased to enclose our final report, it was a pleasure to be of service to you, and we look forward to our continuing association.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials- whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Signed

Diane Whittlestone	**Jane Seymour**	**David O'Hare**	**Caroline Suttie**
Customer Services	Customer Services	Customer Services	Customer Services

Valid if signed by any of the above signatories.

mCERTS

UKAS TESTING 1291 GROUP

Compiled By

Byron Hagan

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ALcontrol Geochem
TEST SCHEDULE

JOB NUMBER : 06/21506/02
CLIENT : Faber Maunsell
CONTACT : Emily Godsiffe
DATE OF RECEIPT : 02/12/06
LOCATION : ST.HELENA

BATCH NUMBER : 1
CLIENT REF/CODE :
ORDER NUMBER : AL0274
TURNAROUND : 10 days

Numeric values indicate additional scheduling

* indicates test subcontracted

Sample Number	Sample Identity	P / V	Depth	Sample Type	Metals ICP. 9 (S)	Boron Water Soluble (S)	Vanadium (S)	Cyanide Total (S)	Sulphide Acid Soluble (S)	pH (S)	Phenols HPLC (S)	PAH Spec MS (S)	EPH CWG GC (S)	GRO CWG GC (S)	PCB 7 Congeners (S)	Asbestos Screen (ID)	NRA Leach	Metals ICP-MS 9 (NRA)	Mercury (NRA) (CVAA)	Vanadium (NRA) (ICP-MS)	Cyanide Total (NRA)	Sulphide (NRA)	PAH Spec MS (NRA)	Take Volatile (NRA)	EPH CWG GC (NRA)	GRO CWG GC (NRA)	BTEX MTBE MS (NRA)	pH (NRA)
				UKAS Accredited ?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓														
1	TP/R1	750g Plastic	0.30	SOLID				X	X	X	X					X												
2	TP/R1	JAR 250g	0.30	SOLID	X	X	X					X	X	X														
3	TP/R1	JAR 250g	0.30	SOLID	Sample on Hold																							
4	TP/R1	750g Plastic	0.50	SOLID				X	X	X	X					X	X	X	X	X	X	X	X	X	X	X	X	X
5	TP/R1	JAR 250g	0.50	SOLID	X	X	X					X	X	X														
6	TP/R1	JAR 250g	0.50	SOLID	Sample on Hold																							
7	TP/R1	JAR 250g	1.00	SOLID	Sample on Hold																							
8	TP/R1	JAR 250g	1.00	SOLID	Sample on Hold																							
9	TP/R1	750g Plastic	1.00	SOLID	Sample on Hold																							
10	TP/R2	750g Plastic	0.30	SOLID				X	X	X	X					X	X	X	X	X	X	X	X	X	X	X	X	X
11	TP/R2	JAR 250g	0.30	SOLID	X	X	X					X	X	X														
12	TP/R2	JAR 250g	0.30	SOLID	Sample on Hold																							
13	TP/R2	750g Plastic	0.50	SOLID	Sample on Hold																							
14	TP/R2	JAR 250g	0.50	SOLID	Sample on Hold																							
15	TP/R2	JAR 250g	0.50	SOLID	Sample on Hold																							
16	TP/R2	750g Plastic	1.00	SOLID				X	X	X	X					X												
17	TP/R2	JAR 250g	1.00	SOLID	X	X	X					X	X	X														
18	TP/R2	JAR 250g	1.00	SOLID	Sample on Hold																							
19	TP/R4	750g Plastic	0.30	SOLID				X	X	X	X					X	X	X	X	X	X	X	X	X	X	X	X	X
20	TP/R4	JAR 250g	0.30	SOLID	X	X	X					X	X	X	X													
21	TP/R4	JAR 250g	0.30	SOLID	Sample on Hold																							
22	TP/R5	750g Plastic	0.30	SOLID				X	X	X	X					X												

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ALcontrol Geochem
TEST SCHEDULE

JOB NUMBER : 06/21506/02
CLIENT : Faber Maunsell
CONTACT : Emily Godsiffe
DATE OF RECEIPT : 02/12/06
LOCATION : ST.HELENA

