2.0 SCHEME FOR ASSESSMENT AND ALTERNATIVES

2.1 INTRODUCTION AND OVERVIEW OF SCHEME

2.1.1 Introduction

This Chapter provides a description of the proposed airport and its supporting infrastructure including an explanation of how the airport is likely to be constructed. An explanation for the choice of the preferred scheme and the alternatives that were considered is provided.

2.1.1 Overview of Scheme

The proposed airport on St Helena will incorporate a number of elements, including:

- The airport and its essential support facilities at Prosperous Bay Plan (PBP), as well as an in-shore sea rescue service to be based at Jamestown;
- A new wharf and associated facilities at Rupert's Bay;
- A bulk fuel installation (BFI) in Rupert's Valley;
- A haul road for construction and permanent access road link from Rupert's Bay to the airport on PBP;
- A permanent water supply system from Sharks Valley for the operation of the airport, which may be augmented by a dam at the top of Dry Gut at the south end of PBP.

An overview of the scheme is provided by Figure 2.1 in Volume 3 of this ES.

In addition to the permanent infrastructure, the project will require a significant amount of temporary works to enable and support the Contractor during the construction phase. The methodology, phasing and support facilities such as offices, storage, accommodation, along with the type and size of equipment required to construct the development will ultimately depend upon the successful Contractor's approach and methodology, and as such these details cannot be finalised at this stage.

Atkins has provided a description of the possible construction activities and sequencing of works. This has been made on the basis of the designs prepared to date and has been used as the base reference for the working methodology and programme quoted throughout this ES.

The Contractor's temporary works in support of the permanent works may include:

- A wharf in Rupert's Bay for landing the heavy equipment required to construct the wharf, airport and all other supporting infrastructure,
- A temporary quarry in Rupert's Valley to provide material for the construction of the wharf;
- Compounds for storage areas and offices in Rupert's Valley and at two sites to the west of the airport works for the Contractor's work force, equipment and bulk materials storage;
- Possibly, a temporary private airstrip within the Contractor's compound to the west of the airport that may be required until the permanent runway is constructed;
- Possibly, a temporary seawater pump and delivery pipeline may be required from Gill Point to the airport site; and
- Possibly, a temporary storage reservoir in Dry Gut.

It is likely that the Contractor's temporary work in Rupert's Bay will be constructed first, which include the opening of a temporary quarry in Rupert's Valley to enable construction of the wharf, haul road and BFI. Enabling works on the airport site to start concurrently or shortly after the works in Rupert's Valley depending upon accessibility and the type of equipment the Contractor chooses to employ.

Once the haul road link is complete this will enable large earthmoving equipment to be deployed to the airport site and the main earthworks can get underway. As soon as a sufficient area is created at the final earthworks level construction of the runway and Terminal Buildings can commence.

As the buildings and infrastructure near completion the Contractor will start commissioning systems and training staff ready for certification of the aerodrome. Once certified, the construction period ends and the development moves into its operating phase.

2.2 AIRPORT COMPONENTS

2.2.1 Overview

The airport consists of a runway, airside and landside facilities including Terminal Building, car park, Air Traffic Control (ATC) tower, fire station, airport fuel farm and other infrastructure required to support the safe operation of the airport, see Figures 2.2 to 2.13 in Volume 3 of this ES.

2.2.2 Earthworks

Generally it is expected that the earthworks will achieve a 'cut to fill' balance within the airport site i.e. earth removed from one location will be used in another location to create a level surface, thereby minimising the amount of imported material required or waste disposal. The bulk cut and fill earthworks directly associated with the airport site will generally be carried out in a continuous operation and will accommodate the following infrastructure:

- A 1950 metres (m) long by 45 m wide runway and 240 m long by 90 m wide Runway End Safety Area (RESA);
- Single taxiway and apron for two Boeing 737/800 aircraft;
- Runway and taxiway strip where gradients are controlled;
- Airport buildings, Airport Fuel Facility (AFF), fire training rig, landside circulation road and car-parking areas;
- Storm water attenuation storage ponds and diversion channels; and
- Underground services (drainage, airfield ground lighting pits and ducts).

The earthworks required to generate a level area of land for the runway and RESA are considerable, involving the excavation of approximately 8 million cubic metres (m^3) of material from PBP. This will reduce the height of the ridge of land on the eastern edge of the plain, where the proposed runway will be, by between zero and approximately thirty metres. The excavated material will be used as fill in Dry Gut creating a large embankment structure some 700 m long by 100 m high, as shown in Figure 2.4 in Volume 3 of this ES. Twin concrete arch culverts 2.2m high and wide will be constructed to allow any stormwater passing down Dry Gut to pass under the fill.

Minor earthworks works will also be required to construct the following works:

- Excavation required for diversion of watercourses and gullies intercepted in Dry Gut near the toe of the fill embankment at the south end of the runway and RESA;
- Excavation required for construction of the airport water supply abstraction works; and
- Surface preparation works for the navigation aids at Bradleys Government Garage and Remote Obstacle Lighting (ROL).

These works are located adjacent to the main airfield site, however due to their location and relatively small scale, these items are unlikely to be incorporated in the gross cut and fill balance.

2.2.3 Runway

The general airfield layout is shown in Figure 2.3 in Volume 3 of this ES. The declared runway will be 1650 m long by 45 m wide. A runway starter extension will be provided at the northern end of the runway of 300 m length and 45 m width, incorporating aircraft turn pads, bringing the total paved length to 1950 m. All the airfield pavements will be formed in pavement quality concrete construction.

Extending 60 m beyond the southern end of the runway will be a 240 m Runway End Safety Area (RESA). The RESA is a graded area provided for aircraft safety in emergencies where an aircraft overshoots or undershoots the runway. A similar RESA facility is incorporated within the paved runway length at the northern end of the runway.

A Runway Strip with strict controls on gradient is provided 150 m either side of the runway centreline. The inner section of the graded area is referred to as the ‘clear and graded area’ which extends 105 m either side of the runway centreline. This section has even tighter controls on allowable changes in gradient and must be free of surface and subsurface obstructions to aircraft. Infrastructure for the safe operation of the airfield within the clear and graded area must be frangible. The Runway Strip and clear and graded area are shown on Figure 2.3 in Volume 3 of this ES.

An emergency runway will be provided on the eastern side of the Runway Strip. This is a parallel granular paved runway, or landing strip, 1615 m long and 30 m wide. The emergency runway would be used by emergency services if the primary runway were made un-useable for a short period of time. The design of the emergency runway also includes a RESA extending 150 m beyond each of the thresholds and a further 45m graded area.

Surface water drainage will be provided to the edge of the runway and will drain about the runway mid point to Fishers Valley to the north and Dry Gut to the south. The design of drainage system includes measures to restrict flows to prevent erosion of the existing water courses.

2.2.4 Apron and Taxiway

The apron and taxiway are part of the airfield pavements and will be formed in pavement quality concrete construction. The taxiway will connect the apron to the runway. The apron is designed to accommodate two Boeing 737-800 aircraft simultaneously on individual self manoeuvring stands as shown on Figures 2.3, 2.5 and 2.6 in Volume 3 of this ES.

A hydrant re-fuelling system will be incorporated in the central portion of the apron within the aircraft stands. As such the central portion of the apron will be positively drained to a full retention interceptor to separate oil spills from rainwater before entering the southern stormwater attenuation pond. There is an area safeguarded for future expansion of the apron to the north between the proposed two stand apron and the fire training rig, and also to the south of the apron, as shown in Figure 2.3 in Volume 3 of this ES.

2.2.5 Airside Facilities

Airside refers to areas within the airfield and airport buildings which are generally only accessible to members of staff, visitors and passengers who have received security clearance. Secure airside facilities will be provided to serve all aspects of the airports operational requirements and are shown in Figure 2.5 in Volume 3 of this ES. Figure 2.6 in Volume 3 of this ES provides a bird's eye view of the airside facilities.

2.2.5.1 Combined Building

Located south of the terminal, the majority of the airports functional requirements will be housed inside the Combined Building. The ATC Tower, airport fire service, administrative offices, potable water treatment plant, power generation control, Aeronautical Ground Lighting (AGL) control, and airline secure storage rooms will all be located here. Figures 2.7 and 2.8 in Volume 3 of this ES provide a ground floor layout plan and section for the Combined Building providing 1,475 metres squared (m^2) of floor space (gross external area). The shape, form and materials are derived from that of the Terminal Building so as to create a coherent architectural language throughout the airport.

The internal planning of the building is driven by the need to locate the Fire and Rescue element as close to the apron as possible with direct access to the runway without having to negotiate bends in the road. The maintenance area is placed in the west end of the building. Shared facilities such as office-areas, toilets, changing-rooms, general plant, and store-facilities are placed in the central area of the building. The ATC tower is located on the south-eastern corner of the building with stair access from inside the Combined Building.

The southern, western, and eastern façades are formed from local basalt stone with openings for plant-room, storage, and access-doors as well as rapid rise roller shutters to vehicle bays. The northern façade is made out of a modular, diffuse light-transmitting, insulating sandwich-panel system, 'Kalwall', with sections of glazing inserted to create views onto the apron and Terminal Building beyond. All external columns are made out of 'Corten', a type of steel.

2.2.5.2 Storage Compound and Generators

Located south of the Combined Building, the storage compound is an enclosed general purpose storage area, as shown in Figure 2.5 in Volume 3 of this ES. Located adjacent to this building is an identical building housing the airport electrical power generators. All of the airports power requirements will be supplied from this facility by three large generators (duty, standby and spare) and a single smaller generator. The latter is sized to support essential services at the airport during non-operational periods. Fuel for the generators will be supplied from the Aviation Fuel Facility (AFF) by underground pipeline.

2.2.5.3 Aviation Fuel Facility

Located west of the Combined Building, the AFF will be the local fuel storage area for aircraft, power generation and airport vehicle use. The AFF comprises three 54 m^3 tanks for aviation fuel and one 54m^3 tank for gas oil, a receipt pump/filter platform, and facilities such as piping, valving, pumps and filters for product handling. A pipeline from the AFF to the apron supplies fuel to the aircraft via hydrants set into the concrete pavement. The area will be positively drained to the southern stormwater attenuation pond via a full retention interceptor to separate oily water from rainwater.

2.2.5.4 Future Fisheries Protection Building

Located north of the Terminal Building is an area designated for a future fisheries protection building for the UK Foreign and Commonwealth Office which would be the subject of a separate planning application. General provision has been made for both landside and airside access from the circulation road and via a future apron extension respectively and underground services will be designed to accommodate this site.

