St Helena Government

2030 Vision & Infrastructure Plan

SHG Capital Programme (2020-2030)

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Executive Summary

Background

As a distant, isolated island with little natural resources, St Helena has very limited scope for offering competitive exports. What it can offer is a set of unique land- and sea-based tourist experiences and the airport provides a means of swiftly increasing the number of stayover visitors. The Air Access Feasibility Study (2005) had researched a number of proxy islands and rates of increase of tourism from which it projected the number of tourists that could visit St Helena each year up to about 2050. Although a 'cap' was applied based on the likely quantity of tourist accommodation, the annual tourist projections were still considered to be too optimistic. A further study commissioned by DFID in 2010 halved the projections to around 29,200 per year. The question remained: how quickly could this target be achieved. The 2010 report examined various rates of increase in tourism that had been achieved by similar islands following *improvements to air access* (i.e. not introduction of air access, as in the case of St Helena). The rates of increase varied considerably, but an annual growth of 17.2% was adopted for St Helena. This rate of growth has stark implications for tourism accommodation and virtually all infrastructure on the island.

It was a similar realisation after the Air Access Feasibility Study that led to DFID commission the **2006 Infrastructure Review**. The intention was to review current infrastructure and identify the improvements and additions that would be needed to meet the demands of tourism and growing businesses after opening of the airport. The review determined that the current infrastructure was insufficient to meet even the existing demands of residents, businesses and the efficient functioning of government. There were issues with water quality and quantity, electricity reliability, roads were badly deteriorated, and so on. The review recommended a twenty-year programme of infrastructure improvements in three phases. Phase 1 would address immediate needs; Phase 2 would include the opening of the airport (expected to be in 2012) and therefore provide for initial growth in demand. Phase 3 would comprise the second half of the twenty-year programme and provide additional infrastructure apace with growing demand from tourism and other new businesses. The broad recommendations of the 2006 Review were developed into a detailed **Infrastructure Plan in 2008**, which comprised Phase 1 and 2 of the Review period. At the end of Phase 2 an updated Infrastructure Plan would be required that would identify the needs and priorities for the next ten-year period.

The airport eventually became fully operational in October 2017 and it is now time to review St Helena's current infrastructure and identify the needs and priorities for the ten years up to 2030. That is the purpose of this **Infrastructure Plan**.

Context for the Infrastructure Plan

The question of how much infrastructure will be required in 2030 must begin with a clear vision of what St Helena intends to be in 2030; i.e. the vision of its future state. In 2017 SHG issued a 10-Year Plan, based on community consultations, that described islanders' aspirations. The responses were grouped to create five social development pillars: altogether safer, altogether healthier, altogether a better place for children and young

people, altogether greener, and altogether wealthier. The economic aspects of the 10-Year plan were reviewed by SHG to more clearly define the development challenges. These were recorded in the Sustainable Economic Development Plan, issued in 2018. Since then, strategy documents have been produced for the main economic sectors. Two additional documents of note are the Labour Market Strategy (LMS) and the Land Development Control Plan (LDCP), both of which indicate the extent of the development challenges for St Helena in terms of the very limited resources (human and terrestrial).

While the suite of SHG documents (10-Year Plan, SEDP, sector strategies, LDCP) provide a bottom-up description of what is to be achieved by 2030, an Independent Economic Review (IER) carried out during the past two years has provided a long-term vision of St Helena in 2050 with a set of interim development goals for 2030. This top-down approach complements the SHG documents by providing additional detail of what the 2030 vision should comprise (in terms of objective targets, such as size of population, the visitor economy, and the remainder of the economy) and how this might be achieved including, but certainly not limited to, a new 'Compact' development partnership with the wider UK Government rather than the donor-recipient relationship that has existed to date between DFID and SHG.

Combined, the SHG documents and the IER provide a fairly clear **Vision 2030**. These documents have been compiled into a table in Section 2 of this Infrastructure Plan to illustrate the implications for the infrastructure. The IER proposed that infrastructure requirements could be grouped under four themes to give context and impetus for the provision of infrastructure that will *enable* achievement of Vision 2030. Figure 2.2 summarises the analysis of all the development documents and highlights the broad infrastructure requirements under the four themes of: Transport & Logistics Corridor, 21st Century Island, Visitor Economy Infrastructure, and Productivity-Based Infrastructure.

Section 3 of this Infrastructure summarises the current infrastructure in St Helena. It is the new starting point for defining the gap between what new or improved infrastructure is required to achieve Vision 2030.

Section 4 examines the Vision 2030, particularly the potential rates of increase for tourism and resident population. The analysis in this section draws on the SHG suite of development documents and other studies to examine likely trajectories for the increase in infrastructure demand, particularly utilities (as these are most sensitive to the numbers of people on island: residents, tourists and other business people). The IER Vision 2050 and the LMS are at odds when projecting future population. The LMS predicts a maximum of 4700 resident Saints by 2050 based on policies and programmes proposed in that document; the IER aspires to a resident population of 8,000 Saints. Figure 4.1b illustrates the huge difference these two projections imply for 2030. To achieve the IER 2050 target, this would require an average of 130 new residents every year for the next thirty years. This is very unlikely to happen. It is more likely that some initiative may happen once all the facilitating institutional measures and enabling infrastructure are in place for a period of rapid increase in population. Whether this enables 8,000 to be reached by 2050 remains to be seen, but for the period to 2030 an 's-curve' increase in the population is more likely and

enables closer correlation between the LMS and the IER projections. Section 4 then investigates the implications for infrastructure demand based on these two population projection curves.

Section 5 considers how the projected infrastructure demands can be met. **Electricity** demand is adequately met at present and with a Power Purchasing Agreement due to be signed very soon with PASH, the sector could achieve its development targets of 100% renewable energy by 2022 and keep pace with increasing demand to 2030.

Water supply is the main concern at present and recent drought-like conditions resulted in Connect having to impose water use restrictions to reduce peak consumption from 1,400 m^3 per day to around 1,000 $m^{3.}$ Applying this factor of 1400/1000 to the recent consumption figures from Connect suggests that daily demand could be around 2,100 m^3 by 2030. Although recent rains (since March 2020) have eased the drought restrictions (since the reservoirs are now about two-thirds full), a programme of deep aquifer borehole exploration and development is recommended as a cost-effective and swift solution to providing up to 500 m^3 per day. The deep aquifers are largely unexploited and can be tapped into but will require careful monitoring and management to allay some fears on the island that such exploitation could deplete the largest raw water resource. This resource is unlikely to be endangered because the annual draw-off of the aquifer for 500 m^3 per day would amount to less than about 1/1000th of the annual aquifer recharge rate. Desalination for 500 m^3 per day could be provided at less than half the cost of the proposed Fisher's Valley reservoir. The recent study for that reservoir raises many concerns regarding the hydrogeological suitability of the site as well as the geotechnical conditions at the dam location. The review by the Infrastructure Consultant suggests that the final cost of this scheme, if it were to be feasible, could be over £7 million, which is around twice what the feasibility study had suggested. It would also take at least six years until the reservoir would be fully operational. Climate change considerations also raise doubts about the reliance on run-off recharging of the island's reservoirs.

Of the two other utilities, **wastewater** is an issue in the Half Tree Hollow (HTH) and adjacent areas. This is an issue that was raised in the 2006 Infrastructure Review and has still not been addressed. Studies carried out for Connect proposed combining the HTH and Jamestown (JT) systems by placing a sewer down the side of Jacob's Ladder. The disruption to the Ladder (notwithstanding that it needs safety renovations) was a sensitive issue so the proposal struggled through the initial planning application. This Infrastructure Plan proposes a cost-effective alternative that could be swiftly approved and implemented using local contracting capacity. The two separate schemes proposed in this Infrastructure Plan could be completed for a similar cost to the combined scheme in the 2016 WSP study. WSP had proposed a combined system with only screening and preliminary treatment connected to a 500 metre long sea-outfall to a depth of 25 metres below sea-level. The proposal in this Infrastructure Plan includes tertiary treatment so that WHO water quality standards can be achieved and no resulting risk to the marine environment, nor to swimmers, divers and other people using the sea near to the coastline. The operating costs would be greater for this system than the WSP proposal, but a charge levied on diving and game-fishing vessels could be collected and used to offset the higher operating costs.

Solid waste is now very well managed in St Helena and the current arrangements are adequate to provide effective and environmentally-responsible disposal of solid waste up to at least 2030.

The island's **roads** are cause for concern. Inspections of the road pavements reveal that the are at the critical stage where accelerated deterioration is to be expected. Without a programme to arrest this deterioration, as a minimum, the roads will in the next few years reach the overall poor condition they were in when inspected for the 2006 Infrastructure Review. There are numerous studies by the World Bank, the UK's Transport Research Laboratory, and many others, that strongly recommend the "stitch in time" approach to road management. The typical figures quoted in these studies is that for every pound not spent on timely periodic maintenance of roads, three to five dollars will be required in rehabilitation or even five to eight pounds in reconstruction. The clear message is to protect the investments that have been made in the road network. This is a fundamental principle of **infrastructure asset management**. Managing infrastructure should be done on the basis of whole-life costs. The total envelope of costs for operating and maintaining infrastructure plus the costs of replacing infrastructure, is minimised when adequate and timely maintenance is the priority. Failure to provide sufficient recurrent budget for servicing and maintenance will result in far greater costs in terms of replacing of prematurely deteriorated assets. This point is elaborated in the Strategic Plan (see Appendix C to this Infrastructure Plan).

The **Strategic Plan** considers the five development pillars of the SHG's 10-Year Plan and recommends a capital programme to address infrastructure for social development in parallel to infrastructure for economic development. These are shown as Components A and B, respectively, in Appendix B of the Strategic Plan. Within each component, there are immediate priorities to be addressed within the next three years. The first priority infrastructure for social development are water supply and waste water so that the four utilities will fully address foreseeable demand. The first priority infrastructure for economic development are the projects that are already underway: the container-handling facility at Ruperts and the cable-landing station. The will enabling both economic and social development. Once these projects have been addressed, then the focus should turn to infrastructure the directly enables acceleration of the visitor economy.

The **Capital Programme** shown in Section 6 of this Infrastructure Plan is arranged to prioritise projects for the 10-Year social development pillars of altogether safer, altogether healthier and altogether greener. The second priority social development projects are aimed at making the island a better place for children and young people. The high priority projects in the economic development component address the 10-Year altogether wealthier goal, while also strengthening the better place for children and young people goal. The improvement of the marine-related infrastructure (particularly James Bay wharf) is aimed at the high-spending diving and game-fishing tourists; this is also high priority infrastructure. The second priority economic development infrastructure focuses on enabling rapid growth in the visitor economy (towards the IER goal of £10 million per year by 2030) and the export and import substitution economy (£5 million per year by 2030).

Contents

Appendices

1. Introduction

1.1 Background to the current study

Air Access Feasibility Study (Atkins, 2005)

In 2004 a feasibility study was undertaken for the introduction of air access to St Helena. The rationale for air access was that it would lead to positive economic growth through tourism and increased inward investment, resulting in St Helena achieving financial self-sufficiency by about 2043. Spin-off benefits of an airport would include inter alia improved employment prospects, population growth, and better access to health care. It was concluded that the risk of not achieving these benefits was considerable, but the cost-benefit analysis indicated a positive outcome could be achieved. The analysis was particularly sensitive to two main parameters: the number of tourists and the average spend per tourist. Values for the two parameters were difficult to ascertain because even studies of proxy islands could not replicate the mix of circumstances that are unique to St Helena.

Supporting studies (principally, the tourism studies in 2005 and 2013)

Several studies were carried out in the years leading up to the air access decision, including studies for tourism, inward investment, private sector development, labour force, and social and environmental impacts. With respect to the two cost-benefit analysis parameters, a significant study was the 2005 Tourism Study by Kelly & Robinson that provided a significant update on the 1997 Tourism Master Plan. It identified three groups of tourists for St Helena: those arriving currently by cruise ship or yacht, and those would arrive by air. In terms of possible tourism numbers, the study made reference to SHG records for cruise and yacht visitors and air passenger projections in the Air Access Study. Kelly & Robinson provided a SWOT analysis of the current tourism product and recommendations on developing the product as a number of six distinct tourism development areas (TDAs). Studies by The Journey and Whitebridge in 2013 have provided further context and clarity of St Helena's tourism sector and what needs to be done to achieve the tourism development goals.

Infrastructure Review (Cox, 2006)

The air access and tourism studies led to a realisation that a rapid increase in economic activity upon completion of an airport would require additional infrastructure. Accordingly, a review of the island's infrastructure was commissioned in 2006 to consider the infrastructure investment needs and priorities for the next twenty years. The report identified that existing infrastructure was insufficient to meet current demands of residents, business and the efficient functioning of government. The twenty year infrastructure investment plan was arranged into three phases. The first phase years (2006-2009) would focus on commencing the process of addressing the current infrastructure deficit. The second phase (2010-2015) would complete the exercise of meeting immediate needs and coincide with the commencement of air access (anticipated to be around 2012). The end of Phase 2 would be a decade after the 2006 Infrastructure Review and signal the time for an update of infrastructure demand (current and future) compared to infrastructure available at the time. The third phase (2016 onwards) would implement prioritised additional infrastructure to meet the growing demands of increased resident population, tourism and growing economic activity.

Infrastructure Plan (Cox, 2008)

The Infrastructure Plan identified 35 infrastructure projects. An Infrastructure Plan Steering Group (IPSG) was formed to prioritise these projects from which a short-list of projects was developed that could be delivered within Phases 1 and 2 of the Infrastructure Review. Prioritisation criteria were developed by the IPSG, supplemented by recommendations from the Infrastructure Consultant, and the highest priority items were carried forward to implementation. Water and energy projects were the highest priorities to be funded by DFID, followed by roads rehabilitation/maintenance and the James Bay safe landing facility to be funded from EDF-10. Next priorities included enabling and installing renewable energy, improvements to Field Road, a new laboratory at the hospital, and improving medium-term water supply.

A key feature of both the Infrastructure Review and the Infrastructure Plan was the bringing together of other relevant studies (economic, social, investment, tourism, etc) and SHG's Land Development Control Plan (LDCP) and environmental policies. The combination of these studies and SHG planning (land use) criteria highlighted the need for ***comprehensive infrastructure and land planning***. This was best illustrated in the 2008 Infrastructure Plan by a satellite photo of St Helena onto which all social, economic and tourism development locations were shown (see overleaf). The photo clearly showed that if all developments and infrastructure were completed as planned at that time, ***there could be less than 300 acres of remaining developable land by 2026***. Land development was controlled by environmental "no go" areas as well as an important requirement in the LDCP that new developments should not disturb the quality or supply of groundwater. More than a decade later, there is a need to renew this message so that it remains forefront in the consideration of any land use plans/applications and development controls.

Multi-Year Pan, (SHG, Cox, 2016)

Both the 2006 Infrastructure Review and the 2008 Infrastructure Plan included detailed recommendations on strengthening SHG's capacity to plan and implement major infrastructure projects through the provision of engineering managers and other professional staff. These measures considerably helped in the utility sectors (energy, water supply and wastewater management) along with the commercialisation of the utilities via the establishment of the government-owned Connect St Helena. But other infrastructure sectors continued to suffer from inadequate infrastructure management capacities. Annual reviews of the DFID-funded capital programme (CP) in 2015 and 2016 identified a need for special measures to address the shortcomings and to get implementation of the CP back on schedule. DFID also determined the need for strengthening the operation and maintenance of completed infrastructure.

During the interim years since the Infrastructure Plan, many additional projects had been added to the list of infrastructure. The long-list amounted to around forty projects that comprised a Multi-Year Plan (MYP). Prioritising these diverse projects required consideration of social needs and economic criteria in addition to infrastructure management considerations (such as meeting consumer demands, operations and maintenance). A multi-criteria analysis approach was developed and the MYP was updated to illustrate overall priorities, as well as showing the stage of implementation of each project according to the RIBA 7-Stage project cycle.

Current situation (2020)

The MYP continues to be SHG's primary project management tool for coordinating the planning, design and implementation of infrastructure projects. However, there is now a need for a major

review of the overall programme to ensure that it aligns the provision of infrastructure with SHG's current plans for the island's development. This is the purpose of the current study.

1.2 Approach to the study, Main Assumptions

The Terms of Reference (TORs) for the study are attached at Appendix A. The TORs have been interpreted as shown in the table below, with each key objective being mapped to a specific deliverable.

TOR item	Intended deliverable from the current assignment
2.1 Develop a **Vision** (future state) for the programme	This will be a description of St Helena in 2030; i.e. a step towards the 2050 Vision. The deliverable will pull together the various plans that have been developed by and for SHG in recent years (SDP, SEDP, Labour Market Strategy, etc and the proposed IER 2050 Vision) and distil these into a single set of projections; **a single clear vision for 2030**
2.2 Develop a **Strategic Plan** demonstrating programme outputs, capabilities, outcomes and benefits to be achieved	Taking the updated population projects and the projections of infrastructure demand from businesses, tourism, etc up to 2030, this will be similar to the 2006 Infrastructure Review. It will outline the types and magnitudes of infrastructure required to meet demand in 2030 and the relative priorities. The deliverable will be a **Strategic Infrastructure Plan**, broadly describing the way forward to achieve the Vision 2030 in terms of a prioritised list of infrastructure
2.3 Develop an **Infrastructure report/plan** for 2019/20 – 2024/25	This will take the Strategic Infrastructure Plan and provide more detail for the specific projects to be implemented between 2020 and 2030, with focus in the projects to be funded from EDIP, with consideration of how these contribute towards the longer term 2050 Vision. The deliverable will be similar to the **Multi-Year Plan (MYP)**, updated to show the current status of existing projects and including the additional projects from the Strategic Plan and indicative costs. The MYP will be supported by a narrative report describing the projects, priorities and specific measures required for delivery of the programme.

1.3 Layout of the study report

The three TOR items are dealt with separately in this report. Item 2.1, a **vision** of the future state of the island is provided in Section 2 of this report. It records SHG's own development plans (the 10-Year Plan and the Sustainable Economic Development Plan) and shows how these fit into the longer-term vision that has arisen from the Independent Economic Review (IER). The IER provides an umbrella vision for 2050 with interim objectives targets for 2030 that provide a sense of scale SHG's medium-term plans (10-Year Plan, SEDP, etc). SHG's individual sector strategies for investment, labour market and infrastructure (energy, water, digital, etc) elaborate how the medium-term plans may be realised. The hierarchy of these visions, plans and strategies is shown in Figure 2.2. The table presented in Figure 2.2 highlights the infrastructure implications of each policy, plan and strategy.

Item 2.2 of the TORs, the **Strategic Plan** is addressed via a separate document (Strategic Plan 2020-2030, issued along with this Vision and Infrastructure Plan in May 2020). The strategic plan describes how the Vision 2030 can be realised and the *enabling* role of infrastructure. This **Infrastructure Plan** records the current state of infrastructure in St Helena (Section 3), the demand projections to 2030 (Section 4), and the options for meeting the demand (Section 5). The recommended infrastructure is consolidated into a **Capital Programme** in Section 6.

2. Vision of the future state of St Helena in 2030

2.1 Overview of SHG's socio-economic and infrastructure development plans

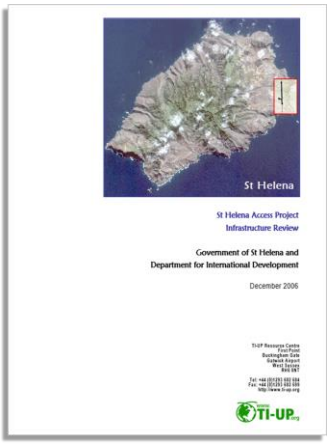
In early 2016, with full operationalisation of the airport imminent, SHG undertook an island-wide consultation with the community and businesses to identify a shared vision for St Helena's future. The consultative process brought together what is important to St Helenians under five main headings and national goals. The resulting document was **SHG's 10-Year Plan 2017-2017**. The five main headings are:

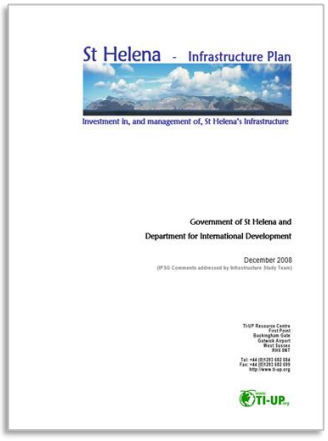
- Altogether Safer
- Altogether Healthier
- Altogether Better for Children and Young People
- Altogether Greener
- Altogether Wealthier

The Plan sets out clearly what the island would like to achieve and how it intends to achieve it. The Plan was intended to help SHG move away from its previous short-term approach to development projects and to plan in advance and make best use of limited resources. It was intended that SHG's Directorates would use the Plan as a guide and to update their 3-Year Strategic Plans and disaggregate these to create updated Operational Plans. The process for this would be SHG's Medium-Term Expenditure Framework (MTEF), which comprises a three-year rolling budget. However, DFID financial aid arrangements did not permit budgeting for more than one year at a time.

SHG proceeded to consider how the 10-Year Plan should be realised; in particular, what economic activities could help achieve the future vision. It updated its Sustainable Economic Development Plan (SEDP). The previous SEDP had focused on tourism as the key growth sector, which the airport was intended to facilitate. Tourism attractions had been improved, and new restaurants and hotels had been opened. While tourism will remain very important for growth, there was a need to identify opportunities for economic diversification. Accordingly, SHG developed an updated **SEDP 2018-2028**.The SEDP focuses on the 'Altogether Wealthier' goal of the 10-Year Plan. It recognises that St Helena is a net importer and national wealth is consequently at risk of decreasing because more money goes out of the country than comes in. To meet the objectives of the 10-Year Plan, significant improvements are required in quality of life, reduction of poverty and increases in wages. St Helena needs to increase wealth by ensuring that more money is earned by the island and put into circulation in the local economy. Businesses need to be attracted that will create more and better paid jobs. Tax revenues from these new economic activities would enable SHG to balance its budget and to better manage the island's infrastructure. Increasing economic activity will place increasing demands on the island's infrastructure.

The Infrastructure Review of 2006 and subsequent Infrastructure Plan in 2008 had outlined the requirements for meeting current and future needs, but these were based on population and





economic activity assumptions made a decade before completion of the airport. The Review covered a twenty year period to 2026, while the Plan provided specific project recommendations for the first ten years of the Review period. St Helena's infrastructure now looks very different to what it did in 2006. Management of utilities (energy, water supply and wastewater management) was restructured in 2013 via the creation of the government-owned entity Connect St Helena Ltd. Connect has been particularly successful in rehabilitating, replacing and enhancing the island's power energy sector. Power outages that plagued Jamestown and Half Tree Hollow in 2006 have been addressed, network upgrades provide for more efficient maintenance, and a significant part (almost 30%) of the island's power requirements is met from renewable sources (principally wind, but an increasing amount of solar). The quality of treated water supply now meets 100% of the required health standards, water storage has been significantly increased, and expansion of the pipe network enables redistribution of water to most areas. However, the droughts that St Helena experiences continue to challenge the overall quantity of water available to consumers. And the management of wastewater has yet to be fully addressed.

Other aspects of implementing the Infrastructure Plan were not so successful and two annual reviews by DFID led to 'special measures' being imposed to bring the capital programme back on track. This took place in 2016. The rationale for the Infrastructure Plan and the prioritisation of projects within the Plan had been distracted by many other shorter-term priorities, some of which had arisen from the 10-Year Plan. These had been compiled along with the larger infrastructure projects into a **Multi-Year Plan (MYP)**.

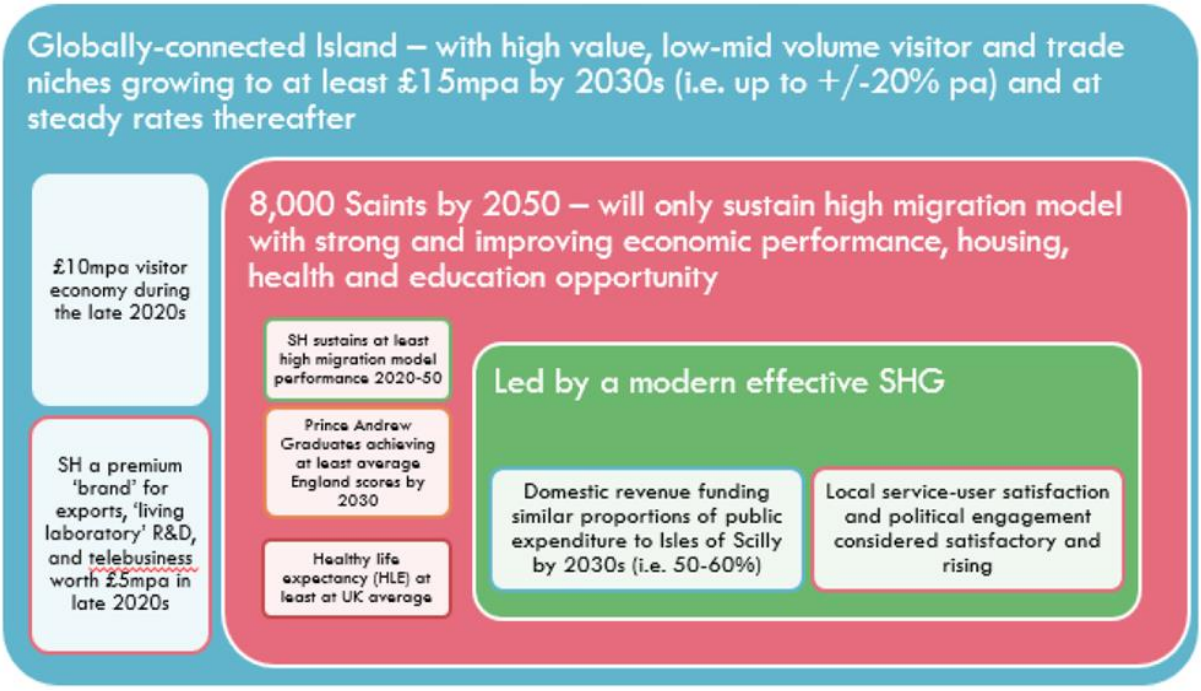
Both the Infrastructure Review and the Infrastructure Plan had recommended updates to the consideration of infrastructure needs around 2016. While not a complete update of the island's infrastructure needs and priorities, a review of the MYP was conducted in late 2016 to prioritise and coordinate what had become a very wide range of large and small projects. A system of multi-criteria analysis was used to take account of the competing priorities from the 10-Year Plan and the need to protect existing investments in critical infrastructure (i.e. balancing socio-economic needs with infrastructure management needs).

Notwithstanding the constraints of DFID's budgetary support arrangements, it was recognised that a new approach was required to economic planning and implementation of the plans if St Helena is to achieve its 10-Year Plan and the longer-term benefits intended from the airport. In 2018 an **Independent Economic Review** was commissioned to deliver an *independent* view of St Helena's economic development status to inform ministers of the viability and potential benefits of driving a refreshed capital programme (CP) for the island. The Terms of Reference required the consultant to consider:

- the level of capital programme to deliver growth and address trade balance
- prioritise public capital investment
- business opportunities and mobilising private investment

- stress-test investment barriers – labour market, scale, banking, logistics, land
- review current policy reforms and whether any others are needed for attracting and growing investment.

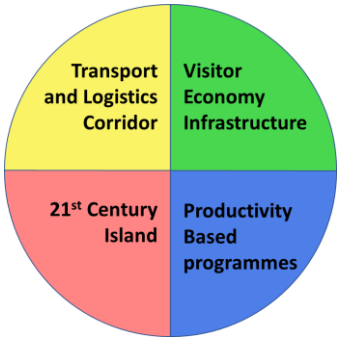
While the consultant has not delivered the detail (e.g. level and priority of capital investment) to fully address the TORs, his findings were that the new CP should not fund a list of individual and opportunistic projects. Rather, DFID and SHG should develop a joint narrative of their shared ambitions for the long-term success of the island and this should form the rationale for the new CP. The year 2050 was adopted as the horizon for the longer-term success and a graphic was included in the IER report to illustrate the 2050 goal and some key steps to achieving that goal.



The vision of success for 2050 is described in terms of a resident population of 8,000 Saints to be achieved via a high inward migration model supported by strong economic performance, adequate housing, and good health and education opportunities. Interim steps towards achieving the vision were described for the year 2030 and key drivers were outlined for the 2020s. 2030 is therefore seen as the medium-term goal for SHG's economic development efforts. Achieving the 2030 targets is considered as a necessary **springboard for success** in achieving the 2050 vision.

The IER proposed that a new capital programme should be constructed around four key themes, namely:

- transport and logistics corridor
- visitor economy infrastructure
- 21st century island, and
- Productivity-based programmes



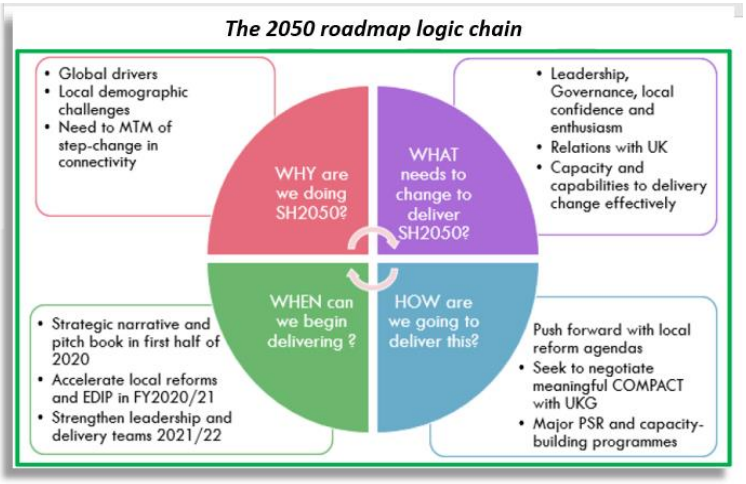
The four themes are intended to support the goals of the 10-Year plan and, more specifically, the SEDP, as follows.

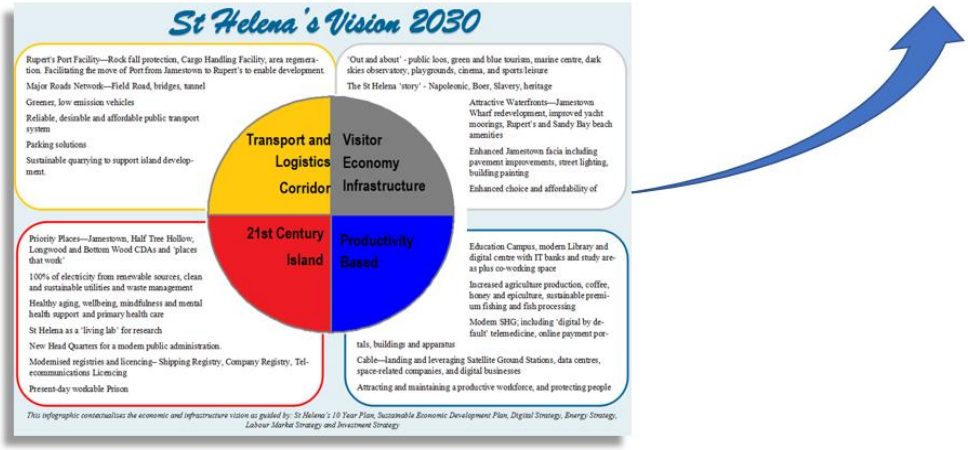
Transport and logistics corridor	Operationalisation of the airport has provided huge improvements in access of people to St Helena, but growing economic activity on the island (tourism and many new economic areas) will require efficient and cost-effective movement of goods to the island (ranging from food items for an increasing population and for tourists, to building materials, etc) and cost-efficient export of the island's produce. The main freight port will be at Rupert's wharf. (This would also become the point of transfer for sea-borne visitors when the conditions at James Bay are unsuitable for passenger transfers). There needs to be efficient transfer of freight from Rupert's wharf to recipients, principally in Jamestown. This demands improvements in the route for large freight vehicles between Rupert's and Jamestown. Jamestown is a pinch-point in vehicular movements and parking. This needs to be addressed as part of an improved logistics corridor. Transport improvements are also required in terms of a shift to low-emission vehicles, consistent with St Helena's green/blue development goals.
21st Century Island	Facilitating population growth to 8,000 Saints (plus non-Saint residents) will require suitable residential accommodations. Comprehensive Development Areas (CDAs) have been identified and these are now being developed in Half Tree Hollow, Longwood and Bottom Woods; they will include some provision for social and affordable housing. Much more accommodation will be required and the current Land Development Control Plan (LDCP 2012-2022) makes provision for an additional 4,155 dwellings above the 2012 amount. The LDCP states that this would provide for an additional population of 9,970. Quality of life and cost of living are important concerns for people making home in St Helena. The provision of electricity from 100% renewable sources will considerably reduce costs compared to that produced by the diesel generators. Affordable and reliable water supplies are equally important, as is environmentally responsible management of wastewater. Providing facilities for the aged and disabled, for children and young people is a notable goal in the 10-Year Plan and the island must ensure that these needs are addressed as St Helena progresses. Further priorities in this theme include; a 'living laboratory' for research purposes, a workable prison, and new administrative offices for SHG.
Visitor economy infrastructure	For tourism to be the backbone of the island's economy, a high priority must be given to developing the tourism product. A number of tourism studies have identified St Helena's unique tourism "selling points" (green and blue tourism, dark skies, military heritage, ecology and, of course the island's culture). In addition to a wide range of smaller interventions to bring St Helena's tourism product up to world best standards, some larger interventions are required, including the development of Jamestown and waterfronts at James, Rupert's and Sandy bays, and possibly Prosperous Bay. Tourism accommodation is another priority and St Helena needs to attract private sector investment in enhancing and widening the choice of tourist accommodation across the island.