BATCH NUMBER : 1
CLIENT REF/CODE :
ORDER NUMBER : AL0274
TURNAROUND : 10 days

Numeric values indicate additional scheduling

* indicates test subcontracted

Sample Number	Sample Identity	P / V	Depth	Sample Type	Metals ICP. 9 (S)	Boron Water Soluble (S)	Vanadium (S)	Cyanide Total (S)	Sulphide Acid Soluble (S)	pH (S)	Phenols HPLC (S)	PAH Spec MS (S)	EPH CWG GC (S)	GRO CWG GC (S)	PCB 7 Congeners (S)	Asbestos Screen (ID)	NRA Leach	Metals ICP-MS 9 (NRA)	Mercury (NRA) (CVAA)	Vanadium (NRA) (ICP-MS)	Cyanide Total (NRA)	Sulphide (NRA)	PAH Spec MS (NRA)	Take Volatile (NRA)	EPH CWG GC (NRA)	GRO CWG GC (NRA)	BTEX MTBE MS (NRA)	pH (NRA)
				UKAS Accredited ?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓														
23	TP/R5	JAR 250g	0.30	SOLID	X	X	X					X	X	X	X													
24	TP/R5	JAR 250g	0.30	SOLID	Sample on Hold																							
25	TP/R5	750g Plastic	0.50	SOLID				X	X	X	X					X	X	X	X	X	X	X	X	X	X	X	X	X
26	TP/R5	JAR 250g	0.50	SOLID	X	X	X					X	X	X	X													
27	TP/R5	JAR 250g	0.50	SOLID	Sample on Hold																							
28	TP/R5	750g Plastic	1.00	SOLID	Sample on Hold																							
29	TP/R5	JAR 250g	1.00	SOLID	Sample on Hold																							
30	TP/R5	JAR 250g	1.00	SOLID	Sample on Hold																							
				Total Number of Tests	7	7	7	7	7	7	7	7	7	7	3	7	4	4	4	4	4	4	4	4	4	4	4	4

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ALcontrol Geochem
TEST SCHEDULE

JOB NUMBER : 06/21506/02
CLIENT : Faber Maunsell
CONTACT : Emily Godsiffe
DATE OF RECEIPT : 02/12/06
LOCATION : ST.HELENA

BATCH NUMBER : 1
CLIENT REF/CODE :
ORDER NUMBER : AL0274
TURNAROUND : 10 days

Numeric values indicate additional scheduling

* indicates test subcontracted

Sample Number	Sample Identity	P / V	Depth	Sample Type	Phenols Low HPLC (NRA)	PCB 7 Congeners (NRA)
		UKAS Accredited ?				
1	TP/R1	750g Plastic	0.30	SOLID		
2	TP/R1	JAR 250g	0.30	SOLID		
3	TP/R1	JAR 250g	0.30	SOLID	Sample on Hold	
4	TP/R1	750g Plastic	0.50	SOLID	X	
5	TP/R1	JAR 250g	0.50	SOLID		
6	TP/R1	JAR 250g	0.50	SOLID	Sample on Hold	
7	TP/R1	JAR 250g	1.00	SOLID	Sample on Hold	
8	TP/R1	JAR 250g	1.00	SOLID	Sample on Hold	
9	TP/R1	750g Plastic	1.00	SOLID	Sample on Hold	
10	TP/R2	750g Plastic	0.30	SOLID	X	
11	TP/R2	JAR 250g	0.30	SOLID		
12	TP/R2	JAR 250g	0.30	SOLID	Sample on Hold	
13	TP/R2	750g Plastic	0.50	SOLID	Sample on Hold	
14	TP/R2	JAR 250g	0.50	SOLID	Sample on Hold	
15	TP/R2	JAR 250g	0.50	SOLID	Sample on Hold	
16	TP/R2	750g Plastic	1.00	SOLID		
17	TP/R2	JAR 250g	1.00	SOLID		
18	TP/R2	JAR 250g	1.00	SOLID	Sample on Hold	
19	TP/R4	750g Plastic	0.30	SOLID	X	X
20	TP/R4	JAR 250g	0.30	SOLID		
21	TP/R4	JAR 250g	0.30	SOLID	Sample on Hold	
22	TP/R5	750g Plastic	0.30	SOLID		

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ALcontrol Geochem
TEST SCHEDULE

JOB NUMBER : 06/21506/02
CLIENT : Faber Maunsell
CONTACT : Emily Godsiffe
DATE OF RECEIPT : 02/12/06
LOCATION : ST.HELENA

BATCH NUMBER : 1
CLIENT REF/CODE :
ORDER NUMBER : AL0274
TURNAROUND : 10 days

Numeric values indicate additional scheduling

* indicates test subcontracted

Sample Number	Sample Identity	P / V	Depth	Sample Type	Phenols Low HPLC (NRA)	PCB 7 Congeners (NRA)
		UKAS Accredited ?				
23	TP/R5	JAR 250g	0.30	SOLID		
24	TP/R5	JAR 250g	0.30	SOLID	Sample on Hold	
25	TP/R5	750g Plastic	0.50	SOLID	X	X
26	TP/R5	JAR 250g	0.50	SOLID		
27	TP/R5	JAR 250g	0.50	SOLID	Sample on Hold	
28	TP/R5	750g Plastic	1.00	SOLID	Sample on Hold	
29	TP/R5	JAR 250g	1.00	SOLID	Sample on Hold	
30	TP/R5	JAR 250g	1.00	SOLID	Sample on Hold	
		Total Number of Tests			4	2

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ALcontrol Geochem Analytical Services
Sample Descriptions

Job Number: 06/21506/02/01
Client: Faber Maunsell
Client Ref :

Grain sizes

<0.063mm	Very Fine
0.1mm - 0.063mm	Fine
0.1mm - 2mm	Medium
2mm - 10mm	Coarse
>10mm	Very Coarse