2.2.5.5 Fire Training Rig

The Fire Training Rig will provide a facility for hot fire training for the airport fire service and potentially the island fire service. The rig consists of a mock aircraft fuselage set within the airside area and is used to simulate aircraft fire fighting conditions. The fire training rig will be located northeast of the terminal where the airport fire service and potentially the island fire service will conduct their hot fire training. Kerosene and Liquefied Petroleum Gas (LPG) fuels are stored on site for use. Fire fighting and simulator cooling water are supplied under gravity by a local hydrant connected to the airport fire fighting storage tank. The facility is positively drained to the southern stormwater attenuation pond via a full retention interceptor to separate oil spills from rainwater. However, when fire training incorporates the use of fire suppressing foam, the drainage valving is reconfigured so that the foam is drained to a separate foam storage tank. Hot fire training for the Airport's fire fighters would take place on a monthly basis. The fire rig will be used to simulate running fuel fire using kerosene up to 4 times per year other times LPG will be used. A typical rig is shown in Plate 2.1.

Plate 2.1 Typical Hot Fire Training Rig

2.2.5.6 Airside Access Roads

Airside roads are those which facilitate the movement of vehicles around the fenced airport site for maintenance and security reasons. They are also provided to separate vehicles from pedestrians and aircraft, and consist of an access road in front of the Terminal Building, fire vehicle access road to the apron, perimeter security access tracks, access tracks to airfield lighting and Aircraft Navigational Aid (Navids) installations and other infrastructure.

Airside car parking will be provided for airport employees alongside the Combined Building.

A fuel loading bay next to the aviation fuel facility has been provided to enable the controlled and safe re-supply of the AFF from a bridger tanker vehicle delivering from the BFI (separate bridger vehicles will be dedicated to transporting aviation fuel (Jet A1) or gas oil respectively). Details are shown in Figure 2.5 in Volume 3 of this ES.

2.2.6 Landside Facilities

Landside facilities are those which are accessible to the general public without the need for security clearance and consist of the Terminal Building, car parking and drop off areas and the vehicle control point, as shown in Figure 2.5 in Volume 3 of this ES.

2.2.6.1 Terminal Building

The form of the building is determined by the requirement for the terminal to be space-efficient, simple in its construction, flexible with regards to future alterations to internal planning, and expandable with regards to the external envelope. The layout of the Terminal Building shown in Figures 2.9, and 2.10 in Volume 3 of this ES provide sections through the building. Figure 2.11 in Volume 3 of this ES provides a perspective the Terminal Building entrance, and Figure 2.12 and 2.13 in Volume 3 of this ES provide internal perspectives.

The Terminal Building design focuses on the provision of adequate facilities for arriving and departing passengers as well as their meeters and greeters. The internal volume is essentially a single open space with landside and airside areas separated by a core containing all the essential operational facilities. Within this core the main passenger processes take place including passport control, security, and customs. The core contains the cafeterias that serve landside and airside concourses and the toilet main block. A mezzanine floor for plant is also provided. The Terminal Building provides 2,873m^2 of floor space (gross external area). Landside facilities will include the concourse, check-in area, airline offices and units for currency exchange and tourist information. Airside facilities will include the departure lounge, business and VIP lounge, arrivals hall and baggage reclaim facilities.

The core is split in two units on either side of a central area giving people on the landside direct access to the east side of the building giving views onto the apron and parked aircraft. This creates a link between travelling and non-travelling persons of the airport. Either side of this area is glazed onto both the departures gate and arrivals hall to create further visual links between passengers and their meeters or greeters.

The cargo-facility has been incorporated into the Terminal Building envelope to make use of shared facilities and reduce construction cost.

The building envelope takes on two forms; from the landside approach to the airport it is to be seen as a fortification or monolith, with reference to the islands history, creating a "safe" port to travel from; once inside the building this perception changes to one of transparency with light filtering in through the semi-transparent walls towards the airside. Similarly this transparency greets arriving passengers and creates clarity in the function of the building.

A monopitch roof is concealed behind the façade, and falls towards the landside elevation. Roof-lights located between structural roof beams permit natural, controlled daylight to enter the landside end of the building.

The landside (west), north and south façades are formed from local cut stone with openings for the main entrance and cargo-facility. The airside (east) façade is formed from a modular, diffuse light-transmitting, insulating sandwich-panel system with sections of glazing inserted to create views onto the apron and waiting aircraft. Exposed external columns are made out of Corten steel, which provides a weathered, rusted appearance, sympathetic to the colours of the surrounding landscape.

Future expansion of the footprint is safeguarded to the south of the Terminal Building, where the cargo facility is located. Minor expansion can be accommodated within the cargo-facility which can easily be converted into additional terminal-area, minimizing the disruption to the operation of the airport. The Terminal Building will include a number of features to reduce energy and resource consumption as follows:

- Air source heat pump - Space heating to the main entrance of the building will be provided by an air source heat pump. This provides low temperature hot water to an underfloor heating system at efficiencies up to four times greater than a conventional fuel burning boiler;
- Windcatchers - The check in area will be naturally ventilated via windcatchers located on the roof. These allow for the supply and exhaust of air which helps keep the building cool whilst providing outside air for the occupants;
- Low energy lighting - The lighting will be low energy which will both reduce electricity consumption and minimize heat gain to the space. The lighting system will be controlled by photocell tied in to a control system for both internal and external installations. Passive infra red detectors will also couple into the system for occupancy control. Roof lights assist in reducing the reliance on electric lighting;
- Solar hot water - Hot water will be provided by solar collectors sized for 100% of the hot water requirements supplemented by electric immersion heaters for times of low or no solar radiation;
- Domestic water - Hot and cold water will be provided by sensor activated taps to reduce water consumption; and
- Building fabric - Natural stone has been specified for sections of the external envelope sourced from within the airport site area.

2.2.6.2 Car Parking and Drop Off Facilities

The airport is linked to Rupert's Bay and the existing island road network by the proposed access road. At the airport end this road becomes an airport circulation road around a central car parking area, as shown in Figure 2.5 in Volume 3 of this ES. The circulation road has been designed as a conventional one-way system for passenger drop off and pick up and bus parking. Short and long stay parking will be provided in the central car park. A total of 85 standard spaces and 3 disabled spaces are proposed for passengers.

Initial vehicle access to the airport airside is controlled through a Vehicle Check Point (VCP) located off the southern point of the airside circulation road. The VCP is a small rectangular building with a floor space of 36m^2 (gross external area).

For access to the cargo facility, a dedicated manoeuvring area has been provided for lorries to reduce congestion on the circulation road at the southern end of the Terminal Building.

2.2.6.3 Vehicle Control Point

Vehicular access to the airside area will be controlled through a vehicle control point located off the southern side of the airside circulation road. The vehicle control point will be a small rectangular building with a floor space of 36m2 (gross external area);

2.2.7 AGL and Navaids

Airfield Ground Lighting (AGL) has been provided to assist the safe arrival and departure of landing aircraft and manoeuvring of taxiing aircraft on the runway, taxiways and apron. Typical approach masts are shown in Plate 2.2.

Plate 2.2 Typical Airfield Approach Lighting Structures

Navaids assist in the safe arrival and departure of aircraft and are located either on or near the airport site. Wind direction indicators, Non Directional Beacon (NDB) and Instrument Landing System are located on the airport site relatively close to the runway. The Doppler VHF Omni-Range radio station (DVOR) and Distance Measuring Equipment (DME) is located remote from the airport near the Bradleys Government Garage. A typical DVOR array and Instrument Landing System is shown in Plate 2.3.

Plate 2.3 Typical DVOR Array

Plate 2.4 Typical Instrument Landing System

ROL's are located on high points in the vicinity of the airport where high terrain causes an obstacle to air navigation as shown in Figure 2.1 in Volume 3 of this ES.

2.2.8 Security Fence

Security fencing specified as airport perimeter fencing will be a 2.9 m high welded steel mesh fencing with two layers of plastic mesh provided to secure the airport boundary from intruders and hazards to aircraft. This fencing combined with natural boundaries provides effective separation between landside and airside.

2.2.9 Surface Water Storage Ponds and Drainage

On the airport site a combination of conventional drainage systems with primary full retention interceptors (where required) and clean water diversion channels with energy dissipation structures (where required) will be provided. The surface water drainage collection system is split into two areas about the mid point of the runway. To the north of the runway mid point water is positively drained from the runway to the northern stormwater attenuation pond. South of the runway mid point, the runway, taxiway, apron, fire training rig, Terminal Buildings and landside drainage areas are positively drained to the southern stormwater attenuation pond.

South of the fill embankment in Dry Gut, a number of intercepted gullies will require diversion structures and channels to re-route the water away from the toe of the fill embankment. These are required to protect the embankment from erosion.

2.2.10 Sewage Treatment Plant and Foul Water Drainage

All foul water from the Terminal and Combined Buildings will be piped either by gravity or small pumping station to the Sewage Treatment Plant (STP). The STP is located adjacent the fire training rig and connects into the surface water drainage system post treatment, as shown in Figure 2.5 in Volume 3 of this ES. Its location has been selected to minimise the spread of odour to the terminal area given the prevailing trade wind direction on St Helena.

2.2.11 Services

Services external to buildings are provided for AGL, telecommunications and lighting. Cables for AGL and Navaids connecting the control centre in the Combined Building to the installations will be below ground in a pit and duct system. Telecoms cables connecting the airport buildings to the existing island infrastructure will be direct buried from the airport to Bradleys Government Garage or carried on overhead lines on the existing network. Electrical cables for external lighting will be direct buried. All electricity will be generated on the airport site by diesel powered generators in the generator compound opposite the Combined Building.

2.2.12 Waste storage and disposal

Waste arising from the airport operation will be collected by Environmental Health, Public Health and Social Services Department on a regular basis the frequency of which will depend on the airport's demand.

2.2.13 Temporary Airstrip

The remoteness of St Helena, complex construction logistics and the limitation of frequent access via the RMS may require the construction of a temporary air strip by the Contractor within the ADA boundary. It is possible that this will be required to ensure that the project can be cost-effectively delivered.

The airstrip would be constructed by grading the surface to a 1000 m long by 80 m wide un-paved strip. The location proposed is marked on Figures 2.1 and 2.2 in Volume 3 of this ES, and is to the west of the airport along the route of the permanent access road. This location has been selected for the following reasons:

- It avoids the highly sensitive Central Basin of Prosperous Bay Plain, although it is still located within the proposed National Protected Area;
- It is proposed in a location where the access road will be constructed in any case, minimising the additional impact of the temporary runway;
- The availability of suitable flat land is very limited, restricting the choice of possible locations;
- The location has also been chosen for safe operation of the aircraft, involving input from the Regulator; and
- The selected location close to the airport site will enable efficient working practices, ensuring that the project is developed as cost effectively as possible.