Productivity-based programmes	While good living conditions (the 21st Century theme) should attract people to make home in St Helena, it will be the provision of new and well paid jobs that will enable the high inward migration policy. This demands the creation of new and expanding businesses, within and outside of tourism. St Helena faces significant challenges in facilitating viable businesses that will increase the island's exports. This theme is intended to support businesses by providing a source of well educated and skilled labour (via an Education Campus, etc) infrastructure that support increases in agricultural produce (coffee, honey, fishing, etc), and additional infrastructure that facilitates a 21st Century economy (telebusinesses, data centres, and so on) via a fibre-optic cable.

SHG has now taken the four themes and brought them together with the other development plans and strategies to create a Vision 2030: the springboard for success in 2050 (see Figure 2.1). The MYP has also been restructured into these four themes in order to better illustrate how the current capital programme contributes to the 2030 goals. The MYP needs to be further updated so that the projects therein reflect clear priorities towards delivering each of the four themes and ensuring that 2030 really does become a springboard for St Helena's success.

Figure 2.1: The four themes of the new CP mapped to Visions 2030 and 2050





2.2 Hierarchy of SHG's policies and plans

SHG has adopted in principle the 2050 Vision as its longer-term goal for the island's development; the measure of success. The Vision 2030 comprises the springboard for that success. Accomplishing the 10-Year Plan (2017-2027) would ensure that St Helena is well on the way to achieving the 2030 goals and the SEDP (2018-2028) further elucidates the economic development aspects of the 10-Year Plan.

In addition to the SEDP providing detail for the economic aspects of the 10-Year Plan, SHG has prepared a number of strategy papers that describe the way forward in other sectors. These documents include:

The Labour Market Strategy (LMS) 2020-2035	One of the steps necessary to achieve the goals articulated in the SEDP is to develop, maintain and attract a skilled workforce across the public and private sectors. The LMS describes a strategy for providing this workforce.
An Investor prospectus and Investment Strategy	Describes arrangements for making St Helena a desirable and competitive to do business; for encouraging growth through import substitution, export promotion and domestic production; support to the local economy in competing in the open economy, etc
SHG Strategy 2020-2023	A strategy to capitalise on the airport investment, prepare people for improved connectivity, and policies to make St Helena a better place to live and do business
Digital Strategy	A strategy for improved connectivity in support of encouraging investments in the island and achieving the target resident population, and improvements in health, education and economic development
Energy Strategy	A strategy to achieve the use of 100% renewable energy by 1st April 2022
Water Strategy	A strategy for the management of the island's catchments and storage facilities for the coming years; recommends the development of a Water Resources Master Plan by June 2021.

These documents are all subordinate to the 10-Year Plan. Together, these foregoing documents (Visions 2050 and 2030, 10-Year Plan, SEDP and the strategies) describe the future vision of the island and the means of achieving the vision. It is clear that the rationale for the airport was to facilitate a sustainable economy on St Helena. It is important, therefore, to take account of the UK National Audit Office's (NAO) study in 2016. "**Realising the benefits of the St Helena Airport Project**". The report records the work done by DFID in making the business case for the airport and various studies that examined the viability of the investment, including revisions to projections of tourists and residents compared to the 2004 Air Access Feasibility Study. The report's implications are important with regard to the targets included in the Visions 2050 and 2030, and for the planning of infrastructure in the interim years.

The vision (future state) of St Helena is well described by the hierarchy and content of all these documents. Figure 2.2 summarises the future state in a top-down format, commencing with the Vision 2050 and cascading down to the sector strategy documents. The NAO report provides the 'final word' in that it provides a cautionary note that should be carried forward when using, reviewing and updating any of the strategies.

Figure 2.2 focuses on the infrastructure aspects of the visions and strategies and groups the infrastructure into the four Vision 2050 themes: transport and logistics, 21st Century Island, Visitor Economy Infrastructure, and Productivity-based programmes. These must be carried forward to create the new capital programme of which EDIP will be an important part spread over six years (2019 to 2025) and comprising £30 million (£15 million in the first three years and £15 million in the second three years provided that SHG passes a mid-term breakpoint review of progress in implementing EDIP). The capital programme will be part of a wider mixed-investor programme for delivering the future state. In addition to DFID, investors will include other UK government departments, local and international private sector investors, and possibly philanthropists.

The starting point for Figure 1 is the Vision 2050, as developed by the IER. The first three years of the programme focus on putting in place the foundations upon which the ensuing works of the 2020s can achieve the 2030 Vision. The foundation comprises:

- backbone investments in infrastructure
- governance reforms
- local policy development
- a new agreement ("Compact") as the basis of UKG's and SHG's working relationship
- local capacity building

The IER also proposed an Island Masterplan competition to describe spatially and qualitatively the Vision 2050. A starting point for that competition would be consideration of the very many items to be built and located as described in the documents referred to in Figure 2.2. Figure 2.3 provides an indication of this starting point, although much greater detail can be obtained from the individual documents, the Lands Planning Department and the Chief Secretary's Office. The visioning exercise that forms the background to Figure 2.3 was prepared by SHG's Investment Enabling Group in 2019.

2.3 Summary of the Vision (future state of the programme)

The hierarchy of policies, plans and strategies portray a picture of St Helena in 2030 as having achieved a lot in terms of becoming a healthy, safe and prosperous place for families to work and live. St Helena will be an attractive destination for tourists, businesses and inward investors. The tourism product will be well developed and marketing of the island will have succeeded in St Helena being a well known and go-to *green* and *blue* destination for a variety of visitor types: those interested in the island purely from curiosity, those interested in cultural and military history, bird-watcher and ecological interest groups, adventure tourists (hill-walking, climbing/abseiling, diving, game-fishing, mountain-biking, etc), and those who just want a quiet far away place for relaxation, wellness and "finding themselves".

Reliable and affordable digital services will have transformed lives and businesses. The freight port at Rupert's and logistics corridor will be combined with affordable shipping to support cost-effective import/export activities. There will be a tangible sense of achievement among Saints; a contagious sense of well-being that will continue to attract more inward investment and residents. St Helena in 2030 will be on a sustainable development path towards the 2050 goal of 8,000 Saints living healthily, safely and prosperously, with an active economy led by a well-developed tourism product and supported by adequate, reliable and affordable infrastructure.

Figure 2.2: Vision of the programme to 2030 and 2050 *(description of 'future state' with respect to infrastructure)*

<table>
<tr><th>Planning document
(date produced)</th><th>Vision 2030</th><th>Vision 2050</th></tr>
<tr><td rowspan="15">Independent Economic Review (IER)
(2020)</td><td>• £10million pa visitor economy
• £5million pa from exports, living laboratory, R&D, telebusinesses
• Prince Andrew graduates achieving at least average England scores
domestic revenue funding similar proportions to Isles of Scilly</td><td>• 8,000 Saint population
• high migration model to 2050
• healthy life expectancy at least UK average</td></tr>
<tr><td>Capital Programme: "Springboard for Success" (investment to unlock growth)</td><td rowspan="14">2030

2050</td></tr>
<tr><td>2020 – 2022:
• Backbone infrastructure investments
• Governance reforms and 2021 elections
• Local policy development
• UKG / SHG Compact
• public services reforms and capacity building early wins
• Island Masterplan competition

2023 – 2030:
• Policy, programme and project delivery
• Diversification and new anchors
• Confidence and can-do culture
• Global St Helena Brand</td></tr>
<tr><td>Transport and logistics corridor
Rupert's port, logistics hub
major roads network
parking solutions
sustainable quarrying</td></tr>
<tr><td>21st Century Island
priority places (CDAs)
water security
100% renewable energy
Bottom Wood CDA | St Helena as 'living lab'
new SHG head offices
present-day prison</td></tr>
<tr><td>Visitor Economy Infrastructure
'out and about' facilities
St Helena story (heritage)
attractive waterfronts
enhanced Jamestown facia
enhanced tourist accomm choices</td></tr>
<tr><td>Productivity based programmes
education campus
increased agri and food processing
cable-landing
Bradleys Camp & Business Park
Business workspace</td></tr>
<tr><td rowspan="2">Vision 2030
(2020)</td><td>Infrastructure as shown for IER + non-infrastructure objectives</td><td rowspan="2"></td></tr>
<tr><td>2020-2022: | 2023-2025
Rupert's Ph.1 (cargo op's) | Rupert's Ph.2
Field Road & Side Path | Major roads/bridges
New and enlarged reservoirs, new water tanks | Water security
Sustainable sewerage
Jamestown facia/waterfront | Jamestown marina
Increased agricultural production | Education campus
Micro-projects | Micro projects</td></tr>
<tr><td>St Helena 10-Year Plan 2017-27
(2017)</td><td>Individual projects included in SHG's Multi-Year Plan (MYP);
2016 version now restructured into four groups of infrastructure:
Transport and logistics | Visitor Economy Infrastructure
21st Century island | Productivity Programmes</td><td></td></tr>
<tr><td>Sustainable Economic Development Plan (SEDP) 2018-28
(2018)</td><td>Mostly economic goals, but recommendations include inter alia:
• encourage the provision of tourist infrastructure
• improve land productivity
• sustaining natural and built heritage
• using local tax revenues to improve infrastructure
• investing in broadband services and infrastructure towards delivering a fibre-optic cable for the island
• explore health tourism opportunities</td><td></td></tr>
</table>

Labour Market Strategy 2020-2035 (2019)	Focuses on developing, maintaining and attracting a skilled workforce across the private and public sectors in support of the 10-Year Plan and the SEDP. Makes mention of the sustainability of the 2016 population (4837 in January 2016) given the infrastructure at that time. This implies the need for additional infrastructure to meet the growing needs of residents, businesses and the efficient functioning of government as the population grows in line with the Visions 2030 and 2050.			**2035**	**2050**
	Reduced costs of port and cargo operations				
	All infrastructure, including utilities and telecoms, developed and maintained				
	Robust and resilient ICT systems and infrastructure in place with supporting policies and legislation				
Investor Prospectus 2019-20 (2019)	Mostly investment-related objectives, but infrastructure targets include:			**2030**	**2050**
	Fibre-optic cable by 2021	100% renewable energy by 2022			
Investment Strategy (2019)	Sets out a strategy to encourage and facilitate investment in St Helena. Mentions that investors will require land and this will need to be serviced with sustainable and reliable utilities. Investments in utilities is also encouraged				
SHG Strategy 2020-2023 (2019)	A strategy to capitalise on the airport investment, prepare people for improved internet connectivity, and put in place policies to make it better to live and work in St Helena. The strategy builds on the 10-Year Plan, SEDP, and the Investment Strategy. Makes mention of infrastructure with respect to the 10-Year Plan: *"We live in well-designed sustainable places where we are able to access the amenities and services we need".* More specifically, it mentions:				
	Reduced costs of port and cargo operations				
	All infrastructure, including utilities and telecoms, developed and maintained				
	Robust and resilient ICT systems and infrastructure in place with supporting policies and legislation				
Digital Strategy (2017)	Aims to take the island forward in line with ICT infrastructure in developed economies, with benefits for health, education, the economy and communications. It intends to build on St Helena's unique location that is attractive to investors and tourists, and to help attract and retain a growing resident population on the island.				
	Fibre-optic cable	100% renewable energy by 2022			
Energy Strategy (2016)	Aims to achieve 100% renewable energy by 1st April 2022. 28.8% renewable had been achieved by 2015/16. **Current generating infrastructure includes:** 6 diesel generators: 7.6MW (total) 12 wind turbines: 960 kW (total) Solar array at Rifle Range: 500kW Other solar panels: 178kW (total) **Connect SH's plans for further renewable energy sources include:** 1.8MW wind turbines and 0.5MW solar to be installed during 2020/21 Further renewables to be installed by PASH based on demand and financial viability PASH guarantee to provide 5MW (9.133 GWh) renewable energy which, when added to current capacity, would achieve about 100% renewables. However, Connect reports that there are technical challenges still to be addressed				
		100% renewable energy by 2022	Further additions to the energy network will be provided under a Power Purchasing Agreement (PPA) between Connect SH and PASH		
Water Strategy (2020-draft)	The Water Strategy (WS) outlines St Helena's current water catchment and storage and considers the impact of various population projections to 2050. An S-curve increase from the current on-island population of around 4500 to 8000 in 2050 is proposed. A Water Resource Management Plan (WRMP) is proposed to be completed by June 2021. In the meantime, Connect SH is responsible for examining options for meeting current and medium-term water demands in the face of climate change. The WS does not attempt to predict the impact of climate change on the island's rainfall, but IPCC modelling suggests that the region of the South Atlantic around St Helena is likely to receive 20% less precipitation in future years with a 4-8%reduction in intense rainfall. This needs to be taken into account in the WRMP and Connect's water supply considerations.				
		WRMP by Jun 2021	Implementation of the WRMP		

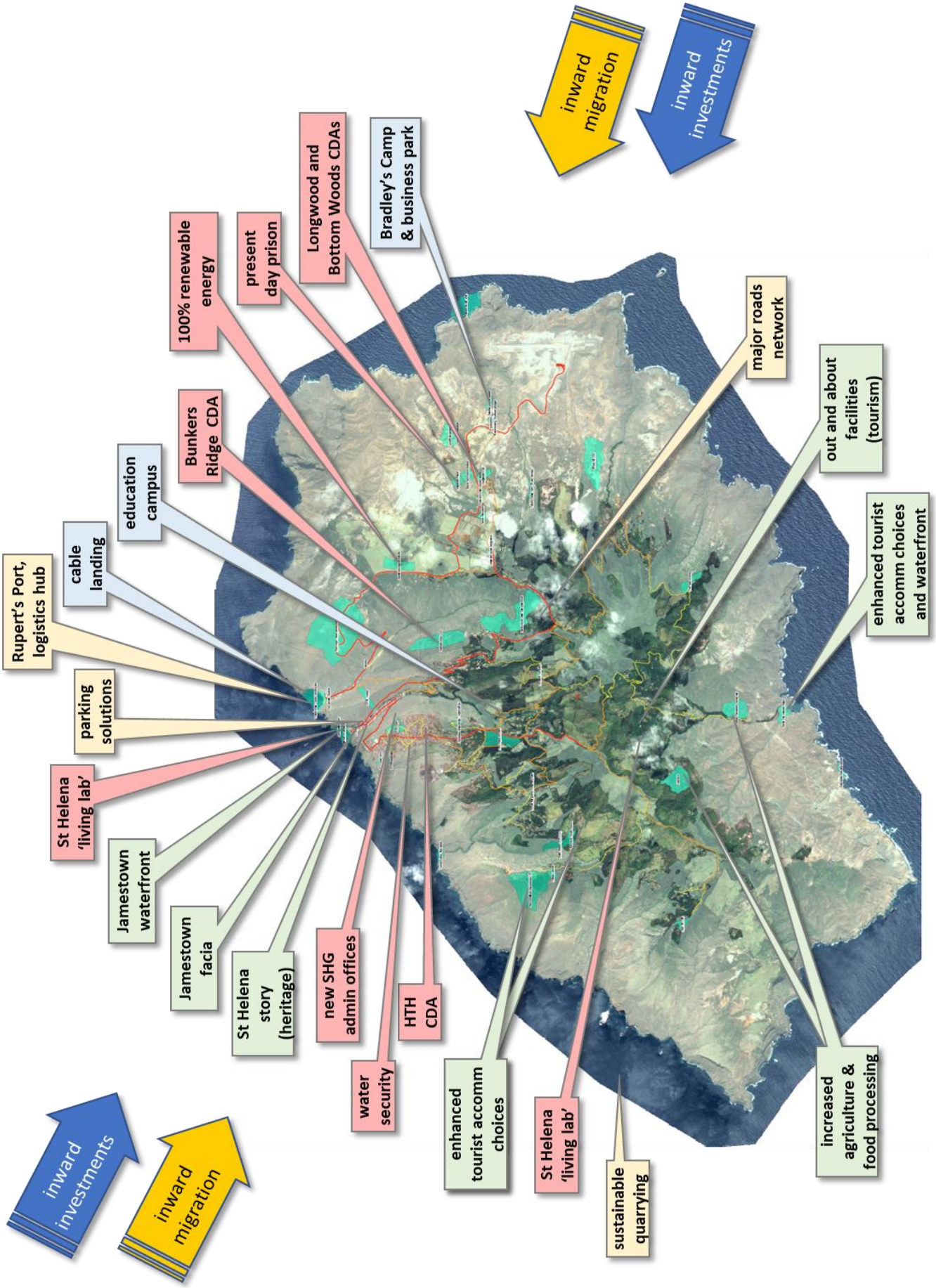
<table>
<tr><td>Realising the Benefits of St Helena Airport
(2016)</td><td>Produced by the UK's National Audit Office (NAO)
Refers to the DFID Business Case for the airport in which assumptions were made regarding future adequacy of tourist accommodation, and that SHG is looking to increase the quality and type of accommodation on offer by building a 30-room hotel by 2017. It is not stated in the report, but further increases in tourist accommodation will need to be achieved outside Jamestown and this will require the provision of utilities to locations identified in SHG's Land Development Control Plan.
The non-monetised benefit from the airport project include (Section 2.9 of the report): improved employment prospects, more private sector investment, improved medical services, and a reversal I population decline, all of which imply an increasing need for infrastructure on island. In Section 2.16, the report records the review of air tourist projections that were halved (<u>29,208</u> within 25 years of the airport opening; i.e. by 2042) compared to the original consultants' forecasts (59,000). Figure 7 of the report suggests no further increase from 29,208. This number would require 5 flights per week at 120 pax per flight. The current aircraft carries around 95 pax, so it would be prudent to reduce the annual total by 95/120, unless more flights per week would be provided. This would reduce the number of air tourists on island per week in 2030 from 833 to 660, a reduction of about 160 people. This will not make a big difference to infrastructure planning, so the higher figure has been retained for now.</td><td></td></tr>
<tr><td>Economic Development Investment Programme (EDIP) 2019-2025
(2019)</td><td>DFID's EDIP Business Case (BC) proposes to provide £30M between 2019 and 2025, of which £15M in the first three years and £15M in the second three years provided that SHG passes the break point review in 2022. The BC states that investment in critical infrastructure is required for economic development and expansion of the private sector in order to grow tax revenues. The programme will support policy and institutional reforms, implementation of strategic infrastructure and leverage private sector investments to maximise the benefits from the airport. EDIP will support the three of the four groups of infrastructure in the 10-Year Plan, as shown below. (The fibre-optic cable will be funded by the EU from EDF-11). Based on the ICAI 2008 report on the risks of short-termism in major infrastructure projects, the approach for EDIP should be longer term. This is consistent with the IER Vision 2050 an Compact proposals.
<table>
<tr><td>Transport and logistics</td><td>Visitor Economy Infrastructure</td><td></td></tr>
<tr><td>21st Century island</td><td>No EDIP projects yet identified for this theme</td><td></td></tr>
</table>
The BC states that it is imperative to invest now to get the island's infrastructure to a good state to optimise the economic opportunity from increased tourism.
Impact: (Section 49 of BC and EDIP Theory of Change) increased attractiveness and economic development opportunities for sustainable development in St Helena.
Outcome: (Section 50 of the BC) EDIP aims to provide adequate infrastructure and a vibrant private sector to promote the tourism offer on the island, leading to sustained economic growth and prosperity.
Outputs: (Section 52 of the BC) will include:

fit for purpose, resilient infrastructure to support economic growth & development
increased amount of revenues, particularly from tourism ad niche sectors
adequate public utilities to meet current and future needs of citizens and tourists
improvements to SHG's project management and procurement capabilities
delivery of an assets management system, which helps prevent further deterioration of public infrastructure and reduces upward pressure on the recurrent budget
economic reforms implemented in key areas
enhanced private sector role in the island's development

Potential areas for investment include.
<ol type="a">
Social investment and basic infrastructure: only essential social development projects to attract immigration and address social exclusion challenges (e.g. the aged and disabled); a cap of £5M will be applied to these projects
Major economic development projects: these would likely include projects with a clear economic rationale that help develop St Helena as an attractive tourist and investment destination, contributing to St Helena's revenue generation and mobilise additional private sector capital. It will include a specific target for mobilising funds through PPPs (e.g. commercial developments in Rupert's Valley, new housing developments, pursuing the digital economy, etc)
SEDP niche investments: Prioritised projects that generate the highest economic returns towards economic growth targets.
Quick wins: (see Section 75, 76 of the BC) projects that are important with regard to putting existing (previous) DFID investments to good use and help to kick start economic development; e.g. an improved road connection between Rupert's and
</td><td></td></tr>
</table>

	Jamestown to maximise benefits from the new wharf in Rupert's. For example: • specialised rockfall protection at Rupert's Wharf and Jamestown • Rupert's cargo handling facility • Psychiatric Intensive Care Unit construction • HTH/Jamestown sewerage design and construction • Longwood/Bottom Woods housing CDA design and implementation • setting up effective management systems for land registry • technical assistance to implement EDIP and design projects for outer years; support policy and institutional reforms e. ***Technical assistance:*** to support policy and institutional reforms, provide professional technical and managerial support to the programme delivery to achieve higher value for money outcomes. The programme is to be delivered via the PMU, putting SHG 'in the driving seat' to work within the budget constraints ensure priorities are dealt with and delivered efficiently. EDIP will be complemented by DFID support to ESH and through synergies with Technical Cooperation (TC) through DFID's financial aid to St Helena.	

Figure 2.3: A visualisation of the future St Helena



3. Current State of St Helena's Infrastructure

3.1 Electricity Infrastructure

Current infrastructure

When the Infrastructure Review was carried out in late-2006, the energy sector was managed by SHG's Public Works & Services Department (PWSD). Generation capacity at that time comprised six diesel generators, three of which were nearing the end of their design life. There were also three wind turbines (rated at 80kW each), but the technology was unreliable and the turbines rarely produced any significant energy. The cost of diesel was expensive and the wind turbines were intended to be used to minimise energy costs to consumers. The total generating capacity was 4.5MW. Average daily demand was 0.7MW, with an evening peak demand of 1.1MW. Despite the overall excess of capacity, the demand for Jamestown and HTH was on one switch, leading to frequent power outages during peak demand.

Three further 80kW wind turbines were added to the system during 2008-09. The power station was completely renovated in 2011-12, along with the replacement of the three oldest diesel generators. These became operational during the 2013-14 fiscal year. As can be seen from Figure 3.1, the new generators were much more efficient than the older models and used around

Figure 3.1: Connect SH's generation capacity

	Gen 1	Gen 2	Gen 3	Gen 4	Gen 5	Gen 6	Solar Seales	Solar PS	Carnarvon	CCC	Rifle Range
Unit	CAT 3516B	CAT 3516B	CAT 3516B	RK215	CAT 3508B	RK215	Power Solutions	Power Solutions	Power Solutions	Power Solutions	Power Solutions
Power rating, kWe	1600	1600	1600	1000	800	1000	25	41	20	92	500
Alternator, kVA	2000	2000	2000	1250	1000	1250	-	-	-	-	-
RPM	1500	1500	1500	750	1500	750					
Year Installed	2012	2012	2012	2001	2012	2001	Jun-12	Aug-13	Apr-14	Sep-15	Jun-15
Hours Run 1/4/18	19,201	10,963	16,781	30,007	7,471	30,050					
Hours Run 31/3/19	19,258	17,871	18,647	30,007	9,001	30,053					
Total hrs run	57	6,908	1,866	0	1,530	3					
Hours Run Last Year	872	86	7,970	0	1,173	0					
Average hrs /yr	465	3,497	4,918	-	1,351	1					
kWh 1/4/18	17,574,739	10,428,532	15,313,811	2,038	3,611,715	15,861					
kWh 31/3/19	17,623,346	16,805,321	17,069,369	2,038	4,373,531	16,736					
kWh generated	48,607	6,376,789	1,755,558	0	761,816	875	30,729	88,677	60,623	123,849	693,340
Litres fuel 1/4/18	4,146,147	2,465,625	3,895,188	531	897,907	13,139					
Litres fuel 31/3/19	4,157,468	3,902,652	4,289,232	531	1,082,786	13,139					
Total Litres fuel	11,321	1,437,027	394,044	0	184,879	0					
Litres oil	640	4,480	1,920	0	1180	0					
Oil consumption	640	4480	1920	0	1180	0					
Fuel litres/kWh	0.233	0.225	0.224		0.243						
Orientation Loss							19%	8%	8%	8%	8%
Effective Rating							20.25	37.72	18.4	84.64	460

	WEC 1	WEC 2	WEC 3	WEC 4	WEC 5	WEC 6	WEC 7	WEC 8	WEC 9	WEC 10	WEC 11	WEC 12
Unit	WES18/80	WES18/80	WES18/80	WES18/80	WES18/80	WES18/80	WES18/80	WES18/80	WES18/80	WES18/80	WES18/80	WES18/80
Power rating, kWe	80	80	80	80	80	80	80	80	80	80	80	80
Alternator, kVA	80	80	80	80	80	80	80	80	80	80	80	80
RPM	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable	Variable
Year Installed	1999	1999	1999	2009	2008	2009	Apr-14	Apr-14	Apr-14	Apr-14	Apr-14	Apr-14
Hours Run 1/4/18												
Hours Run 31/3/19												
Total hrs run												
Hours Run Last Year												
Average hrs /yr												
kWh 1/4/18												
kWh 31/3/19												
kWh generated	205,671	190,553	82,175	199,239	185,302	154,005	163,038	110,076	216,630	150,533	206,126	206,401
Litres fuel 1/4/18												
Litres fuel 31/3/19												
Total Litres fuel												
Litres oil												
Oil consumption												
Fuel litres/kWh												
Orientation Loss												
Effective Rating												

0.24 litres per kWh compared to 0.36-0.39 litres/kWh for the older models. During 2012-13, two small solar systems were added to the network, rated at 25kW and 41 kW.

In 2013, SHG established Connect SH, a government-owned entity to manage the island's utilities: energy, water and wastewater. In 2014, Connect SH installed six more wind turbines (also 80kW each) and a third solar system rated at 20kW. A major leap forward in solar power generation was achieved in 2015 with the addition of a 500kW solar array at the Rifle Range site. By 2018 the proportion of renewable energy amounted to around 25%. This has been increased to just under 30% by the end of 2019. In the late 2000s, adding renewable energy into the system was a huge challenge due to voltage stabilisation. This remains a technical issue, but SHG has set a target of 100% electricity from renewable sources by 2022.

Reliability of supply

In addition to improvements in power generation, Connect has undertaken many improvements to the distribution network and general customer service. The number of electrical disruptions was reduced from 146 in 2013 to 81 in 2018. Electrical connections are now achieved within just 12 days compared to 50 days prior to the establishment of Connect.

3.2 Water supply and distribution

Hydrology and groundwater studies in St Helena

Water supply has long been a challenge in St Helena. Toens (2000) and Mathieson (1990) determined that annual precipitation on the island ranges between 175 mm and 1050 mm, with the higher rainfalls corresponding to the higher elevations. Mean annual precipitation is at least 600mm above the 500 metre contour. Most of the rainfall is caused by orthographic uplift (warm air from low altitudes rising over the island, cooling and turning to precipitation), hence more rain falls in the higher elevations. Rain from weather fronts are responsible for lesser amounts of the island's annual rainfall. Mist interception is also an important source of precipitation in the central peaks area, possibly increasing rainfall in the higher areas (above the 500 metre contour) by up to 50%. Mathieson estimated the annual rainfall as 54 million cubic metres. WSP (2017) quoted a much reduced mean annual precipitation of 47 m^3; (i.e. 87% of Mathieson's figure).Lawrence (1983) had estimated the annual aquifer recharge at between 1.5 and 2.5 million m^3. In 1990, the PWSD estimated 3.6 million m^3. Based on the reduced mean annual precipitation quoted by WSP, it is likely that the annual aquifer recharge has similarly reduced to between 1.3 and 3.1 million m^3.

Mathieson (1990) had stated that St Helena experiences a drought cycle of around 15 years. Connect has recorded three droughts in the past decade (2013, 2016, 2019), although it is unclear whether Mathieson and Connect used the same definitions of "drought". Connect's records of drought vs increasing demand suggest a need to develop additional water sources to reduce the dependency on rainfall and overland runoff[1].

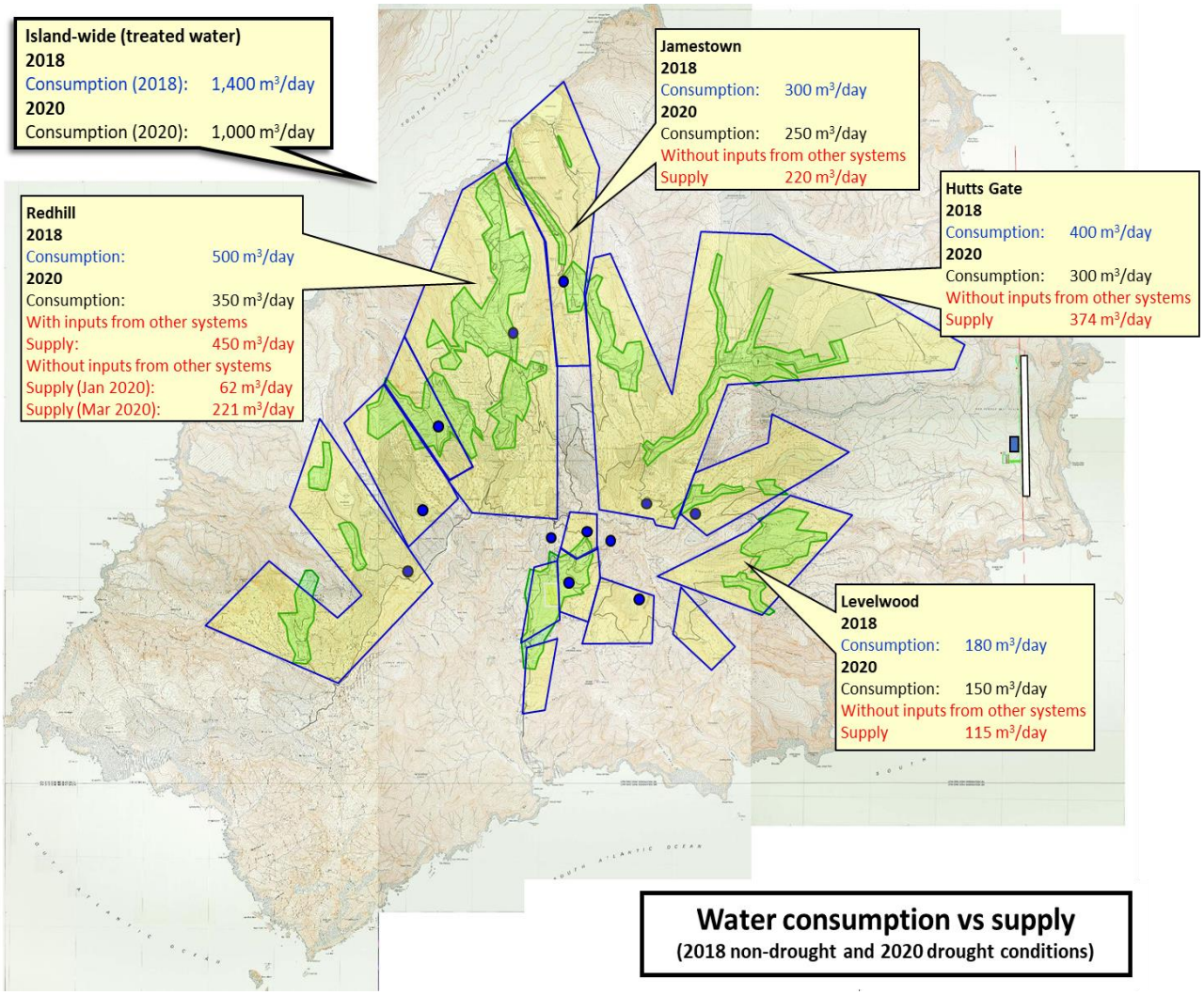
Current infrastructure

The water infrastructure inherited by Connect from the PWSD comprised fourteen water distribution areas, of which the four largest and most important are: Redhill, Hutts Gate, Levelwood and Chubb's Spring / Jamestown. Two areas are supplied only with untreated water,

[1] "Water Plan", Connect (2019)

namely the Sandy Bay and Blue Hill areas. While the four main areas have their own storage (reservoirs, tanks) and treatment works, water shortages in the Redhill area (north-western side of the island) remain a problem. At the time of the Infrastructure Review in 2006, the distribution areas were separate and the PWSD had to transport water by bowser to needy areas. When Connect was established in 2013, while there was adequate water on the island as a whole, especially in Levelwood and Hutts Gate, there was inadequate supply in Redhill. Connect installed pipelines that enabled water to be pumped from Levelwood to Hutts Gate and from there to Redhill.