Sample Identity	Depth (m)	Colour	Grain Size	Description	Batch
TP/R1	0.30	Brown	<0.063mm	Sand	1
TP/R1	0.50	Brown	<0.063mm	Sand with some Stones	1
TP/R2	0.30	Brown	<0.063mm	Sand with some Stones	1
TP/R2	1.00	Brown	<0.063mm	Sand with some Stones	1
TP/R4	0.30	Brown	<0.063mm	Sand with some Stones	1
TP/R5	0.30	Dark Brown	0.1mm - 2mm	Sandy Clay with some Stones	1
TP/R5	0.50	Dark Brown	0.1mm - 2mm	Sandy Clay with some Stones	1

* These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials-whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.
Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
[1] Sample Description supplied by client

Validated ☑
Preliminary ☐

ALcontrol Geochem Analytical Services
Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 06/21506/02/01 **Matrix:** SOLID
Client: Faber Maunsell **Location:** ST.HELENA
Client Ref. No.: **Client Contact:** Emily Godsiffe

Sample Identity	TP/R1	TP/R1	TP/R2	TP/R2	TP/R4	TP/R5	TP/R5			Method Code	LoD/Units
Depth (m)	0.30	0.50	0.30	1.00	0.30	0.30	0.50				
Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID				
Sampled Date	23.11.06	23.11.06	23.11.06	23.11.06	23.11.06	23.11.06	23.11.06				
Sample Received Date	02.12.06	02.12.06	02.12.06	02.12.06	02.12.06	02.12.06	02.12.06				
Batch	1	1	1	1	1	1	1				
Sample Number(s)	**1-3**	**4-6**	**10-12**	**16-18**	**19-21**	**22-24**	**25-27**				
Boron Water Soluble	7	9	7	5	8	11	4			TM129#M	<1 mg/kg
Arsenic	12	12	9	12	<3	<3	<3			TM129#M	<3.0 mg/kg
Cadmium	3.6	3.0	1.8	0.5	<0.3	2.3	1.0			TM129#M	<0.3 mg/kg
Chromium	25.3	29.8	29.4	18.9	44.6	33.5	31.6			TM129#M	<4.5 mg/kg
Copper	25	24	26	23	<6	18	15			TM129#M	<6 mg/kg
Lead	7	46	27	<2	15	<2	<2			TM129#M	<2 mg/kg
Mercury	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6			TM129#M	<0.6 mg/kg
Nickel	7.8	7.6	12.0	4.3	10.8	17.3	13.5			TM129#M	<0.9 mg/kg
Selenium	<3	<3	<3	<3	<3	<3	<3			TM129#M	<3 mg/kg
Vanadium	64.8	79.0	92.8	93.8	125.0	95.7	107.8			TM129#M	<1.5 mg/kg
Zinc	135.2	141.7	147.6	107.3	122.6	151.2	127.9			TM129#M	<2.5 mg/kg
Acid Soluble Sulphide	<50	<50	<50	<50	<50	<50	<50			TM101#	<50 mg/kg
Phenols Monohydric	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15			TM062#M	<0.15 mg/kg
Total Cyanide	2	2	1	1	<1	<1	<1			TM153#M	<1 mg/kg
Asbestos Presence Screen	No Fibres Detected	No Fibres Detected	No Fibres Detected	No Fibres Detected	No Fibres Detected	No Fibres Detected	No Fibres Detected			TM001	NONE
pH Value	5.40	5.62	5.45	4.61	7.07	8.30	7.63			TM133#M	<1.00 pH Units

All results expressed on a dry weight basis.

Date 25.01.2007

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Validated ☑
Preliminary ☐

ALcontrol Geochem Analytical Services
Table Of Results

\# ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 06/21506/02/01 **Matrix:** SOLID
Client: Faber Maunsell **Location:** ST.HELENA
Client Ref. No.: **Client Contact:** Emily Godsiffe