Such an air service would be for the sole and private use of the Contractor and not for commercial activity. It is expected a service would be operated once per week. The proposed aircraft for this particular long range air service, Walvis Bay to St Helena and vice versa, is a four engine de Havilland Canada DHC-7 (“Dash7”) which has low take-off speeds ideally suited to short take-off runs and is shown in Plate 2.5.

On a case by case basis, the service may be used for emergency medical evacuation and extended to Saints, subject to the necessary insurance and agreement from doctors the air service provider and Contractor. As soon as possible, the flight operation would be shifted from any temporary airstrip into the new runway or emergency runway, depending on which first available. On completion of the airport the land used for any temporary airstrip would be restored to its existing profile and vegetation re-established.

Plate 2.5: The Dash 7

2.3 AIRPORT OPERATION

2.3.1 Passenger and Aircraft Movements

The airport is programmed to open in 2013. Table 2.1 shows the scheduled passenger and aircraft movements which are forecast for the new airport on St Helena and are based on the use of a B737-800 in 162 mixed configuration fit of 12 business and 150 economy seats.

Table 2.1 Forecast of Scheduled Passenger and Aircraft Movements

Year of Operation	Saints	Visitors	Total	Aircraft per Week
1	5530	1493	7023	1
2	5479	1717	7196	1
3	5590	2490	8080	1
4	5807	3984	9791	1
5	6088	6375	12463	2
6	6482	7331	13813	2
7	7192	8431	15623	2
8	7374	9695	17069	2
9	7727	11149	18876	2
10	8123	12822	20945	3
11	8583	14745	23328	3
12	9092	16957	26049	3

Year of Operation	Saints	Visitors	Total	Aircraft per Week
13	9664	19500	29164	4
14	10257	22426	32683	4
15	10981	25789	36770	5
20	15208	41782	56990	7
25	20189	58601	78790	9
30	22200	58601	80801	10
35	23983	58601	82584	10

The St Helena Access Feasibility Study (WS Atkins, 2004) undertaken for the long runway airport (described in more detail in Section 2.10) suggested a cap of 58,000 passengers per annum to control the numbers of visitors to the island.

In addition to this there may be a small number of charter flights per week as the island tourist business matures, if at all, these are likely to occur sometime after year 2 of airport operations and are unlikely to exceed two flights per week for about 26 weeks of the year. Passenger numbers per flight will depend on the country of origin, but the most likely will be South Africa or Namibia. In this case each charter aircraft can be expected to carry about 160 passengers.

There may also be a number of business jets visiting for short periods as occurs on Ascension Island. If this business does come about, then the likely pattern is for one to three of these visiting once a month and almost certainly over a 'long' weekend. The maximum number of passengers carried by any of these aircraft is limited to 19, but it is more likely that the number will be 10 – 14 per aircraft.

2.3.2 Originating Countries and Airports

The originating airports for schedule and charter traffic are, in the longer term likely to be: Cape Town, South Africa; Johannesburg, South Africa; Walvis Bay, Namibia; Windhoek, Namibia: Wideawake Airfield, Ascension Island; London Stansted; and London Gatwick.

2.3.3 Air Cargo

Most air cargo will be carried in the hold of the scheduled aircraft. This is expected to be about 1000 kilogram (kg) – 2000 kg per aircraft. However, there will be some occasions when charter air cargo aircraft are used (one to three times per year). This is most likely to be a Lockheed L100 Hercules operating out of Johannesburg. The payload will probably be about 15,000 kg – 20,000 kg depending on the last airport of origin (the larger loads being carried from Walvis Bay or Ascension Island).

2.3.4 Fisheries Protection Aircraft

Space has also been provided on the airport, at the request of the Foreign and Commonwealth Office, for an apron area to accommodate two fisheries protection aircraft. Although there are no plans at present for the establishment of a fisheries protection service if it does occur then the aircraft will be two small, twin turboprop aircraft capable of carrying about six passengers. These aircraft would fly between St Helena and Ascension Island and provide fisheries protection for both islands. From the St Helena perspective, there would be about six aircraft take offs and landings per week.

2.3.5 Aircraft Maintenance on Airport

There will only be basic line check maintenance carried out between landing and take off for the scheduled aircraft. This will involve an aircraft engineer (carried on board the aircraft) undertaking visual inspections, electronically checking the aircraft systems via a lap top and occasional tyre inflation.

However, there will be rare occasions when there will be a requirement to change a tyre or affect minor repairs to the aircraft. This is unlikely to occur more than two or three times a year. Even rarer will be the requirement to change an engine. In these circumstances, if the aircraft is significantly delayed, the apron has room for a second aircraft so that the scheduled air service can continue.

Normal operations including re-fuelling, baggage loading and unloading, catering, passenger embarkation and disembarkation will occur for each flight.

2.3.6 Specialist Vehicle Maintenance

The specialist vehicles such as the fire fighting vehicles will undergo daily routine inspections before the start of flying. Provision has been made in the general purpose building for a garage area with servicing pit for deeper servicing checks, off-line maintenance and component changes.

2.3.7 Building and Infrastructure Maintenance

Maintenance of the building fabric and infrastructure will be required and is expected to be minimal in the first five years of operation. Routine checks of the surface water drainage system will take place yearly with cleaning and oil removal as demand dictate. This is unlikely to be more frequent than bi-annual.

2.3.8 Maintenance of Airfield Lighting

Planned maintenance would normally be scheduled to take place on a weekly basis during non-operational hours and comprise the following tasks:

Weekly

- The Contractor shall inspect all AGL lights for serviceability. This shall be used to confirm the Client's weekly report of lamp failures.
- Replace all failed lamps and lamps with low output
- Note and correct dirty or misaligned luminaires
- Check that all Precision Approach Path Indicators (PAPI) lamps are serviceable and the lenses are clean (see safety note above).
- Check PAPI transition
- Check the operation of the Lighting Panel within the control room
- Check serviceability of Obstacle Lighting
- Check serviceability of High Level Apron Floodlighting

Monthly

- Check all luminaire fixings are secure

Quarterly (Three monthly)

- Clean all luminaries
- Align runway edge lights
- Check and adjust the brilliancy currents
- Carry out photometric measurement of the light output from luminaires
- Check and adjust constant current regulators

Twice yearly (Six monthly)

- Check alignment of all elevated luminaries and adjust where necessary
- Check approach masts are secure and undamaged
- Check condition of secondary leads on approach masts
- Measure the insulation resistance of all primary circuit cables

Annually

- Check operation and condition of runway guard lights
- Check condition of wind sock
- Calibrate test equipment

2.3.9 Maintenance of Navigational Aids

Daily checks would be undertaken for operation and condition of equipment and security fencing. Navaids inspection and servicing would be by vehicle with tools and spares necessary for the task. An annual flight check is required for the approach aids and PAPI.

2.3.10 In-Shore Sea Rescue

2.3.10.1 Mooring and Serviceability

There will be an in-shore sea rescue lifeboat, Royal National Lifeboat Institution (RNLI) Tyne class or equivalent moored at Jamestown or at some other place as agreed by SHG, the Contractor and Air Safety Support International (ASSI). The boat will be specially equipped with liferafts and detection gear to enable it to be used for sea rescue of passengers from a ditched aircraft up a range of about 50 nautical mile (nm) from St Helena. The lifeboat will be kept in a serviceable condition and in particular at all times when flying takes place. On shore facilities will include crew stores and changing area.
For the first two years of aircraft operations, the lifeboat is to be at sea and within fifteen minutes sailing time from the airport for one half hour before the arrival of aircraft and for one half hour after the departure of that aircraft. After two years, this arrangement will be reviewed.

2.3.10.2Lifeboat Crew Training and Practice Rescues

The Coxswains and crew of the lifeboat will be found from the general population of St Helena or others as determined by SHG. The Contractor will be responsible for initial and continuation training and any proficiency testing of the lifeboat crews. The lifeboat and crew will undertake a weekly practice rescue at sea involving call out, deployment of the lifeboat in and around the waters of St Helena.

2.3.10.3 At Sea Rescue Coverage

For the first two years of aircraft operations the lifeboat is to be at sea and within fifteen minutes sailing time from the airport for one half hour before the arrival of the aircraft and for one half hour after the departure of that aircraft. After two years this arrangement will be reviewed.

2.3.11 Aircraft Crash and Disaster and Fuel Installation Emergency Plan for St Helena

An outline Aircraft Crash and Disaster Plan has been prepared to support this planning application. The Plan also makes provision for the handling of emergencies at the aviation fuel facility at the airport and the BFI.

The Plan outlines the organisational structure that shall be put into place on St Helena for the contingency planning and training of staff to handle the following types of emergencies and accidents:

- On airport aircraft emergencies and accidents;
- Off airport but on Island aircraft emergencies and accidents;
- In shore sea aircraft emergencies and accidents;
- Off shore sea aircraft emergencies and accidents;
- On airport fires and explosions;
- Airport fuel facility emergencies and accidents; and
- BFI emergencies and accidents.

Where possible, the Plan attributes specific responsibilities to organisations and post holders and requires the formation of a number of committees and sub-committees to deal with emergencies. A Disaster Control Centre will be created located in Jamestown with a Disaster Control Team including an Incident Commander, Duty Airport Manager, Duty Air Service Provider Manager, Duty Meteorological Forecaster, Duty Fuel Facility Manager, Duty Police Commander, Duty Medical Liaison Officer, Duty Island Fire Officer, Harbour Master or Sea Rescue Coxswain not at sea, Press Officer and Next of kin Information Officer. The Plan further sets out:

- The specific responsibilities of the individual Disaster Control Centre Operations Room staff;
- Details of the staff training required;
- The roles and responsibilities of the on airport rescue fire fighting services;
- Details of sea rescue facilities including mooring and serviceability, lifeboat crew training, details of practice rescues, at sea rescues coverage and sea rescue crew callout;
- Details of the provision of temporary facilities and other support vehicles, equipment and volunteers in the event of a major incident; and
- Details of the practice of callouts and emergency procedures and; the containment of air crash wreckage both on land and at sea.

