St Helena Government

St Helena Water Resource Management Plan (Draft for Consultation)

APRIL 2026

Report Details

Prepared by JBA Consulting on behalf of St Helena Government

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Contents

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Abbreviations

CAPEX	Capital Expenditures
CSH	Connect Saint Helena
DMA	Demand Management Area
DO	Deployable Output
EDIP	Economic Development Investment Programme
ENRP	Environment, Natural Resources and Planning
FCDO	Foreign, Commonwealth and Development Office
GR6J	Modèle du Génie Rural à 6 paramètres Journalier
NTU	Nephelometric Turbidity Unit
OPEX	Operational Expenditures
PWS	Public Water Supply
RCP	Representative Concentration Pathways
SDB	Supply-Demand Balance
SHG	St Helena Government
SHG PMO	St Helena Government Programme Management Office
SHRF	St Helena Resilience Forum
SLA	Service Level Agreement
UKCP18	United Kingdom Climate Projections 2018
UKWIR	UK Water Industry Research Ltd
URA	Utilities Regulatory Authority
WHO	World Health Organisation
WRMP	Water Resources Management Plan
WTW	Water Treatment Works

Executive Summary

Aims

The St Helena Water Resources Management Plan (WRMP) has been commissioned by St Helena Government (SHG) to support long-term planning for water resources on the island. It is a strategy for maintaining the balance between supply and demand for water over the next 40 years, aiming to ensure a secure and sustainable supply of water to meet forecast customer demand.

Background

Water supplies on St Helena are provided by an integrated water resource system comprising reservoirs, spring abstractions and groundwater boreholes. The water provided from these different water sources is treated at one of four treatment works for supply to customers through an interlinked network of water distribution pipes.

St Helena is reliant on rain-fed sources, which are susceptible to climate change and drought. Storage has been identified as a key vulnerability within the system, with limited capacity relative to demand and drought risk and volumes can be rapidly depleted during extended dry periods as supplies reduce. Due to the island's steep and variable topography, the supply system is reliant on pumping which makes the network energy and cost intensive and dependent on energy reliability. High pressure and aging infrastructure mean that leakage is a significant issue and reduce the effective yield of available resources and increase the cost per cubic metre of billed water.

The water treatment works (WTWs) on St Helena are coming to or past the end of their design life. This can cause issues such as reduced efficiency, outage risks, high maintenance requirements as well as making it increasingly difficult to keep up with changing water quality needs and standards. Although drinking water on St Helena consistently meets World Health Organization (WHO) microbiological safety standards, public consultation responses and stakeholder engagement revealed ongoing concerns about taste, odour, and appearance of water in parts of the island. This reduces the consumer confidence in the supply system.

The current identified vulnerabilities and issues within the water supply system and how these interact defines the scale and nature of the planning problem.

Supply demand balance

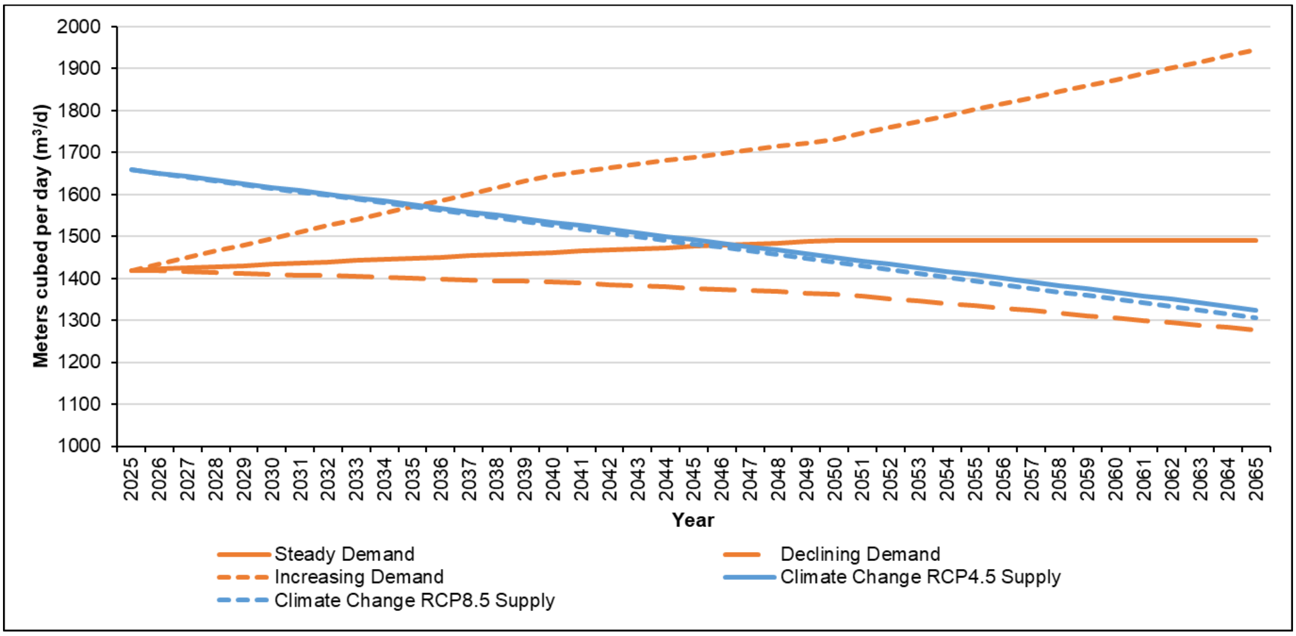
Under the WRMP a detailed assessment of the volume of water that can reliably put into supply under current conditions has been undertaken alongside a review of the quantity of water required to meet consumer demands. These available supplies and required demands have then been forecast over the 40-year plan period, taking into account the impacts of climate change and population change, as well as economic growth, technological advances and other factors that may impact on water security. These forecasts are then compared to assess the balance of supplies and demands and how this may change in future. If the supply-demand balance is in surplus (supply is greater than demand), then there is enough water to meet demand. If the balance is in deficit (demand greater than supply), interventions are needed to meet demand.

The system supply-demand balance is currently in surplus; meaning that the majority of the time there is enough water to meet demand during average and dry conditions. In droughts the system may experience stress (as evidenced in the 2019/2020 drought) but is able to supply consumers with minimal interruption if demand is managed. This assessment has demonstrated however the majority of water supply is concentrated in the eastern region, particularly around Hutts Gate and Levelwood due to the additional resilience provided by groundwater resources, whilst the majority of demand is concentrated around Redhill and Jamestown. Under drought conditions, there is limited capacity for transfers between zones. Therefore, supplies and demands are not balanced across the island.

Looking to the future three scenarios were explored to make the plan as adaptive and resilient as possible, with the acknowledgement that predicting how the future will evolve contains significant uncertainties:

- High impact, with future high population growth, economic development and climate change impact
- Moderate impact, with steady population growth and economic development, moderate climate change impacts
- Low impact, with declining population and moderate climate change impacts.

The supply demand balance over the plan period under these different scenarios is shown in the figure below.



A supply-demand deficit emerges under moderate and high impact scenarios, with deficits arising from the mid-2030s onwards in the higher impact case and 2050 in the moderate case.

Options assessment and adaptive planning

The WRMP has appraised a number of options aimed at addressing system vulnerabilities and the forecast supply deficit. The purpose of the appraisal was not to select "one solution", but to develop a portfolio of interventions that collectively manages risk across a wide range of future conditions. This is particularly important for St Helena where uncertainty is high (climate variability, small population changes, data limitations), and where major infrastructure investment must be proportionate, scalable and affordable.

This process comprised the following key steps:

- Development of a long list of options that may deliver benefits and screening these options, evaluating each option against criteria such as cost, scalability, social acceptability, environmental impacts, energy and carbon costs.
- Following the screening process and stakeholder engagement, the options that had passed through were assessed in detail and further developed/refined in terms of their design/implementation considerations, costs and benefits.

The screening and appraisal process recognised that no single option could resolve the identified deficit in supply-demand balance alone. Instead, a portfolio approach has been adopted, combining infrastructure, operational, and nature-based measures. This has been done with the appreciation that (1) the projected deficit is not the only current issue with the St Helena water supply system and (2) water security is not the only pressure effecting St Helena, which faces many challenges (e.g., energy, wastewater). The selected options therefore try to deliver co-benefits.

A portfolio of interventions was developed to collectively manage risk across a wide range of future conditions. The portfolio groups the range of supply- and demand-side interventions into four phases:

Phase 1 implements low-regret actions from 2025-2028. Actions include leakage reduction, pressure management, chlorination optimisation, operator training, sediment management measures in the Jamestown catchment, and targeted demand savings (including rainwater harvesting new developments).

Phase 2 implements short-term strategies from 2028-2035 to address emerging supply-demand pressures and reduce reliance on reactive drought operations. Actions include new or expanded storage at Longwood, enhanced connectivity between supply zones, water treatment works upgrades to remove operational constraints, rehabilitation of existing boreholes (subject to testing), treated wastewater reuse for non-potable demands, and continued catchment management.

Phase 3 implements medium-term strategies from 2035-2050 if adverse climate or demand conditions begin to materialise. Actions include storage enhancements at Harpers Valley and Levelwood, and further groundwater development following staged investigation.

Phase 4 retains long-term strategic options post-2050 as a safety net against severe or worst-case futures, such as desalination and major additional reservoir storage. These options are not required under moderate scenarios.

This staged process is shown in the figure below.

The later phases are not implemented at a fixed point in time but are designed to respond to adverse or changing conditions.

Impacts assessment

The above preferred actions will have positive environmental impacts, including lower abstractions from stressed sources through leakage reductions and improved efficiency, reduced turbidity through sediment control measures, and soil stabilisation through catchment protection. There is potential for adverse impacts including land-take, altered drainage patterns, and disturbance. However, the WRMP emphasises solutions that integrate environmental co-benefits and minimise negative impacts through adaptive monitoring.

Delivery of the WRMP requires institutional adjustments such as clearer coordination between SHG, Connect Saint Helena Ltd (CSH) and Utilities Regulatory Authority (URA); targeted investment in skills and operational capacity; strengthened abstraction and groundwater governance; alignment with planning and land-use processes; and improved monitoring and adaptive review mechanisms.

The WRMP does not propose immediate or automatic tariff increases. Medium- and long-term infrastructure investment could influence tariffs, but only if and when such options are required. All tariff changes remain subject to URA oversight, affordability assessment, and public consultation. A diversified funding strategy, including non-tariff mechanisms such as; targeted subsidies; government budget allocations and subsidies; public-private partnerships and service contracts; and non-revenue water savings is critical to managing long-term affordability.

Conclusions

The St Helena WRMP meets the forecasted water needs of the island community, addressing key system vulnerabilities and delivering co-benefits where possible. It is consistent with planning objectives, is scalable, adaptive and provides a “no regrets” approach to investment in new infrastructure. The WRMP identifies schemes that should be implemented in the next 5-10 years, and those which can be reserved dependent on how future pressures like climate and population change evolve.

1 Introduction

1.1 Study context

St Helena faces a number of long-standing and emerging challenges in managing its water resources, driven by its geographical isolation, limited freshwater availability, and increasing vulnerability to climate variability and change. Its climate is mild and equable, moderated by southeast trade winds, but rainfall patterns can vary significantly across the island and between seasons. This has been evident in recent years, following a series of drought events (2013, 2016, and 2019/20) which have highlighted the island's vulnerability to water scarcity and the limitations of existing supply infrastructure during extended dry periods.

As a direct response to the island's critical need for sustainable and resilient water management, the St Helena Government commissioned the development of a Water Resources Management Plan (WRMP), with the work undertaken by JBA Consulting Ltd. The WRMP is intended to provide a structured approach to managing water resources over the 40-year period from 2025 to 2065 on the island. The WRMP aims to assess and understand current and future supply and demand balance challenges, and determine the actions required to ensure the security and reliability of supply on the island amidst future climate and population uncertainties.

1.2 An overview of St Helena

St Helena is a small (122km^2) volcanic sub-tropical island located in the South Atlantic Ocean, approximately 16km long and 10km wide. The island is isolated, located 4000km east of Brazil and 1950km west of Namibia. The closest landmass is Ascension Island, which lies 1132 km to the northwest of the island. **Error! Reference source not found.** shows a location Map of St Helena, showing population centres.

The majority of the population live to the north and east of the island. The capital, Jamestown, is situated on the island's northwest coast located within a steep sided and narrow valley. Other major residential areas include Half Tree Hollow, the largest residential district located uphill from Jamestown, and Longwood, an important area for agriculture and historically significant location as the site of Napoleon's exile. Levelwood, Bluehill and Sandy Bay are more remote rural communities located within the south and east of the of the island.

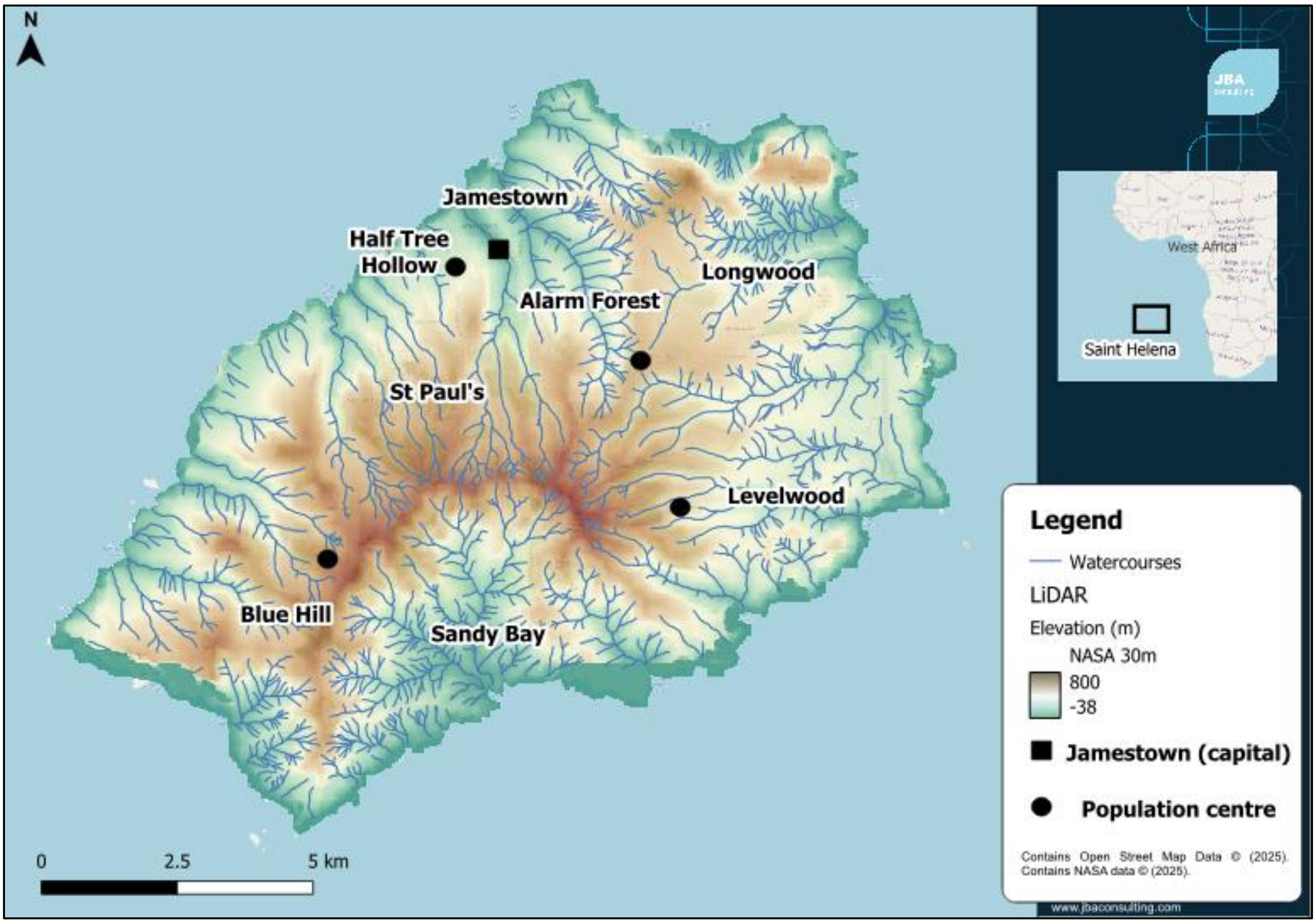


Figure 1-1: Location Map of St Helena, showing population centres and the names of St Helena's eight districts.