Sample Identity	TP/R1	TP/R1	TP/R2	TP/R2	TP/R4	TP/R5	TP/R5			**Method Code**	**LoD/Units**
Depth (m)	0.30	0.50	0.30	1.00	0.30	0.30	0.50				
Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID				
Sampled Date	23.11.06	23.11.06	23.11.06	23.11.06	23.11.06	23.11.06	23.11.06				
Sample Received Date	02.12.06	02.12.06	02.12.06	02.12.06	02.12.06	02.12.06	02.12.06				
Batch	1	1	1	1	1	1	1				
Sample Number(s)	**1-3**	**4-6**	**10-12**	**16-18**	**19-21**	**22-24**	**25-27**				
GRO (C4-C12)	<10	<10	<10	<10	<10	<10	<10			TM089$^{\#}_{M}$	<10 ug/kg
MTBE	<10	<10	<10	<10	<10	<10	<10			TM089$^{\#}$	<10 ug/kg
Benzene	<10	<10	<10	<10	<10	<10	<10			TM089$^{\#}_{M}$	<10 ug/kg
Toluene	<10	<10	<10	<10	<10	<10	<10			TM089$^{\#}_{M}$	<10 ug/kg
Ethyl benzene	<10	<10	<10	<10	<10	<10	<10			TM089$^{\#}_{M}$	<10 ug/kg
m & p Xylene	<10	<10	<10	<10	<10	<10	<10			TM089$^{\#}_{M}$	<10 ug/kg
o Xylene	<10	<10	<10	<10	<10	<10	<10			TM089$^{\#}_{M}$	<10 ug/kg
Aliphatics C5-C6	<10	<10	<10	<10	<10	<10	<10			TM089	<10 ug/kg
Aliphatics >C6-C8	<10	<10	<10	<10	<10	<10	<10			TM089	<10 ug/kg
Aliphatics >C8-C10	<10	<10	<10	<10	<10	<10	<10			TM089	<10 ug/kg
Aliphatics >C10-C12	<10	<10	<10	<10	<10	<10	<10			TM089	<10 ug/kg
Aliphatics >C12-C16	1237	10439	1352	1764	1353	2180	868			TM173$^{\#}$	<100 ug/kg
Aliphatics >C16-C21	<100	10198	12096	<100	<100	1054	<100			TM173$^{\#}$	<100 ug/kg
Aliphatics >C21-C35	8417	10262	2410	6654	2567	2519	3563			TM173$^{\#}$	<100 ug/kg
Total Aliphatics C5-C35	9654	30899	15858	8418	3920	5753	4431			TM61/89	<100 ug/kg
Aromatics C6-C7	<10	<10	<10	<10	<10	<10	<10			TM089$^{\#}_{M}$	<10 ug/kg
Aromatics >C7-C8	<10	<10	<10	<10	<10	<10	<10			TM089$^{\#}_{M}$	<10 ug/kg
Aromatics >EC8-EC10	<10	<10	<10	<10	<10	<10	<10			TM089	<10 ug/kg
Aromatics >EC10-EC12	<10	<10	<10	<10	<10	<10	<10			TM089	<10 ug/kg
Aromatics >EC12-EC16	<100	730	580	878	<100	<100	1480			TM173$^{\#}$	<100 ug/kg
Aromatics >EC16-EC21	<100	1255	362	537	<100	<100	<100			TM173$^{\#}$	<100 ug/kg
Aromatics >EC21-EC35	5907	14136	6364	2888	5390	4303	3496			TM173$^{\#}$	<100 ug/kg
Total Aromatics C6-C35	5907	16121	7306	4303	5390	4303	4976			TM61/89	<100 ug/kg
TPH (Aliphatics and Aromatics C5-C35)	15561	47020	23164	12721	9310	10056	9407			TM61/89	<100 ug/kg

All results expressed on a dry weight basis.

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ALcontrol Geochem Analytical Services
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ISO 17025 accredited
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* Subcontracted test
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Job Number: 06/21506/02/01 **Matrix:** SOLID
Client: Faber Maunsell **Location:** ST.HELENA
Client Ref. No.: **Client Contact:** Emily Godsiffe

Sample Identity	TP/R1	TP/R1	TP/R2	TP/R2	TP/R4	TP/R5	TP/R5			Method Code	LoD/Units
Depth (m)	0.30	0.50	0.30	1.00	0.30	0.30	0.50				
Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID				
Sampled Date	23.11.06	23.11.06	23.11.06	23.11.06	23.11.06	23.11.06	23.11.06				
Sample Received Date	02.12.06	02.12.06	02.12.06	02.12.06	02.12.06	02.12.06	02.12.06				
Batch	1	1	1	1	1	1	1				
Sample Number(s)	1-3	4-6	10-12	16-18	19-21	22-24	25-27				
PAH by GCMS											
Naphthalene	1248	2535	822	1271	1630	1565	500			TM074#M	<10 ug/kg
Acenaphthylene	24	587	23	144	23	42	15			TM074#M	<5 ug/kg
Acenaphthene	387	3616	267	819	416	525	142			TM074#M	<14 ug/kg
Fluorene	156	1975	111	455	166	261	110			TM074#M	<12 ug/kg
Phenanthrene	100	2659	96	557	77	163	56			TM074#M	<21 ug/kg
Anthracene	25	659	23	121	<9	26	<9			TM074#M	<9 ug/kg
Fluoranthene	53	2077	218	431	74	94	<25			TM074#M	<25 ug/kg
Pyrene	41	1555	206	322	63	71	<22			TM074#M	<22 ug/kg
Benz(a)anthracene	39	754	188	176	53	46	<12			TM074#M	<12 ug/kg
Chrysene	24	807	238	197	55	46	<10			TM074#M	<10 ug/kg
Benzo(b)fluoranthene	19	803	186	138	30	25	<16			TM074#M	<16 ug/kg
Benzo(k)fluoranthene	<25	222	93	117	26	29	<25			TM074#M	<25 ug/kg
Benzo(a)pyrene	15	613	111	85	19	<12	<12			TM074#M	<12 ug/kg
Indeno(123cd)pyrene	15	388	104	79	17	16	<11			TM074#M	<11 ug/kg
Dibenzo(ah)anthracene	<8	130	29	17	<8	<8	<8			TM074#M	<8 ug/kg
Benzo(ghi)perylene	14	522	91	90	19	17	<10			TM074#M	<10 ug/kg
PAH 16 Total	2160	19902	2806	5019	2668	2926	823			TM074#	<25 ug/kg

All results expressed on a dry weight basis.