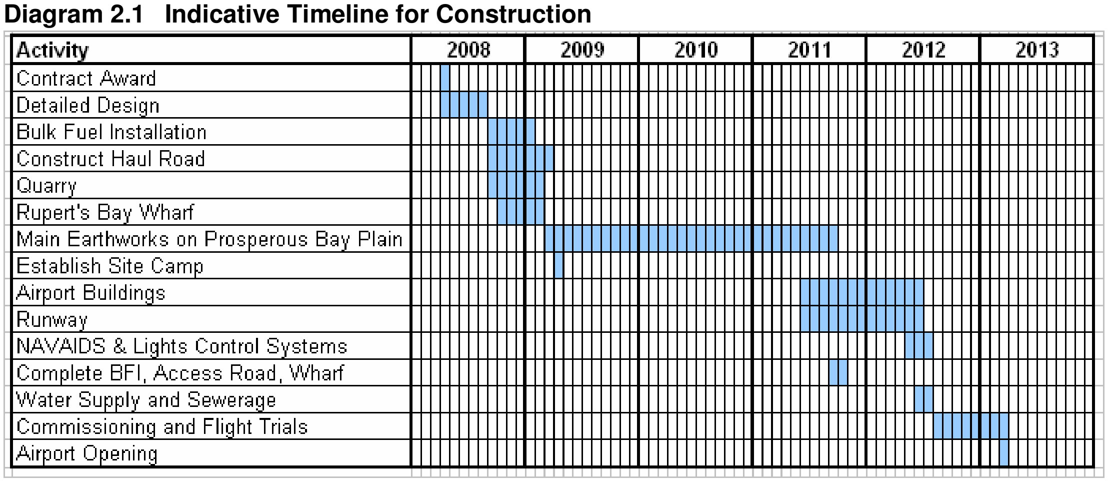
2.4 CONSTRUCTION PHASING

The phasing of construction is very much dependent on the successful Contractor's methodology and as such a detailed construction programme was not available during the EIA process. Based on the designs prepared to date the duration of the works including commissioning has been estimated to be approximately 4 years and 6 months from commencement of construction activities until the airport is operational. The main elements of the works are likely to be as follows:

- Contract award. Mobilise to island;
- Detailed design; Advanced enabling works;
- BFI in Rupert's Valley;
- Quarry establishment;
- Construct wharf in Rupert's Bay;
- Establish Site Camp and carryout main excavation works at airport site at Prosperous Bay Plain;
- Construct Terminal and Combined Buildings and other airfield infrastructure including NAVAIDS;
- Completion of permanent wharf, access road and airport water supply for operational activities;
- Commissioning and flight checks; and
- Certification of the aerodrome. Airport opening.

Diagram 2.1 provides an indication of the phasing and duration of the main construction activities. Some activities will overlap, particularly during the initial phases of construction.

Diagram 2.1 Indicative Timeline for Construction



Description of the construction activities involved for the main elements of the scheme is provided below.

2.5 AIRPORT CONSTRUCTION

This section provides a description of the possible construction approach and methods according to the designs prepared to date. The successful Contractor's approach may vary from that described in the following sections.

2.5.1 Earthworks and Culverts

The main area of ground to be excavated lies along the centreline of the runway to the north of the airport buildings. The main area of fill is in Dry Gut Valley to the south of the airport. However, before filling can commence in Dry Gut Valley, twin culverts approximately 800 m long are required to allow the existing stream to pass beneath the proposed fill. The culverts fall generally in an east-south-east direction and are shown on Figure 2.2 in Volume 3.

2.5.1.1 Access to Dry Gut Valley for Construction

Access to the culverts is down the steep valley sides and it is proposed that temporary access roads be formed in the valley sides so as to keep road gradients within the safe limits of the haulage trucks and other Contractor's plant. It is further suggested that there will be two haul roads so that Contractor's traffic moves on a one way system (initially) some 2 kilometre (km) long. This is for safety reasons and also allows narrower roads and easier maintenance of those roads. These haul roads can be shortened as the fill rises.

2.5.1.2 Dry Gut Valley Culverts

Having built the haul roads to the valley floor, the ground for the culverts will be excavated to the required profile primarily using bulldozers but with an excavator for trimming to more precise levels.

The culverts are proposed as being cast in place concrete arch culverts each 2.2m wide and 2.2 m high internally. To cast the culverts the Contractor may use steel formwork to maintain the require shape of the sides and arched roof until the concrete gains sufficient strength to support itself. After casting the concrete base, such formwork can travel on the culvert base and after each use can then be folded inwards and lowered so that it can be moved inside the culvert to the next section to receive concrete.

Concrete will be delivered to the valley by truckmixer and placed using chutes, concrete skip and crane and/or by an excavator suitably adapted.

In order to allow fill to Dry Gut to proceed as soon as possible, it is probable that the culvert construction will commence in the lower zones and progress to the higher zones (east to west) with the inlet and outlet structures constructed last of all.

2.5.1.3 Excavation and Fill

Bulldozers each weighing some 40 to 60 tonnes will rip and stockpile the ground to be used as fill. Where the rock is hard enough to slow progress to uneconomic levels the ground will be quarried using explosives. It is essential for construction to maximise excavation in the south for two reasons. Firstly the excavated material provides the shortest haul distance to Dry Gut Valley and secondly the area is required to construct the Terminal Buildings.

Of the excavated ground, most will have to be carried to fill zones using dump trucks but with careful planning, considerable amounts of ground may be dozed (or ripped and then dozed) directly from cut to fill. The type of plant chosen will cumulatively be able to sustain an average excavating rate of some 14,500 m^3 per working day to maintain programme, and there are a number of ranges of size and types of plant that the Contractor might choose. The minimum size for a primary front shovel (of which there may be three) will be such that one could drive a Ford Modeo into the bucket without scratching the sides. Plates 2.6 to 2.9 show typical plant that maybe used for the earthworks.

The dump trucks used to convey the excavated ground to the fill zones will be chosen to suit the front shovel; the smaller the shovel the smaller the dump trucks and the greater number of each required. Logistically there are limits to the number of excavation and fill areas that can be worked at any one time and maintain critical elements of the programme. It follows that if the Contractor uses relatively small plant, he will have to work longer hours to meet programme targets. It could be that the Contractor will choose to work two shifts per day on critical elements of the earthworks.

Rock that is too hard and strong to be ripped economically will be blasted. The quantity to be ripped and quantity to be blasted will have to be determined through site trials. To perform blasting operations the Contractor will have drill rigs and explosives available. It should be noted that with modern explosives, mixing on site is anticipated so transporting and storing large quantities of ready mixed explosives will probably be averted. Additionally, large vertical faces should be available for blasting which should require very low explosive consumption and thereby minimise the impact on buildings and wild life.

The excavated fill may, where necessary, be damped down to minimise dust and assist compaction. In such case it is suggested that excavated material will be pre-conditioned, as the complete conditioning and mixing might prove impractical in fill areas due to restricted access and large volumes of material being imported. This would be achieved through the laying of temporary pipelines to the main excavation zones.

Spreading and compaction of fill material is likely to initially have a greater capability than that of the fill delivery. This is due to an increased rate at which fill is delivered as a result of fill rise in Dry Gut Valley reducing the haul road distances. Additionally, problems with final conditioning and compaction should not be allowed to significantly hold up the importation of fill. The plant for spreading is likely to be the same as the excavation dozing plant for reasons of interchangeability. Therefore it is expected that in Dry Gut Valley, dozers of 275 kilowatt (kW) or greater would be used for the western fill whereas in the eastern corner where some ground reinforcement is required less powerful dozers will cope with the lower importation of fill rate.

Compaction is planned to be performed primarily with 15 tonne self propeller vibrating rollers but routing traffic over the fill will also enhance compaction.

The terracing to Dry Gut Valley will be formed from the layered construction of the fill. Trimming of the formed slopes and placement of slope protection rock will be by excavators with suitable reach and rock handling tools.

During the excavation, some 200,000 m^3 of fill will be selected for screening and crushing on site. Such material will be used in concrete and the base course for pavements. The material for crushing will be handled by the plant used for the access road construction, augmented as required.

Haul roads at the airport site will be maintained with graders and water bowsers supported by dozers when necessary.

Plate 2.6 – Dump Truck Loading Shovel for Excavating Fill Material

Plate 2.7 – Dump Truck for moving fill material

Plate 2.8 Bulldozer for spreading fill material

Plate 2.9 Vibrating Roller to compact fill material

2.5.2 Pavement Construction

It is anticipated that runway construction will commence away from the south end of the runway to allow the deep Dry Gut Valley fill as much time as is reasonable to settle. The runway construction is basically a base course of dry-lean concrete under an un-reinforced concrete pavement. Both dry-lean concrete base course and the concrete pavement will probably be laid with the assistance of a slip-form paving machine. The output of the paving machine, concrete batching plant and truckmixer delivery capacity will need to be harmonised. A concrete mixing plant capable of maintaining at least 40 m^3 per hour would be provided to meet this demand. Plate 2.10 shows a typical concrete batching plant and Plate 2.11 shows a concrete paving operation.

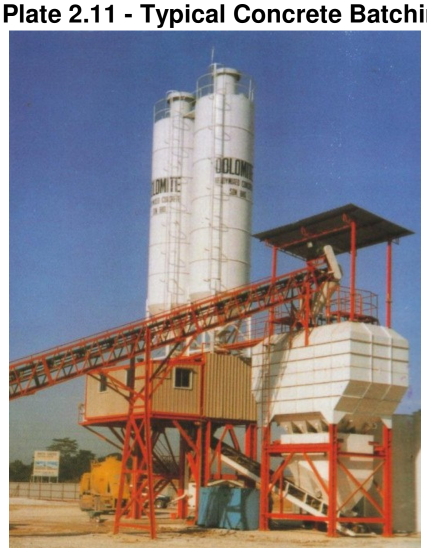
In the paving design there is some 4.5 km of expansion / contraction joints to be placed as the paving progresses.

Taxiways and the aircraft parking apron will also be suitable to lay with slip-form paving but the hard-standing areas around the terminal are more likely to be constructed in bays using traditional ‘manual’ methods of screed rails and vibrating beams.

Cement will be imported in sealed one tonne bags. Concreting sand will probably be obtained through both imported sand and fines from crushed stone so as to minimise the former.

Plate 2.10 - Typical Concrete Paving Machine

Plate 2.11 - Typical Concrete Batching Plant



2.5.3 Airport Terminal Construction

The Airport Terminal is of steel frame on reinforced concrete foundations. Construction of the steel frame will require a crane of at least 30 tonnes capacity to be able to work at useful radii.

It is unlikely that a small fixed crane will be used and most materials handling will probably be performed with the 30 tonne mobile crane and a four wheel drive materials handler.

Co-ordination of the finishes, mechanical and electrical services will be crucial to maintaining programme during the construction of the Terminal Building. So to, the delivery of imported materials and equipment will be crucial as will be obtaining the services of specialist personnel to fix / install them.

Airport services such as water, power, telecommunications, AGL ducting and drainage will be constructed after the bulk earthworks and in conjunction with construction of the Terminal Buildings and associated infrastructure.

Fuel and power generation facilities will most likely be among the last items to be constructed prior to commencing operations as these items are to be handed over to the airport operator in an 'as new' condition.