The island is formed by two coalescing volcanoes, and the island rises steeply from sea level to a central high ridge of peaks, to a maximum of 823 m above mean sea level at Diana's peak. This ridge is locally known as the peaks and forms the long axis of the island. As a result of this St Helena features diverse landscapes, ranging from rugged coastlines and steep valleys to lush central highlands. Ecologically important areas include The Peaks National Park, which is a critical location for biodiversity conservation and mist capture.

Water supplies on St Helena are provided by an integrated water resource system comprising of a network of reservoirs, spring and stream abstractions and groundwater boreholes. The water from these sources is stored and treated at one of four water treatment works before being supplied to households and commercial properties across the island. Connect Saint Helena Ltd (CSH) own and operate the supply system from source to distribution.

1.3 Structure of the plan

The structure and supporting technical appendices of the St Helena WRMP are summarised in **Error! Reference source not found.**.

Table 1-1: Structure of the St Helena WRMP

Section	Description	Supporting appendices
1: Introduction	Overview, context and structure of the WRMP	
2: Policy and strategy background	Sets out the policy and regulatory framework in which the plan is set	
3: WRMP Purpose	Outlines purpose of WRMP, UK framework this St Helena WRMP is based on, and plan development and best practice.	Appendix E: Public consultation
4: Water supply system	Description of the Public Water Supply (PWS) system, including sources, treatment, transfers, and current challenges.	Appendix A: Supply Demand Balance assessment
5: Supply forecast	Overview of steps involved in producing the supply forecast and modelling used to estimate deployable output, including assessing the impacts of climate change.	
6: Demand forecast	Assessment of current demands and forecasts for three future scenarios.	
7: Supply demand balance	Supply demand balance process, description of scenarios, and impacts on nature and timing of deficits.	
8: Option appraisal and best value planning	Describes how options were identified, screened and taken forward to form the WRMP best value preferred plan	Appendix B: Options appraisal and best value planning, Appendix E: Public consultation
9: Roadmap to implementation	Outlines how the plan can be implemented as a roadmap.	
10: Impact assessment	Assessment of the potential implications of the plan on the environment and tariffs and describes the institutional adjustments and alternative mechanisms to funding available.	Appendix C: Institutional framework, Appendix D: Environment Assessment

1.4 Collaborative partners

This WRMP has been commissioned by the St Helena Government (SHG). SHG provides the overarching policy and legislative framework within which water resources are managed. Multiple directorates and portfolios contribute to the WRMP, including:

- Environment and Natural Resources Portfolio (ENRP), responsible for water resources policy, abstraction controls, environmental protection, and climate change adaptation.

- Planning, responsible for land-use planning and development control, influencing the siting and feasibility of water infrastructure and future demand growth.
- Health Directorate, responsible for public health regulation and ensuring compliance with drinking water quality and sanitation standards.
- Finance and Economic Development, with an interest in affordability, subsidy, and long-term financial sustainability.

SHG will use the WRMP to inform policy decisions, regulatory oversight, and long-term investment planning.

Though the WRMP has been commissioned by SHG the work has been delivered in close collaboration with other stakeholders. Connect Saint Helena Ltd (CSH) is the licensed water service provider and is responsible for abstraction, treatment, storage, distribution, and customer supply on the island. CSH has been a key partner in the development of the WRMP and have contributed operational data, system knowledge, and future planning assumptions to the WRMP.

The WRMP supports Connect by:

- Providing a strategic framework for maintaining security of supply
- Informing asset management and investment prioritisation
- Supporting compliance with operating licence requirements
- Identifying opportunities to improve efficiency and resilience

In addition to formal partners, the WRMP has been informed by engagement with a wider group of stakeholders where relevant, including infrastructure operators, emergency planning functions, and policy leads. This collaborative approach ensures that the plan reflects operational realities, cross-sector dependencies, and the needs of the island as a whole. Examples of other stakeholders have included:

- SHG Statistics Office
- Cloud Forest project team and partners
- National Trust
- SHG Sustainable Economic Development Portfolio

2 Policy and institutional background

2.1 Policy context

The plan follows and has been developed in support of the St Helena Water Resource Strategy (2020), which has the aim of ensuring sufficient quality and quantity of water to promote healthy living, sustain economic activity, enhance food security, and maintain environmental and ecosystem functions. The objectives and targets outlined in the strategy are summarised in Figure 2-1.

Water security

- The frequency of drought incidents should be minimized
- If drought occurs there is minimal impact to business.
- Improve efficiency of the water network.
- Increase uptake of water efficiency and water storage measures among homes and businesses.
- Ensure continuity of water supply.
- Assure access to water supply for all.
- Improve customer experience.

Drinking water quality

- Achieve drinking water quality expectations with regard to health (compliance with WHO guidelines), appearance, taste and odour.

Water affordability

- Ensure water bills are affordable.
- Reduce reliance on untargeted subsidies from St Helena Government.

Water sustainability

- Preserve the environment and ecosystems.

Figure 2-1: Key objectives and targets as defined in the St Helena Water Resource Strategy

In addition to the Water Resource Strategy the WRMP has been developed within the context of the relevant policies and legislation as summarised in Table 2-1, with more details given in the sections below.

Table 2-1: Policies and legislation relevant to water management

Policy/Legislation	Responsible Agency	Key focus	Key Relevance to WRMP
Water Ordinance	SHG/ENRP	Regulation of water abstraction, licensing, and use of water resources	Defines water abstraction, licensing and supply provisions.
Planning and Development Control Ordinance (2013, last amended 2021)	SHG Planning	Land-use planning and development control	Influences siting of new infrastructure, water-sensitive development.
Public Health Ordinance (1938, last amended 2017)	Health Directorate	Drinking water quality, sanitation, and public health protection	Controls public health standards for water safety and sanitation.
Connect Saint Helena Operating Licence (established by Utility Services Ordinance, 2013)	CSH/SHG	Service standards, tariff principles, operational and reporting obligations	Sets service standards, tariff structure, and supply obligations.
Climate Change Policy (2025)	SHG / ENRP	Climate change adaptation and drought resilience across sectors	Mandates drought and climate adaptation planning across sectors.
Utilities Regulatory Authority (URA) (established by Utility Services Ordinance, 2013)	URA	Consumer protection, tariff regulation, financial sustainability	Regulates quality of utility services and tariffs charged, therefore influencing capital available for investment.

2.1.1 Legislation

The Water Ordinance, administered by SHG through the Environment and Natural Resources Portfolio (ENRP), provides the primary legal basis for water resource management on St Helena. It defines provisions relating to water abstraction, licensing, and the control of water resources, and establishes the framework for regulating the use of surface water and groundwater.

The Ordinance supports the sustainable management of water resources by enabling controls on abstraction where necessary, particularly during periods of scarcity. The WRMP is consistent with the intent of the Water Ordinance by providing an evidence-based assessment of current and future water availability, risks, and management options to support licensing and abstraction decisions.

2.1.2 Connect Saint Helena Utilities Services Licence

The CSH Operating Licence, issued by SHG and regulated by the URA, defines Connects obligations as the water service provider. The licence sets out requirements relating to:

- Service standards and continuity of supply
- Asset management and operational responsibilities
- Tariff structures and billing principles
- Reporting and performance monitoring

The duration of the CSH Utilities Services Licence is comparatively short. This limits CSH as it is not of sufficient length to provide certainty to support long-term investment.

The WRMP supports the need for a long-term utilities licensing system and the objectives of the Utilities Licence by providing a strategic, long-term framework for maintaining security of supply, improving system resilience, and managing future risks. The plan also informs future investment decisions required to meet licence obligations efficiently and sustainably.

2.1.3 Current tariff framework

Water tariffs on St Helena are set within a regulated framework overseen by the Utilities Regulatory Authority (URA), with Connect Saint Helena Ltd responsible for proposing tariff structures and operating the water supply system. Tariffs are designed to balance three key objectives: ensuring the financial viability of water services, maintaining affordability for customers, and limiting the level of subsidy required from the St Helena Government (SHG).

The current water tariff structure comprises a combination of:

- A fixed standing charge, applied by customer class (e.g. domestic, commercial, government), and
- A volumetric charge, applied per cubic metre (m^3) of water consumed.

This structure means that customer bills are influenced both by the level of consumption and by fixed costs associated with maintaining the water supply system, regardless of usage.

Available evidence indicates that current water tariffs on St Helena are constrained by a combination of affordability considerations and the high underlying cost of service provision associated with operating a small, remote and energy-intensive supply system. Published tariff schedules show that domestic customers pay a quarterly standing charge alongside rising volumetric rates, with higher marginal charges applying at increased consumption levels. Typical household water bills are therefore sensitive to both usage and household size, and can represent a material proportion of income for lower-wage households, given median earnings on the island.

Regulatory and operational evidence suggests that tariffs do not fully recover the cost of water collection, treatment and distribution, with ongoing financial support from the St Helena Government required to maintain service provision. This has implications for long-term financial sustainability, particularly in relation to asset maintenance, renewal and leakage reduction. High levels of non-revenue water increase operational costs and reduce the effective yield of available resources, placing additional pressure on tariffs and subsidy requirements.

Within this context, current tariffs can be considered broadly affordable but structurally constrained in their ability to fully fund long-term system resilience. This reinforces the importance of the WRMP's emphasis on cost-effective, low-regret measures—such as leakage reduction, pressure management and operational efficiency improvements—which offer the greatest opportunity to improve financial sustainability and service resilience without placing disproportionate pressure on customer bills.

Additional information on Tariff structure and affordability is found in Appendix G.

2.1.4 Implications for the WRMP process

WRMP options have the potential to affect tariffs through several mechanisms:

- Changes in operating costs, for example due to increased energy use, additional treatment requirements, or reduced pumping through demand management or leakage reduction.
- Capital investment requirements, where new infrastructure, upgrades, or resilience measures are required to maintain security of supply.
- Changes in demand, which influence the volume over which fixed costs are recovered and therefore affect unit costs per m^3.
- System efficiency improvements, such as reductions in non-revenue water, which can reduce the effective cost of supplying each billed cubic metre.

As a result, the selection and sequencing of WRMP options will have direct and indirect implications for future tariffs, subsidy requirements, and affordability.

3 Purpose of the WRMP

3.1 WRMP background and process

3.1.1 Purpose of the WRMP

In the UK water companies have a statutory duty to prepare a Water Resource Management Plan and a Drought Plan every 5 years. There is no regulation or statutory requirement for St Helena to publish a plan, however, given the vulnerabilities within the water supply system as highlighted in recent droughts, SHG has commissioned this WRMP to simultaneously take a longer-term view on water supply provision and to better manage supplies during drought conditions.

The WRMP for St Helena addresses long-term planning for water resources to ensure essential water supplies can be maintained during future drought events. This is particularly important given the island's exposure to climate variability, limited natural water resources, and uncertainty around future population and economic development. Long-term planning supports the early identification of supply and demand management options needed to maintain reliable water supplies as pressures evolve. It allows sufficient time for feasibility studies, environmental assessment, planning, and construction of interventions so that measures are operational when required, thereby reducing the risk of water shortages during prolonged or severe droughts in future. A long-term planning horizon, extending to 2065, has therefore been adopted.

The specific objectives of the plan are as follows:

- **Understand the current and future situation**: assess St Helena's water resources, climate conditions, infrastructure, economic situation, and environmental constraints under current and future conditions.
- **Carry out options appraisal**: recommend suitable and scalable options to improve water availability, enhance the overall resilience of water infrastructure and reduce the risk of future water shortages.
- **Drought planning:** Create an updated drought plan with defined triggers, roles, and responses.
- **Assess affordability and tariffs:** Analyse potential impacts of the WRMP on water tariffs and ensure water remains affordable and accessible, exploring various funding options to support necessary investments.
- **Review Institutional, legal, and policy context:** Recommend improvements to current policies, regulations, and institutional frameworks to accommodate options.

Please note that the drought planning aspect is not covered within this WRMP document. Refer to the accompanying drought report for details of the work carried out under this objective.

3.1.2 Best practice

The UK WRMP process has evolved over many decades. In developing the plan, we have referred to and considered the following technical guidance:

- Water resources planning guidelines
- Drought Planning guidelines
- UK Water Industry Research (UKWIR) (2016), series of Water Resources Planning Methodologies.
- UKWIR (2014) Handbook of source yield methodologies
- UKWIR (2020), Developing a Best Value Water Resources Management Plan.

3.1.3 Developing the plan

In developing the WRMP for St Helena, a pragmatic and tailored approach has been adopted, broadly following UK best practice while aligning and scaling methodologies to the island's unique context.

The methodology has focussed on practicality and relevance, building on previous studies and incorporating local knowledge to ensure the plan reflects on-the-ground conditions. Recognising the limitations in data availability, this assessment has prioritised establishing a reliable baseline of existing water resources and infrastructure using established and simple methods and techniques, with recommendations made to improve this assessment in future as required. This approach has been selected to deliver clear and actionable outcomes that directly address St Helena's key water supply challenges, supporting sustainable and resilient management without unnecessary complexity. The steps followed are outlined in Figure 3-1.