Figure 3.2: The four main water supply area in St Helena



The figure shows the average consumption (demand) in the four main distribution areas and the supply in normal, non-drought (2018) and drought (2020) conditions. The deficiencies under normal conditions illustrate why Connect installed the pipe network that enables them to pump between the various distribution areas. For example, it can be seen that Hutts Gate would not have sufficient water if it were not supplemented from other sources.

The 2020 water usage restrictions have reduced demand in the Redhill area to about 350 m^3 compared to 500 m^3 under normal (non-drought) conditions; a recent peak demand was 550 m^3. In January, the supply from within Redhill area alone was just over 60 m^3. By late March, with

increased rains, the daily supply was around 220 m^3. Redhill therefore has a deficit of around 300-450m^3 per day and has to be supplemented from other systems, principally Hutts Gate. Since completion of the airport, Hutts Gate receives a pumped supply from “Borehole 5” from the airport programme during drought periods. Construction of the airport had required a large amount of water (mostly for compaction of earthworks and for production of concrete) and this demand was met largely from Borehole No.5 (about 70 metres deep) located near the airport site. This is now a valuable supplement to the main water system.

The two main challenges for water supply infrastructure are supply and storage: (1) the majority of water is supplied from sources on the east side of the island but the highest demand is on the west side, and (2) there is an overall shortage of stored water in appropriate locations.

Studies to increase water supply

A study carried out by Fairhurst in 2011 suggested development of a deep borehole programme to meet the island’s future water needs. The report provided an outline 20-Year Water Resource Master Plan. Guided by the report, Connect decided to proceed with an incremental water resources development programme in two phases:

Phase 1: commenced in FY2014/15, to refurbish existing water extraction infrastructure and expansion of raw water storage

Phase 2: focus on exploration of additional water sources across the island, including deep borehole exploration

Most of the Phase 1 works were completed by 2019. A list of works carried out by Connect under Phase 1 is provided in the Connect Water Plan (2019).

For Phase 2, Connect commissioned a deep aquifer drilling study to examine the feasibility of using deep aquifer groundwater to supplement surface water sources. The study by WSP (2017) conclude that four of the programme’s boreholes could be further developed, but to be confirmed by further testing. However, Connect’s Water Plan included concerns about the viability of long-term pumping from deep boreholes, partly because of the ongoing operational costs that would be incurred.

A further study of importance regarding St Helena’s hydrology is the Darwin Plus Project in 2017. It estimated that mist accounts for 60% of the rainfall in the central peaks area and recommended restoration of the peaks cloud forest. Connect considered the possibility of using mist-catching nets that would collect mist vapour and direct this into the catchment areas. This is a potential longer-term solution but SHG development controls preclude such works at this time.

With respect to replenishment, over 50% of the water in Connect’s water system comes from boreholes, implying that the droughts are affecting the overland systems. In a normal rainy season with the current consumption levels there would only be minor spare capacity, emphasizing the need to store most of the run off when it is raining to cover for prolonged dry periods. The Fairhurst 20-Year Plan had predicted that by 2020 there would still be spare capacity on the overland flows, but deep aquifer (or other sources) being required towards the 2030 predictions. This has not be borne out by experience. Overland flows are below predicted levels, resulting in low levels in reservoirs and consequent water shortages, particularly on the western side of the island. Connect is pumping water from the eastern side of the island to meet the shortages. This is a costly and unsustainable solution. Connect is therefore exploring new supply options, including deep aquifer boreholes and a large reservoir at Fishers Valley.

Water quality

During its first five years of operation (2013-2018), Connect undertook an extensive programme of improvements to the quality of treated water. Water quality improvements up to 2018 are summarised below.

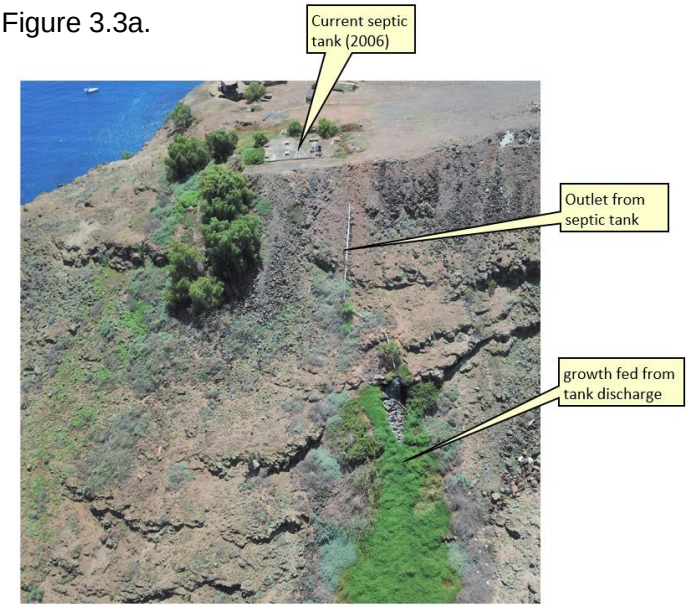
Performance Measure	2013	2018
Microbiological integrity of treated water in CSH network	96.5%	100%
Microbiological integrity of treated water at consumer meter	87%	100%

3.3 Wastewater Management

Current wastewater arrangements

In 2003, SHG had commissioned consultants Mott-MacDonald to undertake a wastewater strategy. The 2006 Infrastructure Review updated the wastewater infrastructure records to record the current situation based on information from the PWSD. The new communal septic tank at HTH that was constructed in November 2006 barely met demand at the time it was commissioned and was unsuitable to meet much additional demand. Little has changed since 2006. The HTH tank discharges via a run-off down the valley adjacent to the Rifle Range Butts (Butts Valley) into the sea; see Figure 3.3a.

Figure 3.3a: Septic tank at HTH, constructed 2006



In 2015, SHG engaged consultants WSP to review the wastewater situation on the island, focusing on three main systems:

- the Half Tree Hollow and Ladder Hill sewage collection and discharge system (HTH)
- Jamestown sewage collection and discharge system (JT)
- Longwood and Bottom Woods sewage collection and discharge system

WSP progressed these systems to conceptual design stage and proposed combining the HTH and JT systems into a single scheme to be achieved by constructing a sewer from HTH alongside the Jacob's Ladder to join the JT system. The combined systems would feed into a treatment works at one of three locations before being discharged into a marine outfall of about 70 metres length. This proposal met with strong opposition when first submitted for outline development

permission. Permission was eventually granted and Connect is currently awaiting final development approval.

For the Longwood and Bottom Woods system WSP proposed a rotating bio-contactor, trickling filter or oxidation ponds.

In parallel to the WSP work, SHG engaged Worley Parsons to study the Rupert's Valley system. The Rupert's scheme has been fully implemented with all reticulation pipework installed and awaiting installation of a treatment plant.

Figure 3.3b: uncaptured discharges in the HTH area

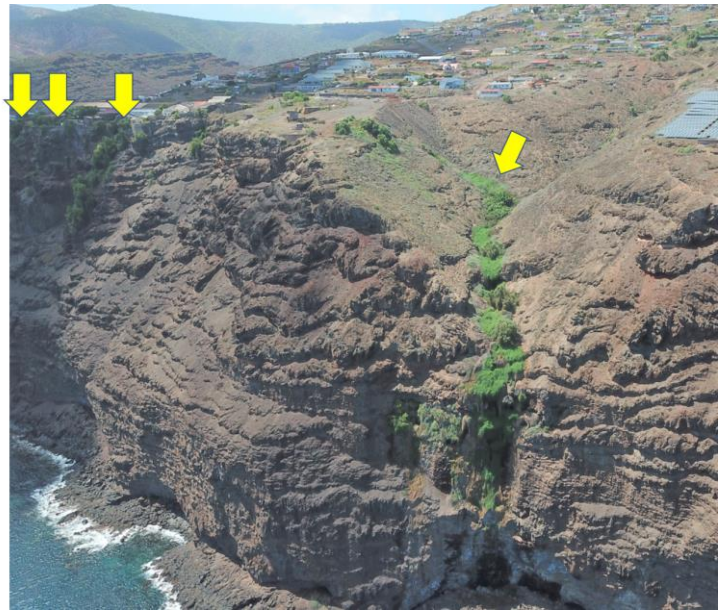
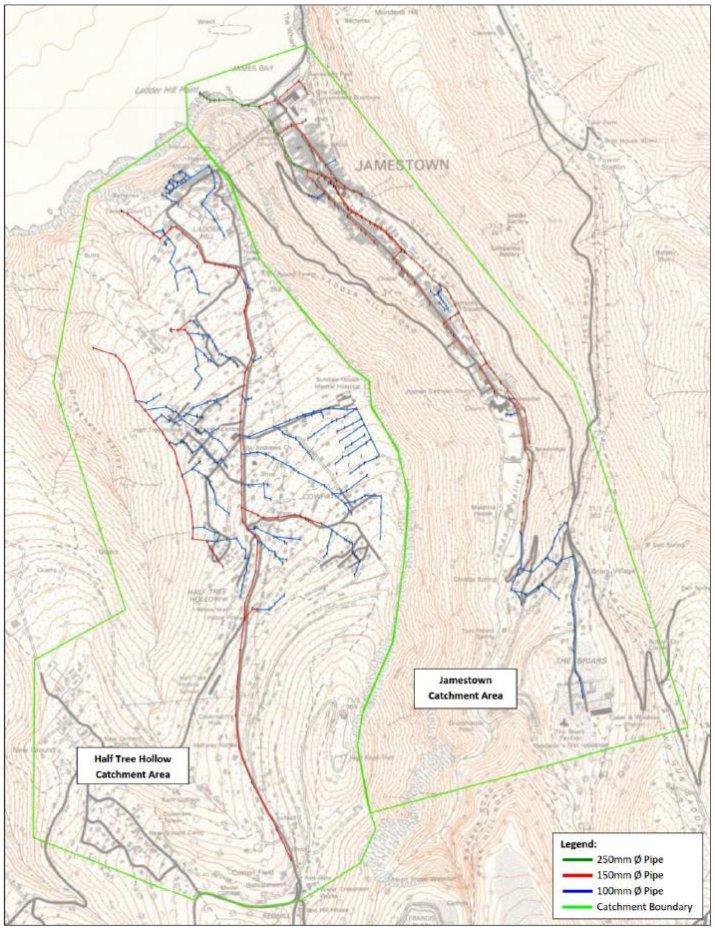


Figure 3.3c: existing JT and HTH collection and discharge systems



3.4 Roads

Road inventory

SHG's Roads Section carried out an inventory of all roads in 2014; see Figure 3.5a. The total length of primary and tertiary roads was recorded as 107 km. Since then, the Haul Road has been completed and opened as a public road, with a length of 14 km. In its 2014 road inventory records, the section included traffic counts that had been carried out in the recent years A indication of pavement condition was included in a simple colour-coded manner for each road, thereby giving an overall indication of the condition for each road link and the overall network.

In 2016, WSP were commissioned to conduct an assessment of highway structures (bridges, culverts, retaining walls). There report provides detailed condition assessment and cost estimates for 49 items. Figure 3.5b shows the summary tables for the high and medium priority items; the low priority items amounted to just £5,133. The total estimated cost for repairing all high, medium and low priority structures at November 2016 was £170,876. However, it will be seen that many of the items refer to works that would normally be funded from a recurrent budget (general maintenance, inspections, clearing debris and unblocking culverts, etc). SHG's Roads Section already carries out many of these tasks. The Roads Section plans and executes recurrent works according to a monthly plan prepared by the Roads Manager; see Figure 3.5c. What the WSP fails to adequately record is the extent of capital works required to some highway structures on the main roads, most importantly Bishop's Bridge.

Current road projects

In order to maximise the benefits of the jetty, wharf and freight-handling facilities at Ruperts, the road link between Ruperts and James valleys (comprising Field Road and Side Path) is to be upgraded; see Figure 3.4. This is the so-called "R2" project that was identified as part of Infrastructure Plan in 2008. The project was designed in detail by WSP in 2016, but on the assumption that the freight traffic would include container trucks. The new facility at Ruperts Wharf will include transferring the contents of containers to lighter trucks that can better negotiate Field Road, Side Path and Napoleon Street. The R2 project is now being reviewed with respect to reduce the technical content (to take account of the lighter freight traffic) and a revised cost estimate. It is expected that R2 can now be executed using local contracting capacity.

Figure 3.4: "R2" road upgrading project between Ruperts and James valleys

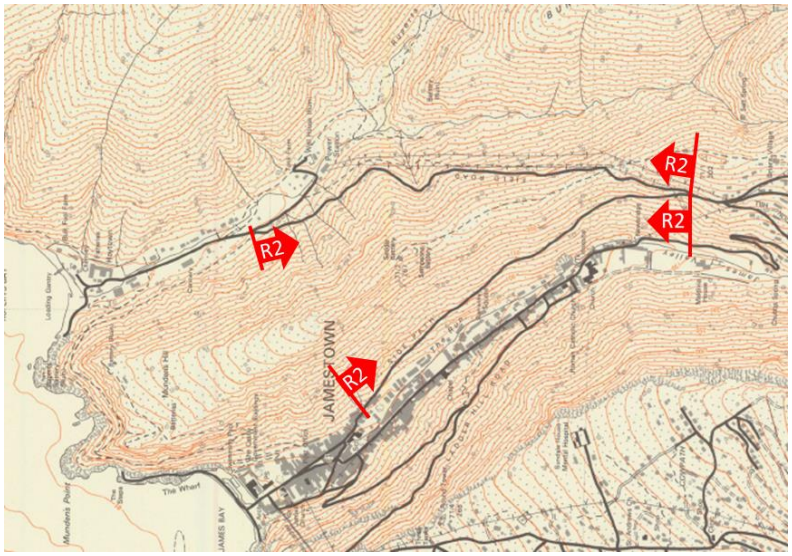


Figure 3.5a: Road inventory and indicative road condition (Source: SHG, 2014)

St Helena Strategic Road Network - 2014									
Route Number	Route Section	Route Name	From	To	Length (m)	Average Width (m)	Average (Sq mtrs)	12hr Traffic Flows 06-18 (2010)	12hr Traffic Flows 07-19 (2013)
A1	A1.1	Ladder Hill	China Lane	Shy Road	450	6.05	2,723	1220	903
	A1.2a	Ladder Hill	Shy Road	Ladder Hill	700	6.4	4,480	1238	
	A1.2b	Ladder Hill	Ladder Hill	White Wall	2,025	6.4	12,960		1553
	A1.3		White Wall	Redhill	958	7.7	7,377	730	
	A1.4		Redhill	White Gate	867	7.5	6,503	651	
	A1.5		White Gate	Bates Branch	1,500	6.1	9,150	397	
A2	A2.1	Side Path	The Canister	Field Road	1,500	5.3	7,950	588	
	A2.2	Side Path	Field Road	The Briars	119	6.3	750	547	
	A2.3		The Briars	Gordons Post	2,281	5.7	13,002	499	706
	A2.4		Gordons Post	Hutts Gate	2,152	5.7	12,266	446	626
	A2.5		Hutts Gate	Longwood Gate	1,744	5.7	9,941	562	
	A2.6a		Longwood Gate	Bottom Woods	2,406	4.9	11,789	no data	
	A2.6b		Bottom Woods	Horse Point	1,000	4.9	4,900	no data	
A3/B3	A3.1		White Wall	Sapper Way	900	6.8	6,120	561	825.5
	B3.2		Sapper Way	Sunny Side	1,250	7.8	9,750	271	
	B3.3		Sunny Side	Rosemary Plain	787	6.5	5,116	128	
A4/B4	A4.1		White Gate	Scotland	1,000	8	8,000	427	
	B4.2a		Scotland	Spring Gut	990	7.3	7,227	137	
	B4.2b		Spring Gut	Rosemary Plain	700	7.3	5,110		
	B4.3		Rosemary Plain	Crack Plain	1,617	5.9	9,540	90	
A5	A5.1	Market Street	China Lane	The Canister	920	7.8	7,176	no data	
A6	A5.2	Main Street	The Canister	The Arch	262	12.45	3,262	no data	
B1	B1.1		White Gate	Watercourse	977	6.1	5,960	318	
	B1.2		Watercourse	Lemon Tree Gut	884	6.9	6,100	284	
	B1.3		Lemon Tree Gut	The Dungeon	494	6.4	3,162	275	
	B1.4		The Dungeon	Hutts Gate	2,202	6.8	14,974	183	
B2/C2	B2.1	Dianas Peak RR	Hutts Gate	Silver Hill	5,633	5.8	32,671	198	
	C2.2	Dianas Peak RR	Silver Hill	Bellstone	533	5.3	2,825	no data	
	C2.3	Dianas Peak RR	Bellstone	Pinegate	6,076	4.7	28,557	37	
B5	B5.1		Bates Branch	Stitches Ridge	1,690	5.1	8,619	126	
	B5.2		Stitches Ridge	Pinegate	1,385	5.5	7,618	129	
	B5.3		Pinegate	Jenkins Cottage	2,732	4.9	13,387	134	
B6	B6.1	Field Road	Side Path/Field Rd	Power Stn Jn	1,563	5	7,815	137	
	B6.2	Field Road	Power Stn Jn	Fisheries	546	4.2	2,293	no data	
	B6.3	Field Road	Fisheries	Ruperts Wharf	175	5.3	928	no data	
B7	B7.1		Side Path/Briars	The Briars	533	4.4	2,345	196	
B8	B8.1	Constitution Hill	China Lane	Side Path/Briars	1,580	5.6	8,848	287	
B9	B9.1	Francis Plain	Watercourse	Pr Andrew Sch	786	6.2	4,873	107	
	B9.2	Francis Plain	Pr Andrews Sch	Harpers Valley	497	4.7	2,336		
	B9.3	Francis Plain	Harpers Valley	Redhill	730	5.3	3,869		
B10/C10	B10.1		Bates Branch	Frenches Gut	2,057	5	10,285	210	
	B10.2		Frenches Gut	Thompsons Wood	1,910	5.2	9,932	no data	
	C10.3		Thompsons Wood	Blue Hill CC	1,239	5.2	6,443	no data	
B11	B11.1		Scotland	Sunny Side	1,123	3.75	4,211	162	
B12	B12.1		New Ground	Donkey Plain	477	6.9	3,291	292	
B13	B13.1	Sapper Way	New Ground	Model Cottage	636	5.1	3,244	236	
B14	B14.1	Plantation Upper	Redhill	Model Cottage	400	5.1	2,040	137	
	B14.2	Plantation Upper	Model Cottage	Plantation Jn	406	5.5	2,233	145	
	C14.3	Plantation Upper	Plantation Jn	White Gate	444	3.9	1,732		
	C14.4	Plantation Lower	Plantation Jn	White Gate	543	4.5	2,444		
B15	B15.1		Longwood Gate	Deadwood Plain	1,769	6.3	11,145	no data	
C1	C1.1		Gordons Post	The Dungeon	2,190	4.75	10,403	81	148
C3	C3.1		Lemon Tree Gut	Stitches Ridge	1,512	4.4	6,653	34	
C4	C4.1	Shy Road	Ladder Hill	Jamestown	814	4.1	3,337	15	
C5	C5.1		Field Road	Power Station	445	5.1	2,270	no data	
C6	C6.1		Frenches Gut	Head O'Wain	1,081	4.2	4,540	no data	

Total primary network 72,190 metres 406,470 sq. metres

Tertiary network 35,090 metres

Total network: 107,280 metres

Figure 3.5b: Inventory and condition assessment of highway structures (Source: WSP, 2016)

Priority Level	Structure	Brief Description of Recommended Repair Work	Estimated Cost [£]
High	Structure 01	Replacement of bridge members, general maintenance and inspection of bearings	£8 405.00
	Structure 06	Temporary support of structure and quantitative investigation of structural integrity	£23 990.00
	Structure 10	Assess structural integrity of timber support and general maintenance of members	£2 006.00
	Structure 11	General maintenance, investigate soffit after removal of rusting formwork	£1 612.00
	Structure 22	Clear debris, unblock culvert and re-inspect	£1 569.00
	Structure 23	General maintenance, clear debris and quantitative investigation of structural integrity	£1 422.00
	Structure 35	Temporary support of structure, replace outer beams, install new railings, repair and rendering of headwalls and abutments and general maintenance	£15 764.00
	Structure 40	Reconstruct bridge	£50 000.00
Total Cost Estimate of High Priority Structures			**£104 768.00**

Priority Level	Structure	Brief Description of Recommended Repair Work	Estimated Cost [£]
Medium	Structure 02	Seal cracks, repair balustrades and render abutments	£2 216.00
	Structure 03	Render & repair of weathered masonry	£1 280.00
	Structure 04	Repair of bridge arch and members, relining waterway and general maintenance	£20 394.00
	Structure 07	Replace missing planks and quantitative analysis of bridge	£2 790.00
	Structure 09	General maintenance and installation of handrails	£1 144.00
	Structure 13	Replace timber footway and general maintenance	£878.00
	Structure 14	Seal cracks, rendering of abutments and maintenance of members	£396.00
	Structure 16	Rendering of masonry in abutments and soffits	£1 152.00
	Structure 17	Repair handrails and general maintenance	£2 334.00
	Structure 18	Repair headwalls and clear waterway	£324.00
	Structure 19	Repair headwalls and clear waterway	£520.00
	Structure 20B	Repair headwalls and clear waterway	£428.00
	Structure 20D	Clear waterway	£380.00
	Structure 24	Clear debris and concrete surface repairs	£272.00
	Structure 26	Clear debris and reinvestigate	£986.00
	Structure 27	Concrete repairs, remove formwork and reinvestigate	£1 198.00
	Structure 28	Repair headwalls and clear waterway	£870.00
	Structure 29A	Repair apron slabs and clear waterway	£1 112.00
	Structure 30	Rendering of masonry in abutments and soffits, repair steel railings, add erosion protection and repair headwalls	£2 311.00
	Structure 32	Remove steel pipe and clear waterway	£236.00
	Structure 34	Rendering and repair of headwalls and structural analysis	£1 506.00
	Structure 36	Clear waterway, install new railing and general maintenance	£356.00
	Structure 37	Remove oil drums and clear debris	£184.00
	Structure 38	Concrete repairs, remove permanent formwork, repair masonry walls and clear debris	£1 844.00
	Structure 41	Rendering of arch, reline waterway and clear debris	£13 944.00
	Structure 44	Rendering of abutments and soffit and general maintenance	£1 920.00
Total Cost Estimate of Medium Priority Structures			**£60 975.00**

Figure 3.5c: Indicative monthly plan prepared by the Roads Manager (Source: I&T, 2020)

14-Mar	15-Mar	16-Mar	17-Mar	18-Mar	19-Mar	20-Mar
Patching team 1		Cleaning Deep Valley to Rock Rose (Emergency potholes)				
Patching team 2		Rock Rose to Green Hill (emergency potholes)				
Verge team		Sandy Bay/Blue Hill (Alternatively)				
spraying		suspended until weather improves				
Masons		Bridge St Peter's		Retaining wall R.T.C nr CCC		
Utility team		emrgency potholes various		clear up any existing debris that is left/collect all tools and store them		
21-Mar	22-Mar	23-Mar	24-Mar	25-Mar	26-Mar	27-Mar
Patching team 1		Cleaning Deep Valley to Rock Rose (Emergency potholes)				
Patching team 2		Rock Rose to Green Hill				
Verge team		Sandy Bay/Blue Hill (Alternatively)				
spraying		suspended until weather improves				
Masons		Manhole nr Castle		manhole nr Grapevine		manhole nr A&D's
Utility team		No Parking signs Tinker's/Grocery store			repair road warning signs	
28-Mar	29-Mar	30-Mar	31-Mar	01-Apr	02-Apr	03-Apr
Patching team 1		Cleaning Deep Valley to Rock Rose (Emergency potholes)				
Patching team 2		Rock Rose to Green Hill				
Verge team		Sandy Bay/Blue Hill (Alternatively)				
spraying		suspended until weather improves				
Masons		retaining wall wirless station road		manhole nr Two gun Saddle		
Utility team		Signs to install Haul Road Correct Locations SV		service roads small tools	clean all mirrors'	
04-Apr	05-Apr	06-Apr	07-Apr	08-Apr	09-Apr	10-Apr
Patching team 1		Cleaning Deep Valley to Rock Rose (Emergency potholes)				
Patching team 2		Rock Rose to Green Hill				
Verge team		Sandy Bay/Blue Hill (Alternatively)				
spraying		suspended until weather improves				
Masons		retaing wall nr Five bar gate		repairs to mess room roads compound interior walls		
Utility team		warning sign Bradleys junction		Mirror Intsallation/details by RI		
11-Apr	12-Apr	13-Apr	14-Apr	15-Apr	16-Apr	17-Apr
Patching team 1		Pavement Road nr 3tanks/Slurry Cowpath				
Patching team 2		Continuation of slurry Thompson's Hill/berm nr barracks park newground (cat 65)				
Verge team		Sandy Bay/Blue Hill (Alternatively)				
spraying		suspended until weather improves				
Masons		Rails nr Clay gutt		manhole nr china lane	check culvert nr Bruce salts	
Utility team		Mirror Intsallation/details by RI			Trench rienstament Coleman House	

The Roads Section receives a budget of about £410,000 per year, of which about half is for salaries and administrative/accounting assistance. Only £55,000 of this year's budget is for materials. Even if the roads staff salaries are added to this, making about £230,000 for the year, this represents only about 0.2-0.4% of the current replacement value of the road network. This is (at most) one-fifth of the annual maintenance budget recommended by the World Bank for effective preventative road maintenance. It is therefore not surprising that the overall condition of the St Helena road network has been deteriorating in recent years. Failure to provide adequate preventative maintenance results in premature loss of previous investments in infrastructure assets. In the case of roads, for every pound not spent on adequate and timely maintenance, it costs three to five pounds in rehabilitation works. Considering the problem another way: the current materials budget is just enough to address about 1.2 to 2.5km of full road width per year; using the more economical slurry surfacing developed on island, about 2.7 to 3.1 km could be treated. Bearing in mind that a road pavement can last about 10-15 years between resurfacing, this would suggest an annual requirement of 8-12 km of resurfacing. By this analysis, the roads budget is about one-quarter of the requirement. Thus, three times more deterioration is taking place each year than should be the case.

The Roads Section has submitted two business cases since 2018. The first one provided an assessment of the condition of the network (in five condition categories) and the amount of work required to restore the network to a maintainable condition. The estimate was £4.2 million over a five-year period. This is therefore the loss of investment that has occurred due to inadequate maintenance. The second business case proposed an *additional* £388,200 per year (i.e. additional to the current roads budget) for pavement resurfacing to arrest the deterioration. This is the minimum required for arresting pavement deterioration and would still only represent about half the budget recommended by the World Bank.

3.5 Ports & Wharfs

James Wharf

At the time of the Infrastructure Review (2006) there were plans for significant improvements to James Wharf (to be implemented in three phases). The final phase would have been beautification of the whole waterfront. Figure 3.6a shows the intentions for Phase 1. Following the provision of the breakwater and cargo facilities at Rupert's as part of the air access project, cargo-handling was moved from James Wharf to Rupert's Wharf. Consequently, the three phases at James Wharf were not completed. Figure 3.6b shows the status of James Wharf in 2017.

With the opening of the airport, the RMS ceased service and there are no longer any regular passenger movements at James Wharf. The Wharf is now used mostly by yacht visitors, fishermen, divers and local pleasure vessels. The landing steps are also used by the occasions visiting cruise ship, but Rupert's would offer a safer landing at times when te swells are too high at James Bay. Recreational aspects of James Wharf are considered in Section 3.11 below.

Figure 3.6a: Phase 1 of the James Wharf Improvements (Ref. Infrastructure Plan, 2008)

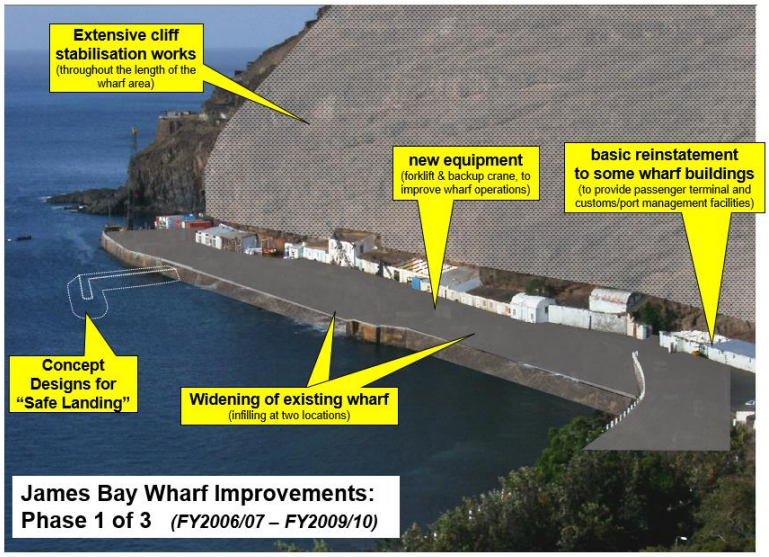


Figure 3.6b: James Wharf in 2017

Rupert's Wharf

Figure 3.6c illustrates the current state of Rupert's Wharf. The jetty and breakwater were constructed as part of the airport project. Ruperts is now the cargo port for receiving freight into St Helena but, because the road link to Jamestown is still to be upgraded, freight is sill barged to Jamestown for unloading. The annual cost of the barging operations is around £0.5 million. To take full advantage of the new port, SHG is planning to upgrade both the wharf and the link road.

Figure 3.6c: Ruperts Wharf in 2019

In 2015, SHG commissioned Royal Haskoning to provide advice on the development of Ruperts, *inter alia*:

- container handling and storage
- provision of a secure site for unloading with customs facilities
- provision of terminal facilities
- allowance for disembarking passengers form cruise ships for when the wharf at Jamestown is unavailable
- retention of access to the beach for the general public (except when security restrictions are in place)

A primary constraint for the development was to avoid disturbance to any archaeological or culturally sensitive areas.

The consultant's report (2016) was not accepted in full and SHG is currently finalising its own designs for the Ruperts Wharf and container handling areas. These arrangements are considered further in Section 5.5 of this report.

3.6 SHG properties (offices, public buildings, etc)

SHG, through its ENRD directorate, manages: Chief Secretary properties, Government Landlord Housing, SHG own-use buildings and SHG commercial properties. The 2008 Infrastructure Plan included suggestions for how residential properties in Jamestown could be vacated of SHG departments and make way for tourist accommodation or be restored as residential premises.

SHG subsequently arranged for the conversion of 1, 2 and 3 Main Street into a new 30-bed hotel. The hotel is now in full operation.

It is understood that SHG has intentions for further vacating premises in lower Jamestown, but for now the businesses (shops, eateries, etc) in the town rely on the trade they get from SHG staff. Moving SHG offices out of lower Jamestown needs to be carefully planned and timed if such a move is not to have a significant negative impact on Jamestown traders.

3.7 Government Landlord Housing

Overall, the size of the Government Landlord Housing, GLH (social housing) portfolio is considered to be sufficient, but changes could be made to the way in which these properties are manged to relieve the financial burden on government. For example, the rents received do not even cover the total costs of maintaining the properties, let alone making improvements or building new properties. Similar considerations can be applied to the commercial properties. These considerations are elaborated in Sections 5.7 and 5.8.

3.8 Solid Waste Management

Horse Point Landfill Site (HPLS)

A visit to the HPLS site in April 2020 revealed a remarkable improvement to St Helena's solid waste management. The organisation of the site and the innovative solutions that have been implemented since 2015 are a credit to the two people who are managing the site. A substantial amount of investment was made in the site as part of the air access project in order to minimise the risk of bird strikes during aircraft landings. The funding enabled SHG to send the two people to the UK for training in environmental health management. Following the training they put in place various measures that make it easier for the public to deposit waste in clearly identified areas. The segregation of various wate types facilitates recycling.

The new site layout enables HPLS to accept large metal waste, such as old vehicles. A clearing up of such waste in recent years has made a significant improvement to some areas of the island where old vehicles had blighted the appearance of some residential areas. This clearance programme is ongoing and the HPLS manager intends that the scrap metal around the island will gradually be collected into a single area at HPLS.