2.5.4 Construction Compounds and Temporary Work Areas

The Contractor will require a compound to provide accommodation for construction workers, as well as space for activities such as storing materials, operation of construction equipment such as rock crushing, cement making and so on, maintenance of construction equipment, and administration, as shown on Plate 12. A Contractor's compound has been provisionally shown near Bradleys Government Garage. However, this is some distance from the airport site and it is possible the Contractor will wish to locate a temporary compound somewhere closer to the airport site. This may be important to enable cost effective delivery of the project, and to enable efficient working practices. A provisional location on the western side of Prosperous Bay Plain is shown on Figure 2.2. This location avoids the sensitive Central Basin, although it is partially within the proposed National Protected Area. The compound is proposed in a location where the access road will be constructed in any case, minimising the additional impact of compound. If a compound is required close to the airport site, the detailed location will be carefully reviewed to ensure that environmental impacts are minimised.

Plate 2.12 Typical Contractor's Compound

Temporary work areas will be required to construct remotely located infrastructure items such as the Navids and ROL units. The footprint and access requirements for these temporary areas will depend upon the Contractor's design and construction method. Access to some of the more remote sites is only possible by foot or alternatively helicopter.

2.5.5 Water Supply for Construction (Currently Unknown)

There will be a water requirement for compaction of the bulk fill earthworks. As supply is relatively scarce on the island it is likely that a number of supply options will have to be considered. A brief overview of the construction water supply options is listed below:

- The permanent water abstraction works at Sharks Valley may be developed to supply part of the requirement subject up to a maximum abstraction of $40m^3$ per day. In addition to this water may be abstracted from Sharks Valley close to the waterfall at the beach provided a residual flow is maintained;
- Water may be supplied by pipe from other parts of the island where surplus is available to temporary storage tanks. One option is to utilise Dry Gut and create a temporary weir structure and reservoir; and
- Sea water may be pumped from Gill Point to be utilised in selected parts of the fill where leaching of salts in to the environment can be effectively controlled or proven not to be detrimental to the environment.

2.5.6 Temporary Site Drainage and Pollution Control Measures

The Contractor will be responsible for providing temporary drainage for his compound and work areas, and to construct and maintain adequate controls to prevent the discharge of contaminants to the environment.

2.6 RUPERT'S BAY WHARF

2.6.1 Proposed Development

The existing wharf facilities and access through Jamestown are considered insufficient to support the import of plant, equipment and materials required for the construction of the airport and associated facilities. Physical restrictions include lack of sufficient water depth, minimal storage area on the quay, available crane capacity and the narrow Jamestown arch. Along with adverse impact that construction traffic would have on Jamestown. It is possible that in the very early stages of construction that the Contractors staff and a few small items of equipment would arrive at Jamestown.

New wharf facilities are therefore required both for the construction of the airport and to provide a permanent facility for the island. It is likely that a new temporary wharf will be constructed at Rupert's Bay which will be removed after construction and replaced with a permanent facility. Provision of the permanent facility is subject to funding and affordability, although it forms part of the scheme for assessment. The location of the proposed permanent and temporary wharfs is shown in Figure 2.14 in Volume 3 of this ES.

2.6.2 Temporary Wharf

The early stages of constructing the airport will require the delivery of heavy plant and equipment to St Helena. A temporary wharf is likely to be constructed on the western side of Rupert's Bay. This is likely to be a promontory constructed from quarry run fill covered in a layer of protective rock armour. Depending on the type of vessel deployed this may require a quay wall to be formed from sheet piles or blockwork. The approximate size of the temporary wharf is shown on Figure 2.14 in Volume 3 of this ES.

Road access to the temporary wharf would be gained by extending the existing road from The Shears (an existing quay in Rupert's Bay), part of which may need to be on reclaimed land. The temporary wharf and its access road would be a temporary structure and removed on completion of the airport. It is likely that material from the temporary wharf would be used in the permanent wharf construction.

2.6.3 Permanent Wharf

The marine facilities post airport construction will be required to accommodate a wide range of commercial shipping and to transfer and handle a range of cargoes including dry and liquid bulks, general cargo, containers and petroleum products. It is proposed that in the long term the new facilities will replace Jamestown as the commercial port for St Helena although foot passengers will continue to land at the Jamestown Wharf as at present.

Marine facilities will comprise a solid jetty structure extending seaward from the shoreline at approximately right angles to the shore to provide a measure of protection against waves from the north west. The facility is designed as a 'multi user' port with the following key features as shown in Figure 2.14 in Volume 3 of this ES:

- A 120 m long main quay with minimum alongside water depth of 7 m for bulk, containerised and general cargoes;
- A 15 m wide fixed ro-ro ramp for vehicular cargo;
- A 40 m long 'lighter' berth with minimum water depth of 3 m for lighter berthing as is currently practiced in Jamestown;
- A 25 m wide cargo handling 'apron' over the whole length of the main quay;
- A rock revetted slope constructed from precast concrete units or rock armour to protect the structure from wave action; and
- A causeway connecting the above to the shore.

The post airport construction marine facilities are designed to accommodate a range of vessels as shown in Table 2.2 below.

Table 2.2: Vessels to be Accommodated at Rupert's Bay Wharf

Vessel Type	Deadweight (tonnes)	Length Overall (m)	Beam (m)	Design Draft (m)
Dry Bulk Carrier	<5,000	<90.0	<16.0	<5.7
General Cargo	<2,600	<105.0	<20.5	<6.0
Roll on Roll off Vessel	<3,000	<125.0	<20.0	<6.0

Rupert's Bay will remain as the fuel supply point for St Helena during and post construction of the airport, and as such the facility is to include fixed pipelines and facilities for the deployment of a floating hose for servicing petrochemical parcel tankers moored offshore as is current practice.

2.6.4 Cargo Handling Operations

Cargo transfer operations will be carried out by a combination of self unloading using 'ships' gear' and by mobile cranes operating from the wharf apron. Due to the prevailing sea conditions, it will only be possible to unload cargo directly onto the wharf for about 340 days of the year. When sea condition prevent direct unloading, this can be carried out as at present using lighters shuttling from the ship to the lighter berth.

2.6.5 Wharf Access

An access road to connect the quay to the existing road in Rupert's Bay and the new permanent access road will be provided that incorporates a turning head near the wharf appropriate for the types of vehicles expected to be used for wharf cargo operations. The section of road on the quay will be a minimum paved width of 8 m wide.

2.6.6 Navigational Aids

Aids to navigation will be provided for the operation of the marine facilities. These are likely to comprise fixed jetty lights marking the extremities of the wharf and marker buoys indicating safe water depths in the approaches and manoeuvring areas. Temporary lights will be provided as necessary by the Contractor for the temporary works. These will be in accordance with the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA).

2.6.7 Port Authorities Accommodation during Airport Construction

During construction of the airport, temporary accommodation for the Port Authorities will be provided comprising offices, holding room and Water closets, (WC's). Port Authorities accommodation post airport construction is yet to be determined and will be subject of a separate planning application. The buildings will comprise offices for the Harbour Master, Administration and Control Authorities together with ancillary and amenity provision.

2.6.8 Services and Waste Disposal

Service containment for power, water, lighting and communications will be provided along the wharf. Waste reception facilities will be provided including oil handling in accordance with the International Maritime Organization (IMO) Marpol Convention. The drainage system shall be designed to trap debris, silt and oils.

2.6.9 Construction of Rupert's Bay Temporary and Permanent Wharfs

It is expected that the initial concentration for the works will be to construct a temporary wharf on the west side of Rupert's Bay in order to provide a landing facility there for importation of the large earthmoving plant required at the airport site and to construct the airport access road.

Key elements of construction for the permanent wharf and access causeway are likely to comprise reclamation formed of quarry run rock and material from the temporary wharf. It may also including some proportion of dredged sand contained within geotextile fabric and intermediate rock filter layers with rock armouring protection on the exposed seaward faces. The quay walls used to retain the rock fill and permit close berthing of the vessels will comprise mass concrete blockwork founded on a prepared seabed rock 'mattress' and that the surfacing of the quay will comprise interlocking pre-cast concrete block pavers.

A new temporary quarry in Rupert's Valley will supply material for the wharf for which there are currently two options for the location of the quarry, as shown in Figure 2.1 in

Volume 3 of this ES. The rock fill will be hauled to the wharf in articulated dump trucks in the order of 30 tonnes capacity.

Construction of the wharf would start off on land by building the causeway. The main causeway and wharf will be built from land with end tipping of quarry fill material. However, the geotextile and the dredging will require marine plant. Typical marine plant would comprise the following as a minimum a multicat work boat with small front end loader, a floating barge or jackup barge with excavator and rotary drill rig and a 100 tonne barge.

The main wharf is expected to be created by end tipping quarry run material derived from local quarries using up to 30 tonne road lorries. The armour rock would be placed by a combination of crane and excavator. A 100 tonne crane would be used for the long reach underwater rocks (below -3 m chart datum). Divers are likely to be required to ensure the rocks are correctly placed. The armour rock above -3 m chart datum could be more effectively placed using a 45 tonne excavator with a rock grab.

The marine plant would be used to dredge and prepare the quay wall foundation. For dredging, the excavator would be mounted on the barge and would first excavate the loose sand material and load this onto the barge. The barge would then moor at the quay and the sand would be unloaded into a road lorry and then dumped (if suitable) on the adjacent beach area.

For dredging of the hard rock a drill rig would be used to drill holes into the bed rock and blast to fragment the hard material. The excavator would then load the blasted rock into the barge. This could then be reused in the core of the wharf.

The marine plant would then be used to prepare the rock fill foundation for the quay wall blocks. This would require divers. The quay wall blocks weighing 20 to 30 tonnes would be placed from land using a crane.

2.7 BULK FUEL INSTALLATION

2.7.1 Overview

At present there are fuel stores at the shore in Rupert's Bay and further up the valley at approximately 900 m from the sea. These installations are supplied by ocean going tankers via a pumping facility on the beach at Rupert's Bay. Two 6 inch diameter (approx) pipes carry gas oil and gasoline from the beach to the current storage facilities.

There is currently no facility for the existing fuel storage to handle aviation fuel (Jet A1) required for the operation of the airport, and therefore the development of the airport requires a new facility. Further, the existing BFI facility does not meet current health and safety regulations, and its small capacity requires frequent supplies by ship. With larger on island storage capacity, fuel could be supplied more cost effectively, particularly as the island's fuel demand increases through development of an industry to support tourism.

Therefore, a new BFI will be located in Rupert's Valley beyond the power station and quarantine station building. The location has the benefit of being further away from residents in Rupert's Valley than the existing facilities and avoids disturbing known grave sites. The BFI is shown in Figure 2.15 in Volume 3 of this ES.