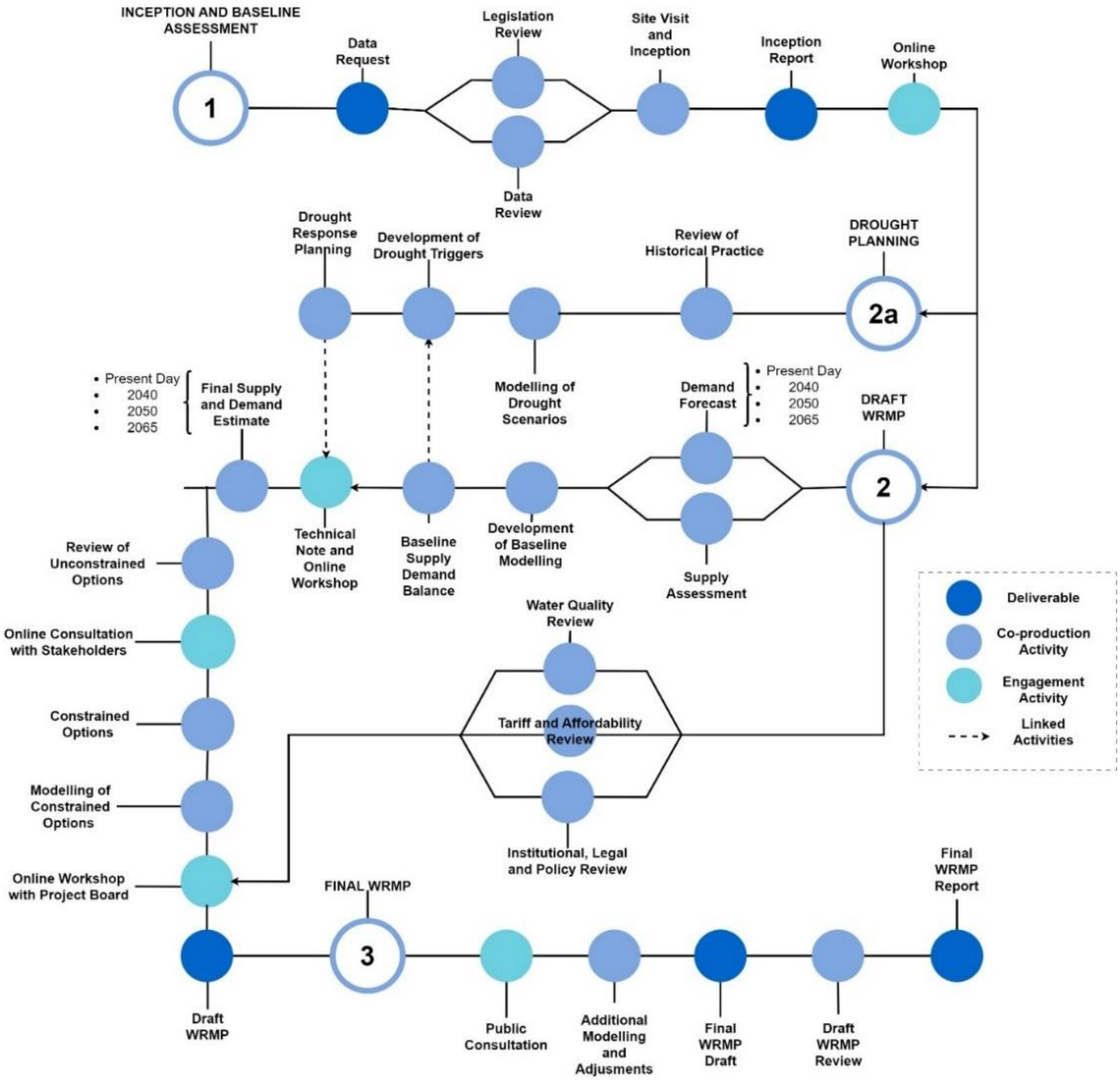


Figure 3-1:Roadmap for the development of the WRMP

3.1.4 Planning conditions

The focus of the WRMP is a supply system's ability to meet consumer demands during dry years, with the expectation being that in normal or wet years there is plenty of supply available to meet requirements. In a dry year limited rainfall and higher temperatures are coupled with higher demands from consumers, leading to increased risk of there being a shortfall in demand. Understanding and testing the performance of the system in dry years is therefore critical to assessing the reliability of supply.

Demand is therefore quantified in two ways:

- Normal or average year - average system demand under typical meteorological conditions.
- Dry year - demand uplifted to account for impact of dry weather

These demands are then assessed in conjunction with the reduced supplies available during dry or drought years of differing severity across the historical record. The available supply from a water resources system is usually quantified as the Deployable Output (DO). DO is defined as the volume of water that can be reliably supplied by a system, considering system constraints. These constraints include infrastructure capacity and abstraction rules, as well as hydrological limitations such as periods of low flow.

In line with UK best practice, DO is linked to a defined level of service, which reflects how often supply shortfalls are permitted to occur. Under this approach, DO is estimated as the volume that can be supplied from a system within a specified frequency of occurrence, which is commonly expressed as a return period in the form 1 in-X-years. For example, a 1 in-5-year DO corresponds to a demand level that the system would fail to supply no more than once every five years. Alternatively, this can be expressed as a 20% chance of failure in any given year.

St Helena does not currently have a legislated level of service for public water supply, so an appropriate service level was established as part of this project. In England, water companies are required to meet a 1 in-500-year level of service. However, this is likely to be disproportionate to the needs and context of St Helena. The selected level of service must strike a balance between resilience, feasibility, and affordability, while aligning with the island's strategic objectives. Following discussions with SHG and CSH, a 1 in-100-year level of service was agreed. This is the supply that can be reliably extracted by the system with a 1% probability of failure in any given year, or alternatively with a 44% of occurring over the plan period. The 1 in 100-year deployable output has therefore used for the purposes of the WRMP to quantify and understand the current and future supply available on St Helena.

3.1.5 Supply demand balance

As part of the WRMP supplies and demands are forecast over the 40-year plan period, taking into account the impacts of climate change and population change, as well as economic growth, technological advances and other factors that may impact on supplies or demand. These forecasts are then compared to assess the supply demand balance. If the supply-demand balance is in surplus (supply is greater than demand), then there is enough water to meet demand to the planned level of service. If the balance is in deficit (demand greater than supply), supply enhancement, new supply options and/or demand management are needed to meet demand. This concept is demonstrated in Figure 3-2.

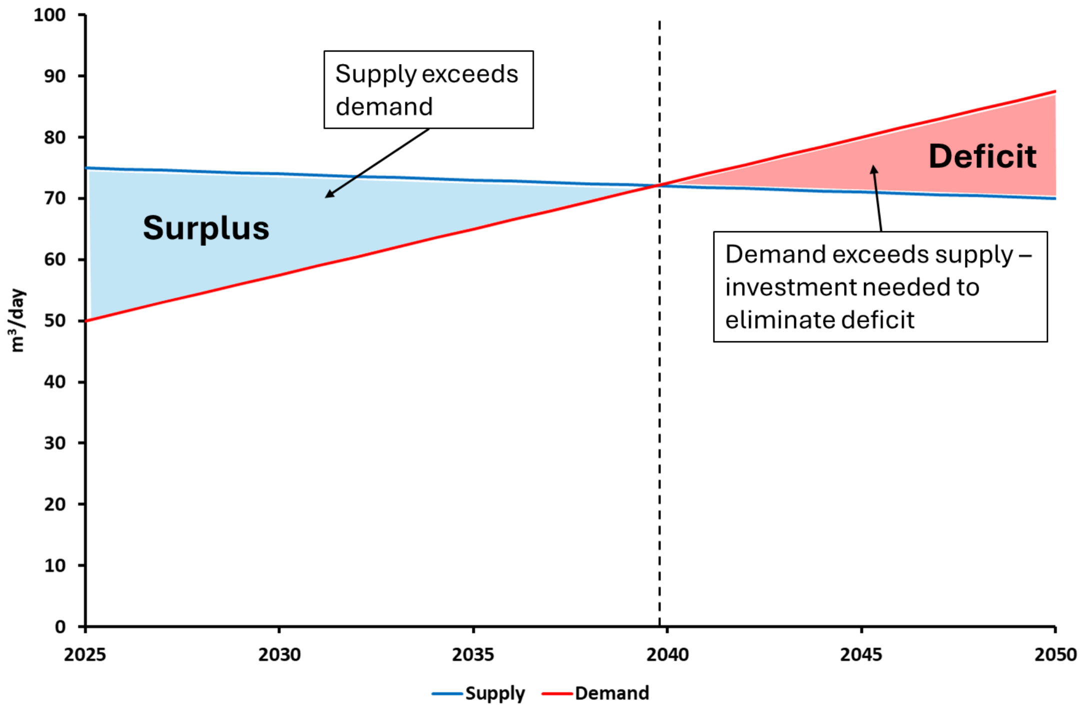


Figure 3-2: Example schematic of the supply-demand balance

3.1.6 Plan development

The supply demand balance is intended to indicate when, and under which future there may be a deficit. Understanding when a deficit may occur allows planning of what options should be initiated and when to mitigate the risk of a deficit before it occurs. These options could be demand-side, for example water efficiency and leakage reductions, or supply-side for example developing a new supply source or increasing storage capacity. These form the key output of the plan.

Supply demand balances are created for a range of current and future scenarios to allow exploration of a range of possible conditions. This allows planning for a range of future conditions ranging from best to worst case. This takes into account the inherent uncertainties within forecasting supply and demand in future. It is extremely difficult to predict what may happen in future, for example how demographics might change, what technologies may be available, or how climate change impacts will be realised. Assessing a range of scenarios therefore allows for a degree of adaptive planning to be built into the plan.

A wide range of options are explored as part of the plan process. These are then assessed for feasibility and robustness, to select options that may be taken forward for development. A key consideration within this process is the balance between ensuring system resilience to the required level of resilience and the cost of achieving this.

The final options selected are therefore a balance of water resource benefit and costs, whilst considering other factors such as environmental, social and carbon aspects. These options are part of a 'best value' plan which delivers water security and resilience at low cost whilst, if possible, delivering other benefits (e.g. enhancing the natural environment).

The plan considers options which can deliver benefits at a range of timescales:

- 'Quick win' options that can be delivered immediately to realise benefits.
- 'Low regret' short term options to deliver benefits in the near term, these are options that are sensible no matter the future conditions.
- Longer term schemes that are likely to be needed in the future to address for example the impacts of population growth or climate change.

The preferred plan is a set of options aimed to deliver benefits across this range of timescales.

3.2 Consultation

3.2.1 Plan partners

The WRMP has been developed in close collaboration with plan partners and other stakeholders.

Between 3rd March and 10th March 2025, JBA Consulting visited St Helena for an initial consultation with stakeholders. The key objective of the visit was to collect data, both quantitative (e.g. supply, demand, infrastructure) and qualitative (e.g. stakeholder insights, operational challenges), to support development of the WRMP. This was done to understand how the plan could feed into and support their activities on the island, and to ensure the range of activities current and planned were captured and accounted for. Where possible, all stakeholder requirements and needs identified on this visit have been fed into the plan and considered.

In addition to the wider stakeholder engagement the WRMP has been developed in close collaboration with key project partners, SHG PMO, ENRP and CSH. Partner preference has been a key consideration within the options stage to select options for further assessment.

3.2.2 Public consultation

Effective public consultation is a vital part of the WRMP process. It ensures transparency, builds community trust, and helps decision-makers understand local preferences, concerns, and priorities. On an island such as St Helena, where water is a visibly shared and valued resource, engaging the public in the planning of future water resource options is especially important to promote ownership, behavioural change, and resilience.

During the project team's visit in November 2025, presentations were made to the EDIP Water Security Project Board, and to the elected members of the SHG legislative council. Public consultation was carried out on shortlisted options. Evening meetings were held at Kingshurst Community Centre in St Pauls (Tuesday 17th November 2025), Longwood Community Centre (Wednesday 18th November 2025) and the St Helena Community College Hall in Jamestown (Thursday 20th November). In addition, a drop-in session was held in front of the Canister, Jamestown on the morning of Thursday 20th November, where members of the public were shown plans and discussed their concerns about water supplies on the island. Members of the community were asked to fill in an online or paper questionnaire. The questionnaire and analyses of the responses are shown and discussed in Appendix E.

4 Water resource management practices

4.1 The St Helena supply system

The water supply system on St Helena is characterised by limited natural water resources, complex topography, and a high degree of operational interdependency between abstraction, storage, treatment, pumping, and distribution. The system has evolved incrementally over time and comprises multiple discrete sources and supply zones rather than a single integrated network.

There are four main raw water zones, Redhill, Hutts Gate, Levelwood and Chubb's Spring (or Jamestown). These areas have their own supplies, storage and treatment works, and supply water to different districts. These zones are distributed across the island but are mainly focused within the central and northern regions, aligning where the majority of the population live.