The Consultant's projections for the Infrastructure Plan suggested that without recycling and separation of biowaste, HPLS could be filled by 2024. With recycling and biowaste measures, the "life" of HPLS might be extended to 2030. The current estimate of the HPLS manager suggests that with the current measures the existing site could indeed extend to about 2030. The concern now is what to do about waste management post-2030. This is discussed in Section 5.9 of this report.

3.9 Telecommunications

Upgrades since 2006

At the time of the Infrastructure Review Internet speeds in St Helena were just 28.8 kbps for standard subscribers and 192kbps for dedicated lines. This was extremely slow, even for 2006. The island suffered socially and commercially from these constrained services. Many people did not consider that the service provided value for money. Consequently, there were just 2,212 telephone subscribers, 427 Internet subscribers, and only 1148 television subscribers (with only

two channels available). Overall, the services were limited, even in comparison to low-income countries in Africa. Within the next two years, the standard connection speed was increased to 128 kbps. All telecommunications services at that time were provided and managed by Cable & Wireless Ltd. In 2010, Sure became part of the Cable & Wireless Group and was bought by the Batelco Group in 2013, but business in St Helena continues to be under the name of Sure.

Further updates to infrastructure have been undertaken and today Sure offers:

- Broadband with up to 1mbps upload/download (plus a range of lower speed plans for flexible offerings to private and business consumers)
- Mobile phone services with either 'pay as you go', or monthly payment plans; the service offering includes limited international roaming for St Helena subscribers: just four countries (Ascension Island, Falkland Islands, Cape Verde, and South Africa), but others to be added soon, including the UK and the USA. International roaming is available to visitors with SIM cards from 13 providers in the UK, USA, Europe, South Africa and the Middle East.
- Wireless local area networks (WLANs) are available and this has been a huge improvement socially on the island, in addition to improvements in businesses. For example, children now have the opportunity to use hand-held devices (tablets, etc.) to experience the same social networking, games and other online facilities as children in developed economies.

Current improvements in telecommunications infrastructure

Notwithstanding the infrastructure improvements during recent years, St Helena still has relatively slow and expensive telecommunications services.

3.10 Tourist infrastructure

Tourist accommodation

In 2006, there were just over 100 beds available to tourists. While the main hotels and guesthouses (The Consulate, The Wellington, Harris', Farm Lodge, etc) provided almost 70 beds, the remainder were mostly bed and breakfast facilities at peoples' homes. This would have been insufficient to meet the projected increases in tourists that the airport would enable. SHG has since completed the conversion of 1, 2 and 3 Main Street into a 30-bed hotel in Jamestown. In addition, private sector developments such as the Blue Lantern and Richards' Travel Lodge have added to the island's overall tourist accommodation. The current tourist accommodation amounts to around 195 beds. Whereas there was previously a dearth of tourist accommodation, there is now an over-supply. Tourism promotion efforts from both SHG and the private sector now need to make swift steps to increase the flow of tourists so that all tourist accommodation in St Helena can produce a positive return on investment.

Post-Box Walks

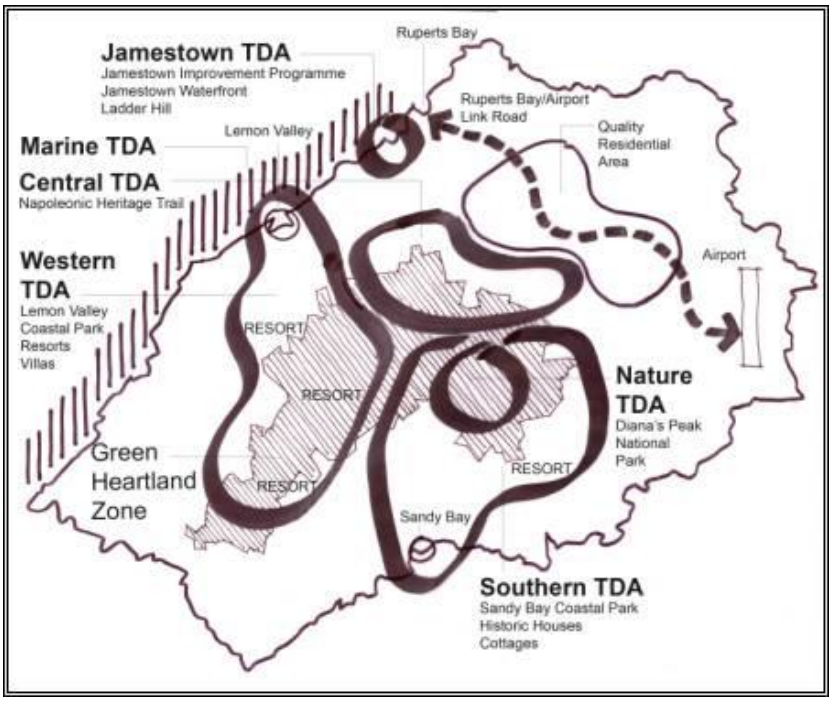
SHG maintains the Post-Box Walks better than in previous years. Signage (information board and direction arrows) is also now more prevalent. This is particularly appropriate with respect to the higher age group of many of St Helena's tourists. The Blue Point Walk, for example, has recently received simple handrails and wooden-supported earthen steps, making the walk easier.

Continuous inspection and maintenance of the Walks is important for St Helena to have a reputation of challenging but safe walking experiences.

Other facilities

An earlier tourism study had suggested "Tourism Development Areas" (TDAs) in St Helena, including the marine area (Ref. Kelly & Robinson). The principle of the TDAs is consistent with other proposals for St Helena to appeal to specific tourist groups.

Figure 3.7: Proposed TDAs in St Helena (Ref. Kelly & Robinson, 2006)



Given the importance of tourism to St Helena's future, there is an imperative to develop the island's tourism products apace with proactive promotion of the island to the specific target groups. The Air Access Feasibility Study carried out a review of ten proxy islands, from which it determined that Easter Island, Dominica and the Galapagos Islands provide specific lessons for developing tourism in St Helena. The Feasibility Study also indicates how best to reach out to the target tourist groups. The development of tourism infrastructure must be guided by an agreed tourism master plan that takes account of:

- air visitors: these visitors would visit the island for typically one or two weeks; the specific groups would include: those who wish to visit the island purely from curiosity, those interested in cultural and military history, bird-watcher and ecological interest groups, adventure tourists (hill-walking, climbing/abseiling, diving, game-fishing, mountain-biking, etc), and those who just want a quiet far away place for relaxation, wellness and "finding themselves";
- cruise ship visitors: cruise visitors spend just a day on St Helena and the island is already well acquainted with schedules for trips around the island and catering to large groups within Jamestown; however, per head expenditure on island is relatively low and more could be done to create opportunities for these visitors to spend money thereby increasing income (and tax revenues)

- yacht visitors: these visitors spend longer on island and could partake in at least some of the same activities as the air visitors.

There are also people who would visit St Helena for specific events. The Bi-centenary of Napoleon's death will be celebrated in 2021. This event will attract a very large number of visitors to the island, for which much more accommodation will be required. Other opportunities could include, for example, the International Hash (Inter-Hash). In 2017, the Inter-Hash was convened in Fiji, which is almost as remote as St Helena. About 1700 people attended that event. St Helena would have to develop much more accommodation to attract such an event, but the potential exists. Earlier suggestions by the then SHDA included holding high-security events, for example the G7. That might be somewhat far-fetched, but there may well be other events that would benefit from the remoteness of St Helena and help promote the island as a secure venue. Such events notwithstanding, it is largely for the private sector to develop the tourism products for St Helena, part from (for example) heritage items and protected areas, which should be developed by, or at least under the supervision of, SHG.

3.11 Recreational facilities

Waterfronts

Plans were made in the early 2000s for improvements to James Wharf and for beautification of the seafront (see Section 3.5 above). Figure 3.8a illustrates the improvements that were planned to be undertaken as Phase 2. The widening works were completed only in front of the old customs building. Improvements also made to the customs shed and other government structures. Sine then, the air access project has been completed, which included upgrading of Rupert's Wharf, principally for managing cargo. The Phase 2 works were not undertaken. Phase 3 would have included "beautification" of the waterfront.

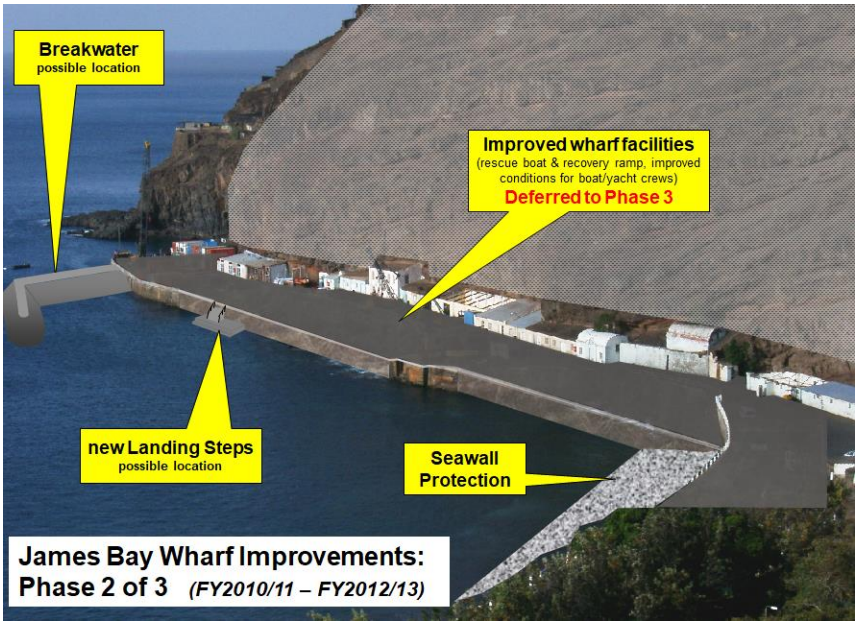


Figure 3.8a: Intended works as part of development of James Bay waterfront

Figure 3.8b shows the current state of James Bay waterfront in 2020.

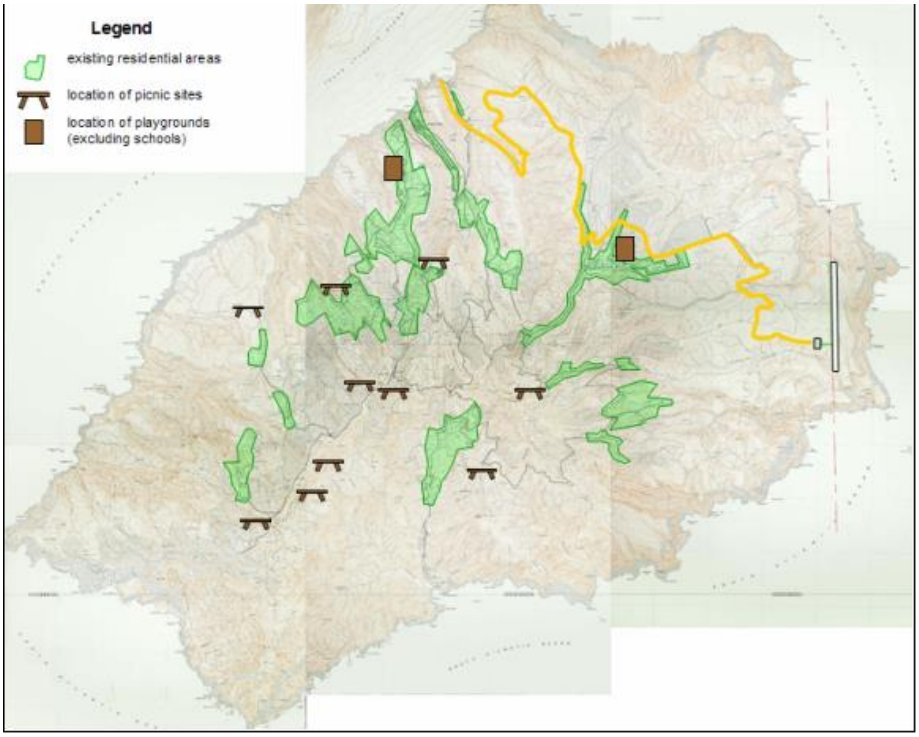
Figure 3.8b: James Bay waterfront in 2020

Picnic areas, children's playgrounds, sports facilities

The Infrastructure Review illustrated the location of the main recreational facilities in St Helena in 2006; see Figure 3.9. These remain largely unchanged in 2020. The review stated that there was a need to provide more family-related recreational facilities; this was based on community consultations during the Review. With the planned increase in the number of residents for St Helena there will become increasing pressure for family-friendly facilities.

There are insufficient sports facilities close to residential areas to which children and young people can walk. Each of the new CDAs should include adequate playgrounds and youth sports facilities.

Figure 3.9: Location of primary recreational facilities



4. Projecting Future Infrastructure Demand

4.1 Projections of the number of consumers for infrastructure services

Previous projections of residents and tourists

The Air Access Feasibility Study had suggested that the resident population could reach 8,050 by 2048 if a medium length runway would be built and 8,900 if a long runway were to be provided. It also suggested that these runway options could lead to around 19,990 tourists per year for the medium runway solution and up to 58,600 per year for the long runway option. Section 6.118 of the study's Main Report considered capping the number of air tourists at 1,300 on any one day based on a resident population of around 8,000 and limitations of tourist accommodation.

The Air Access study suggested that visits by cruise ships would become increasingly important for St Helena and 20-25 per annum could be expected in future years, dependent particularly on improved safe landing. Although the study did not suggest maximum daily numbers, the Infrastructure Review applied a cap of 1,300 cruise ship passengers on any one day (i.e. similar to the number of air visitors), based on an assumption of the island's capacity to provide attractions/visits to locations across the island and several hundred passengers remaining in Jamestown. Visitors arriving via yachts would use their own accommodation, but would generally spend several days at James Bay and make more use of on-island facilities than cruise passengers. An upper figure of 200 on island on any one day was assumed for the Infrastructure Review; i.e. a maximum of 1,500 sea-borne visitors at any one time.

Recent and current projections of residents and tourists

SHG's Statistician has reviewed recent population trends since completion of the airport and provided four projections of population for the island; see Figure 4.1a. The most optimistic projection is based on a slowing of the outward migration trend by 2025 and inward migration as per the Labour Market Strategy (2019). This indicates a resident population of around 4,700 by 2050.

By contrast, the Independent Economic Review (IER) study has proposed a Vision 2050 with a resident Saint population of around 8,000. While this figure is not impossible to achieve, it would require some remarkable level of inward investment to create enough well paid jobs to double the current population. Alternatively, it would require some other initiative such as a large number of tourists, or a residency programme for fairly wealthy people, whose expenditures and activities on island would support high levels of local business activity. Since the figure of 8,000 is part of the Vision 2050, it should not be ignored in infrastructure demand projections. The current infrastructure study has therefore considered that some upswing in inward migration in the coming years could put St Helena on a growth path towards a resident population of 8,000 Saints. Some sort of "S-curve" is a more likely way of reaching 8,000 than a straight-line increase; see Figure 4.1b. It should be noted that the IER only suggested 8,000 resident Saints, leaving further assumptions to be made regarding the number of non-Saint residents.

In 2010, DFID's Chief Economist raised concerns regarding the high level of uncertainty in the projected tourism figures. A new study was commissioned and this greatly reduced the long-term tourist estimates from almost 59,000 to 29,200[2]. Based on the new study, DFID capped the

[2] Reported in "Realising the benefits of the St Helena airport project", National Audit Office (2016)

number of tourists at 29,208. This suggests a halving of the projected number of visitors. However, after some years the total air tourists on island on any one day would still reach the 1300 cap proposed in the Air Access Feasibility Study, so for the current infrastructure review (2020) it is proposed to retain the same cap due to anticipated limitations in tourist accommodation. For now, cruise ship tourists and yacht tourists will be similarly reduced to 1,000 and 100, respectively. These projections are illustrated in Figure 4.1c. It will be seen that at any time in the coming decades, the number of residents (Saints and non-Saints) would be much greater than the number of tourists even in the case of the resident Saint population growing at only the rate in the SHG Statistician's Projection 4.

Figure 4.1a: SHG projections of resident population *(Ref. SHG Statistician)*

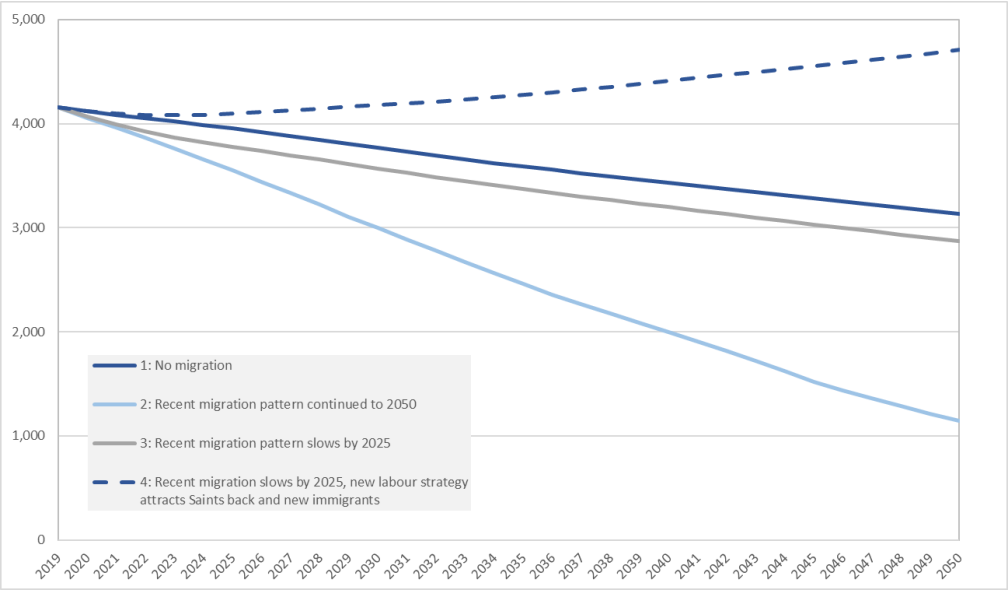


Figure 4.1b: Infrastructure Consultant's projections for achieving a resident population of 8,000 Saints

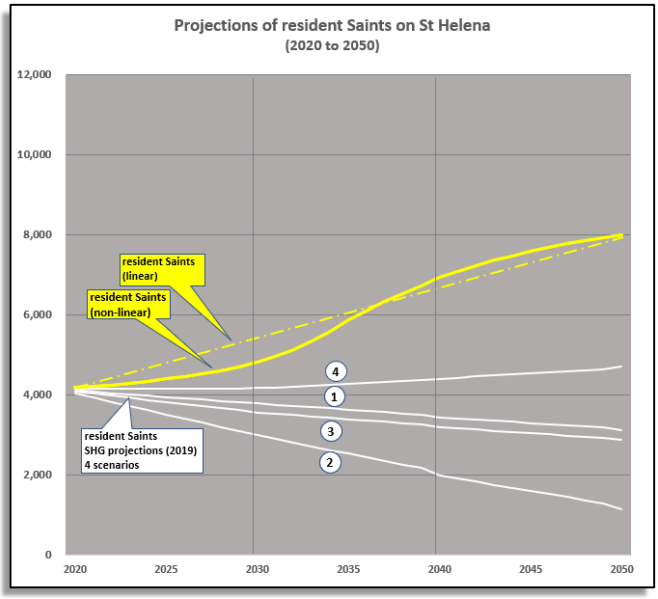
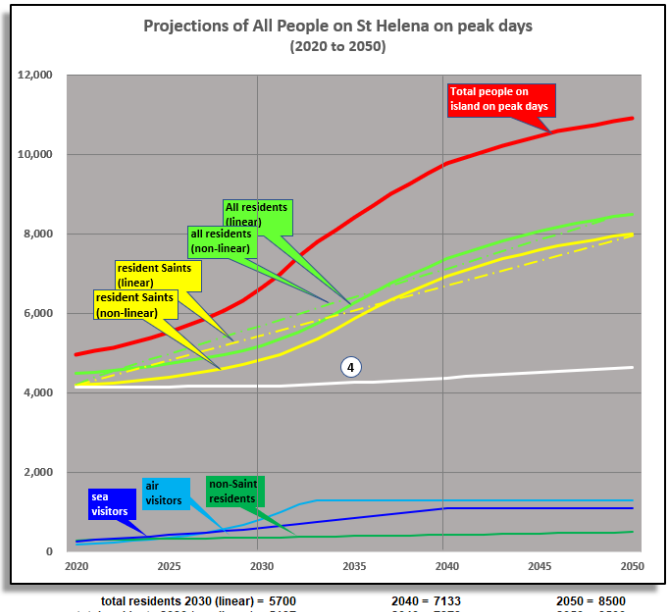


Figure 4.1c: Infrastructure Consultant's projections for all people on island up to 2050



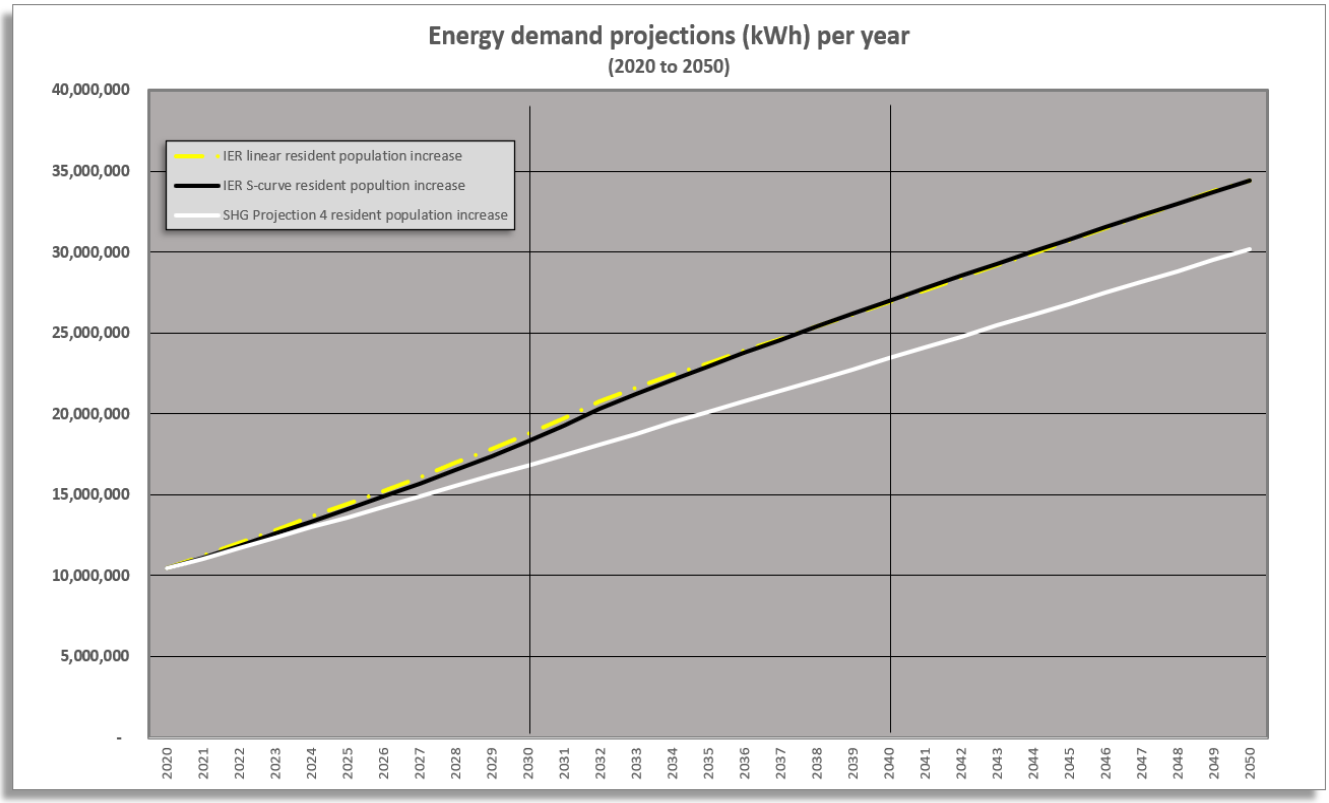
Factors affecting infrastructure demand

The current infrastructure review is considering demand for the coming decade; i.e. up to the Vision 2030. By 2030, the SHG Projection 4 suggests a population of 4,177, which is just about thirty more residents than in January 2020. With respect to the IER study, a straight-line projection to 2050 for 8,000 Saint residents and about 500 non-Saint residents implies a total resident population of about 5700 by 2030. An S-curve increase in these two resident population groups suggests total residents of around 5200 by 2030. It is prudent to investigate the impact of these three population projections on the demand for infrastructure, particularly utilities.

4.2 Electricity demand

Figure 4.2 illustrates the projections for annual electricity demand to 2050 based on the three projections of resident population up to 2030, and continued population increases to 2050.

Figure 4.2: Projections of annualised electricity demand to 2050



Interpolating the three demand curves at 2030 suggests the following

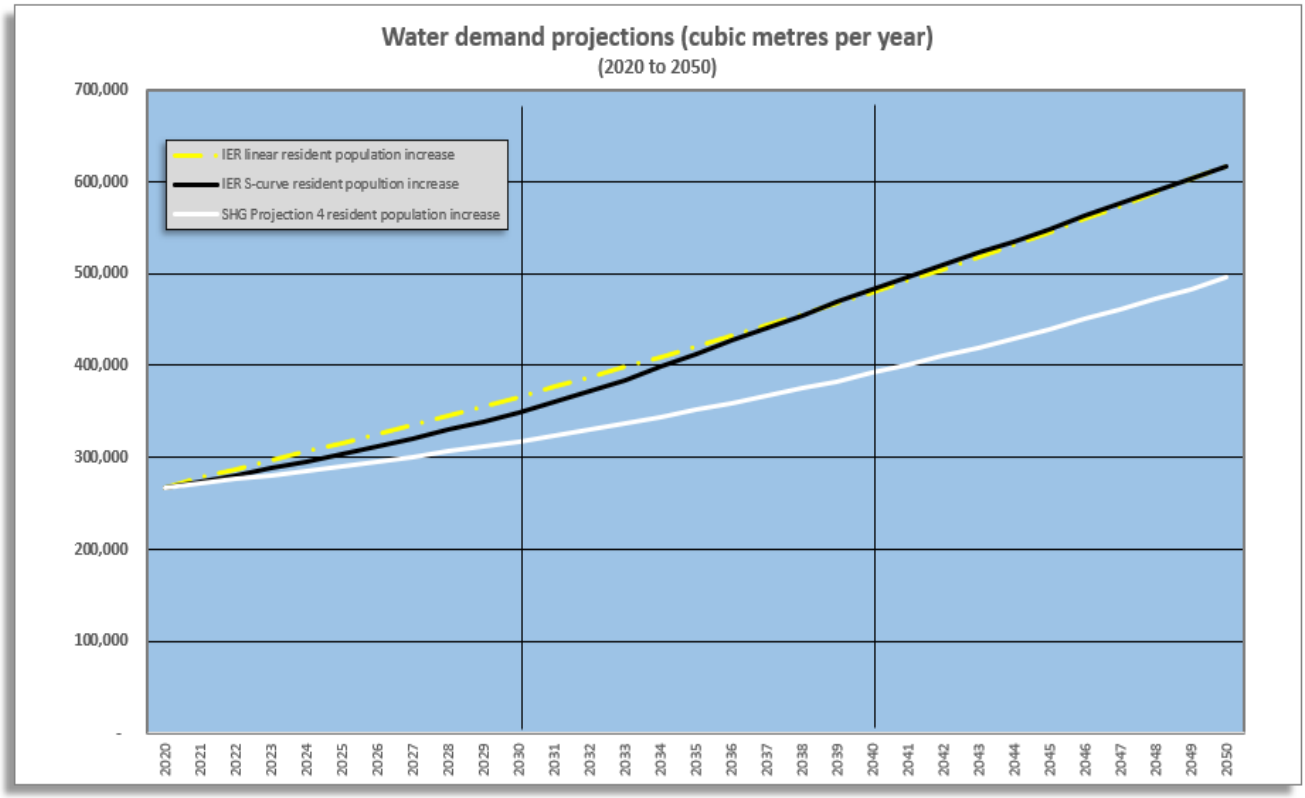
Type of population projection	Projected electricity consumption in 2030	Projection as % of the S-curve demand
IER linear increase in resident population	18.8 million kWh	103%
IER linear increase in resident population	18.3 million kWh	100%
SHG Projection 4 increase in resident population	16.8 million kWh	92%

The reason that there is no large difference between the linear and S-curve demands is because the non-resident demand is assumed to remain the same in both cases. That is to say, whether the resident population increases linearly or as an S-curve, it is assumed that tourism promotion efforts result in the same number of air and sea-borne tourists. On this basis, the electricity demand associated with the SHG Projection 4 population increase is about 92% of the IER S-Curve. In other words, since St Helena's future economy is expected to remain highly reliant on tourism, all effort must be given to achieve the forecast tourist numbers and electricity provision should be based on these assumptions for the period to 2030 and the corresponding S-curve for electricity demand. Since tourists are expected to use more utilities per head, this reduces the overall differences between the demand curves associated with the three resident population projections.

4.3 Water demand

Figure 4.3 illustrates the projections for annual water demand to 2050.

Figure 4.3: Projections of annualised water demand to 2050



Interpolating the three demand curves at 2030 suggests the following:

Type of population projection	Projected water consumption in 2030	Projection as % of the S-curve demand
IER linear increase in resident population	366,000 m^3	105%
IER linear increase in resident population	350,000 m^3	100%
SHG Projection 4 increase in resident population	317,000 m^3	90%

The assumption in Section 4.2 that the numbers of air and sea tourists remain the same regardless of the size of resident population is also used for the water demand projections. On this basis, the water demand associated with the SHG Projection 4 population increase is about 90% of the IER S-curve demand. An upper-level estimate using a linear population increase would suggest only an additional 5% water demand in 2030 compared to the S-curve demand. As for energy, it seems appropriate to use the S-curve projections for water demand to 2030.

Factors affecting water demand and supply

The recent island-wide consumption of treated water in non-drought conditions is approximately 1,400 m^3 per day. Current demand (early 2020) with drought restrictions in place is about 1,000 m^3 per day. There is currently a deficit of 500 m^3 per day. It is possible that the demand by 2030 could be as much as 2,100 m^3 per day. In order to help meet demand, a programme could be considered that would make better use of harvested rainwater.

4.4 Wastewater

The 2006 Infrastructure Review and the 2008 Infrastructure Plan were both developed within the framework of the then Land Development Control Plan (LDCP). That version of the LDCP did not provide for enough new dwellings within the developable area, which was mostly limited to the Intermediate Zone as defined within the LDCP. SHG's current LDCP (2012-2022) enables substantially more development, particularly in the Coastal Zone. The LDCP now makes provision for up to 4,155 additional dwellings. At an average occupancy rate of 2.4, this would permit an additional 9,970 residents on St Helena island. The LDCP indicates where the additional developments would take place, as shown in Figure 4.4.

With regard to wastewater management, the LDCP states that in Comprehensive Development Areas (CDAs), Coastal Village Areas (CVAs) and new developments in existing residential areas where there will be ten dwellings or more, development permission will be granted only where there is a common wastewater system and separate from the stormwater drainage system. The development may not come into use until such provision for wastewater and stormwater have been made.

Recent development permissions have been granted for 150+ dwellings on Bunkers Ridge, and around 40 dwellings at Horse Point. The Longwood and Bottom Woods CDAs have received development approval, as has the CDA at HTH. All these schemes are stalled due to the need for adequate wastewater management systems.

Completion of the HTH, JT and Longwood/Bottom Woods schemes are now a priority.

Figure 4.4: Additional dwellings permitted in the LDCP (2012-2022)

Location	Land Availability	Density Projections*	Plot availability
CDA's	30.7 Hectares	12-25 dwellings per hectare	420
CVA's	32.5 Hectares	6-8 dwellings per hectare	235
Intermediate Zone	168 Hectares (with gradient of less than 1:2.5)	12-25 dwellings per hectare (average 18)	2,600
Coastal Zone	150 Hectares (capable of meeting the strict criteria)	6 dwellings per hectare	900
Total			4,155
Assuming occupancy rates of 2.4 persons per dwelling this provides for an additional population of 9,970			
*The above densities are low and any increase will allow for a greater number of dwellings.			

4.5 Roads

Rupert's to Jamestown logistic corridor

Due to the constricted width of road route between Rupert's Valley and Jamestown, there are plans to upgrade Field Road and Side Path. These works were identified as "R2" (Road Project No.2) in the 2008 Infrastructure Plan. The works are expected to commence during 2020. Until this route is improved and made suitable for the transfer of freight between the two valleys, SHG is spending around half a million pounds per year on barging the larger freight items to James Wharf. Even after upgrading Field Road and Side Path, the constriction at Napoleon Street will continue to impede the efficient movement of freight into Jamestown. Alternative routes being considered are the coastal road and a tunnel between James and Ruperts valleys.