2.7.2 BFI Facilities

2.7.2.1 Receipt from Ocean Going Tankers

Located at the end of the new wharf, a floating pipeline and landfall pipework will tie into the existing 6 inch transfer pipeline. Due to the pumping characteristics of the vessels which are likely to deliver bulk fuels to St. Helena, a booster pumping station located at or near the landfall will be required in order to assist the transfer of fuels to the tanks at the BFI.

2.7.2.2 Fuel Transfer Pipes

A single multi-fuel transfer pipeline is required to transfer all fuel types from the delivery tankers to the new BFI. Fuel will be transferred from the beach site to the new BFI via the existing supply line which will be extended. At the BFI, the single line will enter a fuel interface system and change over facility where the different types of fuel can be separated and sent to the correct tanks. As part of the transfer pipeline works, a new gas oil fuel supply line connecting the BFI to the existing power station will also be installed.

2.7.2.3 BFI Main Facility

The BFI Main Facility area comprises product handling (piping, valving, pumps, filters etc), storage tanks and product loading platform for road trucks. The BFI comprises four 750 m^3 tanks for gas oil, two 750 m^3 tanks for aviation fuel and two 750 m^3 tanks for gasoline, a receipt pump/filter platform, and facilities such as piping, valving, pumps and filters for product handling.

Space is provided within the BFI to provide office accommodation, staff amenities, spare parts and consumables storage, a plant control room, electrical switchgear, uninterruptible power supply, emergency generator and fire-fighting plant accommodation. An electrical distribution system will be provided to connect the BFI with the existing power station. Fuel will be loaded into bridger tankers at the BFI for distribution to the airport AFF site and island fuelling stations as is current practice.

2.7.3 Fire protection

Main storage tanks at the BFI will be provided with fully automated foam systems and water cooling systems to control and prevent the fire spreading. Adequate foam and water storage facilities will be provided. Water from the public main will be used to fill fire water storage tanks. Fire hydrants and portable fire fighting and first aid will be provided at strategic locations in the BFI.

2.7.4 Watercourse Diversion

At present, a watercourse meanders down the valley at the location of the proposed BFI. This will be diverted around the BFI in a stabilised channel with appropriate inlet, outlet and energy dissipation structures to minimise long term erosion of the stream bed.

2.7.5 Drainage

The surface water drainage system within the BFI will collect, convey and treat surface water runoff from the areas within the BFI and discharge into the sea or local watercourses. Treatment shall include oil interception. In emergencies resulting in a potential pollution incident, the surface water will require storage and treatment before final discharge.

The foul water drainage system will collect and convey foul water from the buildings to a septic tank for collection by Public Works and Services Department (PWSD). Effluent from the septic tank will be suitable for discharge into a soakaway.

2.7.6 Safety Fencing

Safety fencing will be provided to delineate the BFI from areas of public access and for mandatory safety clearance requirements. Fuel will be loaded into bridger tankers at the BFI for distribution to the airport site and island fuelling stations as is current practice.

2.7.7 Construction of the BFI

Construction of the BFI is expected to start by relocating overhead power lines in Rupert's Valley this would probably be in conjunction with forming the access road from the existing power station past the quarantine station and to the proposed BFI site. Once access is provided, the Contractor will level the ground to form a platform for the tank farms. Included with this will be the stream diversion and installation of below ground services – drainage and pipework. Work will then proceed to form the reinforced concrete foundations and bund walls for the tanks. Tanks, pipework and control equipment will then be installed along with office accommodation and storage for the operatives. The pipework and power lines will be installed to connect the facility to existing services.

Following a period of testing and commissioning the existing fuel farms will be dismantled and the ground cleared for future development.

2.8 HAUL ROAD AND PERMANENT ACCESS ROAD

2.8.1 Road Alignment

In order to enable the construction of the airport, a haul road is required to connect Rupert's Bay and the airport site. This road will also form a permanent access road with links in to the existing road network at the top of Deadwood Plain, at Fox's Garage near Longwood, at Bottom Woods and south of Government Garage (Bradley's). The design and alignment of the road seeks to minimise effects on landform, responding to the local topography and minimising the extent of earthworks and impacts on the landscape. The alignment of the haul road and access road is shown in Figures 2.1, 2.2, 2.16, 2.17 and 2.18 in Volume 3 of this ES.

The haul and permanent access road will be made up of both upgrading existing roads and stretches of new road . The alignment will begin in Rupert's Bay at the permanent wharf landing site and progress up the valley along existing roads towards the existing power station. The alignment is described below in sections in terms of "chainage (CH.)"

which is the distance along the road from a starting point at Rupert's Bay fuel farm. Chainages are annotated on Figures 2.2, 2.16 and 2.17 starting at CH. 650 m in Rupert's Valley to CH. 13,800 on Prosperous Bay Plain.

At CH. 650 m, the road will deviate from the alignment of the existing road and cross the stream to pass behind the power station (CH. 900 m). From here the haul road continues up the valley to CH. 1,925m at a consistently steep grade of 1:7 (14%) before making its first hairpin turn to traverse back along the upper slopes of Rupert's Valley.

The next section to CH. 2,600 m is also at an average gradient of 1:7 (14%) until the road crosses a watercourse at CH. 2,650 m. From here the road proceeds in a north-westerly direction but shallows to a variable gradient averaging 1:11 (9.1%) on the approach to Rupert's Hill. Upon rounding the corner of Rupert's Hill, now heading east, the road gradient sharpens steeply to 1:7 (14%) until CH. 4,000 m is reached. From here the road flattens briefly, following beside the historic Pipe Path track until CH. 5,350 m. The road alignment is to be adjusted locally onsite to avoid and preserve the Pipe Path track where possible. However, where crossing the Pipe Path is unavoidable provision will be made for steps so that the historic route is not obstructed.

Upon leaving the Pipe Path at the crest of Banks Ridge (CH. 5,350 m), the road begins a shallowing decent to Deadwood Plain at an average 1:12 (8%) gradient to CH. 6,000 m. The road progresses along the western edge of Deadwood Plain, intersecting the existing paved road at CH. 6,200 m and following this route at varying shallow grades until approaching Fox's garage at CH. 7,100 m. Here the road leaves the existing track, making a moderately steep decent to a crossing of the Mulberry Gut at CH. 7,700 m.

Ascending the opposite slope and continuing around Longwood Farm to Bottom Woods where the existing paved road is rejoined at CH. 9,450m. This track is followed over undulating ground to the fork at Bradleys Government Garage at CH. 11,000m. From here the road descends a moderate slope of 1:12 (8%) partly on existing road before traversing the land at Bradley's and Cooks Bridge on the approach to Prosperous Bay Plain.

At CH. 12,500 m the road climbs steeply to meet the ridge overlooking Dry Gut at CH. 13,800 m. The road alignment from Cooks bridge has been designed to skirt around the western perimeter of the protected central basin. Rounding the final bend to the east, the road enters a gradual decent towards the airport site. The last 200 m from CH. 13,800 m to the airport carpark will be cut at a maximum gradient of 1:7 (14%).

2.8.2 Details of the Haul and Permanent Access Road

Where it is mentioned above that the haul road will use the alignment established by existing roads, these roads will be upgraded for the haul road traffic and then adopted as part of the permanent access road upon final completion.

The permanent access road has been designed as 6 m wide with 1 m wide paved shoulders provided each side. Horizontal and vertical alignment accords with a design speed of 40 Kilometre per hour (km/h) as a minimum, consistent with the Island speed limit of 30 miles per hour (mph). The design of the airport access road seeks to minimise effects on landform. The design responds to both the broad scale of the topography as well as small scale landform. The following objectives were applied when selecting the route for the airport access road:

- To design an alignment least damaging to the landscape, that respects existing landform and avoids disruption of major topographical features;
- To find an alignment which uses the existing landform to good effect and which minimises the scale of earthworks;
- To design profiles which reflect existing natural slopes; and
- To achieve a balance between horizontal and vertical alignment that minimises earthworks but provides the best integration with natural landform and the best screening for properties.

When used as a haul road, the road will be sealed to reduce dust and noise impact to the local environment. Once no longer needed for construction traffic, the road will be upgraded to the permanent access road. This will entail a general re-grading of the haul road surface, construction of a final basecourse overlay and applying the sprayed bitumen and chippings surface. Other finishing works will also be completed at this time, such as architectural facings to bridge abutments and walls, line painting and crash barriers.

Retaining walls, used predominantly on the steeper sections of road on Rupert's Hill, will be of colour render to match the overall appearance of the existing weathered surface material across the plain using local aggregate where practicable.

The permanent access road from Bradleys Government Garage to the airport (including roads and tracks around the airport) will comprise a finished surface which assimilates them into the semi-arid landscape of PBP as well as possible. Colour render of surface material will match the overall appearance of the existing weathered surface material across the plain by use of a local aggregate, although it is acknowledged that where tar spray and chipping finish is required, the tar spray will change the overall colouring significantly, particularly when first constructed.

2.8.3 Arrangements for Footpaths

Footways will be provided along the airport access road where the road passes in front of residential and commercial property such as in Rupert's Bay and Deadwood to facilitate the safe access for pedestrians. Safe access will be provided during construction for residents accessing the road from their properties. Where existing footpaths and access are disturbed either by construction or in the permanent works these will be diverted prior to commencing construction.

2.8.4 Drainage Provisions

Road drainage and adequate crossings of watercourses is to be provided for the access road, particularly along hillsides. Drainage will comprise open channels between the road and the excavated face and gullys and drains or culverts under the road. These drains will discharge into local watercourses along the access road at locations resistant against erosion. Alternatively, suitable measures will be provided to prevent erosion. Where the road is built on an embankment consideration will be given to providing bridges or culverts to prevent trapping any potential catchments. In the area of Deadwood, specific drainage provisions are required as the run off needs to be collected and discharged downhill of residential properties.

2.8.5 Safety Provisions

Crash barriers will be provided at corners on steep sections of the road where the change in direction of the road is generally greater than 90 degrees and there is inadequate run-off space at the side of the road. Crash barriers will also be provided to the access road above the Bulk Fuel Installation in Rupert's Valley.

Rock fall protection is not usually provided for roads on St Helena. During construction any loose rocks or rocks that present a risk if they were to fall onto the road will be identified and removed. Specific safety provisions such as arrest netting, fences, walls etc are not currently proposed along the general route of the access road.

Specific rock fall protection will be provided to slopes above the BFI and AFF. No permanent street or pedestrian lighting will be provided along the access road.

2.8.6 Construction of Haul/ Access Road

Construction methods will vary according to the steepness of the incline. For steep sections such as the climb to Rupert's Hill Trig point, between CH. 900 m & 4000 m there is a need to prevent material from the excavations being deposited down the hillside. To minimise this, it is proposed that retaining walls of preformed blockwork made from local aggregate are placed on the outside of the road. On the inside of the road fill will be reinforced with grids of synthetic material to strengthen the fill and lessen the loads transmitted to the retaining wall. Progress in such sections is likely to be slow as the working width behind the gabions is restricted until it is filled to formation level where it widens to full road width.