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* Subcontracted test
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Job Number: 06/21506/02/01
Client: Faber Maunsell
Client Ref. No.:
Matrix: SOLID
Location: ST.HELENA
Client Contact: Emily Godsiffe

Sample Identity	TP/R1	TP/R1	TP/R2	TP/R2	TP/R4	TP/R5	TP/R5			Method Code	LoD/Units
Depth (m)	0.30	0.50	0.30	1.00	0.30	0.30	0.50				
Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID				
Sampled Date	23.11.06	23.11.06	23.11.06	23.11.06	23.11.06	23.11.06	23.11.06				
Sample Received Date	02.12.06	02.12.06	02.12.06	02.12.06	02.12.06	02.12.06	02.12.06				
Batch	1	1	1	1	1	1	1				
Sample Number(s)	1-3	4-6	10-12	16-18	19-21	22-24	25-27				
PCB 7 Congeners											
PCB congener 28	-	-	-	-	<1	<1	<1			TM070	<1 ug/kg
PCB congener 52	-	-	-	-	<1	<1	<1			TM070	<1 ug/kg
PCB congener 101	-	-	-	-	<1	<1	<1			TM070	<1 ug/kg
PCB congener 118	-	-	-	-	<1	<1	<1			TM070	<1 ug/kg
PCB congener 153	-	-	-	-	<1	<1	<1			TM070	<1 ug/kg
PCB congener 138	-	-	-	-	<1	<1	<1			TM070	<1 ug/kg
PCB congener 180	-	-	-	-	<1	<1	<1			TM070	<1 ug/kg
Total of 7 Congener PCBs	-	-	-	-	<1	<1	<1			TM070	<1 ug/kg

All results expressed on a dry weight basis.

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ALcontrol Geochem Analytical Services
Table Of Results

[#] ISO 17025 accredited
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* Subcontracted test
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Job Number: 06/21506/02/01
Client: Faber Maunsell
Client Ref. No.:
Matrix: LEACHATE
Location: ST.HELENA
Client Contact: Emily Godsiffe

Sample Identity	TP/R1	TP/R2	TP/R4	TP/R5						Method Code	LoD/Units
Depth (m)	0.50	0.30	0.30	0.50							
Sample Type	SOLID	SOLID	SOLID	SOLID							
Sampled Date	23.11.06	23.11.06	23.11.06	23.11.06							
Sample Received Date	02.12.06	02.12.06	02.12.06	02.12.06							
Batch	1	1	1	1							
Sample Number(s)	4-6	10-12	19-21	25-27							
Arsenic Dissolved (NRA) (ICP-MS)	4	4	3	4						TM152	<1 ug/l
Boron Dissolved (NRA) (ICP-MS)	400	358	343	278						TM152	<10 ug/l
Cadmium Dissolved (NRA) (ICP-MS)	0.9	0.5	<0.4	<0.4						TM152	<0.4 ug/l
Chromium Dissolved (NRA) (ICP-MS)	<1	<1	<1	<1						TM152	<1 ug/l
Copper Dissolved (NRA) (ICP-MS)	13	10	79	35						TM152	<1 ug/l
Lead Dissolved (NRA) (ICP-MS)	2	<1	3	4						TM152	<1 ug/l
Nickel Dissolved (NRA) (ICP-MS)	15	16	12	16						TM152	<1 ug/l
Selenium Dissolved (NRA) (ICP-MS)	5	7	6	9						TM152	<1 ug/l
Vanadium Dissolved (NRA) (ICP-MS)	6	2	5	23						TM152	<1 ug/l
Zinc Dissolved (NRA) (ICP-MS)	70	34	20	15						TM152	<3 ug/l
Mercury Dissolved (NRA) (CVAA)	<0.05	<0.05	<0.05	<0.05						TM127	<0.05 ug/l
Sulphide (NRA)	<0.50	<0.50	<0.50	<0.50						TM101	<0.5 mg/l
Phenols Low Level Monohydric (NRA)	<0.5	<0.5	<0.5	<0.5						TM062	<0.5 ug/l
Total Cyanide (NRA)	<0.05	<0.05	<0.05	<0.05						TM153	<0.05 mg/l
pH (NRA)	6.03	7.10	7.27	7.56						TM133	<1.00 pH Units

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[#] ISO 17025 accredited
[M] MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 06/21506/02/01
Client: Faber Maunsell
Client Ref. No.:

Matrix: LEACHATE
Location: ST.HELENA
Client Contact: Emily Godsiffe

Sample Identity	TP/R1	TP/R2	TP/R4	TP/R5						Method Code	LoD/Units
Depth (m)	0.50	0.30	0.30	0.50							
Sample Type	SOLID	SOLID	SOLID	SOLID							
Sampled Date	23.11.06	23.11.06	23.11.06	23.11.06							
Sample Received Date	02.12.06	02.12.06	02.12.06	02.12.06							
Batch	1	1	1	1							
Sample Number(s)	4-6	10-12	19-21	25-27							
GRO (C4-C12) (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
MTBE (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
Benzene (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
Toluene (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
Ethyl benzene (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
m & p Xylene (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
o Xylene (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
Aliphatics C5-C6 (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
Aliphatics >C6-C8 (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
Aliphatics >C8-C10 (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
Aliphatics >C10-C12 (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
Aliphatics >C12-C16 (NRA)	<10	<10	<10	<10						TM174	<10 ug/l
Aliphatics >C16-C21 (NRA)	<10	<10	<10	<10						TM174	<10 ug/l
Aliphatics >C21-C35 (NRA)	<10	<10	<10	<10						TM174	<10 ug/l
Total Aliphatics C5-C35 (NRA)	<10	<10	<10	<10						TM61/89	<10 ug/l
Aromatics C6-C7 (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
Aromatics >C7-C8 (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
Aromatics >EC8-EC10 (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
Aromatics >EC10-EC12 (NRA)	<10	<10	<10	<10						TM089	<10 ug/l
Aromatics >EC12-EC16 (NRA)	<10	<10	<10	<10						TM174	<10 ug/l
Aromatics >EC16-EC21 (NRA)	<10	<10	<10	<10						TM174	<10 ug/l
Aromatics >EC21-EC35 (NRA)	<10	<10	<10	<10						TM174	<10 ug/l
Total Aromatics C6-C35 (NRA)	<10	<10	<10	<10						TM61/89	<10 ug/l
TPH (Aliphatics and Aromatics C5-C35) (NRA)	<10	<10	<10	<10						TM61/89	<10 ug/l

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Job Number: 06/21506/02/01
Client: Faber Maunsell
Client Ref. No.:

Matrix: LEACHATE
Location: ST.HELENA
Client Contact: Emily Godsiffe

Sample Identity	TP/R1	TP/R2	TP/R4	TP/R5						Method Code	LoD/Units
Depth (m)	0.50	0.30	0.30	0.50							
Sample Type	SOLID	SOLID	SOLID	SOLID							
Sampled Date	23.11.06	23.11.06	23.11.06	23.11.06							
Sample Received Date	02.12.06	02.12.06	02.12.06	02.12.06							
Batch	1	1	1	1							
Sample Number(s)	4-6	10-12	19-21	25-27							
PAH by GCMS											
Naphthalene (NRA)	<10	<10	<10	<10						TM074	<10 ng/l
Acenaphthylene (NRA)	<10	<10	<10	<10						TM074	<10 ng/l
Acenaphthene (NRA)	<10	<10	<10	<10						TM074	<10 ng/l
Fluorene (NRA)	<10	<10	<10	<10						TM074	<10 ng/l
Phenanthrene (NRA)	<10	81	<10	<10						TM074	<10 ng/l
Anthracene (NRA)	<10	29	<10	<10						TM074	<10 ng/l
Fluoranthene (NRA)	<10	51	<10	18						TM074	<10 ng/l
Pyrene (NRA)	<10	47	<10	16						TM074	<10 ng/l
Benz(a)anthracene (NRA)	<10	<10	<10	<10						TM074	<10 ng/l
Chrysene (NRA)	<10	<10	<10	<10						TM074	<10 ng/l
Benzo(b)fluoranthene (NRA)	<10	<10	<10	<10						TM074	<10 ng/l
Benzo(k)fluoranthene (NRA)	<10	<10	<10	<10						TM074	<10 ng/l
Benzo(a)pyrene (NRA)	<10	<10	<10	<10						TM074	<10 ng/l
Indeno(123cd)pyrene (NRA)	<10	<10	<10	<10						TM074	<10 ng/l
Dibenzo(ah)anthracene (NRA)	<10	<10	<10	<10						TM074	<10 ng/l
Benzo(ghi)perylene (NRA)	<10	<10	<10	<10						TM074	<10 ng/l
PAH 16 Total (NRA)	<10	208	<10	34						TM074	<10 ng/l

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Job Number: 06/21506/02/01
Client: Faber Maunsell
Client Ref. No.:
Matrix: LEACHATE
Location: ST.HELENA
Client Contact: Emily Godsiffe

Sample Identity	TP/R1	TP/R2	TP/R4	TP/R5						Method Code	LoD/Units
Depth (m)	0.50	0.30	0.30	0.50							
Sample Type	SOLID	SOLID	SOLID	SOLID							
Sampled Date	23.11.06	23.11.06	23.11.06	23.11.06							
Sample Received Date	02.12.06	02.12.06	02.12.06	02.12.06							
Batch	1	1	1	1							
Sample Number(s)	4-6	10-12	19-21	25-27							
PCB 7 Congeners											
PCB congener 28 (NRA)	-	-	<10	<10						TM070	<10 ng/l
PCB congener 52 (NRA)	-	-	<10	<10						TM070	<10 ng/l
PCB congener 101 (NRA)	-	-	<10	<10						TM070	<10 ng/l
PCB congener 118 (NRA)	-	-	<10	<10						TM070	<10 ng/l
PCB congener 138 (NRA)	-	-	<10	<10						TM070	<10 ng/l
PCB congener 153 (NRA)	-	-	<10	<10						TM070	<10 ng/l
PCB congener 180 (NRA)	-	-	<10	<10						TM070	<10 ng/l
Total of 7 Congener PCBs (NRA)	-	-	<10	<10						TM070	<10 ng/l