Other new roads

No other major roads are planned. As outlined in the 2006 Infrastructure Plan, the capacity of the road network is adequate. Even if the number of vehicles increases by 50-100% in the coming decade(s), there is unlikely to be a strong economic case for extensive widening of the roads, given the steep and winding routes in St Helena. As mentioned in an earlier tourism study, while the width and curviness of some roads is considered a hindrance to some residents, they are an attraction and fascination for tourists. In any case, the widening and/or straightening of roads typically leads to worsening of the road safety situation, which has higher economic consequences than slow (and, possibly, congested) roads. Attention should instead be given to making the roads safe. This is dealt with in Section 5.5 of this report.

Protecting infrastructure investments

Section 3.4 outlined the two recent business cases submitted by the roads section. Even if the £4.2 million is not provided for a full rehabilitation programme (and this requirement will have already increased due to insufficient maintenance), then the second business case for arresting the rate of pavement deterioration should be considered as a minimum measure. This is discussed in detail in Section 5.5.

4.6 Ports & Wharfs

James Wharf

Now that the decision has been made to develop Ruperts Wharf to manage incoming and outgoing freight, and the road link to Jamestown will be improved in the near future, there are no longer any plans to develop James Wharf for freight-handling. Regarding passenger-handling, it is expected that the steps at James Wharf will continue to be used for passengers disembarking from cruise ships, yachts, pleasure vessels, fishing boats, and dive boats. When the swell at James Bay is too large, the concern of cruise ships' captains (regarding the safety of their passengers) can be addressed by tendering passengers to the jetty at Ruperts Wharf.

Ruperts Wharf

Projections of increased demand for container, freight and passenger traffic have been developed as part of the design brief for SHG's in-house design for the new wharf at Ruperts. The Royal Haskoning projections were found to be high because of the way in which they had extrapolated ship frequencies based on the *RMS St Helena* schedule. SHG's revised demand projections are based on the actual *MV Helena* schedule. The projections include for 50-60 containers on each voyage, every 5 weeks. The exception would be the Christmas schedule when the ship could carry up to 90 containers. Based on turn-around times and numbers of full and empty containers, the container freight station is now being designed for up to a maximum of 163 containers at any one time.

4.7 Government Buildings and SHG offices

As mentioned in Section 3.6, there has long been consideration of moving SHG offices out of lower Jamestown in order to encourage new residents and/or tourism accommodation. A serious consideration is the impact on the economic activity in Jamestown. Most shops, eateries and other small businesses in Jamestown rely on the trade they receive from SHG staff during the work days. It would require considerable residential and tourist trade to replace the current levels of income. If, for example, the Castle were to be sold (or leased) to a private investor to convert into a hotel, the hotelier would want to maximise his income and possibly provide package deals so that tourists would mostly consume food and drinks from the hotel, and not so much from local restaurants. Moving SHG operations out of Jamestown would probably lead to supermarket and eatery businesses relocating closer to the new SHG offices and the "heart" of town life would be largely lost. This would not create a attractive place for tourists or residents.

For the purposes of the current infrastructure review it is assumed that SHG will not move any significant amount of offices (staff) out of Jamestown in the period to 2030.

4.8 Housing

There is a policy in place to divest the Chief Secretary properties. Initially, 199-year leases were considered, but this is negotiable and much longer leases or even freehold is now possible. SHG provides conditions within the lease/sale agreement to guide the restoration of the buildings.

SHG public buildings and commercial properties are a draw on government's very limited financial resources. Changes are required to the way in which these are managed in order to (a) relive the financial burden, while (b) improving the level of maintenance. This is consistent with the objective of improving the Jamestown facia and making St Helena a more attractive place.

4.9 Solid Waste

The waste management team at HPLS currently excavate cells of around 9 metres deep, 16 metres wide and 24 metres long to provide for household waste. Waste is collected weekly. Each cell has the capacity for about twelve months. With suitable recycling, segregation of waste types, and other measures, it is possible that this arrangement could continue to provide adequate domestic waste disposal up to 2030. This is the current projection by the HPLS management team. Thereafter, a decision has to be made whether to use a new location for the island's domestic waste, or to find ways to extend te life of HPLS. The latter option is preferred in order not to spoil further areas of St Helena's precious environment. Indeed, with its large conservation areas and intention to build a strong green and blue image to support tourism, there is a robust case to confine waste disposal and management to Horse Point.

For the purpose of the current infrastructure review there is no need to consider any measures outside the HPLS site. It is simply proposed here that measures need to be considered in the very near future that would further extend the life of HPLS beyond 2030.

4.10 Telecommunications

National development plans

SHG's 10-Year Plan identifies five development pillars (wealthier, safer, better for children and young people, healthier, and greener). Digital communications features directly or indirectly in each of these pillars, including possibilities for enforcement issues. Currently, as mentioned in the Digital Strategy, St Helena suffers from "digital exclusion", the newest form of social exclusion and inequality. The submarine cable is planned to be installed in Ruperts in 2021. This will enable St Helena to:

- fully partake in the knowledge economy and digital age (considered to be a primary driver in the new-world growth
- benefit from business opportunities and inward investment that are enhanced by the unique location and political stability
- allow satellite ground stations, and cloud data centres

Due to the fast developments in the telecommunications and digital sectors, SHG intends to review the Digital Strategy annually to identify new opportunities and any further telecommunications/digital infrastructure requirements.

4.11 Tourist infrastructure

Projections of tourism demands

As mentioned in Section 4.1, the National Audit Office produced a report in 2016 in which it confirmed that the UK Government is using the reduced (2010) tourist projections as the basis for its economic development considerations for St Helena. These projections suggest a steadily increasing tourism sector, capped at 1,300 air tourists on island at any one time (29,200 air tourists per annum) based on assumptions of available tourist accommodation. Visitors arriving via cruise ships would not spend nights on island. Similarly, people arriving by yacht would not use much land-based accommodation. Since tourism is considered to be the biggest driver of St Helena's economy, the island must develop more and a wider choice of accommodation. But tourism growth must be led by demand, to be generated by a proactive and well managed

tourism promotion campaign. As mentioned earlier in this report, there have been several studies[3] to guide the St Helena Tourism Board and the Tourism Association in these promotion campaigns, including which segments of the market to target and how best to engage with them. As a result of a successful campaign, tourist demand for accommodation will grow. The private sector will then respond to meet the demand. In the meantime, SHG has invested in a new 30-bed hotel (the "Mantis St Helena") in Jamestown. This will help the island meet the anticipated demand arising from the 2021 Bi-Centenary of Napoleon's death.

While SHG's Tourism Board must develop a more effective and coordinated promotion strategy, the private sector must also take part in the coordinated promotion of St Helena to generate increased tourist demand and then to respond in terms of accommodation and other facilities.

4.12 Recreational facilities

Facilities for pastime activities

There are three groups of people that would make use of recreational facilities:

- residents (including Saints and non-Saints, working or not working on island)
- stayover tourists (mostly arriving by air and staying a week or more)
- day tourists (arriving by sea and not staying overnight)

Typically, residents would want family-friendly facilities ranging from sports grounds and health/fitness clubs, playgrounds, golf courses, etc. More activity facilities need to be provided and these should be located in/near each the new CDAs.

Residents would occasionally undertake walks and picnics and require parking, toilets and rubbish bins at the start of the walks. Stayover visitors in large hotels may have some facilities provided by the hotel. Those staying in guesthouses might seek outside facilities similar to residents. Day tourists would be more likely to undertake walks and other shorter duration activities, so all groups would require adequate parking, picnic and toilet facilities at the start of the walks.

These are all relatively minor items in terms of costs and as SHG's tax revenues increase (via increasing economic activity on island) it will be better able to provide for the needs of residents. The private sector could be encouraged to contribute some facilities such as the additional quantities required to meet tourist needs at the start of walks, etc.

Waterfronts

It is difficult to predict the demand for waterfront facilities in a quantitative manner. SHG has had intentions of "beautifying" the waterfront at James Bay since at least the early 2000s. A study by Colliers in 2019 provided ideas for improvements to James Bay waterfront that would also increase economic activity. While this report has not been fully adopted by SHG, there does appear to be elements of their proposals that could be developed fairly easily by the private sector, such as the yacht club and conversion of the customs building. The private sector is likely only to invest when it sees an investment opportunity led by a suitable level of demand. This is likely to be the case for all waterfronts in St Helena (James Bay, Sandy Bay, Prosperous Bay, etc). There is therefore no need for these facilities to form part of the updated Infrastructure Plan.

[3] For example: Kelly & Robinson: "St Helena Tourism Strategy" 2006; Atkins: "Air Access Feasibility Study" 2005; The Journey Tourism Consulting: "Visitor Demand Assessment" 2013; Whitebridge: "Tourism Study" 2013

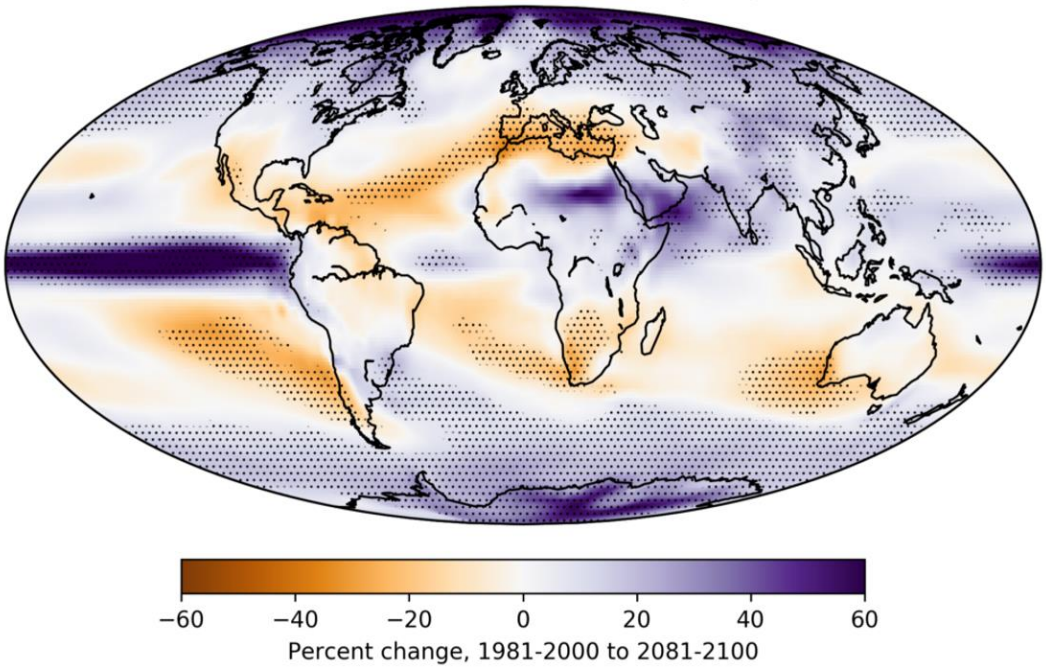
5. Future Infrastructure Provision

5.1 Factors affecting infrastructure provision

Climate change considerations

A primary reference for the impacts of climate change is the Intergovernmental Panel on Climate Change (IPCC). While there remains some disagreement on how average precipitation will change in some parts of the world, there are areas where almost all models produce very similar projections. St Helena lies on the path of the south-easterly winds that traverse the South Atlantic from the Cape of Good Hope (South Africa) towards Brazil. Nine out of ten models agree[4] that precipitation will reduce in the St Helena region by about 20% up to 2100, depending on the overall level of global warming; see Figure 5.1a. The dots show regions of the world where nine out of ten models agree on precipitation projections, implying a strong level of certainty about St Helena's future weather.

Figure 5.1a: Projected reduction in annual precipitation during the 21st Century



Reduction in precipitation will be seasonal: winters in St Helena might only see 5-10% less rain compared to 1980-2000 levels; summers could be more than 20% drier; See Figure 5.1b.

For most of the world, average precipitation levels are expected to increase, but this is mostly over large land areas. Regions that will see reductions in the intensity of rainfalls are over large sea masses, including the South Atlantic; Figure 5.2. The Figure indicates that the intensity of heavy precipitation in the St Helena region would reduce by about 2-4% for each degree increase in temperature. The IPCC temperature models (which have greater correlation than the precipitation models) suggest that the region could become 2 degrees warmer by 2100. Combining the possible temperature increase and Figure 5.2 suggests that St Helena could experience 4 to 8% reduction in intense rainfalls. These figures should be considered with respect to the impact on aquifer recharge and surface runoff. Droughts in St Helena will likely

[4] https://www.carbonbrief.org/explainer-what-climate-models-tell-us-about-future-rainfall

increase in frequency and duration and aquifer recharge will reduce. There are implications for any water strategy for St Helena that would rely on large borehole programmes that draw on the main aquifer and implications for recharge rates for the island's reservoirs.

Figure 5.1b: Projected seasonal variations in precipitation during the 21st Century

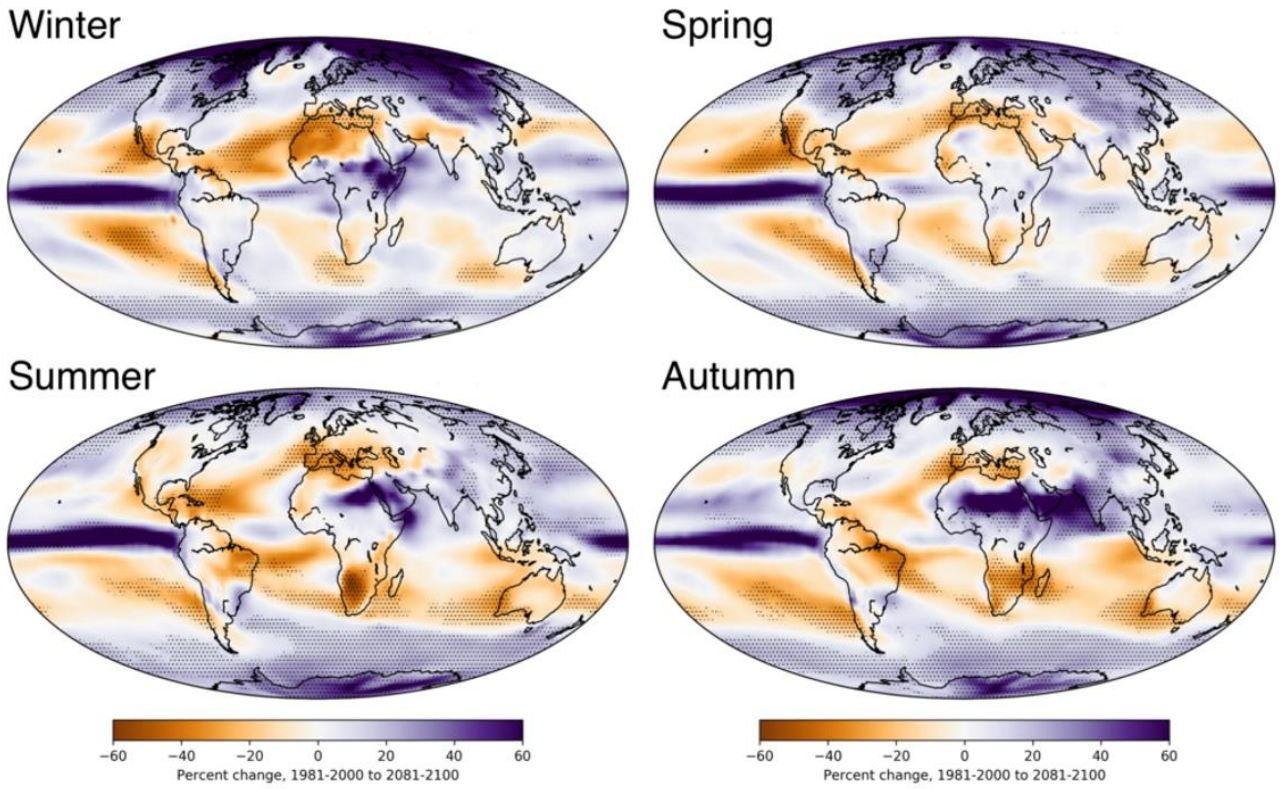
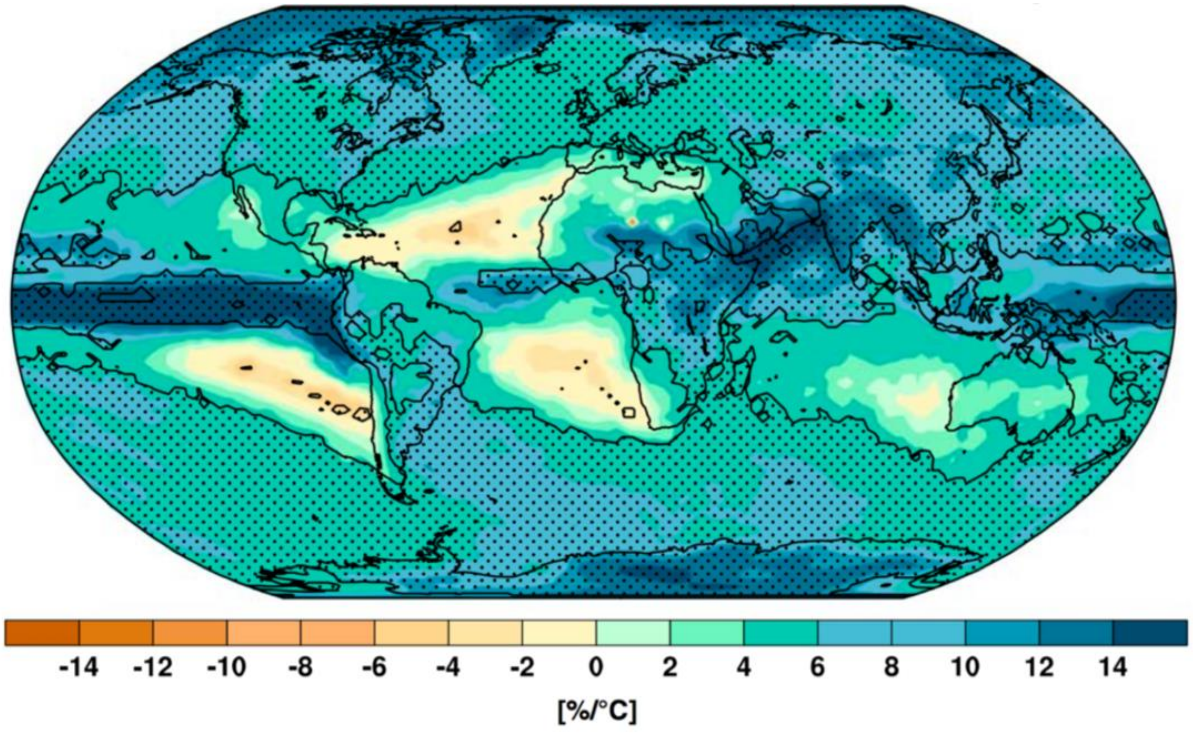


Figure 5.2: Percent change in heavy precipitation per degree of warming.



While the anticipated effects of climate change are mostly negative for water supply, a reduction in rainfall intensities would be positive for stormwater drainage including highway drainage.

St Helena's development priorities

DFID's business case for the airport relied mostly on expected economic activity from tourism. Notwithstanding the reduction in tourist projections (see Section 4.1 above)[5], tourism continues to be the primary sector for economic activity in SHG's visions and development plans. As such, SHG needs to give priority to all infrastructure that enables and supports a rapid increase in the tourism sector. This is mostly of relevance for utilities (water, power and wastewater are all important for tourist accommodation and most tourist activities in one way or another). Further rationale for tourism development and associated infrastructure provision is provided in the 2020 Strategic Plan for the SHG capital programme.

The SEDP details many sectors of the economy that SHG intends to expand in order to diversify the economy as far as possible (thereby protecting the island from future economic shocks arising from any reduction in projected tourist numbers). Priority is to be given to export-related activities (e.g. coffee), but all other on-island activities (new businesses and expansion of existing activities) aimed at increasing the resident population will require new housing plots and business premises. New plots will require utilities.

Considerable progress has been made in utilities since the 2006 Infrastructure Review. In particular, Connect SH has made great strides in achieving self-sufficiency in power. This was one of the two priority sectors identified in 2006; the other being water supply. The future of St Helena's power sector is largely secure due to the achievements of Connect since its establishment in 2013 and the current plans for a long-term Power Purchasing Agreement with PASH that will facilitate St Helena's progress towards 100% renewable energy (for which the Energy Strategy targets 1st April 2022). Thus, **adequacy, reliability and sustainability have largely been achieved in the energy sector**. **St Helena now needs to prioritise the same achievements for the other two utilities: water supply and wastewater management**.

By giving priority now to water and wastewater the demand on utilities for achieving the future state (2030) would be fully addressed and utility infrastructure planning can shift from a state of inadequacy and unreliability to simply managing[6] those assets, thereby freeing up future capital budgets for other infrastructure sectors that will further support St Helena's social and economic development.

5.2 Electricity generation

To meet future demand Connect is intending to sign a Power Purchasing Agreement (PPA) with a company called PASH (currently, the preferred bidder, but a second bidder has been identified as

[5] It is important to note that the airport operations have been made possible due to a change in aircraft type compared to the intended Boeing 737-800 for the long runway solution. The current aircraft has a capacity of 95 passengers compared to the intended aircraft that had capacity for 120 passengers. Since there is scope for increasing the number of flights per week, there is no need to further reduce the 2010 revised tourist projections. The projections used in this 2020 infrastructure review are those from the 2010 study as confirmed in the NAO report (2016): "Realising the benefits of the St Helena airport project"

[6] Managing infrastructure assets was a key message in the 2008 Infrastructure Plan. Once assets have been provided, it is essential that adequate recurrent budget is provided to properly operate and maintain the assets. This will minimise asset deterioration and maximise the economic life of the assets. Effective asset management is based on consideration of the whole-life costs of providing, operating, maintaining and eventually replacing assets.

backup should final negotiations fail). No capital outlay is required from Connect (or SHG). PASH will procure and install the required infrastructure to meet demand and Connect will pay PASH for each kWh it consumes. There is no obligation for Connect to pay for electricity it cannot sell, but Connect is obliged to preferentially purchase power from PASH. An initial installation under the PPA will be a 500 kWp solar array (to be located just above the Rife Range site), 1.8 MWp of wind turbines, and 2.7MWh of battery storage. Once commissioned, it would produce up to 9.133 GWh annually, which is about half of the projected demand in 2030 (18.3 GWh) see Section 4.2 of this report). This is in addition to Connect's current infrastructure, which is expected to produce around 11.8 GWh in 2020. The short-term total will be about 21 GWh (Connect's existing infrastructure plus the near-future additions from PASH), compared to a projected demand of about 10.4 GWh in 2020 and 18.3 GWh in 2030.

5.3 Water Supply

Water supply options

As mentioned in Section 3.2, Connect is currently considering options for addressing the water shortage issues. A large reservoir in Fisher's Valley would increase the total surface water storage threefold to around nine months supply. A deep aquifer programme could lead to new sources on the eastern side of the island and/or a desalination plant in Breakneck Valley or Youngs Valley could address the Redhill shortages. These three schemes are considered below.

Fisher's Valley Reservoir

Connect commissioned consultants iX Engineers in 2017 to study the feasibility of a large reservoir in Fisher's Valley. The consultants recorded that very limited information is available regarding the water flows in Fisher's Valley, other than the Toens Report (2000) that recorded a flow of 90,484 m^3/year 2.8 km upstream of Cook's Bridge and 54,750 m^3/year at the bridge. Toens also stated that the mean annual rainfall in Fisher's Valley is about 4.3 million m^3 per year. iX Engineers assumed that runoff is about 3.5% of the rainfall; this would imply that up to 96,000 m^3/year could be collected at the dam site. However, this is similar to the upstream measurements determined by Toens, so iX Engineers used the Cook's Bridge value rounded-off to 50,000 m^3/year.

The study considered four sizes of reservoir and dam, as follows.

Dam elevation (m amsl)	Dam height (m)	Max. capacity (m^3)	Years to fill (volume / av. inflow)	Approx days supply to StH
328	11	89,200	1.8	60
330	13	145,800	2.9	90
332	15	216,700	4.3	144
334	17	302,400	6.0	200

The time required to fill each dam is based on the average assumed inflow of 50,000 m^3/year and no offtake during that time. Based on an average consumption 1,500 m^3/day, when full the four dams would provide 60, 90, 144, or 200 days supply in addition to the current total storage in St Helena

iX Engineers estimated the cost for the second-largest dam (13m high) to be about GBP3.6 million. There are a several factors that suggest that this figure would be much higher if a decision is taken to proceed with the reservoir and dam. The sub-ground conditions at the site

were assessed only by way of trial pits dug using a backhoe that could reach just 4 metres below surface level. The trail pits collapsed as the excavation work proceeded. A detailed site investigation would be needed including boreholes to ascertain the depth to any firm/solid conditions upon which a dam could be founded. The report also cautions that the inflow (catchment) rates are based on only two records reported by Toens in the years 1969 and 1973). A study will be required to estimate current quantities and these may prove to be considerably less than Toens' figures due to the reduction in rainfalls recorded since the 1980s. These two studies could cost in the order of £0.5 million, at least. Detailed design would be a similar cost. It is likely that the dam would have to be constructed on deeper and wider foundations (i.e. to spread the load on firmer soils) and this could increase the dam cost by 50-100%, or more. The resulting project costs could be expected to be of the order of at least £6-7 million.

In terms of the timescale, it could take at least one year from now to procure and complete the site and hydrology studies, then six to twelve months for detailed design. Approvals to proceed with construction, securing of funding, and procurement of a contractor could take another year, at least. Construction would likely take 18-24 months. Filling of the reservoir will depend on which dam is selected. Using the 13m high dam, iX Engineers estimate almost three years. The total time until the reservoir would be full could be about 6 to 8 years from now. This might help with the longer-term water security for St Helena, but it would not help in the short to medium term.

There is also the consideration of safety. iX Engineers used the South Africa design codes to assess the hazard ratings of the dam and concluded that all four dams are of a low risk. The rating is based on consideration of loss of property and life in the event of a dam failure. The lack of geotechnical information from the study is cause for concern. Unless a subsequent site investigation can confirm suitable ground conditions, the weak and permeable soils in the site could lead to a range of failure modes, including horizontal leakage through the dam causing a failure of the downstream side of the earth embankment, washout at the sides of the dam and/or spillway, or failure of the inner drain. A number of small caves were discovered during the feasibility study and these clearly suggest poor ground conditions (the caves were produced by either percolating water, or erosion of weathered rock).

As a final note regarding the reservoir, it must also be borne in mind that the reservoir would be quite some distance from the areas it is intended to supply, resulting in considerable pumping costs from the reservoir to Hutts Gate and then to Redhill.

Deep aquifer boreholes

The 2017 Deep Aquifer Exploration Drilling Feasibility Study, conducted by WSP, drilled ten boreholes, of which it was assessed that eight intercepted the contact zone between the geological layers known as the Upper Shield and the Main Shield lithologies. The locations of the boreholes are shown in Figure 5.3a, most of which are near the Redhill treatment works. Figure 5.3b summarises the geology versus water strike depth. Figure 5.3c indicates the four boreholes that WSP recommended to be further explored with the possibility of these being developed for production. Of the four boreholes only two are close to the Redhill treatment works: Harpers Valley and Plantation, yielding 1.0 and 0.5 litres per second respectively, (i.e. about 86 m^3 and 43 m^3 per day). These would be just a fraction of the additional 500 m^3 per day required in the Redhill area to overcome current water shortages.

One point to note in locating new boreholes is the likely salinity. WSP noted that the salinity was high for their water tests at lower altitude locations that may be in younger geological layers. But

they also noted that the salinity levels were low at depth regardless of the surface water levels. If suitable flows and salinity can be found relatively close to Redhill treatment works, pumping costs would be considerably less than those associated with the Fisher's Valley reservoir (and much less than the current pumping from Hutts Gate). Redhill is at an elevation of about 500 m amsl. If the boreholes are located (for example) 100 metres lower and go to a depth of, say, 100 metres, then pumping would have to accommodate a head of 200 metres, or more. Fisher's Valley Dam would be at an elevation of about 300 m. While the net head difference is the same (Fisher's to Redhill) pumping would first be to Hutts Gate at 600 m elevation. There are additional elevation differences along the approx. 10 km distance between Hutts Gate and Redhill; distance and elevation increase pumping requirements, hence costs. If a water source can be found on the Redhill side of the island, this would reduce pumping costs and possibly eliminate the current subsidy that SHG has to provide to Connect.

Figure 5.3a: Location of the ten completed boreholes (2017)

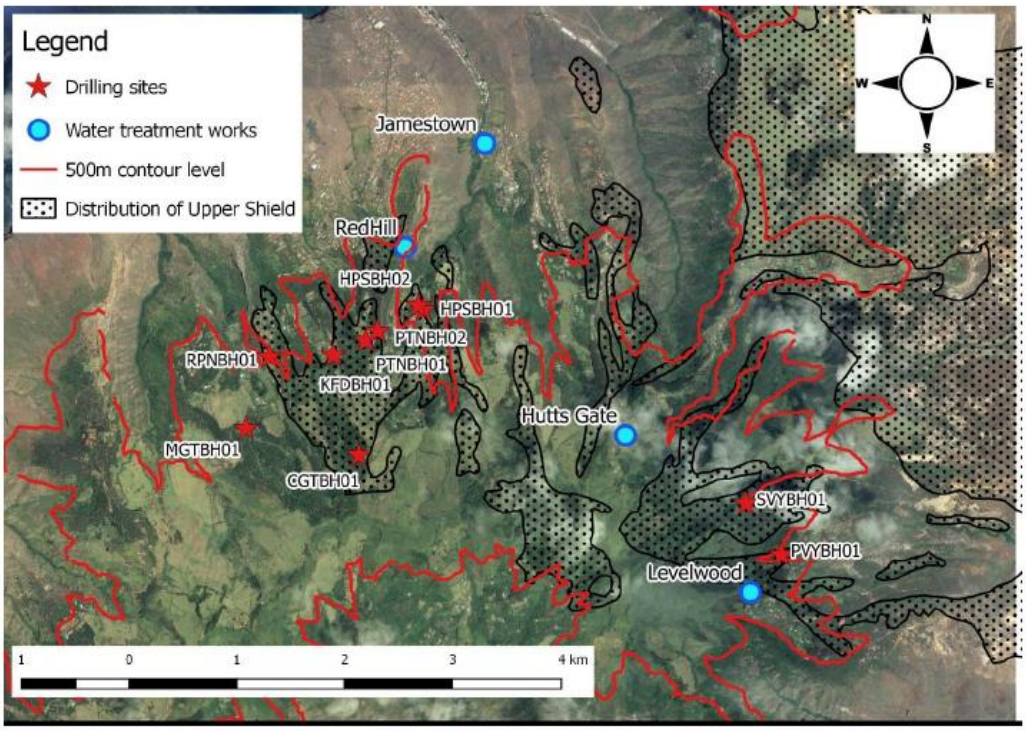


Figure 5.3b: Water strike depth versus assumed depth to Upper/Main shield interface

Borehole ID	Depth of main water strike (m)	Depth of weathering prior to main water strike (m)	Depth of suspected Upper Shield/Main Shield contact zone (m)	Water strike associated with Upper Shield/Main Shield contact (Y/N)
HPSBH01	N/A	N/A	Contact zone not intercepted	No
HPSBH02	85	80-85	85	Yes
SVYBH01	66	60-66	66	Yes
PVYBH01	26	14-26	26	Yes
MGTBH01	45	N/A	Contact zone not intercepted	No
RPNBH01	59	54-59	59	Yes
KFDBH01	64	60-64	64	Yes
PTNBH01	8	N/A	79-86	No
PTNBH02	N/A	39-45	45	N/A
CGTBH01	36	21-36	36	Yes

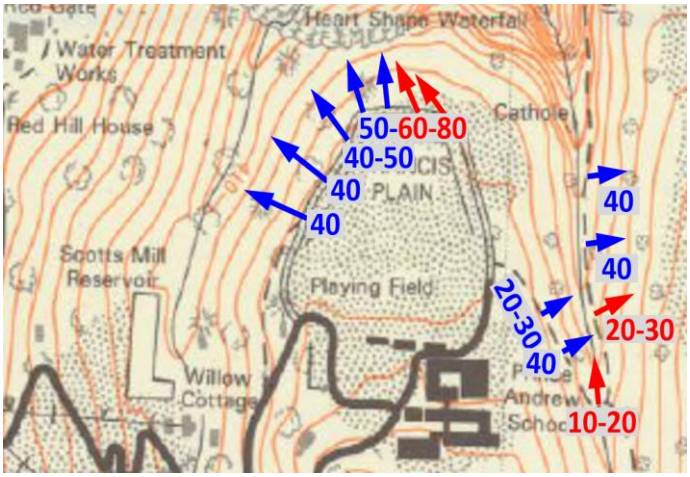
Figure 5.3c: Boreholes recommended by WSP for further development

Borehole ID	Area	Blow yield (l/s)
SVYBH01	Shark's Valley	4.3
PVYBH01	Pleasant Valley	3.2
HPSBH02	Harper's	1.0
PTNBH02	Plantation	0.5

Water divining

While water divining is not proven by the scientific community, neither is it completely disregarded. The method was used successfully to locate ample quantities of water for the airport project. Since the current water shortage in St Helena affects the Redhill area, water diving has been used to identify potential underground water sources near to Harpers and Scotts Mill reservoirs. This map illustrates some of the indications of amounts of sub-terranean. The items in red were strong readings.