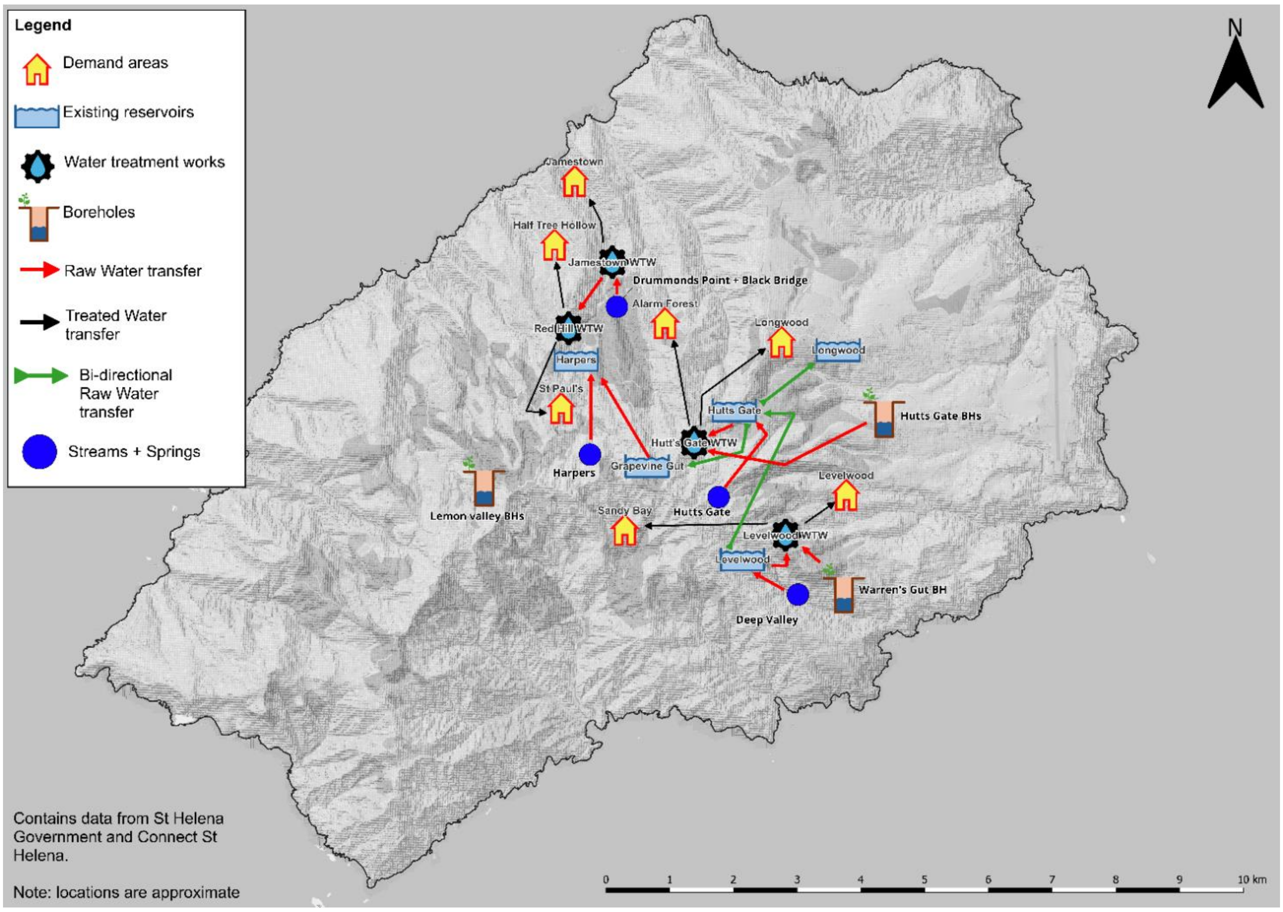


Figure 4-1: Schematic of the St Helena water supply system

4.1.1 Water Sources

Rainfall distribution across the island is uneven due to its topography. The central highlands receive higher precipitation, supporting lush vegetation, whereas lower coastal regions are comparatively arid. Mist capture by endemic vegetation provides over 40% of effective precipitation in the uplands. Groundwater on St Helena flows from the central high-lying recharge areas towards the lower-lying points of discharge, namely springs. It has been estimated that over 56% of the groundwater recharge occurs in the high-lying areas (Toens & Partners, 2000). During dry periods, mist capture becomes the dominant source of water for recharge and is also therefore an important contributor to water availability. This habitat is degraded and is at risk from factors such as invasive species and pathogens, which is a significant issue for water resources.

As a result of this the majority of water collection on the island is within the upland areas. St Helena relies primarily on surface water abstractions, the majority of supply coming from springs and streams, supplemented in some areas by groundwater abstractions. Source yields of the surface water sources are highly variable and closely linked to rainfall patterns, making the system particularly sensitive to seasonal and inter-annual climate variability. The borehole sources are more drought resilient and tend not to show the same sensitivity to rainfall.

4.1.2 Storage Infrastructure

Water storage is provided through a network of small reservoirs and tanks distributed across the island. Within the four main raw water zones, Connect Saint Helena Ltd currently have twelve raw water reservoirs, four of which are used to supply water for agricultural consumers. The total capacity of the reservoirs across the island is 116,219 m^3, which is used to store raw water abstracted from the supplies outlined above before treatment. The majority of reservoirs are offline. Only Grapevine Gut and Harpers 2 receive water from their own natural catchment.

Reservoir storage is complemented by use of tanks across the island which provide an additional storage across the network of 5,507 m^3. Tanks are be used to store both raw water pretreatment and treated water within the distribution system.

Storage plays a critical role in balancing supply and demand, managing diurnal variation, and providing short-term resilience to interruptions in abstraction. However, overall storage capacity is limited relative to demand and drought risk, and storage volumes can be rapidly depleted during extended dry periods. Storage is therefore a key vulnerability within the system.

4.1.3 Water treatment

Raw water from sources is treated to meet public health standards before distribution. Chlorination and basic filtration are the main treatment technologies used on the island, and all water is treated in line with the World Health Organisation (WHO) standards. Based on averages between 2013 and 2019, Red Hill Water Treatment Works (WTW) and Hutts Gate

WTW provide the majority of the Islands water to consumers, providing 30% and 26% of the total Islands water respectively. Jamestown WTW provides around 20% and Levelwood provides 7% of the Island's water.

There are some districts which rely on smaller distribution networks of untreated supplies with no or limited connections to WTW. Sandy Bay is connected to the Levelwood WTW; however, most residents still rely on untreated supplies provided by Solomons. Residents in Bluehill rely on untreated groundwater supplies from boreholes located in Lemon valley. Overall untreated water accounts for 13% of the total island consumption on average.

The majority of the WTW's on St Helena are at, or coming to, the end of their design life (typically 25-40 years). This is particularly true for Levelwood which has not been upgraded since the 1980's. This can cause issues such as reduced efficiency, outage risks, high maintenance requirements as well as making it increasingly difficult to keep up with changing water quality needs and standards.

Levelwood also struggles to meet its required demand currently, particularly in drought. The addition of Sandy Bay into its supply network has caused significant problems with capacity and there is no headroom left at this WTW. The WTW's is therefore being run at maximum capacity constantly, which increases the vulnerability of this WTW to failure and outage.

4.1.4 Distribution Network and Pumping

The distribution network is extensive relative to the size of the population and is strongly influenced by the island's steep and variable topography. Water must often be pumped between areas of different elevation, resulting in a highly energy-intensive supply system. The reliance of the supply system on pumping is a vulnerability, making the network vulnerable to power outage and dependent on energy reliability. Due to the steepness of the island high water pressure is also an issue, causing leaks and the need for pressure reducing measures such as valves across the distribution network.

4.1.5 System Performance and Losses

Non-revenue water, including leakage and unbilled consumption, represents a significant challenge for the system. Losses reduce the effective yield of available resources and increase the cost per cubic metre of billed water. The condition of parts of the distribution network, combined with challenging terrain, makes leakage detection and repair resource intensive. Reducing losses is therefore a key opportunity for improving both water resource efficiency and cost-effectiveness.

4.2 How the supply system is operated

The raw water supply system is operated to maximise storage to maintain the reliability of supply. If reservoir storage falls abstraction from the available sources is maximised. As mentioned previously, the borehole sources tend to be more drought resilient and therefore these sources are reserved for drought periods. When reservoir stocks fall CSH will commence operation of these boreholes.

Each raw water zone is operated independently the majority of the time, however some limited connections between the zones exist which allow water to be moved around the island in drought to try and balance supply and demand and improve storages. At present connections exist between:

- Jamestown to Redhill (and reverse)
- Hutts Gate to Redhill (no reverse connection)
- Hutts Gate to Longwood (and reverse)
- Hutts Gate to Levelwood (and reverse)

Many of the transfers are limited in terms of capacity, particularly the Hutts Gate to Redhill transfer which has to be moved via Grapevine Gut reservoir. In addition, operation of boreholes and pumping water between zones has significant associated cost and is energy intensive, therefore this is only deployed during times of need. When supply is more plentiful operation of the supply network is operated in a way that tries to reduce and optimise efficiency and cost.

The operations of the water supply system on St Helena are all done manually. There are no defined operating rules and procedures, and the above actions are carried out as and when needed based on operator experience. Monitoring is also done manually, based on visual reservoir levels and meters.

During dry or drought periods reservoir stocks are monitored to assess the rate of decline and the potential risk to supply. Reservoir stocks are used to trigger actions such as:

- Water-user compliance strategies, including public communication campaigns, and voluntary savings.
- Maximising use of all available sources and moving water through internal transfers between zones.

In drought restrictions on water use may need to be applied for non-essential users, with even tighter restrictions placed in a severe drought. Please see the accompanying drought plan for a fuller description of the actions taken in dry weather and a review of the operational management practices and drought management measures currently undertaken on St Helena.

4.3 Demand Characteristics

Water demand is driven primarily by domestic use, with additional demand from commercial, government, and institutional users. Demand varies seasonally and is influenced by climate conditions, tourism activity, and behavioural factors. Per capita consumption is sensitive to drought messaging and restrictions, indicating that demand management can play a role in improving system resilience. However, the small customer base means that fixed costs are spread over relatively low total demand, contributing to high unit costs.

4.4 Challenges

The challenges facing water resource management on St Helena are technical, operational, financial, and social in nature. Many of these challenges were confirmed and reinforced through stakeholder and public consultation, which highlighted not only physical constraints in the system but also issues of public perception, trust, and affordability. These challenges are summarised below.

4.4.1 Water quality

Although drinking water on St Helena consistently meets World Health Organization (WHO) microbiological safety standards, public consultation responses and stakeholder engagement revealed ongoing concerns about taste, odour, and appearance of water in parts of the island.

Key challenges identified include:

- Perceived inconsistency in taste, particularly during dry periods or following heavy rainfall;
- Distrust of tap water quality among some households, leading to increased reliance on bottled water or informal storage practices;
- Limited public understanding of why water may taste different at different times or in different locations; and
- Lack of locally defined aesthetic standards for drinking water, with reliance on broad WHO guidance rather than locally tailored targets.

Consultation feedback indicates that improving consistency, communication, and transparency around water quality is as important as meeting technical compliance standards. These concerns are acknowledged in the St Helena Water Strategy 2020-2050, which highlights the importance of not only delivering safe water but also ensuring that it is clear, neutral in taste, and odourless. The strategy outlines targets for reducing complaints, monitoring appearance using NTU values at treatment sites, and improving microbiological levels at consumer meters.

Connect has advised that current treatment processes are primarily geared toward ensuring safety, using chlorination and basic filtration, and that technical capacity for more advanced aesthetic control is currently limited. Changes to sources, storage, or operating regimes must ensure continued compliance with public health regulations, particularly during drought periods when raw water quality may deteriorate.

4.4.2 Agricultural water

Agricultural water use emerged during consultation as a sensitive and sometimes contentious issue, particularly during dry periods.

Challenges include:

- A perception among some domestic customers that agricultural users receive preferential access to water during droughts;

- Limited visibility of how agricultural abstractions are managed, regulated, or prioritised;
- Dependence of some agricultural users on raw water reservoirs and informal arrangements; and
- Limited infrastructure for efficient agricultural water use, storage, or sharing.

At the same time, consultation highlighted the importance of agriculture to food security, livelihoods, and the island's economy. The challenge is therefore not simply one of allocation, but of transparency, fairness, and efficiency. Improved data, clearer communication of drought rules, and targeted infrastructure or demand management for agricultural users are needed to reduce conflict and build trust

4.4.3 Affordability, pricing and willingness to pay

Water affordability and pricing were frequently raised during consultation, particularly in the context of rising living costs and economic uncertainty.

Key challenges include:

- High unit costs of supply, driven by small population size, extensive infrastructure, and energy-intensive pumping;
- Limited ability to spread fixed costs across a large customer base;
- Sensitivity to tariff increases among low-income households and pensioners; and
- A perceived disconnect between price and service experience, particularly where customers experience taste issues, interruptions, or restrictions.

While there is general recognition that water services must be financially sustainable, consultation responses indicate that willingness to pay is closely linked to perceived value and reliability. This reinforces the need for visible service improvements and clear communication alongside any future tariff changes.

4.4.4 Operational challenges

St Helena faces a number of current and future challenges which impact water security and resilience, some of which have been touched on above. These have been split into normal and drought operations and are outlined below.

4.4.4.1 During normal operations

Under normal (non-drought) conditions, the following challenges persist:

Sector	Challenges
Climate and Environmental risks	Reliance on rain-fed sources, susceptible to climate change and drought. Cloud Forest degradation and limited restoration and expansion.
Water Supply and Infrastructure Challenges	Reservoirs have low capacity compared to need, which reduces system resilience. High reliance on pumping increases vulnerability to outage. Infrastructure is aging with leakage identified as a significant issue, this requires significant maintenance. Key infrastructure (namely WTW's) coming to or past end of design life.
Water users	Treated water is used for many purposes (e.g., Agriculture, fire suppression, gardening) for which it is not needed, putting additional pressure on supply
Demographic and Economic Challenges	Population declines and empty houses situation continues or increases Willingness and affordability to pay Water quality concerns and public perception High migration rates of skilled workers limit CSH manpower to operate the manual supply system, as well as capability and capacity to take on new ways of working (e.g., new treatment technology)
Funding & Investment Challenges	Reliance on pumping means the supply network has associated high financial and energy costs to maintain. Limited financial resources for upgrading infrastructure. Securing investment in water infrastructure requires strong political backing and commitment. Short utilities licence available to CSH limits this.

4.4.4.2 During drought

During droughts, existing challenges intensify and additional risks emerge:

Sector	Challenges
Water Supply and Infrastructure Challenges	Increased abstraction required from lower-yield or less reliable sources Requires more intensive pumping and higher costs Greater reliance on storage with limited opportunity for replenishment.
Water management challenges	Supply system is manually operated and requires significant intervention in drought, can be limited by available manpower. No clear framework for planned actions. Supplies and demands are not balanced across supply zones; and areas of high supply and high demand are not aligned. Limited capacity for transfers between zones

4.5 Problem characterisation

Based on the challenges above the key problems across the St Helena supply network can be defined as:

- Ability to maintain a secure and reliable water supply for customers
- Managing drought risk and avoiding severe or prolonged restrictions where possible
- Ensuring compliance with public health and water quality requirements
- Supporting affordability and financial sustainability
- Improving resilience to climate variability and long-term climate change

The current failure of the system to meet these objectives defines the scale and nature of the planning problem.

5 Supply forecast

5.1 Introduction

This section presents the work done to define the water available on St Helena that can be reliably put into supply. The metric most commonly used by the UK water industry used to quantify supply is the deployable output (DO). In the context of St Helena, DO reflects the amount of water that can be consistently provided across the island's diverse water sources meeting customer needs and limiting the risk of service interruptions to 1% in any given year. It is a key input to supply-demand planning and helps identify the point at which the existing supply system may no longer be able to meet expected demand, particularly under stress conditions such as drought.

5.2 Water resources modelling

5.2.1 Hydrological assessment

To accurately assess the water available for supply a long period of inflows is required to better understand how supply from individual sources varies under different climatic conditions. A longer record helps to ensure that the widest range of possible conditions is captured, including dry and drought years, wet years and normal years. There is only a very short period of observed record available on St Helena that can be used to characterise the system inputs, and many locations across the system are ungauged. As such hydrological modelling has been required to define surface water model inputs for the models.