It is anticipated that excavation for the reinforced fill and retaining wall will be performed by a powerful excavator capable of digging out weathered rock. Stronger rock will have to be excavated with a hydraulic breaker attached to the excavator or, if larger volumes are encountered, small scale blasting may be considered. The excavated fill will have to be transported to a screen / crusher to produce suitably grade backfill for the reinforced fill sections.

Most of the access road to be constructed is not as steep as the climb out of Rupert's Bay and construction will proceed much faster and without the need to retain the ground. Progress on construction of the road to formation level is likely to progress at rates up to about 400 m per day depending on the amount of cut and fill required. Placing the stone for the final road surfacing will be performed at a later stage after the required volume of graded stone has been produced.

Construction of flatter sections of the access road is likely to be with graders, bulldozers, motorised shovels and dump trucks. Compaction will be with self propelled vibrating rollers. Water will be brought to the road construction in bowsers to assist compaction of fill material and to lessen the amount of dust disturbed by the construction plant.

Protection of existing utilities, construction of temporary diversions to maintain access, culvert construction etc will take place sufficiently ahead of the access road earthworks so as not to delay its progress. As progress on steep incline sections is likely to be slow there may be two or more working fronts to obtain full access to the airport site as quickly as possible.

The boundary of the Airport Development Area (ADA) is shown in Figures 2.1, 2.2, 2.17 and 2.18 in Volume 3 of this ES includes sloping areas adjacent to the haul/access road where there is a danger of rocks slipping down into the construction area. These areas will be cleared of vulnerable rocks.

2.9 PERMANENT WATER SUPPLY

2.9.1 Introduction

A potential source for the operation and construction of the airport has been identified in Shark's Valley.

This source is a combination of surface water and river bed flow and will be used by the airport development subject to a maximum abstraction rate of 40 m^3 per day. The raw water from this source will to be treated to a standard as necessary for potable use.

2.9.2 Water Supply System

Figure 2.18 in Volume 3 of this ES indicates the components of the water supply system which consists of a weir and associated facilities to abstract water at Sharks Valley, and pipes, pumps and tanks to deliver the water to the airport.

2.9.2.1 Raw Water Intake at Sharks Valley

Water abstraction works at Sharks Valley will be constructed at water gauging point A1+A2 at an elevation of +180 m AOD and includes a stilling basin and weir in the stream, pump chamber and screens, duty and stand-by multi-stage pumps, associated station pipework, main power supply and switchgear including transformer, security fencing and an access path for inspection and maintenance. The existing track to point A1+A2 in Sharks valley will be upgraded to enable access for construction materials and plant.

The stilling basin in the river is to be formed in the stream bed by excavation to achieve at least 30 m^3 storage. The weir is to be constructed in grouted masonry embedded into the river bed. The weir will be faced on the upstream side with reinforced concrete to form a waterproof seal. A reinforced concrete chamber will be constructed in the stilling basin to house the selected pumps and screens.

2.9.2.2 Raw Water Pumping Main to Break Tank

The intake pumping station will deliver raw water to a break tank on nearby elevated land at +350 m. The delivery pipe is to be laid over-ground supported and fixed to reinforced concrete piers generally 500 millimetres (mm) above ground level.

Power for the pumping station will be provided by extending the islands 11 kilovolt (kV) network on overhead cables from Woody Ridge Flax Mill to the break tank. Cables will be run from break tank to the pumping station on the delivery pipeline.

2.9.2.3 Break Tank

The break tank will comprise a proprietary circular covered glass coated steel tank with a capacity of 6.5 m^3. A new graded unpaved vehicle access track to the tank will be constructed from the existing track at Woody Ridge. The tank compound will be security fenced.

2.9.2.4 Raw water Gravity Supply Main

The buried gravity main from the break tank will deliver the water across Dry Gut to raw water storage tanks on elevated land at +350 m close to the airport.

2.9.2.5 Airport Raw Water Storage

Water storage will be provided close to the airport for fire service and general use raw water (potable distribution is supplied from the general use raw water mains).

Two water tanks will be provided. One tank will be used solely for fire fighting with a capacity of 55 m^3. The other will be used to supply the water requirements of the airport with a capacity of 35 m^3.

An unpaved graded vehicle track will be provided from the airport access road to the water storage compound. The tank compound will be security fenced.

2.10 ALTERNATIVE ACCESS OPTIONS CONSIDERED

2.10.1 Introduction

The Socioeconomic Assessment is presented in Volume 6 of this ES. The assessment identifies a number of existing problems and future challenges facing St Helena. The economy is small, in decline, and has a heavy reliance on the public sector for employment and on continued UK aid. The island's population is ageing and decreasing through a combination of outward migration, particularly of young adults seeking employment, and below-replacement fertility. This is weakening and dividing families, increasing pressure on social services and in the long term is likely to lead to declining standards of living.

The island's rich history and striking land and seascapes make it a potential tourist destination. Various studies have identified the development of the tourist industry as the most likely means of stemming the decline in the population and economy, and stimulating new development.

Access to the island is currently provided by the RMS St Helena. The RMS St Helena has in recent years made two round voyages from the UK and South Africa annually, as well as shuttle sailings between St Helena, South Africa, Namibia and Ascension Island. The United Kingdom Government currently subsidise the running of the RMS St Helena to a sum in the order of £2.87 million per annum. Travel to and from the island is costly in both time and expense, and has, to date, failed to generate tourism on a scale that could reverse the existing declining trends. The RMS is coming to the end of her working life, the current contract with the operator, Andrew Weir Ltd, runs out in August 2011.

A study of the island's demographics (WS Atkins 2004) demonstrated that unless some form of improved access is provided that would allow development of tourism as an industry for the island, the population is likely to continue to decline with little future prospect of economic self sufficiency.

2.10.2 Options Considered For Improving Access To St Helena

Over the years a number of studies have considered ways of improving access to St Helena. Before 2003, many focused on making best use of the RMS and existing off-loading facilities. In 2003, pursuant to the recommendations of a High Point Rendall study on access to St Helena, DFID/SHG invited Expressions of Interest for the provision of an air access solution. DFID/SHG commissioned Atkins to assess these proposals based on three key requirements:

- The proposed access option should meet HMG/SHG's commitment to maintaining access to St Helena;
- The selected option would increase GDP on St Helena to such an extent that increases in government revenue would offset any increase in subsidy over 10 years; and
- The option should be technically feasible (i.e. practical).

The conclusion reached was that none of the Expressions of Interest submitted would satisfy DFID/SHG's requirements. Subsequently in 2004, DFID/SHG commissioned Atkins to undertake a feasibility study to establish the most practical and affordable means of providing access to St Helena, covering both sea and air options.

'Long lists' of possible forms of access were compiled for both sea and air based on a thorough review of all previous studies and assessed against the three key requirements. The options considered included:

- **Continuation of Sea Access through replacement of the RMS** - the "do minimum" option of continuing with sea access was considered as the base case option. The current RMS would be replaced with a slightly larger vessel, to carry 180 people instead of the current 128, and have increased cargo capacity. No harbour modifications, other than small upgrades to current handling and transfer arrangements, would be necessary;
- **Other Sea Access Options** – alternatives such as high speed passenger craft and use of cruise vessels were considered.
- **New Airport with a Long Runway** - The long runway option comprised a runway 1950m long surrounded by an area of levelled and graded ground necessary to the meet the regulatory safety requirements (making the total 'runway strip' 2250 m long). The largest aircraft this option could accommodate would be a B737-800 carrying 12 business class and 150 economy class passengers per flight. This option envisaged that the service would start with one return flight per week, and increase over time as demand grew to around ten return flights per week after some 26 years. This option would require:
  - An airport passenger terminal building and an operations building with control tower, firefighting and ground equipment maintenance facilities;
  - Storage for aviation fuel, both on and off the airport;
  - A means for delivering materials to the island and transporting them to the airport site consisting of a wharf and haul road from the coast;
  - A source of fresh water; and
  - A dedicated scheduled air service – to be provided by an established air operator.
- **New Airport with a Medium Length Runway** - The medium runway option comprised a runway 1699m long, surrounded by an area of levelled and graded ground. The concept was to operate a fleet of 19-seat business jets, based on St Helena and owned by SHG, extending as traffic grew. The service would start with a fleet of two aircraft to ensure continuity of service, rising to three by Year +20 for 12,000 visitors, and to six by Year +40 to handle 20,000 visitors. It would be necessary to provide aircrew, engineering support, and a sales and management team to operate what would effectively be an independent airline. This option would require additional buildings (including a hangar, aircraft workshops, offices etc.) and infrastructure, not required for the long runway option;
- **Modified Medium Runway sub-option**: accommodating B737-600s - A sub-option of the medium runway was developed, to explore opportunities to limit the initial capital outlay. The sub-option comprised a 1700m runway, widened to allow operations by B737-600 or equivalent aircraft (which is much smaller than the B737-800) with an extension of the runway to allow operations using larger aircraft 20 years after opening. In all other aspects, the concept and support facilities were similar to those included in the long runway option, i.e. the same buildings, access, fuel storage and a scheduled air service;
- **Short Runway with Extension for Take-offs, St Helena based Aircraft** – This option consisted of the modified medium runway solution but with an option to extend after any given period of operations;
- **Alternative Airport** - This proposal was to use the airport on Ascension Island as a hub facility with flights to Europe, USA, South America, Africa and the Falkland Islands. A passenger terminal would be constructed at Wideawake airfield on Ascension Island to support these operations. In the longer term it would require heavy aircraft to fly from Ascension Island internationally, with a frequency far exceeding the current agreed quota of two rotations per week. Land would need to be acquired from either the MoD or the US DoD as a site for the terminal;
- **The ShinMaywa Amphibian Aircraft** - the use of the ShinMaywa US-1A Kai amphibian aircraft was considered. This option could carry 32 passengers and would require the establishment of water aerodromes in both St Helena and Ascension Island; and
- **Airship** - This option envisaged the acquisition of two long range Airships carrying around 48 passengers. Flying time from St Helena to Ascension Island would be about 15 hours and to Cape Town about 37 hours – with reasonable weather. Given the variability that occurs over the course of a year this solution was considered unlikely to provide year-round reliability and availability of service.

2.10.3 Evaluation of Options and Selection of the "Long Runway" Option

The options listed above, as well as others, were ranked against nine criteria sets: costs; environment; economic; travel and fares; institutional; social; evacuation services; operations; and procurement. A scoring and weighting exercise was carried out and included the likely views of different stakeholder groups. The results of this exercise identified two preferred air access options - the long runway and medium runway options.