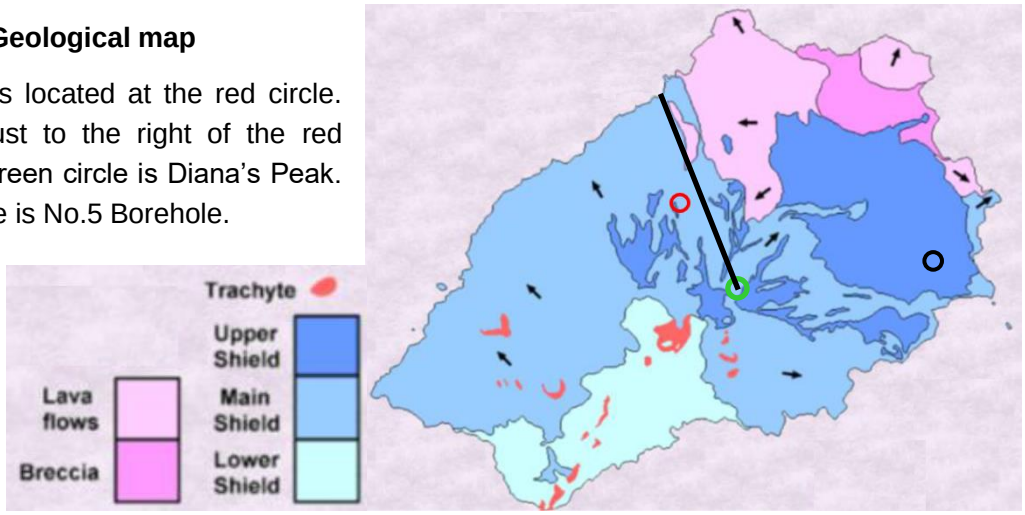
Figure 5.4a: water divining near Francis Plain



Great care must be taken when exploratory drilling is done for boreholes. Drilling in the alignment of surface water flows and springs is not recommended. Better locations would be at elevations below where any water is currently being extracted or locations where subterranean water flows are indicated but no current extraction is undertaken (for example, in the manner in which the successful boreholes were developed for the airport project). If any water is found in such locations, it is an unused source and, being located lower than current extraction points, any drilling should not affect current sources. While the findings shown in this chart just below Prince Andrew School suggest sub-ground flows towards the gut, the findings towards Cathole suggest flows into Peak Hill. Further exploration would be required *before any drilling* to confirm that any drilling would not be likely to disturb the main stream flows that continue from this gut down to Drummonds and Jamestown. The geological map in Figure 5.4b suggests that drilling near the Francs Plain area (red circle) would be into the Main Shield.

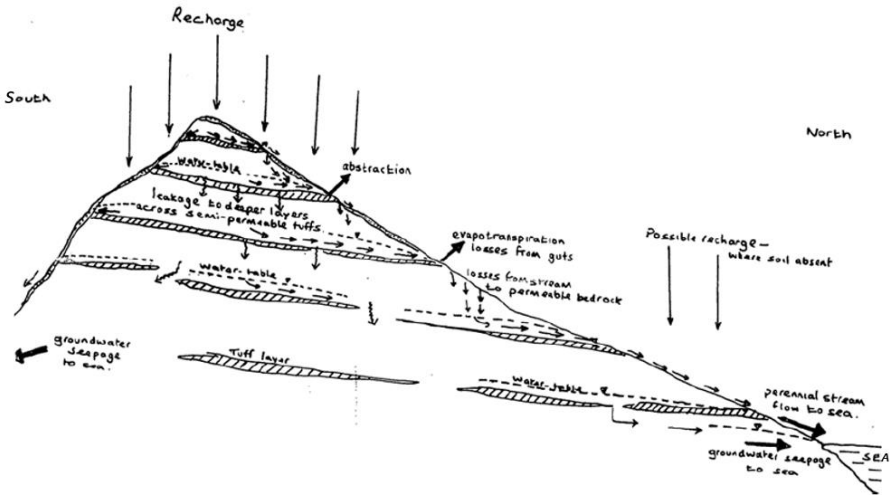
Figure 5.4b: Geological map

Francis Plain is located at the red circle. Peak Hill is just to the right of the red circle. The green circle is Diana's Peak. The black circle is No.5 Borehole.



The black line in Figure 5.4b indicates a line from Diana's Peak to the sea in a generally northerly direction. This is roughly what Lawrence (1983) was illustrating in his typical hydrogeological cross section of the island; see Figure 5.4c.

Figure 5.4c: Typical hydro-geological cross-section of St Helena (after Lawrence, 1938)



The general hydrogeology of the island indicates that soils in the valleys comprise gravels that hold relatively large amounts of water as perched shallow aquifers. However, these are very permeable and water quickly drains from them. They are easily recharged by rainwater and surface runoff, but therefore quickly run dry during droughts. These superficial aquifers are responsible for most of the springs around the island (see Figure 3 in WSP Report, June 2017), which is why the springs tend to run dry at times of low rainfall. WSP stated that "secondary, fractured basalt aquifers of low porosity but high permeability exist in areas of faults, dykes and fissures". They further state that these deeper aquifers are largely unexploited except for a few boreholes that have been developed in Frenches Gut, Iron Pot and Spring Gut on the western side of the island. These are relatively shallow (<22 metres deep) and some are artesian. They are most likely encountering partly confined shallow fractures and are not accessing the deeper secondary aquifers.

Within the lava flows there are layers of impermeable tuff. Water draining through the lava layer will run laterally when it encounters the impermeable tuff and exits at isolated locations in the form of the island's springs. The tuff layers, despite extending over wide large areas (hundreds or thousands of square metres) are likely to leak to lower layers. The lower layers can therefore store huge amounts of unexploited water; i.e. the deeper aquifers. The deeper aquifers will store far greater volumes of water than the perched small aquifers. These will not run dry as quickly as the shallow aquifers because the nature of the deeper rock (Main Shield) is not as porous as the gravels in the shallow perched aquifers. It is these deeper aquifers that need to be explored, but carefully managed. No.5 Borehole near the airport was probably drilled into the Main Shield. Meeting the current and foreseeable deficit of 500 m^3 per day would be very small fraction of the storage in the deep aquifers. By way of scale, 500 m^3 per day is just under 200,000 m^3 per year, which is 1/1000th of the annual aquifer recharge estimated by Lawrence.

If suitable supplies of aquifer water can be found, it would be a very cost-effective solution to the current deficit of 500 m^3 in the Redhill area. A borehole probably costs about £1,000 for the

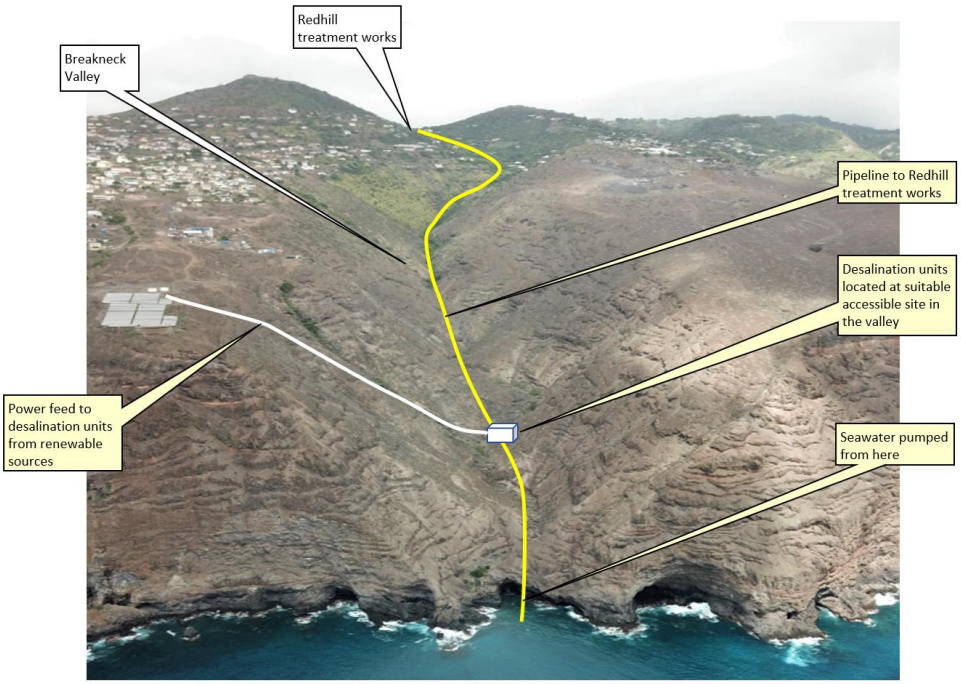
drilling to about 100 metres depth. Provision of a pump and pipework from one or more bores to Harpers or Scotts Mill reservoirs would not be expensive. Including all associated costs, an allowance of £50k should be made for exploration and nominally £300k for development of suitable bores to achieve the required 500m^3 per day for the Redhill distribution area.

Desalination

While reservoirs and deep boreholes share the risks associated with climate change (i.e. lack of recharge from precipitation), desalination has an endless supply. Water could be pumped from the bottom of Breakneck Valley, about 3 kms away from Redhill. The elevation difference would be about 500 metres, but electricity from renewable sources would minimise pumping costs. It is also a scalable solution. Desalination plants are available in containerised units and can be added to according to increasing demand. Currently, the additional requirement is just about 400 to 500 m^3 per day for the Redhill area. This demand could be met via two 250 m^3 units, so that there is always a standby in case of breakdown or maintenance.

Access to the sea at the lower end of Breakneck Valley is possible (Figure 5.5a) and installing a pipeline up the valley and into Redhill would not be difficult.

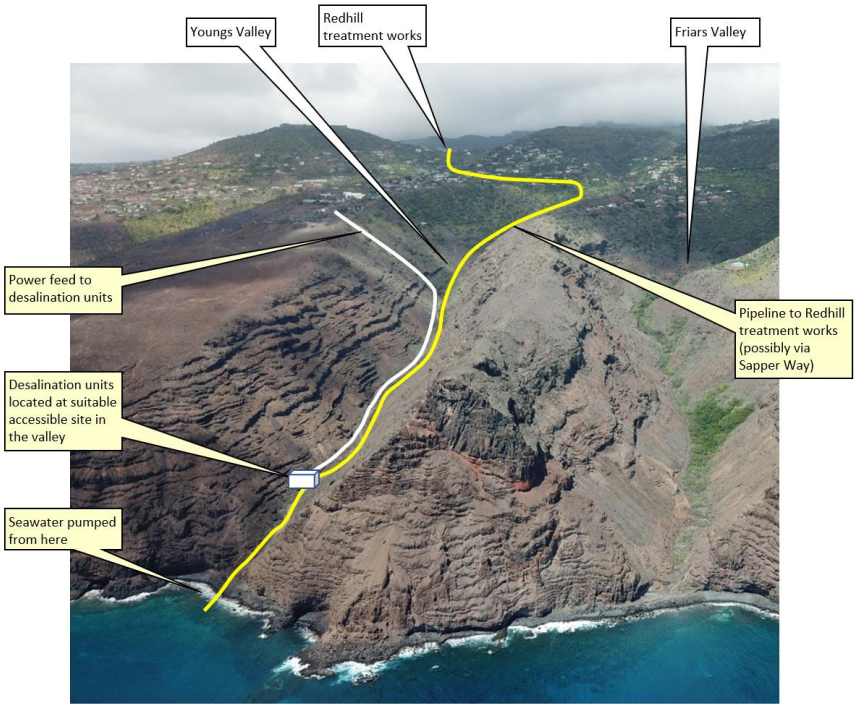
Figure 5.5a: Breakneck Valley with possible site for a desalination system



Youngs Valley provides an alternative location for a desalination plant and an alternative route from the sea to Redhill. Access to the sea is easier than at Breakneck Valley.

The desalination units should be located fairly close to the sea because the discharge would be directed back into the sea. The quality of discharge from some desalination plants can go directly into the sea. This would have to be specified when procuring a system for St Helena to make sure that the discharge is consistent with the blue economy objective. The costs of the desalination units and pipework could be offset over a period of several years. The scheme would certainly be cheaper than a reservoir at Fisher's Valley and without any of the reservoir/dam/climate risks. With a desalination solution, there would be no risks associated with drawdown of the deep aquifer (as would be the risk with deep aquifer boreholes).

Figure 5.5b: Youngs Valley with possible site for a desalination system



Another advantage of the desalination solution would be that the design and supervision of installation could be achieved without the hugely expensive studies associated with the Fisher's Valley reservoir and without the need for large additional storage facilities (although additional treated water tanks could be installed at Redhill in future years if demand warrants such infrastructure). Initial cost indications are that the desalination operating costs would produce water at about £2 per cubic metre, or less. To obtain a tariff for desalinated water, the capital costs need to be added. An initial estimate is that these would be around £3.5 million. Connect would have to consider the impact of such a scheme on tariffs, but it would clearly be much less than the Fisher's Reservoir scheme.

Theoretically, it would be possible to use the desalination system to pump water into larger storage at off-peak times, then use the stored water to run back down and run a turbine located lower in the valley to produce electricity at peak times. But the Power-Purchasing Agreement between PASH and Connect is expected to provide sufficient electricity from renewable sources (solar, wind) that a pumped storage scheme should not be necessary.

Immediate water infrastructure projects

Connect is currently developing projects for:

Water Projects	**Cost**
Chubb's Spring abstraction systems upgrading and new Flocculators	£ 300,000
Enlargement of Reservoir 1 and new Levelwood Reservoir 2	£ 730,000
Upper Wells Abstraction System Upgrading and Hutts Gate Main	£ 150,000
Sandy Bay water reticulation	£ 230,000
Harpers 2 Earth Dam Enlargement	£ 270,000
Total	**£ 1,680,000**

In addition, Connect is considering development of the Fishers Valley reservoir as the main infrastructure in supplying current and future needs for the Island. The estimated cost is £4.5

million, but this is seems underestimated (due to the dam foundation conditions, etc) and the overall project costs with additional hydrogeological and geotechnical studies, larger dam, etc would be at least £7 million.

5.4 Wastewater

Current proposed projects

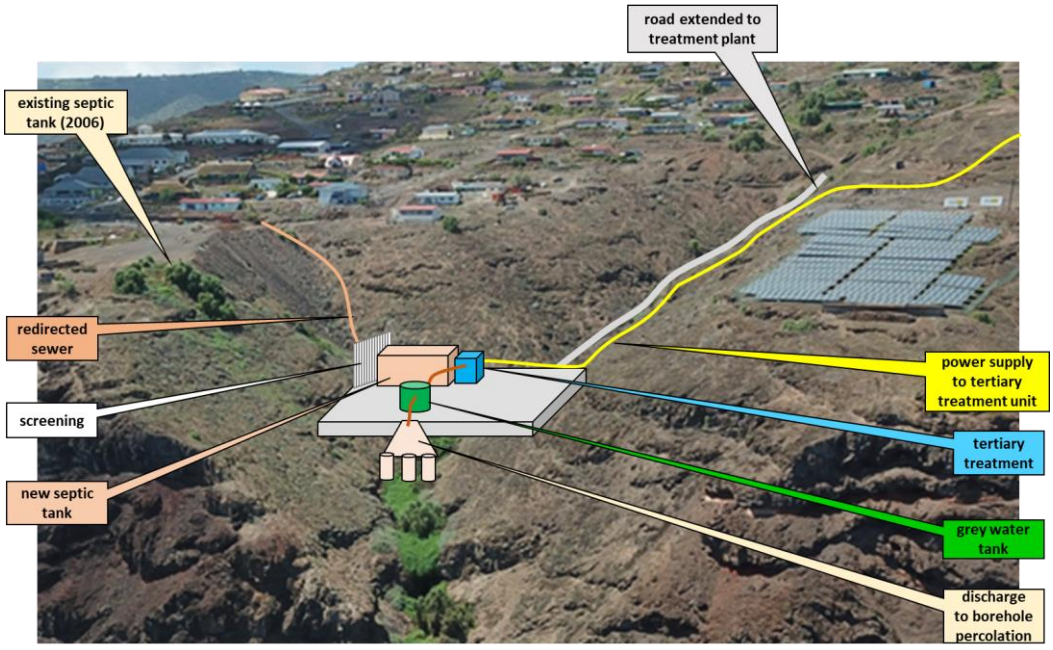
In 2015 SHG engaged consultants WSP to review the wastewater situation on the island, focusing on three main systems:

- the Half Tree Hollow and Ladder Hill sewage collection and discharge system (HTH)
- Jamestown sewage collection and discharge system (JT)
- Longwood and Bottom Woods sewage collection and discharge system

WSP progressed these systems to conceptual design stage and proposed combining the HTH and JT systems into a single scheme with one sea outfall. Part of the reason for this was that a combined long sea-outfall solution would not be so sensitive to the large amount of stormwater in the sewerage system that affects the efficacy of mechanical treatment units. WSP had estimated £1.6 million to separate the connections of individual house stormwaters from the communal HTH wastewater system. The proposal for combining the HTH and JT systems included bringing a sewer down the side of Jacobs Ladder. There is community and political opposition to the proposal for constructing a sewer alongside the Ladder, even though this could include renovating the Ladder and making it safer for the public and tourists. The project has therefore not yet advanced to final design stage and final development approval.

An alternative scheme, aimed at overcoming the impasse, is shown in Figure 5.6a. This scheme would avoid the need for a sewer alongside Jacobs Ladder. Treatment of wastewater from the whole HTH area could be achieved via a new septic tank and a tertiary treatment unit (to ensure water of reusable quality) located on a level area in “Butts Valley” just below the existing tank. The existing tan would be decommissioned.

Figure 5.6a: Proposed location for new HTH sewage treatment facility and disposal system



Due to the tertiary treatment, grey water could be retrieved from this facility to be sold via bowser to customers for selected garden and/or agricultural uses, or even some construction uses. The effluent would have to comply with ENRD standards for the use of wastewater for agricultural purposes.

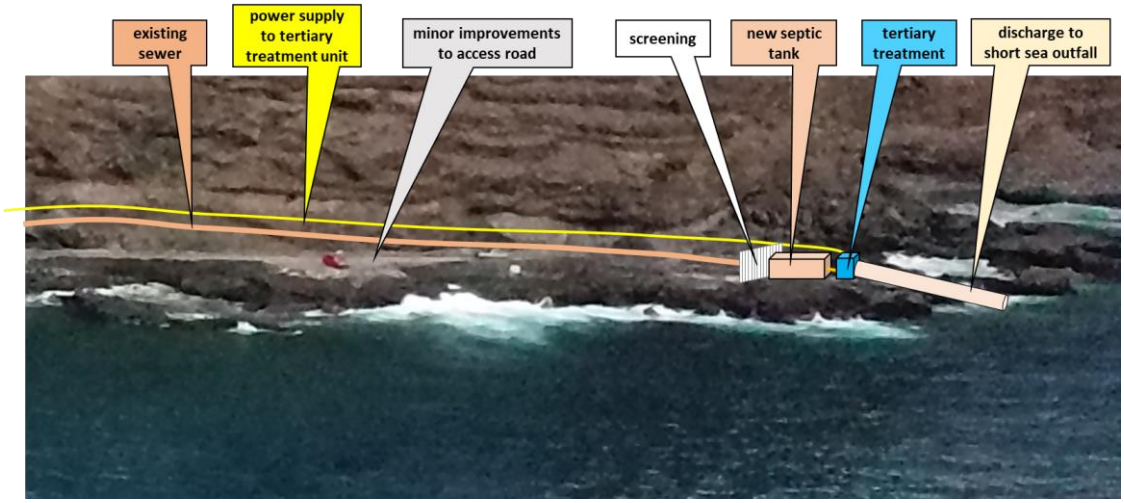
Consideration has been given to providing a discharge pipeline from this new system to West Rocks to join the Jamestown system and a combined sea-outfall. However, a site visit to examine this possibility revealed that, although it would be possible to construct the pipeline along the base of the cliffs and protect it from wave action, there is a high risk of rockfalls. A more secure solution is to direct the discharge (i.e. overflow from unused treated grey water) into boreholes and let the suitably treated water percolate through the rocks. Boreholes in this location would not interfere with any ground water resource and, by suitably treating water before discharge into the boreholes, there would be no sea pollution. This solution would obviate the need for a long sea-outfall for the HTH system.

Providing households with rainwater harvesting tanks from their roofs would be a more cost effective option (about £200 per tank and two tanks per house) than the WSP proposal of £1.6 million for separating storm and foul water. There are probably no more than 50 houses where stormwater separation is still required, implying a costs of about £40,000.

This scheme has the following advantages:

- an initiative to encourage the islanders to reuse water for garden use etc
- eliminate piping the sewerage effluent down the side of the ladder into Jamestown
- recovery of good quality wastewater for construction and agricultural purposes
- if septic tanks options was chosen it would be low maintenance

Figure 5.6b: Proposed new JT sewage treatment facility and short sea outfall



Similarly for Jamestown, a relatively simple system could be provided and with a septic tank and a suitable tertiary treatment so that only a short sea outfall would be required. With suitable tertiary treatment to meet WHO standards, a long sea outfall is not necessary.

It is estimated that the cost of the HTH scheme would be about £1.2 million, including a 15% contingency. The JT scheme would cost of the JT scheme would be about £570,000 also with 15% contingency. With detailed design, the costs will probably reduce to about £1.6 million for both schemes.

5.5 Roads

New roads

The upgrading of Field Road and Side Path (R2 project) will facilitate the movement of decontainerised freight from Ruperts Wharf to James Valley. The entry into Jamestown (Napoleon Street) would not be such a bottleneck as envisaged when WSP did the design in 2016, which assumed that trucks would bring containers from Ruperts to Jamestown. The intention is that the Phase 1 works at Ruperts Wharf will enable the “de-stuffing” of containers and smaller vehicles would then transport the smaller-sized freight to Jamestown. The improved road alignment will avoid most, if not all, the need for the current barging of containers to James Wharf, which would save SHG up to £0.5 million per year. There would therefore be a reduced case for the alternatives of a tunnel or coast road between Ruperts Valley and James Valley. However, for completion and future consideration, these two options are outlined below.

Coast road

No designs or detailed costs have been prepared for the coast road, but assuming an approximate length of 800 metres, a crest width of at least 5 metres and side slopes of 1:2 with an overall height of at least 5 metres, would suggest a total volume of around 60,000 cubic metres. Assuming a first order estimate of £100 per cubic metre, plus 30% for wave/storm protection, concrete road pavement, etc, and 20% contingency, would suggest an initial budget figure of £8-10 million (without the benefit of bathymetric survey, design of wave/storm protection measures, etc, etc). A design using caissons would likely be more expensive.

Figure 5.6: Possible route for a coast road

Ruperts-James Tunnel

There have been discussions since many years regarding the possibility of a tunnel between James and Ruperts valleys. Mention was made in the 2006 Infrastructure Review, but no cost had been carried forward to the infrastructure investment estimates. In early 2019 a small team visited St Helena from Sweden and examined route options for a tunnel; the options are shown in Figure 5.7. All three options were based on a single lane tunnel with traffic lights to control traffic flow. Based on the professional opinions of the team, the recommended option was directly between the two wharfs. In all three cases, the budget figures included just 10% contingencies.

Figure 5.7: Possible routes for a tunnel between Ruperts and James valleys

A tunnel directly between the two wharfs would have a length of approximately 620 metres.

Consideration must be given to queuing areas either end of the tunnel (which would be on James Wharf and near the Fisheries building at Ruperts) and the implications for traffic management beyond each end of the tunnel.

Estimated cost for a single-lane tunnel is £8-10 million.

Double-lane tunnel would be approx. £14.5 million.

A tunnel between Seales Corner and Ruperts Valley would have a length of approximately 570 metres.

Consideration must be given to queuing areas either end of the tunnel and the implications for traffic management beyond each end of the tunnel, particularly the Seales Corner end and the turn-out into Market Street. Land acquisition would be necessary.

Estimated cost for a single-lane tunnel is £8-10 million.

Double-lane tunnel with roads would be approx. £14.5 million.

A tunnel between the old quarry near the hospital and the valley between Field Road and Bunkers Hill, would have a length of approximately 440 metres.

The approach on the quarry side would require some land acquisition. On the Ruperts side, the valley would have to be widened to create the queuing area and the turn out from the tunnel.

Estimated cost for a single-lane tunnel is £8-10 million.

Double-lane tunnel with roads would be approx. £13.5 million.

For a cost estimate based just on visual assessments, a 10% contingency is too low. There are many unknowns associated with each o the tunnel options, such as the type of material that would be encountered within the mountains, extent of water ingress (if any), etc. The cost estimates have been adjusted in Figure 5.7 to include 20% contingency. For all three options the single-lane tunnels would be in the order of £8 to 10 million.

I&T has taken two of the options and considered how much more it would cost to provide two-lane solutions. They also included only 10% contingencies. Adjusting the contingencies to reflect the wide range of unknowns at this stage would suggest budget figures of £13 to 15 million.

The overall budget estimates of each solution for single- and double-lane tunnels are the same order of magnitude.

Bridges and highway structures

The surveys by WSP in 2016 (see Figure 3.5b) enabled estimates to be made of the costs of repairs to the main highway structures. The cost for the high priority repair items amounted to £105,000; the medium priority items were £61,000 and the lower priority items were £5,100. Allowing for about 5% per annum inflation and assuming that it would be at least another year before these works are undertaken, the budgets would be, respectively: £135, 000, £78,000, and £6,500. However, other inspections of the major highway structures suggests that the WSP surveys had under-estimated the amount of works and the associated costs. Taking Bishop's Bridge as an example, a survey for the 2006 Infrastructure Review noted that, as a minimum, the steel beams were highly corroded and needed replacing. There are several options to address the problem of this bridge. Replacing the beams with new steel beams will impose a future burden in maintaining these beams. An alternative would be to replace the existing beams with concrete beams. Both of these solutions rely on the structural integrity of the current abutments. Removing the beams would mean completely replacing the superstructure so a third option would be to replace the short-span bridge with a reinforced concrete deck. A fourth option, and possibly the cheapest and least future maintenance burden, would be to replace the bridge with a concrete pipe culvert (approx. 1.5 or 2 metre diameter), cover with compacted fill (constrained with gabions), and then construct a normal road pavement. The heritage appearance of the bridge could be retained by rebuilding the existing bridge pillars. The PMU is currently investigating options and costs for Bishops Bridge replacement.

Asset protection and replacement

The case was made in the 2006 Infrastructure Review for adequate and timely preventative maintenance. This has been summarised in Section 3.4 of this 2020 Infrastructure Plan. Ideally, a £4.5 million project is required to restoring the network to a maintainable condition over a five-year period. A minimum alternative measure would be to provide the Transport Section with about £300,000 to purchase a slurry paving machine, plus an annual budget for maintaining this. The Roads Section would require an additional annual budget (i.e. in addition to its current £408,000) of £30,000 per year to hire the machine from the Transport Section, plus £335,000 per year for the slurry materials. It would also require £26,500 to employ three additional roads staff. For this budget, the Roads Section could undertake the repair of at least 24 km per year. This is equivalent to a programme of repaving about one-sixth of the network each year and would arrest the current accelerated rate of pavement deterioration.

Capacity and safety of existing roads

The two primary issues for the roads sector at present are protecting investments to date in the road pavements and highway structures, and improving safety. Capacity is not a major issue.

As the number of residents and tourists on island increase there will be more vehicles. Traffic management and road safety will become a greater concern. While the main road network is adequate for current traffic volumes and some considerable increase in the number of vehicles, road safety could be significantly improved. Better maintenance of roads would keep passing bays clear; maintenance of existing warning signs and some additional warning signs would improve traffic management (assuming reasonable levels of driver discipline), and white-lining would improve road safety, particularly at night. Most of these measures should be part of a suitable road sector recurrent budget.

One capital works project that would improve safety would be improvements to Ladder Hill. This was also identified in the 2008 Infrastructure Plan, but was of relatively low importance compared to other projects (water, electricity, etc) and did not feature among the top twenty projects prioritised by the ten Infrastructure Plan Steering Group (IPSG). A first order cost of £1.5 million had been estimated at 2008 prices. Assuming 3-5% per annum increases due to inflation, the cost would now be almost £3 million.

5.6 Ports & Wharfs

Ruperts Wharf

As mentioned in Section 3.5 of this report, SHG is currently finalising designs in-house for development of Ruperts Wharf, which will include facilities to handle up to a maximum of 189 containers container. The design brief for the current works includes the following (compared to the Royal Haskoning study):

- reduced scope (vehicle workshop, covered reach-stacker parking, size of container yard reduced to a maximum of 163 containers, and portable weighbridge facilities
- reduced site footprint
- levelling of the site to allow more containers, thereby reducing the pressure (and cost) for future container storage area
- combined building for port control, biosecurity, and customs

A phased approach to the implementation of the new plans was considered; for example, some operations could be housed in temporary structure in order to reduce the time to operationalisation of the new facilities. But future replacement of temporary structures would entail construction works within a an operational port that has quite a limited footprint. A single phase project is therefore being designed that would provide all that is required for the foreseeable container and other movements in Ruperts. A budget figure for these works is £6 million.

5.7 Government Landlord Housing (GLH)

Previous considerations for converting the management of GLH to a commercial basis, such as housing associations along the lines of the UK model, which are non-profit organisations that provide low-cost social housing. Any budget surplus is used to maintain the housing portfolio and

provide additional housing if required. Although the housing associations are independent they are regulated by government. The associations are able to benefit from not having to pay stamp duty, and being able to take loans. This would enable the financial burden of social housing to be shifted from SHG to the housing association. To cover the cost of loans, the association would need flexibility in rents, which need to be regulated while also reflecting true value, inflation etc. The availability of social housing should be means tested (as proposed many years ago) and different property types should reflect different occupancy requirements.

The housing association model should be investigated in detail by SHG's legal department (AG's chambers). However, if there is insufficient capacity, a budget figure of £200,000 could be set aside to review the model and make firm recommendations on how to set up a housing association in St Helena. An additional budget may be required to provide advice during the actual establishment and early operations of the association.

5.8 Chief Secretary Hosing and SHG Commercial Properties

Chief Secretary properties

The implementation to date of the policy to divest these properties illustrates how SHG can relieve itself of a huge financial burden, while greatly improving the condition of this portfolio. These properties were examined during te 2006 Infrastructure Review. Some are suitable for commercial purposes, some would be better suited as residences, while others could be mixed commercial/residential. Commercial uses could include restaurants, corporate services, etc.

SHG commercial properties

This portfolio includes places such as the Coffee Shop and the Yacht Club. The current rents do not reflect the true value of the properties, nor the maintenance budget, insurances, etc that SHG has for these properties. The portfolio should be run on a commercial basis with true costs covered to at least achieve a break-even budget. There are already precedents in SHG for such arrangements, including the IT and the Transport departments. Properties that provide a primary public service, such as the schools and the hospitals, may continue to be subsidised from the consolidated account, but commercial properties should be managed on a commercial basis. Basing rents and other charges on true value would enable SHG to accumulate asset funds to be used for upgrading and/or rehabilitating properties in this portfolio. The principles of asset management (as outlined in the 2008 Infrastructure Plan) should be a core part of the management of SHG commercial properties.

5.9 Solid Waste Management

Development of solid waste management arrangements

As mentioned in Section 3.8, St Helena's solid waste is these days very well managed. Improvements could include:

- provision of a compactor for aluminium, which would cost approximately GBP30-35k + shipping, etc, say GBP50k as a budget figure to allow for energy-efficient, long-life models to be procured
- arrangements to extend the life of the cell area of HPLS; for example, a means by which another layer of waste could be placed on top of the current domestic cells. This might entail building up the sides of the cells with rubble landfill, or falsework, to enable the

skids and net to be raised so that a new layer of waste can be deposited. This would raise the area of landfill above the original ground level but this would be better than spoiling another part of the island as a second waste site. Thereafter, overall consideration of the existing HPLS site could identify new areas for cell management. A nominal GBP50k could be included in the capital programme to fund arrangements for extending the life of the current cells.