The hydrology of St Helena is complex and highly variable, characterised by steep topography, small catchments, mist interception, and a strong influence of groundwater and springs. A two-step validation of the inflows has therefore been carried out: first against the observed flows available on the watercourse, then within the water resources model to understand how the volumes compare. Validating the derived flows against two sources improves confidence in the estimated flows, by reducing uncertainty and ensuring they are as representative as possible.

The GR6J rainfall runoff model has been used within the hydrological assessment to quantify surface water and spring inputs into the systems. GR6J requires rainfall, potential evapotranspiration to simulate flows. Rainfall and potential evapotranspiration inputs were developed using catchment-mean values derived from observed datasets and a Thiessen polygon weighting, with historical rainfall extended to 1926 through disaggregation of monthly data.

Observed flows are required to calibrate the model over a defined time period, known as the calibration period. There is a distinct lack of long term and good quality continuous flow monitoring data available on St Helena which could be used for model calibration. Following a review of the available data two key locations were selected: (1) Osbournes abstraction, spring flow monitoring point managed by CSH and (2) Black bridge, location monitoring both spring and surface water flows installed and managed by the cloud forest project team.

The performance of both calibrated models is shown in Figure 5-1.

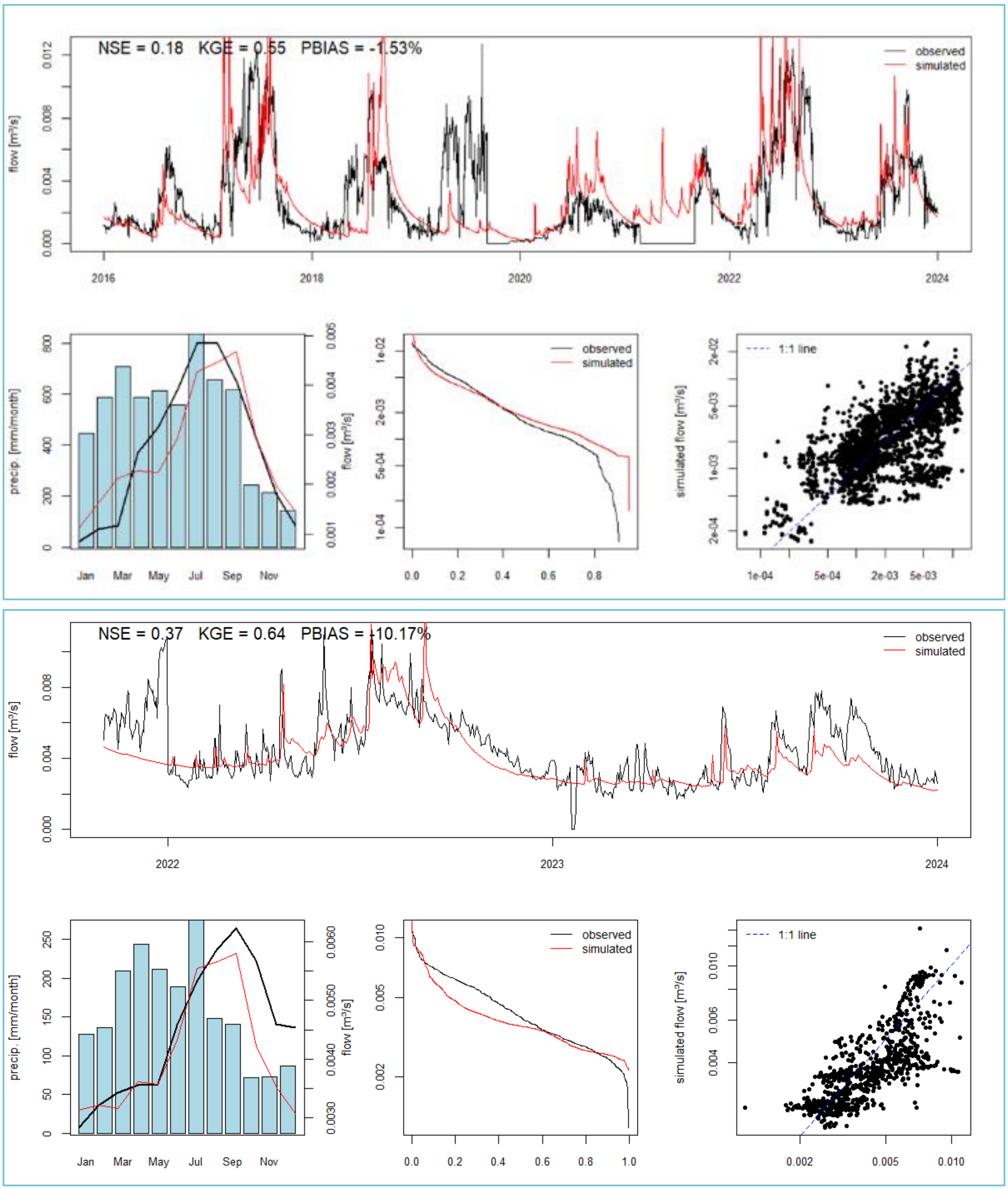


Figure 5-1: Calibrated model performance graphs for the Osbournes (upper) and Black Bridge (lower) GR6J models

Overall, both models produced flow estimates that align well with observed seasonal patterns and volumes, particularly for low-flow conditions which are critical for water resources management. Considering the limitations in data availability and quality the model performance is considered to be fit for purpose. Following calibration, the models were run for the long-term period 1927-2024, with a one-year warm-up period. The model outputs were then checked for validity, including checks like ensuring consistency with low flows during known drought periods.

The flow time series modelled using GR6J required scaling to produce representative flow data for each catchment contributing inflows to the water resources system. This was achieved by scaling the modelled flows by the ratio of the catchment area used in the GR6J model to the area of each target catchment. This approach assumes that flow is directly correlated to catchment area. Spring fed catchments were scaled using the catchment area of Osbornes, whilst catchments fed by surface runoff were scaled using the catchment area of Black Bridge.

The derived inflows were input into the water resources system model and used to run the model for the historical period. Observed data and local knowledge has been used to define the groundwater inputs. The flows were then validated within the water resources system model, to check if these inflows matched with observed volumes within the water resources system. This comparison found the inflows generally well compared to the observed inputs and demonstrated that the flows were representative.

The sparsity of hydrological data across the island means that the derived inflows as part of this assessment contain significant inherent uncertainties. Key uncertainties arise from the short and sparse flow record used to calibrate the models, estimation of rainfall and potential evapotranspiration, assumptions used when extending and disaggregating historical climate data, transposition of models to ungauged catchments by catchment area, model structure and parameterisation within GR6J and the representation of mist interception and groundwater-spring contributions. While the two-step validation has reduced the impact of these issues some inherent uncertainties will remain.

Please see Appendix A for a full description of the hydrological assessment carried out.

5.2.2 Supply system model

The DO is most commonly estimated using a water resource system model. A water resources model is a mathematical or computational tool designed to simulate water systems. These models help predict the movement, availability, quality, and distribution of water in natural and engineered environments. They are a critical decision-support tool for water resources planning as they enable planners to understand the maximum supply of the system given its constraints and allow them to test the impact of future scenarios such as climate change and population change. A variety of different water resources modelling software packages are available. Aquator XV was chosen as the modelling software used for the St Helena base water resources model as it is the predominantly used software by the UK water industry.

The St Helena Aquator model has been developed to represent the four main raw water zones, representing the key features and assets within each zone such as reservoirs, boreholes, inflows and storage tanks. The model build was based on network schematics, and the model was set up based on information provided by CSH. Operational rules were implemented based on discussions with Connect Saint Helena around the operation of their system as well as information gathered from site visits whilst on island. Two model versions have been set-up one with representation of the tanks and one without, to simulate and assess the level of resilience these features provide. See Figure 5-2 for the model schematics.

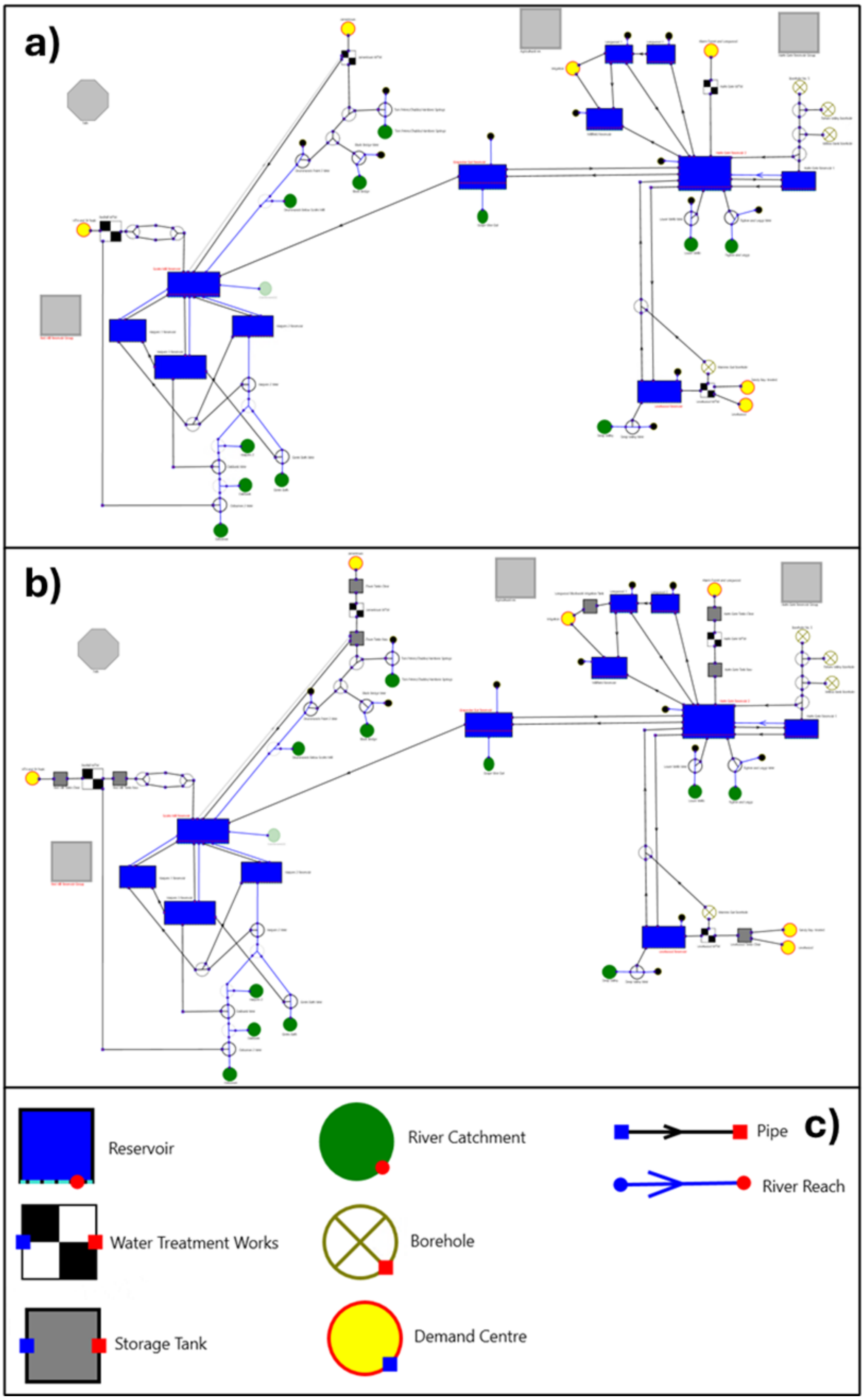


Figure 5-2: a) Base DO model without tanks schematic (Aquator XV), b) Base DO model with tanks schematic (Aquator XV), c) Key to Aquator XV model schematics

The model has been benchmarked against observed data provided by CSH which captures the key inflows, storages and outflows in each zone. This data has been provided for the period 2016-2024. The greatest attention has been paid to replicating observed operations in the 2019/2020 drought as the most recent significant drought event. The model generally performs well at replicating observed storages and water movements over the benchmarking period and is concluded to be a suitable representation of the St Helena supply system. The model has therefore been carried forward to assess DO under current and future conditions. It should be noted however there are some significant uncertainties in the models associated with the hydrological inputs (as discussed in the section above) and with trying to replicate what is a manually operated system using defined rules.

For brevity full details of the model build and benchmarking performance are not given here. Please see Appendix A for details.

5.3 Present day deployable output assessment

The Aquator water resources model was used to estimate deployable output for the overall St Helena water supply system, as well as for the individual treated water zones. Within Aquator, DO is determined by running the model across a range of demand values between defined minimum to maximum at set intervals. The number of supply failures at each demand level is recorded and an extreme value distribution is then applied to the results to derive the deployable output associated with a given return period (e.g. 1 in-100-year or 1 in-500-year DO). DO has been assessed over the historic period 1927 to 2024. The results are given in Table 5-1.

Table 5-1: Results of the island wide baseline DO analysis. The 1 in 100-year DO is highlighted in bold text.

Return Period (years)	DO (m^3/d)	
	No tanks	Tanks
5	1941	2263
10	1759	2089
50	1662	1931
100	**1659**	**1930**

This shows that the baseline 1 in 100-year DO of the St Helena system is 1659 m^3/d, not including tank storage. The DO for this model is constrained by Jamestown as this system has no reservoir storage and therefore no resilience buffer during times of drought.

Including tank storage increases the DO to 1930 m^3/d. This suggests that the tanks offer significant additional resilience in the St Helena system, in the order of 270 m^3/d (15% increase). In the tanks model the DO is still constrained by Jamestown demonstrating the benefit that the tanks have in modulating and mitigating temporary supply failures in this zone.

The tanks Aquator model was also used to define the individual yield of each treated water supply zone. The model was run with transfers between zones disabled to understand the DO of each zone as a standalone. The results are given in Table 5-2. No constraints (e.g., pipe capacities and maximum abstraction rates) have been included in this analysis.

Table 5-2: Baseline 1 in 100-year DOs for the individual treated water supply zones

Zone	DO (m^3/d)
Redhill	308.5
Jamestown	263.0
Hutts Gate	947.5
Levelwood	240.1
Total DO	1759.1

The analysis shows that the majority of water supply on the island is concentrated in the eastern region, particularly around Hutts Gate and Levelwood. This is due to the additional resilience provided by groundwater resources in this area, which can be used to supplement reservoir storage during drought conditions. In contrast, the Redhill and Jamestown supply zones have lower yields. These zones are more dependent on spring and surface water sources, which are significantly less resilient during dry periods and often reduce to zero when there is no rainfall.