A sea access option, i.e. replacement of the RMS, was retained as comparator. It was demonstrated that replacement of the RMS would deliver better value for money than other equivalent fast passenger vessels options. Thus three access options were taken forward for detailed evaluation: the long runway; the medium runway; and the replacement of the RMS.

The St Helena Access Feasibility Study compared the three access options in terms of discounted total costs (capital and operational expenditure, social, institutional, infrastructure, environmental) and benefits (tourism growth, revenues from tourism, Gross Domestic Product (GDP) growth, reduction of subsidy, population growth, employment, investment). The key conclusions from the assessment of the options were:

- The **replacement RMS option** would not be sufficient to arrest the island's social and economic decline as it would be unlikely to generate sufficient levels of tourism to stimulate economic growth and reduce reliance on UK subsidy. In fact, the island's decline would probably accelerate;
- Conversely, there was a high probability that the **introduction of air access** would reverse the economic decline, create job opportunities and enable return-migration by off-island Saints to their currently abandoned families, through the development of tourism and associated industries;
- Of the air options, the long runway solution had the lowest net total cost taken over the long term. This is because the **long runway option** was anticipated to be the most effective in attracting tourists to the island and stimulating the local economy;
  - While the long runway option required greater capital investment in the early years than the medium runway and the RMS replacement option, looking over the long term, the long runway option provided the opportunity through the development of tourism for SHG to become independent of financial aid from Her Majesty's Government (HMG);
  - The subsidy to St Helena from HMG was likely to be reduced to zero most quickly for the long runway option, because of the increased potential to attract tourists and develop the local economy. Via the medium runway option, it could take a further 25 years to reach this outcome. A risk analysis was carried out which indicated that the long runway was the only option under which a reduction in subsidy to zero had a high probability of occurring;
  - The GDP predictions were much stronger for the long runway option than for the medium runway or RMS replacement; and
  - Scoping of environmental issues highlighted the impact of airport construction on the ecosystem of Prosperous Bay Plain as a whole and specifically on landscape affected by the construction (including the filling of Dry Gut), and on the world important endemic invertebrate community in the Central Basin area. Lesser impacts would be on the flora of the area and on the endemic Wirebird. While the impact on the landscape and invertebrates would be significant, careful design and construction would mitigate the effects substantially.

The Long Runway was preferred as it provided the least-cost solution in economic terms and the one most likely to enable St Helena eventually to become self-sufficient. The Government subsidy could be reduced to zero if all went to plan and if the demand projections were achieved, year on year.

The St Helena Access Feasibility Study highlighted that as a prerequisite to success, St Helena would have to make institutional change, particularly in respect of policies and procedures concerning immigration, landholding and inward investment, as well as strengthening marketing structures and activities. Successful implementation of the Long Runway option would require SHG working closely with the air service provider to become effective tourism marketers.

2.10.4 Refining the Long Runway Option

2.10.4.1 Location of the Airport

Previous studies had identified two possible areas on St Helena suitable for airport development. These were:

- Deadwood Plain; and
- Prosperous Bay Plain.

Deadwood Plain is 450m (1476ft) above ordinance datum (AOD) and there is meteorological evidence to show that for around 10% of all occasions in the year the cloud base is 500ft or less above the plain. This is unacceptable in relation to the construction and operation of an airport as the principal source of access to the island. Deadwood Plain was therefore rejected as a possible site.

2.10.4.2 Runway Alignment

Three possible runway alignments/locations on Prosperous Bay Plain had been identified. These were:

- Prosperous Bay/Robinson;
- A North West / South East access runway; and
- Prosperous Bay North/South.

The Prosperous Bay/Robinson alignment (roughly East/West) would take advantage of the prevailing winds (South East Trade Winds). However, the approach to this runway would be over the high points in the centre of the Island. In order to meet the aerodrome safeguarding requirement as detailed in OTAR Part 139 the landing threshold would need to be displaced to the East of Gill Point.

A North West / South East access runway on Prosperous Bay Plain was evaluated. The approaches to the runway would be over Deadwood Plain. The major weakness of this alignment was that the approach would be over high ground which has a history of low cloud cover. Further, it required that steep approach slopes (i.e. greater than 3.5°) would be required. An Instrument Landing System (ILS) would have to be installed to ensure safe and frequent air operations. Analysis shows that a CAT(egory) I ILS would be insufficient and that a much more expensive CAT II system would be required. Further, the proposal meant that considerable earthworks would need to be undertaken in the area between Middle Point and Bradley's to enable such an approach to be used. These earthworks would have had serious impact on the island and added greatly to cost. Even then, it was unclear whether a suitable approach angle, with associated requisite decision heights, could be achieved. This option was therefore rejected.

On the other hand, an airport on Prosperous Bay Plain with a North/South runway alignment allowed for:

- A runway design that could meet the safeguarding requirements of OTAR Part 139;
- 3° descent approaches;
- Instrument approaches to both ends of the runway could be designed with acceptable minimum descent heights; and
- Acceptable missed approach procedures could be incorporated.

This option would be affected by a 30° cross wind for most of the time, but this could be mitigated by constructing a slightly wider runway (45m as opposed to 30m) at no major cost increase. This runway alignment was therefore selected.

2.10.4.3 Approach to Runway Construction

Construction of the north/south runway alignment will involve development of a level area over severely undulating terrain. The eastern plateau of Prosperous Bay Plain currently provides a sheltered environment for the area's ecologically important flora and fauna. Three alternatives to the solution for the construction of the runway were considered in exploring the possibilities of developing the runway while minimising environmental impacts. These were:

- **Balanced cut and fill option**: This solution envisaged a balanced mix of cutting the surface of the Plain, in some cases up to a depth of approximately 25 to 30 metres, and filling the depressions and guts to create a level area for the airstrip and terminal buildings, and the use of this material to fill in Dry Gut to obtain the required airstrip length. This solution will reduce the level of part of the eastern plateau leading to changes in wind speeds and impacts on the area's ecology;
- **High ridge option**: This option involved constructing the runway at a datum height of 320m above sea level. This would require a huge volume of fill, and an approximate doubling of costs compared with the cut and fill option, which would have a major impact on the overall scheme cost. There was also the problem of where to win the fill material from. This would have necessitated the demolition of a small mountain (or parts of a number of mountains and hills) close to Prosperous Bay Plain which would have resulted in a range of environmental impacts and raised a wide range of practical issues; and
- **Bridge deck option**: This proposal was based around a large reinforced concrete deck, constructed in situ to cross Dry Gut, approximately 300m wide by 500m long. The costs of this option were estimated at over four times more than that for the balanced cut and fill solution, having a major impact on the overall scheme cost. There were also doubts over the ability to operate aircraft safely from such a platform because of the interaction of the prevailing winds and the supports and platform of the bridge deck. This would create a major design risk which could only be overcome through prolonged testing periods, adding many years to the construction programme. In addition, the construction of such a massive and challenging structure in this remote location was considered to present a very high risk to the completion date of the airport.

Although the balanced cut and fill solution will reduce the height of part of the eastern plateau, leading to impacts on the area's ecology, it was selected as the preferred approach because it is the only practical, cost-effective way of developing the airstrip. It has significantly lower costs, lower risks, a shorter construction programme and will provide better flight safety, and also avoids the creation of a wide range of additional environmental impacts off site.

2.10.5 Options Considered For Supporting Infrastructure

As explained in the scheme for assessment, the airport will require a range of supporting facilities and infrastructure. As well as a fuel storage area and a source of water for construction and operation, these include:

- A wharf and associated facilities for the delivery of materials for construction and for fuel onto the island;
- A haul route to be used during construction to deliver materials, equipment and staff to the airport site; and
- A permanent access route to be used to access the airport when it is operational.

A number of options were considered for each of these facilities, as explained below.

Consideration was given to two options for providing materials access to the airport as follows: Rupert's Bay; and Prosperous Bay. In addition a route from Turks Cap via Fisher's Valley was considered but rejected on grounds of technical difficulty and interference with dwellings.

The evaluation of the options considered a range of issues as follows:

- The topography and sea conditions were most favourable at Rupert's Bay for construction and operation of the wharf;
- The haul route from Rupert's Bay was the longest at 14.2 km compared with 3.8 km for the Prosperous Bay option. However, construction would be generally easier (possibly assisted by existing island technology) so that costs would not be significantly more than for the route from Prosperous Bay;
- The main impact of the Rupert's Bay option would be the crossing of Deadwood Plain and the effect on the Wirebird, but this could be mitigated by careful final route planning to keep the length of impact short and by creation of new Wirebird habitat. Construction timing to avoid peak breeding / nesting season would also lessen the impact. The Prosperous Bay route would represent an intrusion into a largely unknown (from an invertebrate point of view) and wild landscape;
- The Rupert's Bay route opens up development potential in the Rupert's area; and
- The Rupert's Bay route could also be used as an operational access route either for most of its length if a link road between Rupert's Bay and Jamestown is constructed, and as far as Longwood where it connects with the existing road network if this link is not developed.

Rupert's Bay was therefore selected as the preferred location for materials delivery and the haul road. Permanent airport access would also follow this route, either as far as Longwood or through to Jamestown, depending on the provision of an improved link between Jamestown and Rupert's Bay.

2.10.5.1 Refinements to the Selected Road Alignment

The detailed haul/ access road alignment from the airport site to Rupert's Bay was defined during 2006. The route selection considered engineering, topographic, geotechnical, environmental, land use and social issues. Areas where alternative route alignments were considered included:

- **Cook's Bridge to Longwood Gate** - This option looked at placing the route in Fishers Valley between Cook's Bridge and Longwood Gate. Whilst the majority of the route was technically feasible, topography and land ownership at the connection in Longwood Gate area meant this was not practical. Further, this route would have affected more residents between Longwood Gate and Deadwood;
- **Deadwood Plain** - The selected alignment considers Deadwood residents, Wirebird territories and land ownership, and seeks to provide a balance between each, minimising pasture land take and the number of properties the road will affect; and
- **Rupert's Hill** - The section of road between the existing power station and the summit of Rupert's Hill has been developed as a balance between topography, geotechnical and engineering constraints. These include: a maximum gradient of 1:7 for the road's vertical alignment; minimising the number of hairpin bends to reduce earthworks and maintain reasonable vehicle speed; and avoiding highly eroded gulley on the upper sections of Rupert's Hill.

The alignment shown on Figure 2.1, Volume 3, was identified as the preferred route following discussions between SHG, DFID, local residents and advisors to DFID. The route encompasses existing roads which would be upgraded (mainly at Rupert's and Deadwood).