5.10 Telecommunications

Submarine cable

SHG's Digital Strategy includes provision for the landing of a submarine cable in 2022, which will provide for vastly faster services. This will at last make viable the establishment of many new businesses on island, as well as improved educational and health services. The project to implement the landing is currently underway in Rupert's Valley. At this time, no further developments have been identified for the telecommunications sector that would require public investment, so there is no need to include telecommunications in the updated Infrastructure Plan.

5.11 Tourist infrastructure

Accommodation

Based on the discussions in Section 4.11, it is not expected that SHG will investment in any additional tourist accommodation. Indeed, as soon as possible, its investment in Mantis St Helena is expected to be fully converted into private investment. All future tourist accommodation should be provided by the private sector in response to the demand generated by an effective tourist promotion campaign.

5.12 Recreational facilities

Waterfronts

In early 2019, a new masterplan was prepared by consultants Colliers International for development of the James Bay waterfront. The plan has not been approval (the proposed use of containers, for example, is by no means consistent with heritage waterfrontage), but certain aspects do merit serious consideration and are consistent with the earlier ideas for improving the James Bay waterfront. While it is recognised that the wharf contains many heritage structures, improvements can be made without detracting from the heritage appearance. Making the Yacht Club building more attractive and welcoming would likely result in more economic activity, not just by "yachties", but also by residents and air visitors, and even during cruise ship visits.

Similarly, the freight terminal building could accommodate a number of small businesses, such as bars, eateries, small shops, and so on, to provide facilities for residents, cruise visitors, etc.

Improvements to the Mule Yard could reintroduce recreational facilities that would be more pleasing to the eye, while being somewhat consistent with the dominant heritage style (e.g. the backdrop of the castle and ramparts).

Recognition of the importance of tourism to the economic future of St Helena, it is time for a positive and proactive approach to providing tourist and recreational facilities that will greatly benefit visitors and residents.

As mentioned in Section 4.12, it is appropriate to expect the private sector to respond to any suitable investment opportunity at the waterfronts and these items do not need to be included in the updated Infrastructure Investment Plan.

Family activities and Sports Facilities

Consistent with the 10-Year Plan pillar of making St Helena a better place for children and young people, there should be more for young people to do and more facilities to encourage a healthy, active lifestyle. The proposed sports ground at Bottom Woods is just one such project, but to fully address the altogether better for children and young people development pillar there must be a suitable budget for providing children's playgrounds and young people's sports facilities within or close to all major residential areas, including the new CDAs. A few ideas for providing suitable facilities include:

- a green recreational area in the HTH area similar to the green and children's playground at Longwood
- recreational areas for families and young people at the James Bay waterfront, for example redesigning the Mule Yard as suggested in the Colliers (2019) report. The existing businesses at the Mule Yard could be relocated further along the waterfront once the container handling is moved to Ruperts
- improvements to the Duke of Edinburgh playground to make it more open and family-friendly

6. The Capital Programme - Infrastructure Investments

6.1 Infrastructure Priorities

The Vision 2030 detailed in Section 2 of this report describes the future state of St Helena in terms of social and economic development. The social development vision is largely predicated on the aspirations of the island's communities as recorded in the 10-Year Plan under the five development pillars. The "altogether wealthier" pillar is further elaborated via the SEDP and the IER, as shown in Appendix A of the Capital Programme's Strategic Plan 2020-2030. Appendix B shows the linkages between the projects of the capital programme and the social and economic development pillars. An overview of each projects is provided in Section 6.2 below.

The Strategic Plan describes the development path from 2020 to achievement of Vision 2030 and the priorities for both the social development and economic development objectives. The priorities inform the capital programme in terms of which projects need to be completed soon and which projects can be undertaken later in the programme. For example, there is an imperative to fully address the four utilities, so these are to be addressed in the first few years. Energy and solid waste management have been well developed in recent years and are adequate to address demand up to 2030. Water security and sustainable wastewater are the current priorities.

The Napoleon Bicentenary will be held in May 2021, so tourism projects required to improve the whole Napoleon visitor experience, including some improvements to Jamestown facia and James Bay waterfront must be completed during FY2020/21. Given the importance of tourism to Vision 2030 (the IER suggests a £10 million per annum visitor economy, compared to £5 million per annum for all exports and other businesses), efforts must commence immediately to target and attract visitors. There is a ***very*** steep trajectory to be achieved in terms of the number of visitors and the spend per visitor if the IER target is to be achieved. This further dictates that projects aimed at the visitor economy must have a high priority. Based on recent tourism studies (e.g. the two arranged by ESH in 2013), the low-volume, high-spend tourists that St Helena must target can begin with game-fishing and diving. These tourists generally appear to want good quality accommodation, so they will likely want to stay at the Mantis and SHG can start recovering some of the investment in the hotel and start reducing its subsidy. These tourist groups will only spend large amounts of money on island if there are quality (value for money) items on which to spend. They will also be looking for an overall good quality experience. This raises the importance of improving the waterfront at James Bay and ensuring that the water quality issues are fully resolved at West Rock via a sustainable Jamestown wastewater solution.

While St Helena targets the game-fishing and diving tourist groups, the traditional groups will continue to visit; e.g. hill-walking, bird-watching, etc. But SHG must quickly identify ***in detail*** what the island's main tourist products are and begin focused marketing of these. For example, two islands used frequently in the proxy studies for St Helena's tourism are the Galapagos Islands and Easter Island. The Galapagos are known worldwide for their unique ecosystems. Visitors pay an entry fee to these protected national land and marine parks (US$100 for adults and US$50 for children). St Helena must identify its unique ecosystems and promote these with the aim of also becoming well known worldwide for these items which can become major tourists attractions and income generators.

Easter Island is known worldwide for its cultural heritage (the 1,000 carved stone-heads around the periphery of the island). There is a charge of US$60 for tourists to enter the two main heritage sites. St Helena has a rich cultural heritage with many (interwoven) stories to tell. It must develop these stories in a clear manner and provide information signboards around the island. With suitable information brochures, tourists can explore the island to follow separate story-lines, or they could use tour-guides.

Visitors to the Galapagos Islands generally spend 5 days, while visitors to Easter Island spend just 2-3 days. St Helena has plenty to offer tourists for at least one to two weeks. The tourism products have already been identified via consultancy studies. The products now need to be developed to world-best standards and promoted. Focussed out-reach to marine tourists can start immediately because the sea is “ready” and the private sector already offers diving and game-fishing. Improving the waterfront and developing places where marine tourists can start spending more money must be done soon if St Helena is to avoid “over-selling” its marine-tourism experience. While SHG needs to take a lead in terms of policies to free up development opportunities at the James Bay waterfront, the private sector must be encouraged to invest in high quality tourism products. SHG can then focus its resources on improving the natural and cultural heritage items. With a suitable high quality tourist experience it would not be unreasonable for St Helena to also charge tourists an “ecosystem charge” for land and marine tourism. All visitors arriving on island could pay £50 per adult and £25 for children, for example. In addition, marine tourists (i.e. diving, game-fishing, etc) could be charged £10-20 per day. These charges would provide an income source that SHG can use for various development purposes, such as offsetting the costs of the wastewater facilities (since the tertiary units would be selected to achieve high quality discharge to the sea), developing the built heritage, and so on.

In summary, the main theme for prioritising the economic development interventions is to provide the basic enabling infrastructure (principally utilities) in the next few years (a target of end-2023 would be reasonable), and secondary priorities aimed at enhancing the visitor experience to world best quality from 2024 onwards. Council should also set policies that enable SHG to encourage the private sector to take an increasing role in investing in visitor economy infrastructure.

The combined objective of all parties is achieving the Vision 2030 goals of £10 million per annum visitor economy turnover and a non-tourism private sector economy of £5 million per annum. In parallel, the social development goals of the 10-Year Plan are to be addressed in terms of interventions for the safer and healthier pillars, followed by the better for children and young people and greener pillars. Many of these activities could be funded from tax revenues and tourism charges, hence the key to St Helena’s economic and social future is swift improvement of the number of tourists and the quality of the tourist experience.

6.2 Overview of individual projects in the Capital Programme

Component A: Social Development

1st Priority Projects

EDIP Phase 1 (EDIP-1) Projects

Water security

A potentially swift and cost-effective solution to the Redhill water shortage would be to develop one or more boreholes into the deeper aquifers in/near the Redhill area. The required output is 500 m^3 per day, which should be fed into Scotts Mill or one of the Harpers reservoirs. This will help keep these reservoirs at suitable levels to avoid future water supply deficits in the Redhill distribution area. An exploration budget has been allowed in the CP, plus additional funds will be required for development of successful bores (pipework, pumps, etc) to the Redhill reservoirs.

The reservoir at Fisher's Valley is not recommended. The report by iX Engineers raises too many concerns, the potential for surface water (rain run off) collection in this valley is not proven, and the cost of the dam will very likely be at least twice the estimate in the feasibility study leading to a project cost in excess of £7million. The project, if it could be successfully realised, would increase the water storage by three times to about nine months supply. St Helena has only ever been short of water during droughts, but has never been without water completely. The hydrogeology at the site is questionable and climate change considerations cast doubts over the viability of the project. The case for this reservoir is not robust.

A desalination solution for 500 m^3 per day would cost much more than a borehole solution, but less than half the amount of the Fisher's Valley reservoir. The estimated cost (based on a concept design) including all civil works has been developed. Once the civil works (piping, etc) are in place, the desalination scheme is scalable. Individual units of 250 m^3 per day capacity can be procured and simply connected into the system. This project is shown in Phase 2 of EDIP on the assumption that a suitable borehole solution can be completed immediately under Phase 1 (i.e. during FY2020/21 or FY21/22 at the latest). If financial and physical resources permit and there is still a water deficit after boreholes have been developed, then the desalination solution could be brought forward into EDIP-1.

EDIP-1 should also include some provision for developing a sustainable water resources management plan (WRMP). However, much of the experience and knowledge for this exists on island. Past studies of hydrology and water projects exists for as far back as the 1980s. A technical review of these could be undertaken and a sustainable WRMP could be developed fairly easily. The recent communications with desalination companies, the upcoming borehole exploration works, and the plethora of data at Connect along with existing SHG reports, provides all the necessary information for a WRMP. In case a more detailed analysis of the information and documents is warranted, a small sum from EDIP-1 could be used to contract the services of a hydrologist or hydrogeologist.

Wastewater

The CP includes wastewater solutions for HTH and JT as separate schemes. Each scheme includes for sufficient tertiary treatment such that the discharge will comply with relevant standards: grey water usage for agricultural purposes from the HTH system with excess being discharged via percolation in boreholes; discharge up to 150 metres offshore at West Rocks for

the JT system where swimmers and divers might be, as well as the impact on shellfish that might be consumed. The estimated costs has been developed and are comparable to the combined HTH/JT scheme proposed by WSP in 2016. The provision of higher-quality discharge (via tertiary treatment) of the proposed systems will increase the operating costs compared to the partially-treated effluent discharge in the WSP proposal, but if SHG imposes ecosystem charges on tourists (see Section 6.1 above), or equivalent, this could be used to subsidise the environmentally-friendly tertiary treatment that would provide for St Helena's blue economy.

For Ruperts Valley, the sewerage system has been approved; there is just a need to procure and connect the treatment facility. This is expected to be completed during FY2021/22.

Rockfall protection

This project not been included in this Infrastructure Plan. It is already underway and is due for completion by mid-2020.

Micro-projects under EDIP-1(2020/21)

A Psychiatric Intensive Care Unit (PICU) will be developed via renovation works at the hospital. Additional micro-projects include a covered area at St Paul's primary school, a walkway (footpath) at Longwood, and public toilets at Longwood and Levelwood. A budget of £150,000 per year in Years 2 and 3 of EDIP is provided for these projects.

Other projects under EDIP-1

A number of smaller projects are already underway and/or completed. They include improvements to ICT, Judicial relocation and an outstanding payment to Royal Haskoning. Any additional projects should be aimed at the safer, healthier, greener and better place for children and young people development pillars of the 10-Year Plan.

Non-EDIP Projects

Electricity

With the imminent signing of the Power Purchase Agreement between SHG/Connect and PASH, the supply of adequate, reliable and affordable electricity is assured, with the aim of increasing the percentage of renewable energy sources to 100% by 2022. There is therefore no additional public-funded project in the CP for electricity.

Other-projects

For the Government Landlord (Social) Housing at Bottom Woods, it is expected that the I&T Directorate will fund the provision of services and housing units from the housing revolving fund, these housing units can be connected into the existing wastewater system. See also additional Longwood / Bottom Woods utilities under Component A, 2nd Priority EDIP.

Water security

Connect has already identified number of projects aimed at strengthening water security by way of improvements to spring extraction (Chubbs) and enlarging reservoirs. They have included Levelwood reservoirs in their current list of projects (see page 51 of this report), but that is deemed to be a lower priority. Higher priority projects are those that help address the water shortage on the west side of the island, so enlargement of Harpers is included in the Capital Programme to be funded under EDIP, but not Levelwood. The works at Levelwood can be funded later when the shortages at Redhill have been addressed.

Component B: Economic Development

1st Priority Projects

EDIP Phase 1 (EDIP-1) Projects

Connectivity

The PMU, through its own in-house resources, is designing the container-handling facility at Ruperts. Along with associated works, there is an estimated cost which will be improved when the detailed design has been completed and a bill of quantities has been prepared.

Major roads and bridges

The upgrading of Field Road and Side Path (i.e. the "R2" project) is related to the improved connectivity objective of the Rupert's project. In 2016 WSP had estimated £4.1 million for this project, but the design at that time addressed a requirement of bringing full containers from Ruperts to Jamestown. Now that containers will be "de-stuffed" at Ruperts wharf, the R2 upgrading works can be reduced in scale. The design for these revised works has yet to be done.

Productivity (agriculture)

Increasing the local supply of eggs and meat products is an important part of the import substitutions stated in the SEDP. Funding has been included in the CP to enable a range of productivity initiatives proposed by the ENRP.

Tourism/heritage infrastructure and James Bay waterfront

The Bicentenary of Napoleon's death in May 2021 is an important event for St Helena. A large number of tourists are expected and a lot of work needs to be done for the island to show itself to the world via the possibly global coverage of this event. It is a chance for St Helena to promote itself worldwide. The works are mostly small and varied, ranging from the whole route from Jamestown to Longwood House[7] and getting Bertrand's Cottage operational again, improving the green at Longwood, tidying up the tomb and surrounding areas, and the Jamestown facia including the waterfront. Nominal amounts have been included in the CP for some of these activities, but SHG needs to survey the full range of activities and commence works very soon if it is to complete everything in time. The end of February 2021 should be a target date, thereby making sure that the island is ready at least a month or so before any tourists arrive for the Bicentenary. The private sector in Jamestown should also improve their façades, particularly Main Street and Napoleon Street.

1st Priority Non-EDIP Projects

Connectivity

The cable-landing station is part of the CP, but will be funded from EDF-11. The cost is not yet known.

[7] Any improvements to Longwood House itself would be the responsibility of the French Government, which SHG will need to prompt and coordinate

Digital land registry

The land register is still a paper-based system. All records need to be digitised to improve efficiency and to provide for a safe electronic copy to be stored in a separate location. No cost estimate is yet available for these works.

Waterfronts: further improvements to James Bay

As mentioned in earlier, the diving and game-fishing tourists are big-spenders and must be the first tourist groups to be targeted by SHG. With some momentum for improving James Bay waterfront inspired by the Napoleon Bicentenary, the works should continue in order to improve the whole marine-user experience. The aim should be to get the facilities at the waterfront to world best standards as quickly as possible so that all marine tourists will receive a high quality experience and St Helena will begin to be promoted globally as a 'go to' destination for diving and game-fishing. Council must make swift decisions to enable SHG to put in place projects to improve the waterfront experience at James Bay, including projects that could be funded by the private sector.

Designs for these works need to be developed and then costs can be added to the CP.

In addition to improving James Bay for marine tourists, it should also be improved for land tourists; i.e. tourists who would be undertaking land-based activities and who would want to relax at James Bay waterfront in the evening. Although the Colliers report (2019) has not been accepted in full by Council, there are some suggestions in the report that merit consideration for implementation as soon as possible. For example, works to enable re-use of the customs building can commence as soon as the customs operations are moved to Ruperts. The Yacht club could be leased long-term in a similar manner to other Chief Secretary properties to remove the financial burden from SHG and to enable the club house to be renovated attractively and to increase the economic activity at the waterfront. A suitable bar/restaurant at the lower wharf could be aimed at the higher-end game-fishing people. The Mule Yard could also be improved, especially for local residents to make it a more family-friendly experience.

Component A: Social Development

2nd Priority Projects

EDIP Phase 2 (EDIP-2) Projects

Education campus

This project contributes towards making St Helena a better place for children and young people. SHG is considering development of a campus that would bring all three current primary schools into a single purpose-built campus near Prince Andrew's School. The idea is just at conceptual stage, so no preliminary designs have yet been prepared. A brainstorming session between the PMU's architect and the education department could identify the general range and size of buildings and other facilities and a preliminary budget figure developed using per square metre rates, etc. A 20% contingency should be added to such broad estimates. The contingency can be reduced as the designs are gradually developed until 10% is applied at tender stage. For the CP, depending on capacity in the PMU, some design works could be carried out in Year 3 of EDIP-1 and then the main budget for construction works to be included in EDIP-2.

Wastewater at Longwood and Bottom Woods

Although it is expected that the I&T Directorate will fund services (access roads, etc) for the social housing units and these houses will be connected to the existing wastewater system, new wastewater facilities will be required for the main CDA. It is proposed to fund these works from EDIP-2.

Fire station

This is one of the projects that has been deferred since the mid-2000s. The current allocated site is at Alarm Forest, but the site needs improvement works to make it suitable, as does the road access to/from the site. It is not an ideal site in terms of its distance from the two main residential areas (Jamestown and Half Tree Hollow) and consideration should be given to how the "altogether safer" development pillar would be addressed by a fire station at Alarm Forest. Until a site has been finally decided and at least preliminary designs are available, there is no reliable cost estimate. Hence, this project is in the 2nd priority social development projects.

2nd Priority Non-EDIP Projects

Prison

The prison has also been deferred many times, but a site has now been agreed at Bottom Woods. It is expected that the project would be funded by the UK Government's Foreign & Commonwealth Office (FCO).

Healthy aging

This project is to provide suitable care facilities at Sundale, including the relocation of some care services to the aged from the Community Care Centre at HTH.

Safer roads

Protection of the investments made in the road network is addressed under Component A projects for Economic Development. In addition, as part of the altogether safer pillar, there is a need to improve safety on the road network. Easing some of the bends, pull-outs from residential roads, and white lining and signage would be relatively low-cost improvements to road safety.

Sustainable quarrying

This addresses the greener development pillar, although it does have economic implications. At this stage, it is understood that this project is largely a matter of SHG issuing suitable sustainable policies to guide future quarrying operations on island. However, some laboratory testing might be required to prove the engineering properties of stone at various locations around the island before the policies can be completed. No budget estimate has yet been prepared for this project.

Other projects

The greener vehicles initiative is largely a matter of developing appropriate policies and implementing them. The same is the case for affordable local transport. It is not expected that these projects would include any physical infrastructure measures, but consideration should be given to private sector funding for meeting any associated capital costs.

Parking solutions mostly apply to the Jamestown area. These solutions will require some capital investment but are not a high priority, so parking solutions are included under the 2nd priority social development projects within the CP.

The second priority CDAs include Half Tree Hollow. It is expected that this CDA will be a private sector development, as is the case for the new housing at Bunker's Hill.

Component B: Economic Development

2nd Priority Projects

EDIP Phase 2 (EDIP-2) Projects

Tourism / heritage infrastructure

Tourism is the core economic sector for St Helena's future economy. If resources were available, improvements to the island's primary tourism products should already be underway. However, the capacity for surveying, designing and implementing improvements to the built heritage will require some specialist skills that may take time to arrange. Past surveys need to be updated and a programme for renovation works developed. Some items will be relatively small and can be undertaken and completed fairly quickly. These must be coordinated with the museum and other bodies. The projects should address the various story lines of St Helena's history:

- discovery and early settling, continuing through the sail-ships days (East India Company, etc)
- cultural and economic history
- military history, including Napoleon, the Boers, etc
- astronomy (link to the Dark Skies initiative)
- other specialist areas

The tourism infrastructure improvements should make clear the unique ecosystems on island and this leads to the living laboratory initiative (see below), which can add to the visitor experience.

No cost estimates for these initiatives have been prepared. Some consultancy advice will likely be required and these costs should be included in the CP along with the capital works.

Business facilities

The living laboratory will help to identify and research the unique terrestrial and marine ecosystems of St Helena. These will be part of the island's main tourism products and need to be clearly identified, managed and protected. A preliminary assessment of laboratory research requirements needs to be undertaken to determine whether, for example, part (or all) of the existing customs building can be developed into a living laboratory, which might require large water tanks. Alternatively, this could be part of the wider redevelopment of the waterfront with large water tanks being constructed in the moat. The laboratory will need to find and secure a stream of funding for its ongoing work. This could be achieved by a mixture of funding from universities (with research students staying for periods on island), grants from other societies, and a visitor centre where charges should cover its operations and maintenance while also contributing to the research work.

Bishop's Bridge

The WSP study of highway structures in 2016 identified a range of works across the network, but separate site inspections have revealed that they under-assessed the works to be done at Bishop's Bridge. A site survey for the Infrastructure Review in 2006 had suggested that the bridge needed to be replaced. WSP just suggested replacing two outer steel beams. However, these (along with the inner three beams) support a 320 mm thick reinforced concrete deck. A more durable solution, instead of replacing with new steel beams, would be to use concrete: either prestressed concrete beams, or even a simple reinforced concrete deck.

Another alternative, and much lower maintenance, would be to install a large concrete pipe culvert (1.5 or 2 metres diameter), so that it can be easily cleaned if a storm were to cause branches or rocks, etc to be lodged in the pipe. Whichever solution is adopted, it is recognised that this is a heritage structure (with a story), so the heritage appearance should be retained by rebuilding the existing bridge parapets/pillars. A nominal amount has been allocated in the CP since no design has yet been prepared. Works to other small bridges could be included.

Connectivity (Ruperts Wharf – Phase 2)

The need for any further development work at Ruperts can be best assessed after the Phase 1 works have been completed and has been in operation for a while. Consequently, no budget estimate is included in the CP at this stage.

Non-EDIP Projects

Tourist accommodation

The tourism studies have made clear that St Helena needs to develop its tourism for the low-volume, high-value tourist segments. More higher-end accommodation will be needed, but also more good quality mid-range accommodation. Consideration may be given to converting the Castle into a high-end hotel and other new guesthouses and hotels could be developed across the island, including the conversion of heritage buildings (with suitable controls on type of renovation and type of use). These works should be encouraged with the private sector, domestic and inward investors. Until the extent and type of works are identified, no budget figures are available for inclusion in the CP.

Asset management

A large national asset in which huge sums of money have been invested is the roads network. The Roads Section had prepared a business case for funding the reinstatement of large sections of the network. That request was denied and a smaller project has been developed that would at least arrest the deterioration of road sections that are in danger of swiftly becoming unmaintainable. This would entail the Transport Section procuring a slurry machine which they would then manage and maintain. The Roads section would rent the machine from Transport, but the Roads Section would need a capital budget for materials. They would also need additional manpower (three people) if the other road operations are not to be affected by the redeployment of staff. A budget of £300,000 has been allocated to Transport for procuring the slurry machine and £362,000 per year for three years to protect the road network investments.

Asset management (protecting infrastructure investments)

In addition to roads, other infrastructure investments also need protecting, ranging from utilities to buildings and civil structures. The costs of protecting utilities is deemed to be covered in the tariffs charged to utility customers. The costs for regular maintenance of buildings should be included in recurrent budgets (as for all infrastructure, but the lack of maintenance in recent years means that some infrastructure items now require extensive repairs. Surveys need to be undertaken to ascertain the extent of such repairs and suitable amounts included in the second priority budgets of the CP.

Waterfronts

With Ruperts Bay being developed primarily as the industrial port and James Bay wharf upgraded (largely via the CP priority projects, but also the business facilities under the second priority social development initiatives), attention can turn to Sandy Bay. Again, consideration must first be given to what kind of facilities are to be developed. While SHG may develop the master plan for Sandy Bay development, the private sector should undertake the investments and develop new businesses in the area. No budgets are included in the CP Until the master plan has been developed and initial investments can be estimated.

Business facilities

A study is required into the nature and extent of business facilities that could be developed at Bradley's camp after the current covid situation. However, there are reports from world specialists that corona-like viruses are expected to be around for many years, until suitable vaccines are developed. This can be reviewed in the coming years and then a decision can be made whether to maintain Bradley's as a quarantine facility, or to re-use it for business facilities and develop a business park in the area.

Productive work force

This refers to the initiatives in the LMS, for example Career Access St Helena (CASH). This might require some capital investment in facilities, but consideration could be given to re-using the ESH facilities at Half Tree Hollow.

SHG offices

The 2008 Infrastructure Plan included suggestions for the gradual evacuation of SHG offices from lower Jamestown to make way for new residents and/or businesses, particularly businesses in the tourism sector. The intention is to generate vibrant town life in the evenings and weekends, in addition to during the working day. Current businesses in Jamestown rely very much on the trade they receive from SHG staff during the working week, so plans for further moving of SHG offices out of lower Jamestown should be done apace with increasing tourism and/or increased residency in the lower town area. As such, this project is expected to take place towards the later stages of the capital programme.

Smaller economic development projects

The SEDP includes a proposal for St Helena to develop ship registry facilities as part of its growing and diversified economy. The SEDP also includes suggestions for sailing qualifications (non-sailing boat qualifications and diving qualifications could also be introduced). No cost estimate has yet been developed for these activities.

Capital Programme operating costs

PMU operating costs

The Capital Programme Manager (CPM) and Executive Assistant are SHG full-time staff and their costs are included in the recurrent budget. However, the costs of equipment and consultancies need to be supported from the CP and these should come from EDIP. A nominal amount has been included to cover the costs of the technical team. This equates to 7.5% per year of the average annual EDIP funding (£5M per year average) and is in line with the typical figures to be expected for the planning, design and supervision of large capital programmes (which are usually up to 8%, but can be as much as 12% if significant full-time site supervision is required and/or specialist services).

If EDIP only extends to March 2025, then another source of funding would be required to cover PMU non-recurrent expenses thereafter.

DFID costs

DFID has stated that an allowance should be made of £100,000 per year for its costs associated with the EDIP programme. It is not yet clear what DFID expects to included under these amounts.

Impact of Covid-19

The covid-19 crisis has prevented most people from travelling to/from St Helena and the impact is expected to continue for much of 2020, and possibly beyond, albeit at a reduced level. It has also affected deliveries by ship of building supplies (and grocery items). A continuation of covid-19 (or other corona-like situations) could impact the timely arrival of consultants, overseas contractors, and/or delivery of construction materials and equipment. Advanced planning may be possible for some projects so that offshore items are procured earlier than would normally be done. SHG might need to procure a larger than usual supply of building materials (provided that there is sufficient capacity on the ship and sufficient suitable storage on island) to counter the reduced frequency of ship journeys between Cape Town and St Helena.

6.3 SHG capacity for implementing the Capital Programme

The human resources currently engaged in the PMU include:

- Capital Programme Manager
- Executive Assistance
- Chartered Engineer
- Architect
- National consultants

The current large projects within the capital programme are the Ruperts container facility and the Field Road (R2) upgrading. The remaining projects of EDIP Phase 1 are relatively small, but they still require full programme management, planning, design, procurement oversight, and supervision of the works on site. There is also the need for procuring and overseeing specialist consultancy services for aspects of planning (including feasibility study work) and design.

Along with ad hoc international consultancy support, the current resources are considered to be sufficient for delivery of the EDIP Phase 1 programme.

Appendix A

Terms of Reference

TERMS OF REFERENCE

Supporting the Government of St Helena in preparing a Strategic Plan for the Economic Development Investment Programme (EDIP)

Date: March 2020

1. Background

1.1 The island of St Helena is an internally self-governing Overseas Territory of the United Kingdom located in the South Atlantic approximately 4,000 miles from the UK. The Government comprises a Governor (who is appointed by the Crown) an Executive Council, which has the general control and direction of Government, and a Legislative Council. The Governor retains responsibility for internal security, external affairs, defence, the public service, finance and shipping.

1.2 The island's population is around 4,500 and it has a typical small island economy with a high import dependency, a narrow economic base, a large public sector (around 790 staff), and significant outward labour migration. St Helena receives UK Government financial assistance to support recurrent and capital expenditure as part of their obligation to ensure that the reasonable needs of the population are met.

1.3 The 10 Year Plan for St Helena captures the following National Goals:

Altogether Safer
Altogether Healthier
Altogether Better for Children and Young People
Altogether Greener
Altogether Wealthier

The plan will improve joined up thinking, focus, and crucially reflect the views of the community. This can be found here: http://www.sainthelena.gov.sh/wp-content/uploads/2012/08/10-Year-Plan-20-January-2017.pdf

1.4 The Prospectus for Change, launched in December 2015, is a three year plan which sets out St Helena Government's Goals and Strategies for making the public service a great place to work, while ensuring customers experience the best possible service. This can be found here:
http://www.sainthelena.gov.sh/wp-content/uploads/2012/08/Prospectus-for-Change-Final-Nov-2015.pdf

1.5 The vision and mission that has been agreed for the Public Service and which will be incorporated in future plans and strategies are as follows:

Vision – A great place to work and do business with

Mission – Provide Services that are responsive to the needs and expectations of the people of St Helena, by taking account of their views in decisions on the design, delivery and performance of services, and by working with our colleagues to create an environment that encourages everyone to do their best.

1.6 Commercial flights to St Helena commenced on 14 October 2017. It is hoped that the tourism activity resulting from this will significantly enhance St Helena's economic

prospects and have a dramatic impact on the island community, bringing a period of accelerated social and economic change. Achievement of the Goals and Strategic Objectives will require sound management and transformation of the public sector to make it a professional, modern, and flexible organisation able to initiate and respond to change.

1.7 SHG is implementing a modernisation programme that will enable the Public Service to improve its delivery of the government's developmental objectives. Central to this programme has been the re-structuring of Government functions and directorates. There are currently six directorates reporting to the Chief Secretary who is the head of the Service; Education and Employment, Health, Safeguarding, Environment Natural Resources and Planning, Infrastructure and Transport and Corporate Services. The Police Service reports to the Governor.

1.8 An independent economic analysis undertaken in 2018, has made a persuasive case for a refreshed economic development investment programme, contributing to a vision of growing volumes of visitors and trade, improving economic performance alongside social investment and a modern and effective Government on the island.

1.9 Investment in critical infrastructure is required for economic development and expansion of the private sector in order to grow revenues from taxes. Current low revenue potential constrains the St Helena Governments (SHG's) ability to undertake infrastructure development without UK financial assistance.

1.10 The UK Government will provide up to £30m, £15m committed for the next three years (2019/20 – 2021/22), followed by a break point review to unlock the remaining £15m investment indicatively planned for the following three years (2021/22 – 2024/25).

1.11 The programme commenced in 2019/20, and DFID will be undertaking an annual review in the next three months. However it has been recognised that there is no strategic plan underpinning the EDIP.

2. Key Objectives

The key objectives of the consultancy are to:

2.1. Develop a vision (future state) for the programme
2.2. Develop a strategic plan demonstrating programme outputs, capabilities, outcomes and benefits to be achieved
2.3. Develop an infrastructure report/plan for year 2019/20 – 2024/25.
2.4. Support PMU with the delivery of the prioritised capital programme
2.5. Coordinate with relevant SHG Directorates and external organisations to progress the implementation of the prioritised projects of the capital programme

3. Scope of Work

3.1. The main duties will include but not limited to:

- Disaggregation of plans to determine what is to be achieved within six years
- Identify Infrastructure needs to achieve the six year objectives
- Review the current state of infrastructure and identify shortfalls in capacity (amount of infrastructure) and service level delivery (reliability and quality, hence lack of maintenance)
- Continue and complete current state assessment of infrastructure

- Identify the 'infrastructure gaps' between what is required and what is currently available
- Review the 'gap' and develop into a set of sector-wise infrastructure projects; consider economics of scale for efficiency, cost savings.
- Identify current infrastructure costs and maintenance costs in conjunction with SHG, (Programme Management Unit, Infrastructure and Transport, and Connect Saint Helena)
- Agree parameters for prioritising across infrastructure sectors
- Develop prioritised six-year programme of work
- Agree six-year plan with SHG
- Develop plan into a draft report
- Develop concept designs for the top priority projects, ensuring that the solutions represent VFM
- Provide technical and project management support to the Programme Management Unit on the Capital Programme including specifically the DFID funded economic Development Investment programme (EDIP)
- Review and provide comments on draft Business Cases, prior to seeking donor approval
- Review and provide comment on the EDIP Logframe.
- Review the data and designs for the Field Road and Side Path road rehabilitation project.