Operationally it is understood that Levelwood struggles to meet its required demand currently, particularly in drought. However, this is due to the capacity and age of the WTWs rather than the available supply, the addition of the treated water supplied to Sandy Bay into its load has caused significant problems with capacity and there is no headroom left at this WTW. The model has not represented this, as it would cause failures at any demand higher than the above which may not be representative of the wider system supply. However, this analysis suggests if these operational constraints were removed (i.e., if Levelwood were upgraded) then it would be able to meet a demand of 240 m^3/d, which is mainly due to the additional resilience added by Warrens Gut borehole. The surface water storage in this zone and spring inputs on their own would have a much lower yield.

The analysis therefore indicates that most of the available water resource lies within the south-eastern part of the island, while the highest population and the majority of total demand are located in the north and western part of the island. This results in an existing imbalance between supply and demand across the resource zones, which must be considered in the plan and options appraisal. Disabling transfers between the different supply zones further reduces the resilience of Redhill. This highlights the importance of inter-zone transfers in maintaining reservoir levels in drought, particularly for Redhill which has limited natural supply and high demands.

5.4 Climate change impact on deployable output

Climate change is expected to significantly influence future water availability and is therefore a key factor in assessing how the balance between supply and demand may evolve in future. Variations in rainfall, temperature, and evapotranspiration affect both reservoir inflows and groundwater recharge, which are vital supply inputs on St Helena. Assessing these impacts ensures that water supply systems remain resilient and adaptable under a range of future climate scenarios and aids in selection of long-term options.

Due to the limited availability of detailed climate projections for St Helena, the World Bank Climate Change Knowledge Portal was used as the primary data source, as these projections are the most up to date. This represents a first-stage assessment aimed at understanding the potential impacts of climate change on the island's water resources. The method adopted for this study reflects a practical response to the information currently available and the constraints of the project timetable.

The portal provides climate projections for a number of variables including precipitation and temperature anomalies for a range of Representative Concentration Pathways (RCPs) and future time horizons (epochs). For the WRMP, the 2060s epoch (2050-2079) was selected to represent how climate change is projected to impact on flows to the end of the planning period. Two emission scenarios, RCP4.5 and RCP8.5, were chosen to capture a plausible range of potential futures:

- RCP4.5 represents a stabilising, moderate emissions pathway with a projected global warming by 2100 (relative to pre-industrial levels) of 1.9 to 3.5°C
- RCP8.5 represents a high-emission scenario, with a projected global warming by 2100 (relative to pre-industrial levels) of 3.5 to over 5.0°C.

RCP2.6 was not considered, as it is now regarded as unlikely to be achieved under current global emission trajectories. Assessing RCP4.5 and 8.5 therefore gives a realistic best- and worst-case estimate of potential climate change impact.

The temperature and precipitation anomalies from the climate portal were used to perturb the evaporation and precipitation data used within the baseline GR6J rainfall runoff models. The GR6J rainfall runoff models were run using the climate change rainfall and PET datasets to generate climate change flows for each scenario. These were added to the Aquator water resources model which was then run to obtain climate change values of deployable output.

The results of these Aquator runs are summarised in Table 5-3 below for the no tanks model, as the most conservative estimate. Please note that there were some issues with the no tanks RCP 8.5 DO runs related to the number of failures and length of simulation period, which meant the 1 in 100-year return period could not be estimated. The ratio between the RCP4.5 and RCP8.5 DOs were applied from the tanks model to the no tanks results for RCP4.5 in order to estimate the no tanks RCP8.5 DO.

Table 5-3: Impact of climate change on 1 in 100-year DO

RCP	RCP4.5	RCP8.5
2060s DO (m^3/d)	1325	1306
Change from Base DO (m^3/d)	-334	-353
Change from Base DO (%)	20	21

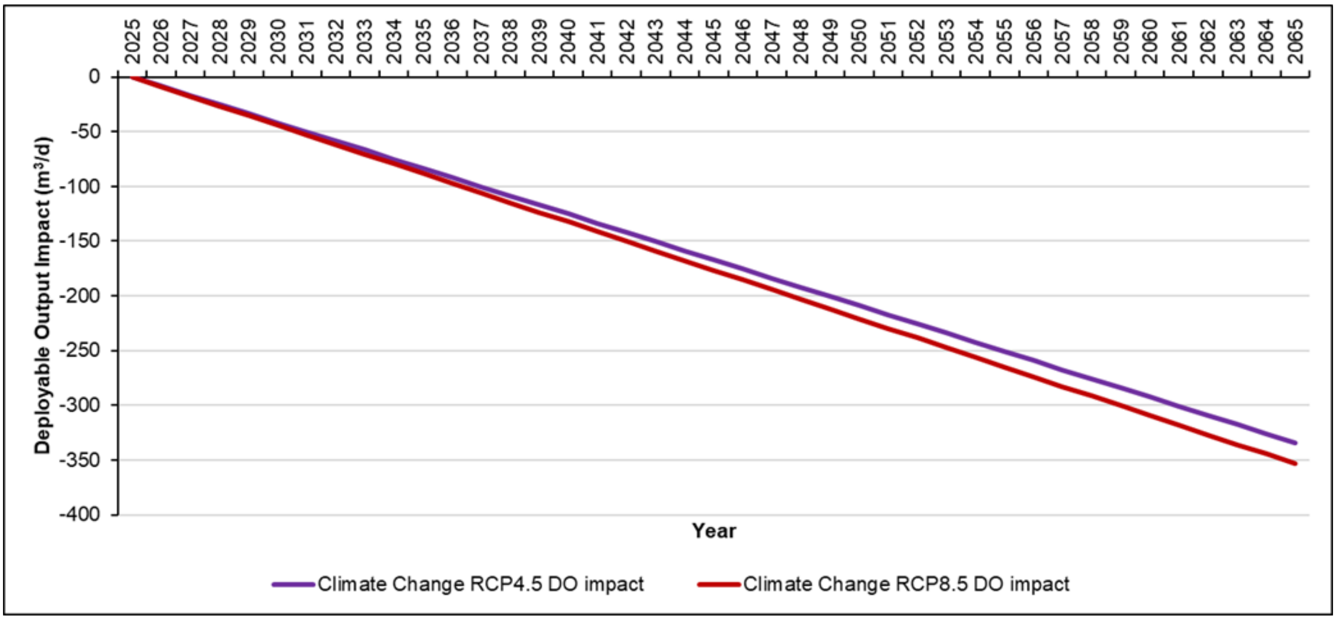


Figure 5-3 Climate change DO impact - no tanks model

5.5 Supply forecast conclusions

In UK best practice an allowance is made to account for the impact of outage which is an allowance for planned and unplanned events that lead to the temporary loss of output from supply sources. Outage covers a range of influences from power failure to short term pollution incidents. No outage assessment has been carried out as part of the St Helena WRMP, however, given the age and condition of some of the water supply infrastructure, particularly the tanks and WTW, the risk of outage on St Helena is considered to be quite high. Therefore, not considering the additional resilience added by the tanks has essentially been used instead of an application of an outage allowance as the most conservative and reasonable worst-case scenario in terms of supply.

The supply forecast derived for the St Helena supply system is given in Table 5-4 for key milestones.

Table 5-4: Supply forecast derived for the St Helena supply system

Component (m3/d)	2025	2030	2040	2050	2060	2065
1 in 100-year DO	1659	1659	1659	1659	1659	1659
Climate Change RCP4.5 DO impact	0	-42	-125	-209	-292	-334
Climate Change RCP4.5 DO	1659	1617	1534	1450	1367	1325
Climate Change RCP8.5 DO impact	0	-44	-133	-221	-309	-353
Climate Change RCP8.5 DO	1659	1615	1526	1438	1350	1306

As previously mentioned, the WRMP has prioritised establishing a reliable baseline of existing water resources and infrastructure using established and simple methods and techniques. This supply forecast therefore represents a starting point, which can be improved upon as needed as better tools, methods and data become available.

The supply forecast contains significant inherent uncertainty and has been limited by the data available. As such the supply assessment is based on a number of assumptions; these are detailed within Appendix A with recommendations for how these can be improved upon in future work.

6 Demand forecast

6.1 Overview of demand

This chapter presents the assessment of current and future water demand on St Helena as part of the Water Resources Management Plan (WRMP). The demand assessment has been undertaken in line with UK Water Industry Research (UKWIR) water resources planning methodologies, adapted proportionately to reflect the island's small scale, high meter coverage, and data availability.

Water demand on St Helena is dominated by domestic household use, with additional contributions from non-household users including agriculture, commercial premises, government facilities, and internal operational use. Demand is sensitive to population trends, climate conditions, and operational factors such as leakage and meter performance.

The purpose of the demand forecast is to:

- establish a robust baseline of current demand;
- assess how demand may evolve under a range of plausible future scenarios; and
- provide inputs to the supply-demand balance and options appraisal.

6.2 Methodological approach

The demand assessment follows the UKWIR principles of:

- using metered consumption data wherever available;
- separating demand into household and non-household components;
- explicitly accounting for leakage and system losses; and
- testing a range of future demand scenarios to reflect uncertainty.

Given the high level of metering on St Helena, the assessment is primarily data-led, with limited reliance on proxy assumptions.

The following data sources were used:

- Metered consumption data extracted from   Consumption Data file provided by Connect Saint Helena Ltd;
- Population data derived from historic trends and extrapolated forward to 2040, 2050 and 2065; and
- Clarifications provided by SHG and Connect Saint Helena Ltd through RFIs and stakeholder engagement.

6.3 Baseline demand

Metered consumption data were grouped using Service Level Agreement (SLA) codes as follows:

- Household (domestic) demand: SLA 110 and 120;

- Non-household demand: SLA 130-193, including agriculture, commercial, government and internal uses.

This classification aligns with UKWIR practice and allows household demand to be expressed on a per-capita basis, while non-household demand is treated separately.

The metered consumption data was then combined with an estimate of unaccounted for water (UFW) is the difference between the volume of water delivered in a network and legitimate consumption, both metered and unmetered. This includes leakage and water taken unbilled. The final baseline demand for St Helena in 2025 is estimated to be approximately 1300 m^3/day.

6.4 Seasonal and drought demands

The demand presented in the section above represents the average expected demand in St Helena. However, demand varies seasonally (tending to peak in summer) and interannually.

A seasonal demand profile has been calculated from the consumption data for the entire island. The monthly variability in demand around the average demand is shown in Figure 6-1. This highlights that demand peaks in summer between the months of December-January and is lowest in winter between July-September.

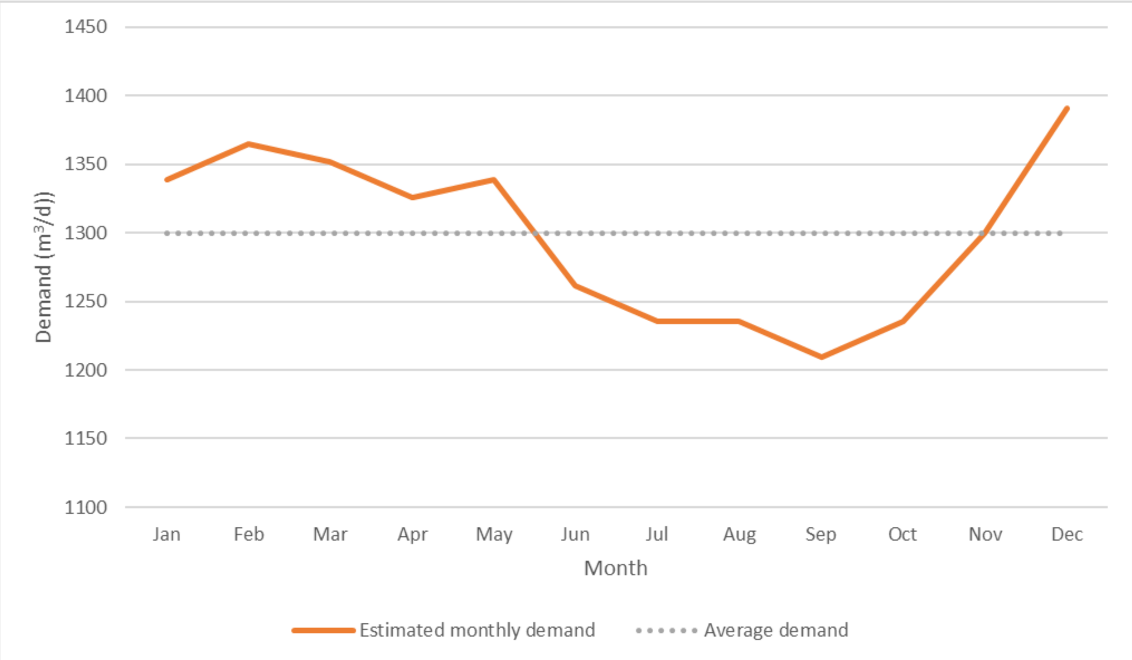


Figure 6-1: Monthly St Helena demand profile

To reflect dry-year conditions a drought demand uplift of +20% has been applied. This value is based on analysis of historic consumption during the 2019-2020 drought period and reflects increased outdoor, agricultural and discretionary water use during prolonged dry conditions. This has been used to stress test the model and also in the drought planning process.

6.5 Demand forecast scenarios

Future water demand on St Helena is subject to a high degree of uncertainty due to the island's small population, constrained economy, exposure to climate variability, and reliance on a limited number of demand centres. To ensure robust planning, a range of forecast demand scenarios has been developed to test the resilience of water supply systems under different plausible futures.

6.5.1 Declining demand scenario

The declining demand scenario assumes a combination of:

- continued population decline or ageing demographics,
- successful leakage reduction and pressure management,
- increased water efficiency in households and public buildings, and
- limited growth in non-domestic or tourism-related demand.

Under this scenario, average daily demand could fall below the current baseline, potentially approaching 1270 m^3/day by 2065. While this scenario reduces pressure on water resources, it does not remove the need for strategic planning, as supply vulnerability during prolonged dry periods remains a key risk.

6.5.2 Steady demand scenario

This scenario assumes that population stabilises around the projected 2040 level and remains broadly constant thereafter. Demand therefore increases to 1490 m^3/day in 2040 and remains at this value until 2065. It represents a central planning case, consistent with UKWIR best practice, and forms the primary basis for the supply-demand balance assessment.

6.5.3 Increasing demand scenario

An increasing scenario was also tested to reflect:

- increasing population;
- potential economic development;
- increased housing or tourism activity; and
- increased agricultural water demand

This scenario represents a high-impact future, used to stress-test system resilience and inform long-term contingency planning.