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Table Of Results

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* Subcontracted test
» Shown on prev. report

Job Number: 06/21506/02/01
Client: Faber Maunsell
Client Ref. No.:
Matrix: LEACHATE
Location: ST.HELENA
Client Contact: Emily Godsiffe

Sample Identity	TP/R1	TP/R2	TP/R4	TP/R5						Method Code	LoD/Units
Depth (m)	0.50	0.30	0.30	0.50							
Sample Type	SOLID	SOLID	SOLID	SOLID							
Sampled Date	23.11.06	23.11.06	23.11.06	23.11.06							
Sample Received Date	02.12.06	02.12.06	02.12.06	02.12.06							
Batch	1	1	1	1							
Sample Number(s)	4-6	10-12	19-21	25-27							
Volatile Organic Compounds											
Methyl Tertiary Butyl Ether (NRA)	<1	<1	<1	<1						TM116	<1 ug/l
Benzene (NRA)	<1	<1	<1	<1						TM116	<1 ug/l
Toluene (NRA)	<1	<1	<1	<1						TM116	<1 ug/l
Ethylbenzene (NRA)	<1	<1	<1	<1						TM116	<1 ug/l
p/m-Xylene (NRA)	<1	<1	<1	<1						TM116	<1 ug/l
o-Xylene (NRA)	<1	<1	<1	<1						TM116	<1 ug/l

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Table Of Results - Appendix

Job Number: 06/21506/02/01
Client: Faber Maunsell
Client Ref. No.:

Report Key :

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03×10^{-7}

NDP	No Determination Possible	*	Subcontracted test
NFD	No Fibres Detected	»	Result previously reported (Incremental reports only)
#	ISO 17025 accredited	M	MCERTS Accredited
PFD	Possible Fibres Detected	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control.

Summary of Method Codes contained within report :

Method No.	Reference	Description	ISO 17025 Accredited	MCERTS Accredited	Wet/Dry Sample [1]	Surrogate Corrected
TM001	In - house Method	Screening of Soils for Fibres			WET	
TM062	MEWAM BOOK 124 1988.HMSO/ Method 17.7, Second Site property, March 2003	Determination of Phenolic compounds by HPLC with electro-chemical detection			NA	
TM062	MEWAM BOOK 124 1988.HMSO/ Method 17.7, Second Site property, March 2003	Determination of Phenolic compounds by HPLC with electro-chemical detection	✓	✓	WET	
TM070	Modified: US EPA Method 8250 & 625	Determination of Total Polychlorinated Biphenyls (PCB's) as Aroclor 1254 and the ICE 7 Congeners by GC-MS			DRY	
TM074	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS. MCERTS Accreditation on Soils for Naphthalene except when Kerosene present.			NA	
TM074	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS. MCERTS Accreditation on Soils for Naphthalene except when Kerosene present.	✓		DRY	
TM074	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS. MCERTS Accreditation on Soils for Naphthalene except when Kerosene present.	✓	✓	DRY	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)			WET	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	✓		WET	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	✓	✓	WET	
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser			NA	
TM101	Method 4500B & C, AWWA/APHA, 20th Ed., 1999	Determination of Sulphide in soil and water samples using the Kone Analyser	✓		WET	
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS			NA	
TM127	Method 3112B, AWWA/APHA, 20th Ed., 1999	The Determination of Trace Level Mercury in Aqueous Media and Soil Extracts by Atomic Absorption Spectroscopy			NA	

[1] Applies to Solid samples only. **DRY** indicates samples have been dried at 35°C. **NA** = not applicable.

ALcontrol Geochem Analytical Services
Table Of Results - Appendix

Job Number: 06/21506/02/01
Client: Faber Maunsell
Client Ref. No.:

Report Key :

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03×10^{-7}

NDP	No Determination Possible	*	Subcontracted test
NFD	No Fibres Detected	»	Result previously reported (Incremental reports only)
#	ISO 17025 accredited	M	MCERTS Accredited
PFD	Possible Fibres Detected	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control.

Summary of Method Codes contained within report :

Method No.	Reference	Description	ISO 17025 Accredited	MCERTS Accredited	Wet/Dry Sample [1]	Surrogate Corrected
TM129	Method 3120B, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 3050B	Determination of Metal Cations by IRIS Emission Spectrometer	✓	✓	DRY	
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter			NA	
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter	✓	✓	WET	
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS			NA	
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser			NA	
TM153	Method 4500A,B,C, I, M AWWA/APHA, 20th Ed., 1999	Determination of Total Cyanide, Free (Easily Liberatable) Cyanide and Thiocyanate using the "Skalar SANS+ System" Segmented Flow Analyser	✓	✓	WET	
TM173		Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GC-FID	✓		DRY	
TM174		Determination of Speciated Extractable Petroleum Hydrocarbons in Waters by GC-FID			NA	
TM61/89		see TM061 and TM089 for details			WET	

[1] Applies to Solid samples only. **DRY** indicates samples have been dried at 35°C. **NA** = not applicable.