4. Support to National Goals and Strategic Objectives

NATIONAL GOAL	STRATEGIC OBJECTIVE	CORPORATE SERVICES OBJECTIVE
Effective Infrastructure	Ensure effective investment in physical infrastructure, including improved access to and around the island	Improving the infrastructure of St Helena Island.
	Effective, Efficient and Accountable Public Sector	
Altogether Wealthier	Ensure sustainable economic development	

5. Qualifications and experience

The Consultant will be expected to have the following qualifications and experience

- chartered civil engineer status or equivalent planning affiliation;
- experienced Programme Manager with at least 15 years relevant experience of leading complex infrastructure programmes
- experience in managing a small multi-disciplinary public works department;
- knowledge and experience of working with small island economies;
- Knowledge of St Helena and its context useful, rather than essential
- experience in developing infrastructure masterplans;
- cost estimation for major civil engineering and building works;
- an ability to work closely with local government
- Strong communication / negotiation skills

6. Outputs, Timing and Reporting

- The Consultant will report to the Chief Secretary, however will provide weekly updates on progress to the Capital Programme Manager
- All reports referenced in 2.1-2.3 must be completed by 01 May 2020.

Appendix B

Composition of the Capital Programme

(linkages between interventions and the development pillars)

Composition of the Capital Programme (Components A and B)

	COMPONENT A. SOCIAL DEVELOPMENT	COMPONENT B. ECONOMIC DEVELOPMENT
	10-Year Plan: Altogether safer, healthier, greener and a better place for Children and Young People	**10-Year Plan:** Altogether wealthier **SEDP:** increasing exports; import substitution **IER (2030):** visitor economy
1st Priority projects	• **water security** • **wastewater management** • **CDAs (utilities and private sector)** • **electricity from all renewable (green) sources** • **safer roads** (ease bends, widening, lining, signs) • micro-projects (particularly contributions to safer, healthier)	• **cable-landing** • **Ruperts Wharf (container-handling facility)** • **upgrade Field Road and Side Path** • **agricultural productivity** • **waterfronts** • **infrastructure maintenance (protecting previous investments)**
2nd Priority projects	• education campus • healthy aging • fire station • prison • sustainable quarrying • micro-projects (contributions to better place for children and young people, greener)	• tourism/heritage infrastructure (including Jamestown facia) • *tourist accommodation (private sector investments)* • *Bradley's Camp, business workspace, light industry (utilities and private sector investments)* • living laboratory • protecting infra investments (roads/bridges, etc) • SHG offices • parking solutions

Appendix C

Strategic Plan (2020 – 2030)

(submitted as a separate document)

Appendix D

Covid-19: scenario considerations

(potential impacts on the SHG Capital Programme)

Assessment of possible scenarios for Covid-19, the impacts on St Helena, and implications for SHG's Capital Programme *Covid-19 and its impact on the world and on St Helena*

The covid-19 pandemic is still evolving, but already the main social, political and economic impacts are clear. In places of medium to high covid-19 incidences, close social interactions are starkly reduced, including the closing of places where people would normally be in close contact, such as places of work, restaurants, and places of entertainment. Close contact on public transport (land, sea and air) is almost eliminated and outside movements are restricted. Lockdowns have been imposed in most countries with the notable exception of Sweden. Lessons have still to be learnt in terms of the most effective ways to control the spread of covid-19.

A vaccination against the virus has yet to be found. Human trials might start later in 2020, but even after a successful vaccine has been developed, it will take time before it can be produced and distributed in large quantities. Academic and medical papers suggest that it could be 2022 before extensive vaccinations can be undertaken. Meanwhile, there is already a growing tide of public opinion against forced vaccinations and forced lockdowns.

Perhaps due to the relatively new nature of covid-19 and the fact that it displays different characteristics to other recent pandemics, there are not yet many academic and medical papers online that speculate about the possible future of the virus. Online extracts of research papers have been found from Imperial College (London, UK), John Hopkins University (USA), University of Hong Kong, University of Minnesota (USA), and the University of California (Los Angeles, USA). Epidemiological modelling from these institutions suggest there is fear of a second large wave of covid-19. Some predict it will be even larger than has been witnessed in the first part of 2020, similar to what happened with the Spanish flu in 1918 and 1919. The influenza pandemics of 1957, and 1958, and the swine flu in 2009 saw a similar pattern: an initial moderate outbreak, an easing-off, then an explosive recurrence about six months later, followed by smaller (largely seasonal) peaks. It is hoped that, learning from those experiences, scientists will suitably advise governments and the public will respond in a manner to limit that second, potentially larger, explosion. But human nature and the demonstrations in western countries (Europe, UK and the USA) suggest that even expert advice and sober actions by governments may be ignored by too many members of the public to avert a second large set of incidences.

Four main models of government action and public response have developed during the first part of 2020:

i. Strictly enforced lockdowns were imposed by eastern Asian governments (e.g. China and neighbouring countries). Strict government controls were imposed, albeit somewhat late, so virus cases were reduced relatively quickly.

ii. Europe has witnessed varying degrees of lockdown. Widespread testing and incidence tracking have been shown to be crucial to minimising new cases. Public response to government lockdowns has varied, so incidences have grown much higher and it has taken longer to contain the virus.

    Measures in the USA are a mixture of mainland Europe (excluding Scandinavia) approaches; when comparing the populations of the USA and Europe (including the

UK) the number of cases are similar in terms of percentage of total population.

iii. The Scandinavian model of less-controlled lockdowns has had better results than most of Europe. The public sense of responsibility has been relied on for social-distancing, particularly in Sweden, and the virus has been controlled more effectively than most of Europe (except Germany, which has demonstrated the effectiveness of swift lockdown and extensive testing).

iv. Across Africa, and in South America and South/Southeast Asia, governments have imposed wide-spread lockdowns enforced by the police, the military, and even vigilante groups. There has been relatively little testing and tracking of cases. The main populations in these poorer countries have had to risk exposure in order to earn money for food, etc. Reports suggest that the pandemic has yet to reach it first peak in these countries, but the poor reporting of cases might already be under-estimating prevalence of the virus in many areas.

The St Helena model has been a combination of the UK and European responses. Potential cases in mid-March were quickly traced and placed in home isolation. In addition to isolation and social-distancing measures, quarantine facilities were prepared near the airport to accommodate any suspected cases and new arrivals to the island. The island has remained covid-free, but there has nonetheless been mixed reactions from the public with respect to social distancing. A law was passed to enforce isolation of suspected cases. Police enforcement of social distancing and isolation measures has not been necessary. Some businesses have closed, while others have stayed open and relied largely on the public respecting social-distancing. Scheduled international flights ceased due to factors beyond the control of St Helena (e.g. the national lockdown in South Africa). Cruise ship visits have been cancelled and restrictions have been imposed on yacht arrivals. St Helena has to a very large extent been physically isolated from the pandemic. But it has not been isolated from the economic and social impacts.

The Statistics Commissioner estimated potential impacts if the virus were to arrive in St Helena, based mostly on data supplied by Public Health England, with input from the epidemiologist assigned to work on Overseas Territories. Details can be found in his paper that was presented to IEG.

The future of covid-19 will have an impact on St Helena and could constrain its ability to achieve its Vision 2030. The purpose of this appendix is to consider how various covid scenarios might impact the island and what the implications might be for the 2020-2030 Infrastructure Plan.

Possible scenarios for the evolution of covid-19

One way of considering the possible socio-political and economic impacts of covid-19 is the approach developed by Deloitte in April 2020. This approach considers the current trends and five critical uncertainties:

1) The overall severity of the pandemic and the pattern of disease progression
2) The level of collaboration within and between countries
3) The health care system response to the crisis
4) The economic consequences of the crisis

5) The level of social cohesion in response to the crisis

In this approach, the first two uncertainties are modelled as follows:

overall severity of the pandemic and pattern of disease progression:

lower impact				higher impact
Rapid Peak The virus's spread shows a rapid peak before quickly declining	**Self-dampening** Rapid exposure across individuals leads to eventual herd immunity	**Gradual progression** A gradual and prolonged spread and development	**Roller-Coaster** Seasonal waves of the virus with decreasing degrees of severity	**Second Act** A second wave of infections emerges, stronger than the first

level of collaboration within and between countries:

significant	marginal
Coordinated response • Nations "think big and act fast". Effective collaboration within and between countries helps to contain the virus's spread through coordinated strategies and best practices • Coordination to reduce mobility of people and slow transmission • Proactive measures by public institutions to prevent future widespread viruses	**Weak and divided response** • Lack of coordination among governments and institutions to provide supplies and resources required to prevent the virus's spread • Lack of accountability and breakdown in communications and information-sharing • Insufficient and uneven response to effectively address mobility of people carrying the virus

The uncertainties are applied to determine which of the following four distinct scenarios might emerge based on current trends. These are shown below:

The passing storm	Lone wolves
The pandemic is managed due to effective responses from governments to contain the virus, but is not without lasting repercussions, which: **disproportionately affect SMBs and lower- and middle-income households/communities** • Relatively constrained disease dynamic • Effective health system and policy response	Prolonged pandemic period, spurring governments to **adopt isolationist policies**, shorten supply chains, and increase surveillance • Severe, rolling pandemics • Insufficient global coordination and weak policy responses
Good company	**Sunrise in the east**
Governments around the world struggle to handle the crisis alone, with **large companies stepping up as a key part of the solution** and an acceleration of trends toward "stakeholder capitalism" • More prolonged pandemic • Collaboration to control the pandemic led by large companies	**China and other east Asian nations** are more effective in managing the virus and take the reins as **primary powers on the world stage** • Severe pandemic • Collaborative health response led by East Asian countries

The four scenarios are considered against five additional uncertainties (societal impacts, technology, the economy, the environment, and politics) to consider how the world could unfold after the crisis. This approach provides an indication of the possible societal, political and economic scenarios post-covid. Deloitte does not conclude its paper by suggesting that any one of the four scenarios is more likely than the other. It just advises that governments and organisations should suitably prepare themselves for any one of the outcomes.

The passing storm	Lone wolves
• Governments effectively communicate the severity of the pandemic and collaborate to share best practices • No indications of a second wave of the virus are identified. Mechanisms to combat the virus (such as immunisation) are mobilised and lead to effective prevention and treatments in the long run • Economic activity rebounds in late 2020. Recovery is initially slow, but speeds up in the second half of 2021 as consumers become more confident	• The SARS-Cov-2 strain that causes the covid-19 disease continues to mutate and evolve, evading eradication • Citizens cede freedoms to governments in the name of virus containment • Countries deemphasise working together and enforce isolationist policies • Governments turn to extreme surveillance and monitoring tools • Global economic recovery by mid-2022, with diverging rates of recovery across countries
Good company	**Sunrise in the east**
• Businesses take the initiative to combat the virus's spread by supplying health care expertise and enhanced software and tools • A shift toward greater corporate responsibility is seen, with new long-term outlooks leading to greater emphasis on investing in workers and communities • Economic recovery begins in late 2021. Recovery slow in early 2022 and speeds up by the second half of 2022	• East Asian countries emerge from the recovery period with less economic impact than the rest of the world • China significantly ramps up foreign direct investment efforts, bolstering its global position • People accept greater surveillance mechanisms as part of the public good • Economic recovery begins in late 2021, with notably quicker and more robust recovery in the East

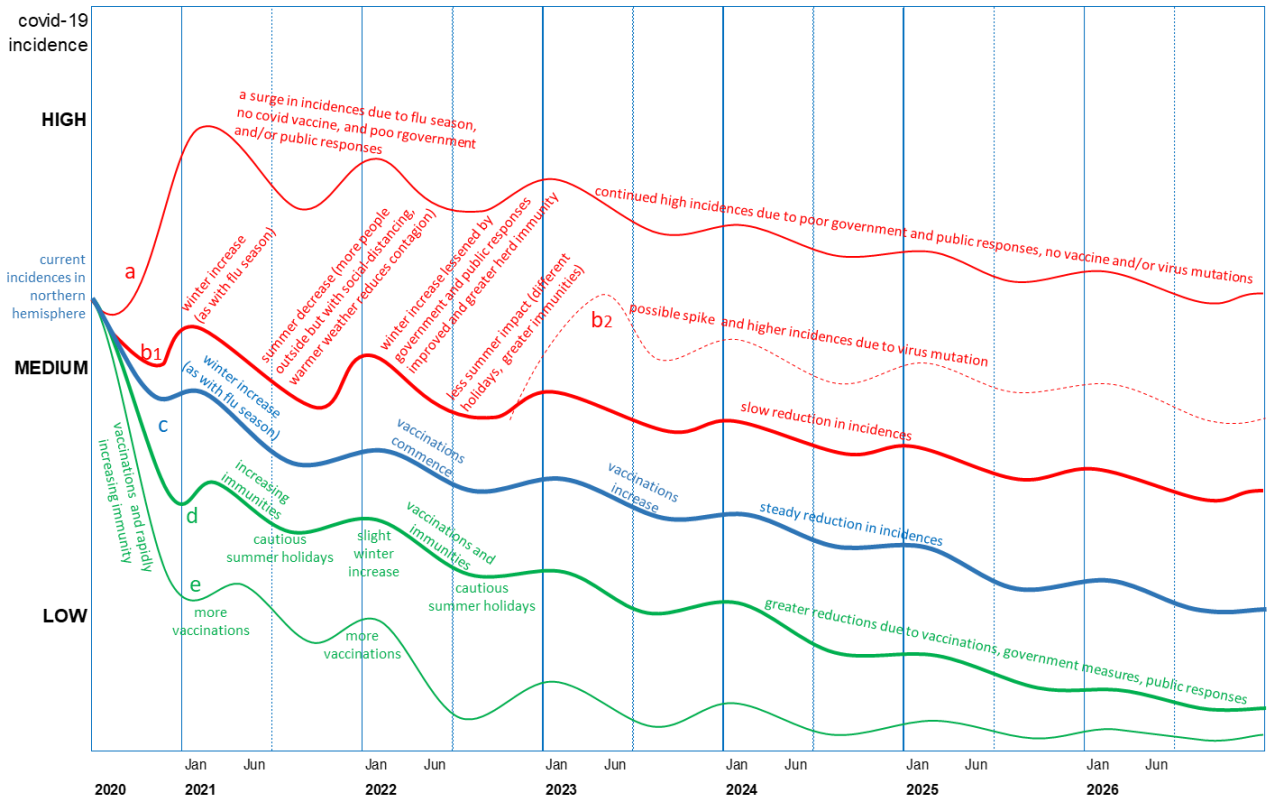
For each of the four scenarios it is the last bullet point in each cell of the table that suggests the most likely impact on St Helena and the implications for infrastructure demand up to 2030. The impacts on St Helena can be summarised as follows.

	2020 H1	2020 H2	2021 H1	2021 H2	2022 H1	2022 H2
Passing Storm	pandemic recedes	initial recovery	slow recovery	recovery speeds up		
Good company	pandemic continues	pandemic continues	pandemic recedes	initial recovery	slow recovery	recovery speeds up
Sunrise in the east	pandemic continues	pandemic continues	pandemic recedes	initial recovery	faster in the east	
Lone wolves	pandemic continues	pandemic continues	pandemic continues	pandemic recedes	global recovery	varying rates of recovery

Based on these scenarios, it would appear that substantial tourism would be unlikely to recover significantly until at least the year after initial recovery. The impact on St Helena would likely be that it could not expect a significant recovery in tourism until at least its 2022-23 season. With continued good management of covid prevention measures, SHG could begin promoting itself in 2021 as a safe (virus-free) tourist destination, with the aim of commencing tourism growth from late 2022. However, for a significant economic recovery in St Helena, the global situation would have to be one where either corona-type viruses have been largely eradicated (as achieved with SARS) or all international airports have appropriate screening in place before passengers travel. This would avoid the need for

quarantining at business and holiday destinations, including St Helena. St Helena will nevertheless be impacted by the actions taken by other governments. The impacts will not be limited to tourism; the lockdown in South Africa, for example, is affecting the availability and cost of goods imported to St Helena.

Another way of modelling covid-19 scenarios is to consider the epidemiological research and the social and economic impacts that this implies. The figure below illustrates a number of possible ways in which the covid virus could evolve. At this time, there is no agreement among the scientific and medical communities on a single definitive scenario. The problem is that the epidemiological spread of the virus is not easy to model. The rate of spread is known and it is nearly ten times more lethal than a normal influenza. Self-isolation will not stop the disease, but it will reduce its spread and reduce the strain on health care systems. The risk of a second, larger wave of incidences is greater in some countries than in others.



a. a surge in covid-19 due to the usual flu season, no vaccine and the public wanting more freedom and/or economic activity, virus(es) continue at medium to high rates of incidence

b1. slower rate of getting covid-19 under control, evolving into a longer-term slow reduction with medium to low incidences

b2. a surge in virus cases, perhaps due to a virus mutation in response to vaccinations against covid-19; government and public respond with increased caution, but incidences continue at medium levels

c. covid-19 at medium to high incidence levels in mid-2020, reducing via government measures, growing immunities and then vaccinations from about 2022, incidences reduce towards consistently low levels within a few years

d. covid-19 brought under control more quickly, perhaps due to improved ways of working and socialising, virus adopts a seasonal pattern, like other flus; with the aid of vaccinations and increasing immunities (perhaps following the Scandinavian governments' approaches) the longer-term incidences are quite low

e. a swifter introduction of vaccinations and/or stricter government controls results in more rapid reduction in incidences, greater reliance on vaccinations, new ways of working/socialising and public interaction (public spaces and public transport, etc); the rate of incidences is swiftly brought down to and maintained at very low levels

Scenario (a) seems unlikely since measures to date across the globe have shown that the incidences can be significantly reduced with appropriate measures. However, the efficacy of these measures depends on the degree to which the public in developed countries continue to accept a reduction in economic activity (and consequent adverse impact on livelihoods) and the degree to which people in under-developed countries are able to survive with greatly reduced incomes. Scenario (b1) is therefore more likely than scenario (a). That is to say, some government measures and some positive social reactions will reduce incidences of the virus, but a mutation and new outbreak (b2) could result in a surge in incidences before being brought under control.

Scenario (c) appears to be the most likely scenario at present, with a vaccine unlikely to be widely available until at least early 2022. The first autumn/winter surge in incidences in late 2020 could be much higher, if there is an explosive second wave similar to the Spanish flu, the 1950s influenzas, and SARS in 2009.

More optimistic scenarios are shown as (d) and (e). These include the possibility of a vaccine being developed and produced in sufficient quantities much sooner than medical experts currently think will be the case, more cautious social/working and holidaying practices adopted by the general public, and swifter rates of herd immunity. A more Scandinavian-like approach by western governments and populations, perhaps combined with more Germany-like testing/tracing could also results in scenarios (d) or (e).

How these scenarios might impact St Helena

St Helena's Vision 2030 aspires to a vibrant economy comprising two-thirds tourism (approximately £10 million per annum) and one-third (£5 million per annum) among other sectors. The economic vision and a much larger population rely on unimpeded movement of people and goods. The table below summarises the possible impacts on St Helena for each of the medium- to longer-term scenarios. The assumed impacts draw on suggestions in the various documents from academic/medical institutions and the Deloitte study.

medium / long-term scenario	possible impacts on St Helena
scenario (a) High incidences in Europe, UK South Africa closed to international arrivals. **No significant economic recovery for St Helena**	• International travel at an absolute minimum • No air or cruise tourism; yachts permitted only with right of entry or under SOLAS obligations • St Helena's economy shifts from focus on tourism to digital businesses and home-working; (tourism target reduced from £10mpa to near zero) • Very small increase in residents if SHG manages covid well as Saints return and to seek a safe haven from high covid risks • Assume near-2020 residents; insignificant visitor numbers.
scenarios (b1, b2) Medium incidences in Europe, UK. South Africa open only to international transfers (no visitors through to land-side) **Possible economic recovery post-2023**	• Low international travel; some increase after suitable measures are put in place (e.g. at airports) • Low air tourism to St Helena, limited yachts, no cruise ships • Tourism target for 2030 amended to about ¼ of the economy • Small increase in residents if SHG manages covid well as Saints return and other people seek a safe haven from ongoing medium-level covid risks • Assume 10% of Vision 2030 target for residents; 10% for visitors

scenario (c) Low incidences continue in Europe, UK. South Africa open to international transfers and visitors with traveller health checks **Economic recovery commences late 2022**	• International travel at near-normal levels, enabled by passenger screening prior to being checked-in for flights • Some reductions in air arrivals; cruise visitors permitted if captain provides suitable proof of screened passengers; yacht tourism; possibility of some quarantining • Assume economy targets reduced to 2/3 of Vision 2030; tourism target ½ of total economy • Modest increases in residents due to labour market strategy, some tourism and other sectors as in the SEDP • Assume about 50% of Vision 2030 residency targets and 33% of tourism targets
scenario (d, e) Very low to negligible incidences continue in Europe, UK. South Africa fully open to international travel **Economic recovery commences late 2021**	• International travel relatively unimpeded • Normal air and sea tourism to St Helena • Tourism target for 2030 remains at 2/3 of the overall economy (£10mpa) • Appreciable increases in residents due to labour market strategy, effective tourism and digital strategies, and development of other sectors as in the SEDP • Maintain Vision 2030 targets for residents and visitors

It is important to note that without inward migration to keep the population at a fairly steady level in scenario a, the population would likely decline in the manner predicted by SHG in its Labour Market Strategy.

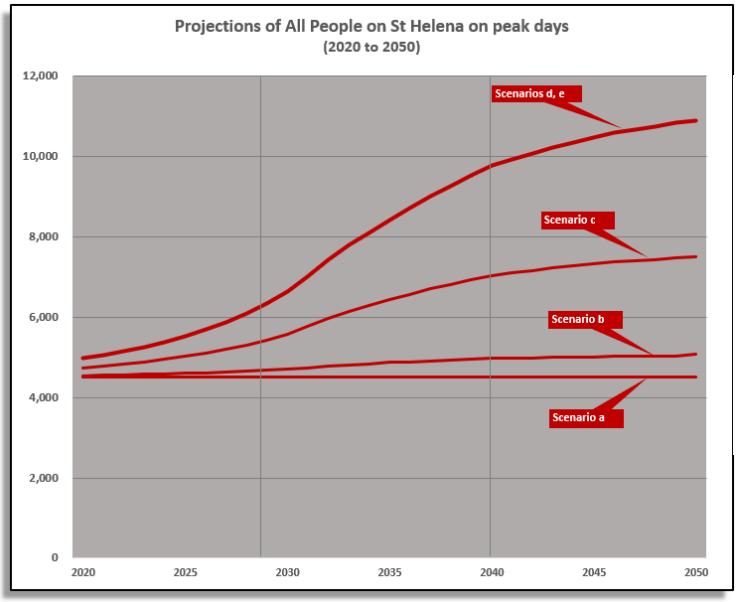
Implications for SHG's Capital Programme (2020-2030)

The scenarios from the foregoing table have been used to assess the possible impacts on the demand for energy and water in St Helena. The upper chart overleaf shows the possible total number of people on the island at any time under each of the scenarios; i.e. resident Saints and non-Saints, plus tourists and business visitors. The middle and lower charts illustrate the associated demand for energy and water under each scenario. It will be seen that there are wide variations in the number of people on island and consequent demand for energy and water in 2050. However, this appendix considers the possible impact of covid scenarios on infrastructure demand during the capital programme; i.e. up to the year 2030. When the resident population and tourist numbers in 2030 are translated into demand for energy and water, it is seen that the differences in demand between scenarios c, d and e is less than 5%. The energy and water demands under scenario b are about 10-15% lower than the Vision 2030 demands (i.e. scenarios d, e). In scenario a, where there are virtually no changes to the current number of residents and no tourism, the energy demand is about 25% less than the scenarios d and e and the water demand is about 15% less.

The net impacts on the recommendations for utilities in the infrastructure plan are as follows:

Energy: A power purchase agreement (PPA) is expected to be signed very soon with PASH and this will provide for whatever demand occurs during the coming decade to 2030. Therefore the covid scenarios do not impact any recommendations for the energy sector in the Infrastructure Plan.

Water supply: The recommendation in the Infrastructure Plan is to provide a solution now to the 500 m3 deficit that occurs in the Redhill area during periods of significantly reduced rainfall. This is required regardless of any covid scenarios, just to address current water security issues. The solution proposed is to provide deep aquifer boreholes and/or desalination, both of which are scalable solutions. There is therefore no net impact on the recommendations in the Infrastructure Plan.

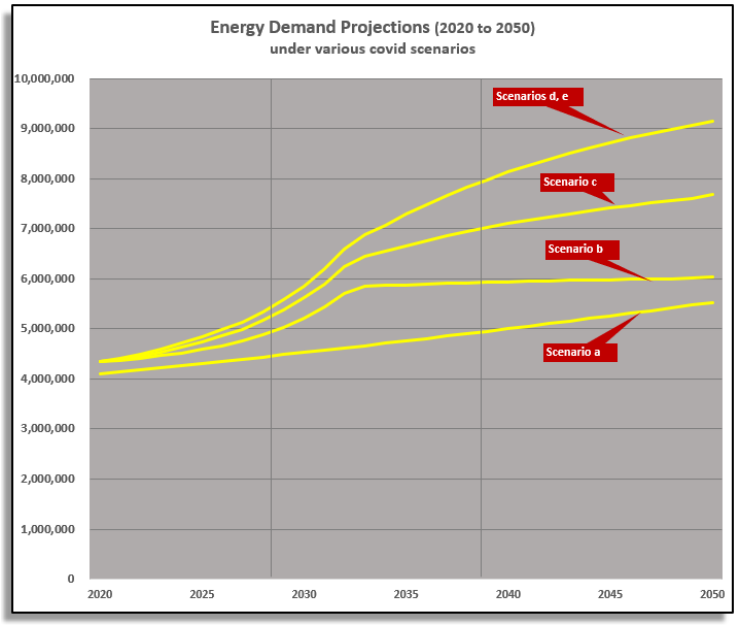


Scenario d,e: residents and tourists as per Vision 2030

Scenario c: residents about 50% of Vision 2030 targets; tourists about 33%

Scenario b: residents and tourists just 10% of 2030 Vision

Scenario a: negligible changes in residents compared to 2020; almost no tourists

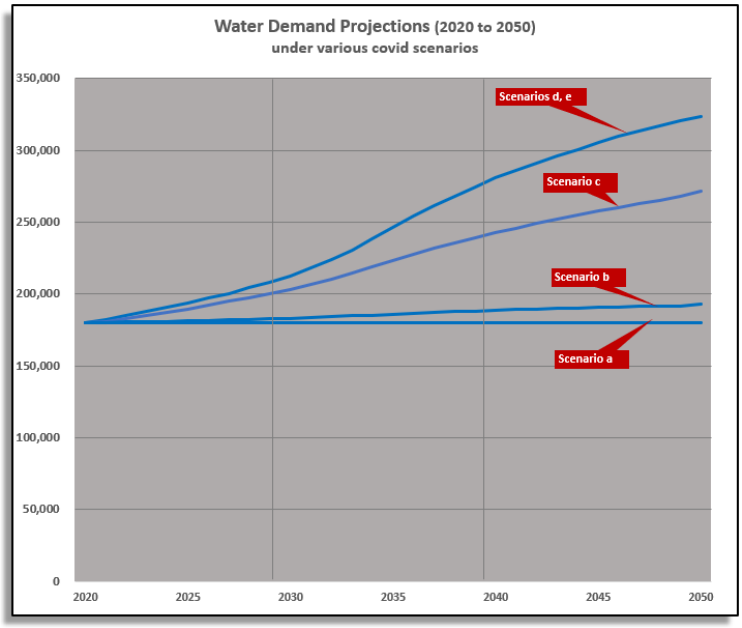


Scenario d,e: energy demand as Vision 2030 S-Curve

Scenario c: energy demand about 96% of scenarios d,e

Scenario b: energy demand about 89% of scenarios d,e

Scenario a: energy demand about 77% of scenarios d, e



Scenario d,e: water demand as Vision 2030 S-Curve

Scenario c: water demand about 96% of scenarios d,e

Scenario b: water demand about 86% of scenarios d,e

Scenario a: water demand about 85% of scenarios d, e

Wastewater: The problems to be addressed are long-standing issues in Jamestown and Half Tree Hollow. The capacity of the solutions proposed in the Infrastructure Plan address potential increases in these two areas, but the space available for new housing is very limited. Thereafter, new housing will take place in other locations for which new wastewater management solutions will be required.

Solid waste: The landfill site at Horse Point has the capacity to meet the Vision 2030 residents and tourists targets. Any reductions in residents and tourists would only result in a lengthening of the life of the site.

With regard to the other priority social and economic infrastructure, the capital programme is repeated below.

SHG's CAPITAL PROGRAMME: INFRASTRUCTURE FACILITATING VISION 2030

				Development Priorities:	10-Year Plan: safer, healthier, greener, better for children and young people			10-Year Plan:wealthier SEDP, IER 2030 targets								
				EDIP Year:	1	2	3	4	5	6						
			Estimated Cost £(M)	CP Year:	1	2	3	4	5	6	7	8	9	10		
		COMPONENT A: SOCIAL DEVELOPMENT		Fiscal Year:	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-2030		
1st PRIORITY	EDIP: Phase 1	water security	St Helena western side security													
			desalination													
			Harpers Reservoir (enlarge)													
		wastewater	Half Tree Hollow													
			Jamestown													
			Ruperts (treatment unit)													
		rockfall protection	completion of protection works													
		CDAs	GLH (Bottom Woods): by I&T													
		micro-projects (EDIP)	PICU, toilets, walkway, etc													
		other projects	ICT, Judicial, RH, etc													
	other CP funding	electricity	100% renewable energy		PASH											
		other-projects (non-EDIP)	other													
		CDAs	utilities & service (B/W, from I&T budget), etc													
		COMPONENT B: ECONOMIC DEVELOPMENT														
1st PRIORITY	EDIP: Phase 1	connectivity	Ruperts container facility													
		major roads & bridges	Field Road and Side Path													
		productivity	agricultural productivity													
			other													
		tourism / heritage	Jamestown facia													
		infrastructure	James Bay waterfront													
			other													
	other CP funding	connectivity	cable-landing station		EDF-11											
		modern SHG	digital land registry													
		waterfronts	for marine tourists													
			for land-based tourists													
		tourism / heritage	St Helena Story (Napoleon)													
		infrastructure	other													
		other projects (non-EDIP)	out and about													

EDIP breakpoint (review)

Implications for Component A: Social Infrastructure 1st Priority (non-utilities)

EDIP - Phase 1

rockfall protection

This project is justified on the basis of health and safety and is already underway. It is due for completion by mid- July 2020. It is not affected by any covid scenario.

CDAs

In a covid scenario where there are significantly less residents on island, new CDAs would most probably not be required.

EDIP micro-projects

These projects will be required regardless of any covid scenario as they are intended to address various health and safety concerns, as well as potential liability cases against SHG on the basis of the Public Health Ordinance (e.g. the PICU).

Other projects

These are costs that have already been incurred against a number of projects in the past and current fiscal years.

CDAs

As mentioned under the EDIP-funded projects, if there is no significant increase in resident population in St Helena, then there would be no need for additional CDAs.

Implications for Component B: Economic Infrastructure 1st Priority (non-utilities)

EDIP - Phase 1

Ruperts Wharf; Field Road and Side Path

Improvements to the wharf at Ruperts are also required regardless of covid because this provides for the safest and most reliable cargo-handling, as well as safer passenger transfers. Even without increases in residents and tourism, St Helena will remain reliant on cost-efficient handling of imports and exports via the port at Ruperts. If a covid scenario evolves in which St Helena tourism is very much reduced, there will be less money coming into the island and minimised costs for imports will be important. The upgrading of Field Road and Side Path is a part of the logistics corridor and is important for minimising the costs of receiving goods in Jamestown.

agricultural productivity

This is a relatively small project, but with potentially large impact. Improvements in the domestic production of eggs, meats and vegetables will become more important if the island has less income from tourism and other export sectors. This project should go ahead regardless of which covid scenario develops.

tourism/heritage infrastructure

Some of these projects are targeted at improving the tourist experiences of St Helena, particularly in preparation for the Napoleon Bicentenary. Under covid scenarios where international travel is severely restricted, the number of international visitors would be very much reduced. It is possible, however, that the French navy might still make a visit. The amounts for these projects are small and it is recommended to carry out these projects in the hope that the current covid crisis will end later this year. If the Bicentenary celebrations do not go ahead, then the monies would be redirected from the Napoleon side of the town to improvements on the other side of the town.

Covid-related infrastructure

SHG has already incurred significant costs while preparing quarantine accommodation at Bradleys. Some of the buildings have been modified to provide suitable intensive care facilities. The costs extend beyond the building works and include the medical fittings, equipment and the ongoing operational costs with and without any confirmed covid cases.

This emergency infrastructure does not form part of SHG's 2020-2030 capital programme.