

13.0 GEOLOGY, CONTAMINATED LAND AND HYDROGEOLOGY

13.1 METHODOLOGY

The assessment of the impact of the scheme on the geological and hydrogeological conditions has been carried out using the source-pathway-receptor approach promoted by the United Kingdom (UK) Environment Agency (EA). For the purpose of this assessment, it has been assumed that the principal receptors at risk from the development would be human beings (site construction workers and end-users of the scheme) in respect of potential ground contamination and controlled waters (groundwater and surface water), in respect of existing ground contamination and scheme construction and operations. The potential impacts on any site of scientific interest relating to geology, and on groundwater resources, are also assessed.

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

A ground investigation was carried out at the only site within the scheme area identified as having a potential for contamination, the existing bulk fuel storage facility in Rupert's Valley. The purpose of the ground investigation was to clarify the ground conditions and to identify risks to human health and groundwater posed by any contaminated ground on the site. Details of the ground investigation are provided in Appendix 13 of Volume 4 of the ES.

13.1.1 Background information

The island of St Helena is composed entirely of volcanic rocks derived from former volcanoes associated with the mid-Atlantic ridge. There are two former volcanic complexes on the island. The North Eastern Volcanic Centre is 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. Rocks from the North Eastern Volcanic Centre outcrop across the northern part of the island and are exposed on the cliffs below Prosperous Bay Plain (PBP). Much of the route of the access road runs across the lava flows of the North Eastern Volcanic Centre.

Rocks associated with the South Western Volcanic Centre cover a much larger area of the island. The rocks associated with this phase of volcanic activity comprise approximately 1500 metres (m) of mainly basaltic lavas. The lavas have been divided into three intrusive phases – the Lower, Main and Upper Shield. In the area of the proposed airport on Prosperous Bay Plain, lavas of the Upper and Main Shield phases overlie the basalt lavas of the North Eastern Volcanic Centre.

PBP is proposed for designation as a National Protected Area (proposed NPA) under the St Helena Land Development Control Plan (LDCP) 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 up to one metre thick. 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.

Groundwater is present within the volcanic rocks. However, borehole yields typically are poor and the groundwater quality frequently is unsuitable for potable use without treatment to reduce, in particular the iron content. Groundwater is not a significant water resource on the island. However, 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 on St Helena.

Based on the results of the walkover survey and desk study, it was concluded that there was potential for ground contamination only associated with the area of existing bulk fuel storage in Rupert's Valley, which would be affected by the access road. It was concluded that the remainder of the route of the access road and the airport site were undeveloped with no history of any potentially contaminative uses.

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 relocated bulk fuel storage facilities 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 human health, controlled waters or 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 also were present at levels significantly below the guidance limits and hence do not pose an ecological risk.

Leachates derived from testing of the soil samples contained elevated levels of copper, above the threshold value for 'saltwater' but significantly below the Drinking Water Standard. No other elevated contaminants were present in the leachate. It is considered likely that the elevated copper concentrations are due to the presence naturally of copper in the volcanic rocks. The results of the laboratory analyses of the soil and leachate samples are presented in Volume 4, Appendix 13 in Volume 4 of the ES.

13.2 CONSTRUCTION IMPACTS

The construction of the airport runway and the access road will necessitate the excavation and movement of a substantial volume of materials. It is considered that the materials to be moved have no significant importance in respect of their geological characteristics and that the geological conditions are not unique to the footprint of the access road or the proposed quarry in Rupert's Valley. 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 the area.

Whilst the excavations for the construction of the airport will not disturb directly the unconsolidated, weathered materials in the Central Basin, there is a risk that the removal of a ridge on the eastern edge of the Central Basin may expose the sensitive dust deposits to increased wind erosion, which may impact on the associated local ecology. This potential impact is considered further in Chapters 7 Air Quality and Dust and Chapter 9 Ecology and Nature Conservation.

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

An earlier proposal was to develop a new borehole to provide a permanent potable water supply to the airport and for fire fighting and training. This water supply option has been discounted and replaced by the proposed development of a surface water source in Sharks Valley. As it is no longer proposed to utilise groundwater as a water supply source for the scheme, it is concluded that the airport construction and operation will have an insignificant impact on the availability of groundwater resources.

In order to minimise risks to the groundwater quality during the construction of the scheme, measures will be implemented to minimise groundwater contamination from spillages and leakages of fuels and chemicals used in the construction phase.

There is potential that the construction of the access road may disturb areas of contaminated ground across the existing bulk fuel storage facility. Whilst no contaminated ground was identified in the investigation at the facility in 2006, the presence of localised areas of contaminated ground cannot be discounted. Contingency measures to manage contaminated ground will be incorporated into the Environmental Management Plan (EMP), in the event that contaminated materials are encountered during the construction work.

13.3 OPERATIONAL IMPACTS

The operation of the airport would have no significant impacts on the geological and hydrogeological conditions.

The storage of aviation and other fuels at the airport and fire training exercises at the airport, involving the use of fire fighting foams, are potential sources of groundwater contamination. Measures will be implemented to minimise the risk of contamination of the groundwater through the storage of fuels in accordance with standard guidance and through the collection of foams in a sealed chamber.

Provided that appropriate measures are implemented to minimise groundwater contamination, it is considered that there will be no potential for impacts related to contaminated land.

13.4 MITIGATION AND RESIDUAL IMPACTS

It is considered that standard guidance procedures are the only requirements to mitigate the risks to ground and groundwater quality from the spillages and leakages of fuels and

chemicals, including fire fighting foams, used during both the construction and operational phases of the scheme.

There is a small risk that contaminated ground may be disturbed during the construction of the site access road across the bulk fuel storage area. Contingency measures will be prepared to manage any contaminated materials identified during the access road construction.

Provided that appropriate protective measures are implemented to manage the identified pollution risks, it is concluded that there will be no residual impacts associated with the scheme in respect of geology, hydrogeology and contaminated land.

13.5 SUMMARY

Based on an assessment of the ground and groundwater conditions, it is concluded that the construction and operation of the scheme would present no risks to human health or surface water and groundwater. Provided that appropriate mitigation measures are implemented to control potential pollution risks during the construction of the scheme and associated with the airport operations, it is concluded that there will be no adverse impacts on the geological conditions, groundwater, nor will there be affects associated with contaminated land. The potential effects of the changes in wind patterns across Prosperous Bay Plain and the Central Basin are discussed in Chapter 9 of Volume 2 of the ES.