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Table Of Results - Appendix

Job Number: 06/21506/02/01
Client: Faber Maunsell
Client Ref. No.:

Summary of Coolbox temperatures

Batch No.	Coolbox Temperature (°C)
1	18.5

APPENDIX

Last updated August 2006

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for one month after analysis is completed (e-mailed) for both soil jars and tubs. All waters, volatile jars and vials will be discarded after one month of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Geochem reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

6. When requested, an asbestos screen is done in-house on soils and if no fibres are found will be reported as NFD – no fibres detected. If asbestos is detected, then identification is carried out by ALcontrol Shutler. If a sample is suspected of containing asbestos, then further preparation and analysis will be suspended on that sample until the asbestos result is known. If asbestos is present, then no further analysis will be undertaken.

7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule.

8. NDP – No determination possible due to insufficient/unsuitable sample.

9. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.

10. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.

11. **Surrogate recoveries** – Currently the only analyses which are surrogate corrected are EPH and PAHs on soils.

12. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

13. Phenols monohydric by HPLC includes phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

14. Total of 8 speciated phenols by HPLC includes Resorcinol, Catechol, Phenol, Napthol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, cresols and xylenols (as detailed in 13).

15. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

16. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.

17. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

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MCERTS

1. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occuring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

2. It should be noted that for a particular set of data some of the data may not always meet the precision and bias criteria as prescribed by MCERTS. This is because whilst criteria were met when the method was originally validated, specific criteria for ongoing AQC were not set by the Environment Agency, so that the point of reference becomes the criteria used for the original validation. The precision and bias data for the certified reference material (CRM), used in the method may itself fall outside these criteria and as a result the samples associated with the batch in question do not strictly meet the MCERTS criteria. This issue is common to all UK laboratories although in practice this is not always reported as such. However in the interest of maintaining strict conformance with both MCERTS and UKAS ISO17025 such data are flagged by Alcontrol as not claiming MCERTS, but still meets the requirements of ISO17025. This should not detract from the usability of such data in terms of their application to the existing project.

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ALCONTROL GEOCHEM - MCERTS UPDATE (8th August 2006)- Annex A (normative)

Table 1 - Performance characteristics (metals and organometallics)	UKAS	MCERTS
Antimony	yes	yes
Arsenic	yes	yes
Barium	yes	yes
Beryllium	yes	yes
Boron (water soluble)	yes	yes
Cadmium	yes	yes
Cobalt	yes	yes
Copper	yes	yes
Chromium	yes	yes
Iron	yes	yes
Lead	yes	yes
Manganese	yes	yes
Mercury	yes	yes
Molybdenum	yes	yes
Nickel	yes	yes
Organolead compounds	no	no
Organotin compounds	no	no
Selenium	yes	yes
Thallium	yes	p
Vanadium	yes	yes
Zinc	yes	yes

Table 2 - Performance characteristics (inorganics)	UKAS	MCERTS
Easily liberated cyanide	yes	yes
Complex cyanide	yes	yes
pH	yes	yes
LOI	yes	yes
Sulphide	yes	p
Sulphate	yes	yes
Sulphur	yes	yes
Thiocyanate	yes	yes
Exchangeable Ammonium	yes	yes

Tabel 3 - Performance characteristics (organics)	UKAS	MCERTS
Benzene (GC- FID & GC-MS)	yes	yes
Benzo[a]pyrene (GC-MS)	yes	yes
Chlorobenzene	yes	yes
Chloromethane	yes	p
Chlorophenol (2-chlorophenol)	yes	yes
Chlorotoluene(2-chlorotoluene, 4-chlorotoluene)	yes	p
1,2-dichloroethane	yes	p
Dichloromethane	yes	p
"Dioxins"	no	no
Ethylbenzene	yes	p
"Furans"	no	no
Hexachlorobutadiene (SVOC)	yes	yes
"Hydrocarbons"	yes	yes
"Nitroaromatics"	yes	no
Pentachlorophenol	p	p
"Phenols" - Phenol by HPLC	yes	yes
"Phthalate esters"	p	p
"Polyaromatic hydrocarbons" by GC-MS	yes	yes, exc naphthalene when Kerosene
"Polychlorinated biphenyls" (Aroclors)	yes	yes
Tetrachloroethane (1,1,1,2)	yes	yes
Tetrachloroethene	yes	p
Tetrachloromethane (carbon tetrachloride)	yes	yes
Toluene (GC-FID)	yes	yes
Trichloroethane	yes	yes
Trichloroethene	yes	yes
Trichloromethane (chloroform)	yes	yes
Vinyl chloride	yes	yes
Xylene (GC-FID)	yes	yes

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yes - accreditation awarded
p = pending - data meeting MCERTS criteria submitted to UKAS - awaiting certification
no = not being submitted in the near future

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