6.6 Assumptions and limitations

The demand forecast is subject to the following key uncertainties:

- population projections beyond 2040;
- future economic and agricultural activity;
- changes in leakage performance over time; and
- meter accuracy and coverage.

6.7 Headroom

In UK best practice a headroom allowance included to account for the significant uncertainties within both the supply and demand forecast. It represents the buffer required to ensure supplies remain reliable despite uncertainties in climate variability, hydrological modelling, demand forecasting, asset performance, and operational assumptions.

The uncertainties associated with the supply and demand forecast for St Helena are quite large. A 20% uplift has therefore been added to the demand estimates to account for these large uncertainties. This ensures that demand is not understated and that the system remains resilient to plausible adverse conditions over the planning horizon.

6.8 Demand forecast summary

The demand forecast derived using these scenarios are outlined in Table 6-1 and are shown plotted in Figure 6-2.

Table 6-1: Demand forecast for St Helena under different future scenarios

Scenario	2025	2040	2050	2065
Steady	1419	1462	1490	1490
Declining	1419	1391	1363	1277
Increasing	1419	1647	1732	1945

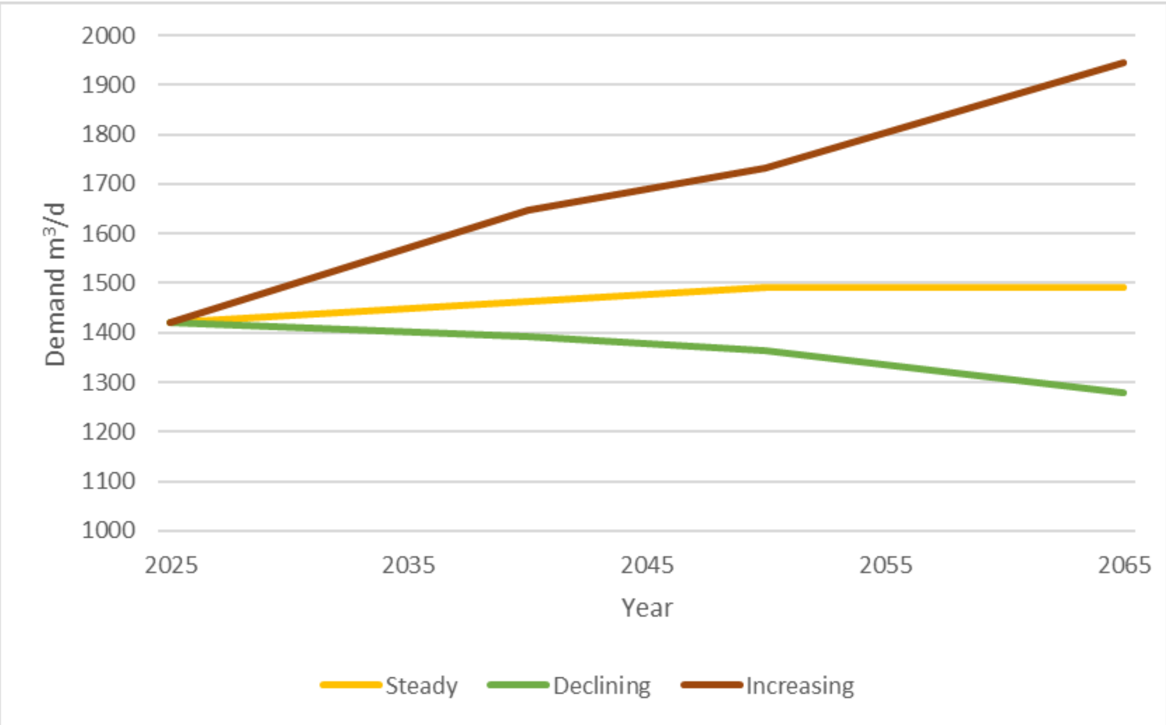


Figure 6-2: Demand forecast for St Helena under different future scenarios

7 Supply demand balance

7.1 Overview of the supply demand balance calculation

The components used to forecast the supply demand balance for St Helena are shown in Figure 7-1.

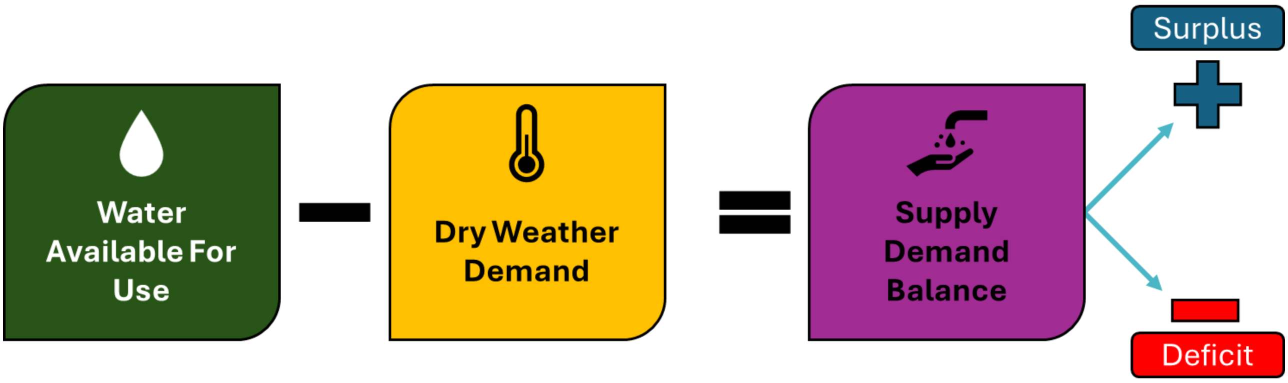


Figure 7-1:Components of the supply demand balance

If the supply-demand balance is in surplus (supply is greater than demand), then there is enough water to meet demand to the planned level of service. If the balance is in deficit (demand greater than supply), supply enhancement, new supply options and/or demand management are needed to meet demand.

7.2 Scenario planning

A number of future scenarios have been explored as part of the plan process to make the plan as resilient as possible. These scenarios cover a range of plausible futures, accounting for how population and demographics might change and the impact of climate change and the uncertainty involved. By assessing multiple future scenarios this allows adaptability to be built into the plan inherently. The following future water resource impact scenarios have been considered:

- High impact scenario - represents a future high population growth and economic development, high climate change impacts
- Moderate impact scenario - steady population growth and economic development, more moderate climate change impacts
- Low impact scenario - low population growth, more moderate climate change impacts

7.3 Supply demand balance forecast

The supply demand balance forecast for St Helena is shown in Table 7-1 and Figure 7-2. This shows that the system is currently in surplus, but under the moderate to high impact scenarios is expected to go into a deficit in future. It is important to note that the current estimated surplus does not mean there are not current supply issues within the system (e.g., drought resilience is not captured here) however indicates that in average conditions there is enough supply to meet demand, which is known to be the case.

Table 7-1:Supply demand balance results for St Helena. All values in m^3/d

	2025	2030	2040	2050	2060	2065
Future supply under climate change (RCP4.5)	1659	1618	1534	1450	1367	1325
Future supply under climate change (RCP8.5)	1659	1615	1527	1438	1350	1306
Steady Demand	1419	1434	1462	1490	1490	1490
Declining Demand	1419	1410	1391	1363	1306	1277
Increasing Demand	1419	1495	1647	1732	1874	1945
Low impact scenario	**240**	**208**	**143**	**88**	**61**	**48**
Moderate impact scenario	**240**	**184**	**72**	**-40**	**-124**	**-165**
High impact scenario	**240**	**120**	**-120**	**-293**	**-524**	**-639**

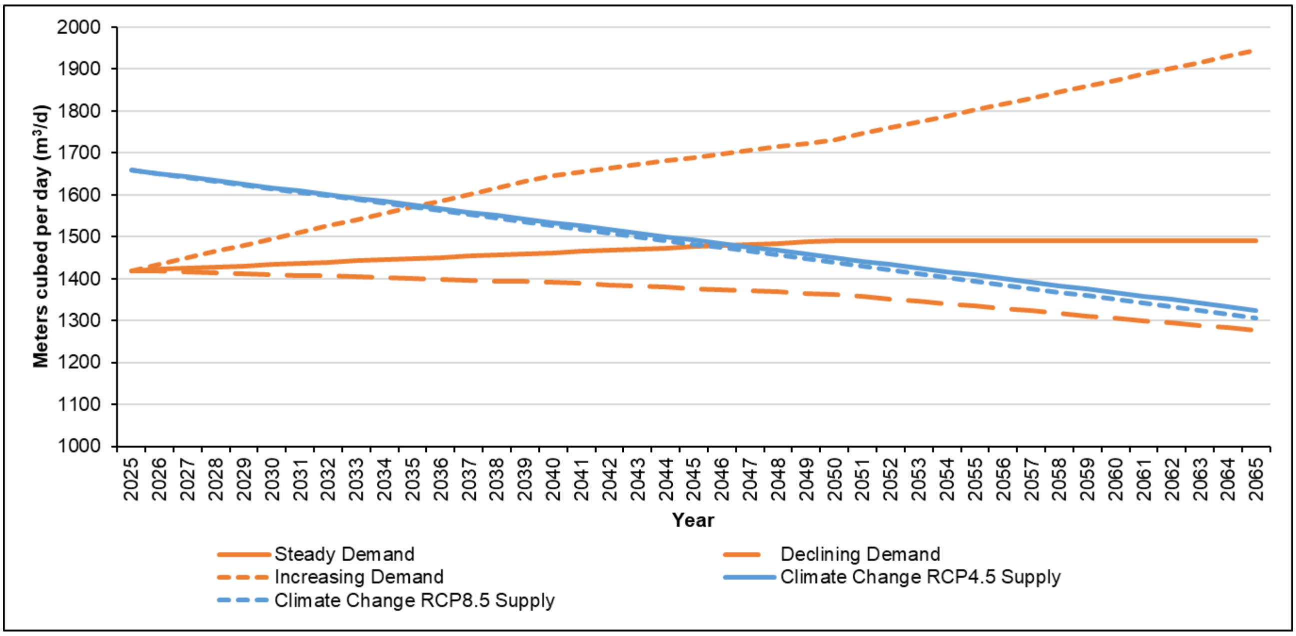


Figure 7-2: Supply demand balance for St Helena

Under the moderate impact scenario, the system is surplus until 2050, after which the deficit increases in size towards 2065 to 165 m^3/d. To put this into context this is 12% of the current demand. This will require investment to prevent this deficit occurring in future if this demand scenario is followed.

The high impact scenario would lead to deficit earlier in the planning horizon, from 2034 onwards. This deficit continues to increase as demand increases and supply decreases due to climate change impacts, reaching 639 m^3/d by 2065, which is 45% of the current demand. Under this scenario, investment and option implementation would be required at a greater rate and more substantial investment than the steady demand scenario would ultimately be necessary.

Under the low impact scenario, a surplus is maintained throughout the planning horizon and therefore investment is not required to close the SDB deficit. However, investment may still be necessary to account for peak demands and outages (e.g. reservoirs out of commission, water treatment works failure) or to enhance drought resilience.

8 Option appraisal and best value planning

8.1 Definitions and context

This section describes how options were identified, screened and taken forward to form the WRMP preferred plan. The purpose of the appraisal was not to select "one solution", but to develop a portfolio of interventions that collectively manages risk across a wide range of future conditions. This is particularly important for St Helena where uncertainty is high (climate variability, small population changes, data limitations), and where major infrastructure investment must be proportionate, scalable and affordable.

A wide range of options have been developed and assessed to understand how the forecast future supply deficit can be addressed.

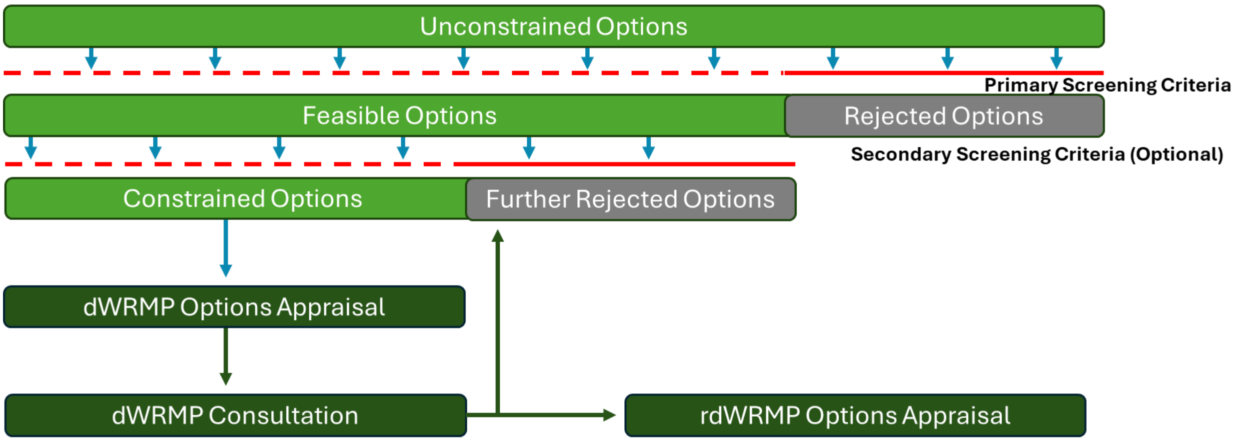


Figure 8-1: WRMP options appraisal process

This approach is consistent with best value planning, which seeks to provide the required level of resilience and service at the lowest whole-life cost, while accounting for environmental, social and deliverability constraints. Best value planning involves choosing options based on a variety of metrics which can include economic cost, environmental impact, customer popularity, biodiversity net gain, generational equity and innovation. There are no fixed metrics to use,

The options appraisal was designed to support an adaptive pathway approach (as illustrated in Figure 8-2), in which:

- Low-regret actions are progressed immediately because they are beneficial in almost all futures
- Short-term options address emerging deficits and operational vulnerabilities within the next few years
- Medium-term options are triggered if adverse climate or demand conditions begin to materialise
- Long-term strategic options are retained as a safety net for worst-case futures.

Adaptive planning allows consideration of multiple preferred plans/options. The adaptive plan sets out how decisions will be made between these plans.

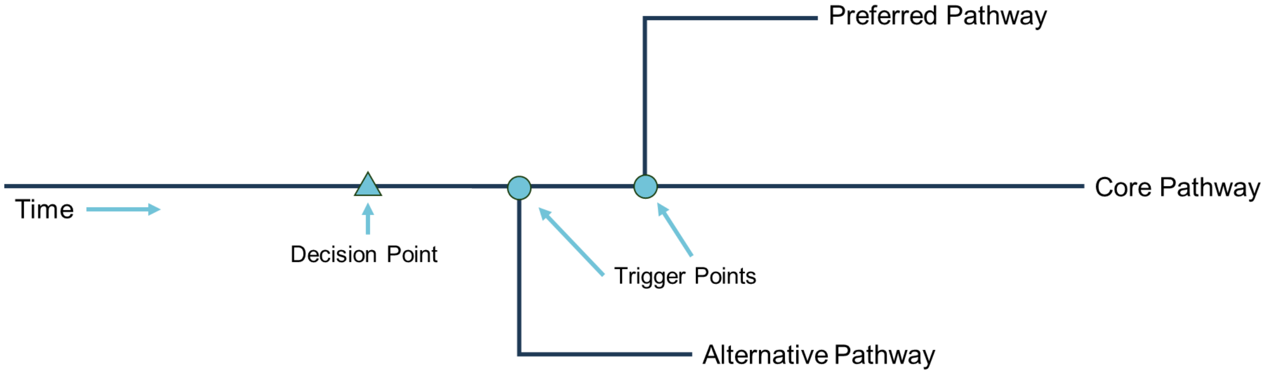


Figure 8-2: Adaptive planning approach

8.2 Long (unconstrained) list of options

A long list of options was developed through:

- Baseline system assessment and stakeholder engagement (SHG, CSH and other partners)
- Review of previous technical studies (including groundwater investigations and Cloud Forest evidence)
- Identification of operational constraints and vulnerabilities (e.g., limited storage buffers, high leakage, treatment limitations after heavy rainfall)
- Consideration of solutions used in comparable island settings and UK WRMP practice.

The long list included interventions across five broad themes:

- Supply and storage
- Connectivity and operational resilience
- Demand management and leakage reduction
- Water quality improvements
- Nature-based and catchment measures (including sediment/runoff management and mist capture pilots)

Please see Appendix B for the full long list of options.

8.2.1 Screening criteria to filter options

Options were screened using a multi-criteria framework that reflects both WRMP planning best practice and the constraints of St Helena. Key criteria included:

- Water resource benefit (contribution to deployable output or reliability)
- Reliability and resilience under drought conditions
- Capital and operational costs (CAPEX and OPEX)
- Deliverability and logistical complexity
- Operational complexity and skills requirements
- Environmental and biodiversity impacts
- Carbon footprint and environmental co-benefits

- Affordability and funding potential
- Synergies with other initiatives (e.g. WTW upgrades, education, climate adaptation.
- Quick-win potential and phasing flexibility.

The criteria and scoring approach are documented in Appendix B and associated spreadsheets.

Each option was qualitatively and quantitatively assessed against the screening criteria. The screening process was used to:

- Remove options with poor feasibility or disproportionate cost
- Group related options (e.g., groundwater as a family of staged interventions)
- Identify combinations that provide better value than standalone measures.

The long list of options was provided to SHG, CSH and the Foreign, Commonwealth and Development Office (FCDO) through the Water Security Project Board for review and comment. Stakeholder preference was combined with the screening process to define the options that should be taken forward for more detailed appraisal.

The screening process recognised that no single option could resolve the identified deficit in supply-demand balance alone. Instead, a portfolio approach has been adopted, combining infrastructure, operational, and nature-based measures. This has been done with the appreciation that (1) the projected deficit is not the only current issue with the St Helena water supply system and (2) water security is not the only pressure effecting St Helena, which faces many challenges (e.g., energy, wastewater). The selected options therefore try to deliver co-benefits.

8.3 Options taken forward and alignment with adaptive capacity

Following screening, options were taken forward as a phased and adaptive portfolio aligned to the different possible future pathways. The shortlist intentionally spans multiple categories because no single option can address the forecast risks in isolation. Some measures primarily improve resilience and operability or address other key problems currently impacting the supply system rather than increasing supply. Options have been aligned to help achieve the targets outlined within the St Helena Water Strategy.

These options and their relative locations are given in Figure 8-3 and are described in more detail in the sections below.

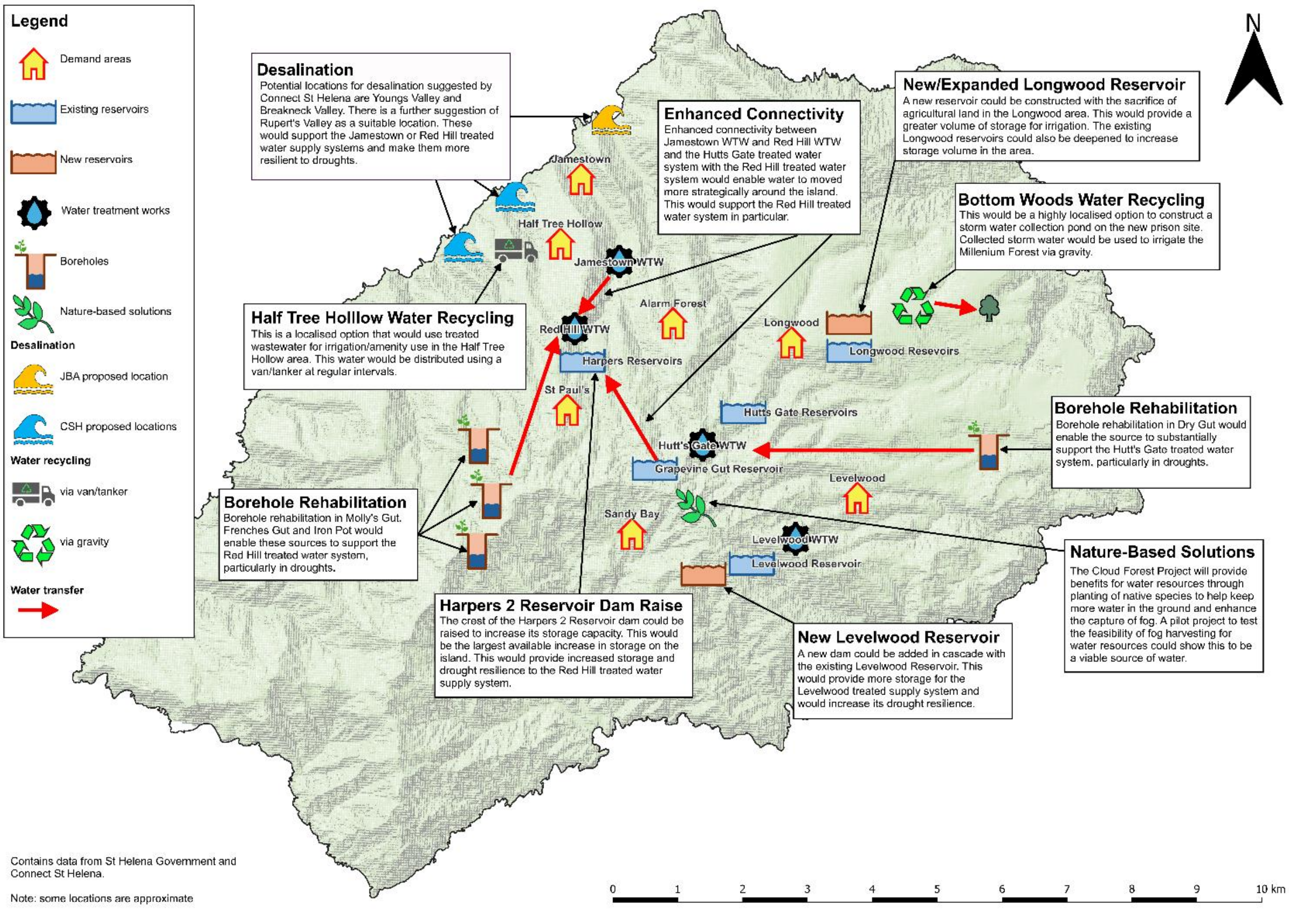


Figure 8-3: Options location map.

8.3.1 Low-regret and quick-win measures

These are actions that improve resilience and efficiency under almost all futures and deliver early benefits. They include:

1. Leakage reduction and improved operational leakage management, supported by targeted equipment and staff training
2. Pressure management and improved monitoring to sustain leakage improvements and reduce burst frequency
3. Chlorination optimisation and operator training to improve consistency of residuals and customer confidence.
4. Small-scale sediment management measures in the Jamestown catchment to reduce turbidity impacts following rainfall events (e.g., check dams / sediment traps, where appropriate and feasible).

These measures provide strong best-value performance because they are relatively low cost, can be implemented quickly, reduce operational strain, and improve the effectiveness of existing water resources.

Leakage reduction and pressure management are considered essential actions for more efficient water management on St Helena and should be a key focus before any supply side options are considered. Without addressing this issue, the effectiveness of any supply side objectives will be reduced.

8.3.2 Short-term infrastructure options

These are options expected to be needed within the next planning period, particularly under moderate and high futures, and are recommended due to their strong resilience value and deliverability:

1. New or expanded storage in the Longwood area, supported by enhanced connectivity to enable water to be moved to where demand is highest. This is with recognition of the potential land-use trade-offs that will be required here.
2. Enhanced east-west connectivity, to address the current mismatch between supply-rich zones and demand centres.
3. Rainwater harvesting in new developments and public buildings as a complementary demand reduction measure.

These options are intended to address emerging deficits and reduce reliance on ad hoc drought operations and high-cost emergency pumping.

8.3.3 Medium-term options for adverse futures

These options were retained as “next steps” if deficits increase, climate impacts intensify, or if demand increases:

1. Harpers Valley storage increase (raising Harpers 2 and/or additional storage upstream), recognising its strategic value as a drought buffer in Redhill, which typically suffers first in drought.
2. Additional storage within the Levelwood system, this will be implemented as a cascaded or smaller-scale storage to improve local resilience).
3. Water treatment works upgrades and treatment process improvements, recognising that treatment capacity and process limitations can constrain deployable output even where raw water exists.

These measures require more detailed feasibility work and funding pathways but provide important resilience and service improvements under adverse conditions. WTW upgrades will become particularly relevant as the current WTW come to the end of their design life. This increases the risk of outage and supply failures significantly. Levelwood is a priority for upgrades, these are likely to be needed in the immediate to short term as this works is already at capacity and is beyond its intended design life. Upgrading treatment works will also have water quality benefits and is expected to lead to considerable improvements in taste and odour particularly if alternative treatments are required.

8.3.4 Long-term strategic resilience options

These options were retained primarily as a long-term contingency should severe deficits occur:

1. Desalination, potential sites include Youngs Valley or Breakneck Valley which would act as a high-reliability backstop.
2. Additional large-scale reservoir development in the longer term where feasible.

These options are not required in the near term under moderate futures, but they maintain a credible pathway if conditions follow the high impact scenario or worsen beyond current projections. Desalinisation is currently cost and carbon prohibitive, however, given the identified need for desalination in many parts of the world, particularly in island nations, this option is likely to become more operable in future as new technologies emerge.

8.3.5 Groundwater as a staged adaptive option set

Groundwater was retained as a grouped, staged option set because it has potential to provide resilient supply, however the yields and sustainability of these supplies are uncertain and further testing and monitoring is required to better understand the supply available from these sources. The approach taken forward is therefore adaptive:

- Rehabilitation/re-use of existing boreholes (where evidence suggests potential and where asset condition allows)
- Further investigation and development of fractured aquifer resources, subject to phased hydrogeological assessment and pumping tests.

Groundwater options are therefore retained for appraisal where data allows, with progression contingent on evidence and funding. Borehole remediation (fixing and relining currently operating boreholes which are damaged/leaking) in particular is a significant need on the island, to prevent loss of this essential freshwater resource to the sea. This is particularly relevant given its strategic importance in managing and mitigating drought. Progressing this option in particular is recommended.

8.4 Best value planning and selection of the preferred plan

The shortlist was carried forward into modelling and appraisal using a best value planning lens. In practice, this means the preferred plan was selected to:

- Meet the agreed resilience/service objective (level of service) with proportionate investment.
- Prioritise low-regret and near-term actions that improve system efficiency, reliability and operability.
- Avoid premature commitment to high-cost infrastructure where uncertainty is high
- Retain flexibility to add or accelerate options if monitoring and modelling show that deficits are emerging sooner or growing larger than expected.

The result is a preferred plan that combines:

- Early efficiency and operational improvements (best-value gains)
- Targeted storage and connectivity to address system vulnerabilities; and
- Contingency options that can be triggered under adverse futures.

8.4.1 Modelling and Detailed Appraisal

The shortlisted options have been taken forward for representation within the water resource system model, allowing their contribution to deployable output (DO), reliability, and resilience to be assessed consistently. This modelling evidence, combined with indicative costing and deliverability assessment has been used as key evidence to define the best-value plan.

The combined water resources and cost results from the detailed appraisal are outlined in **Error! Reference source not found.**. For some of the options modelled the total system deployable output was not sensitive, as the DO was not that sensitive as they deliver local benefits only. The DO's have therefore been assessed assuming improved connectivity between zones and other modelling metrics such as storage benefits and number of days failure in key droughts have been assessed in combination, to create a broader picture of the water resource benefits. Detailed scoring, modelling outputs, and cost assumptions are provided in the accompanying appendices and technical notes. Please note for the **DRAFT WRMP** these results are still in the process of being finalised and reviewed, however the outcomes are unlikely to change significantly.

Table 8-1: Water resources benefit and cost appraisal of the selected options

Option	Actions by timescale	Water resources benefit	Indicative cost (£)	Cost assumptions / notes
Leakage reduction	**Low regret**: Capacity building and training using existing Connect equipment; active leak detection; operational leakage management **Short term**: Expanded leak detection and repair campaigns Ongoing: Sustained leakage reduction	High, delivers on both a local scale and total system scale by reducing demands.	£60k-£120k (initial) £50k-£100k (ongoing)	Assumes reuse of existing equipment with targeted training. Costs include logistics uplift but not full network replacement.
Pressure management & demand management area (DMA) monitoring	**Low regret:** Pressure optimisation using existing valves and monitoring. **Short term:** Targeted DMA roll-out and telemetry Medium term: Integration with storage and transfers	High, contributes to leakage and demand reduction efforts.	£40k-£80k (initial) £100k-£250k (DMA)	DMA implementation limited to priority zones; avoids island-wide full metering.
Chlorination optimisation & operator training	**Low regret:** Pilot booster dosing; operator training (including UK/blended delivery) **Short term:** Expanded monitoring and control	Not applicable, not a supply focused option	£60k-£90k	Includes dosing optimisation, training, travel, and basic monitoring upgrades.

Option	Actions by timescale	Water resources benefit	Indicative cost (£)	Cost assumptions / notes
Sediment traps / check dams (Jamestown catchment)	**Low regret:** Construct small sediment traps and/or check dams upstream of Chubb's Creek and Jamestown WTW **Short term:** Maintenance and refinement, potential for scaling up to other catchments where needed.	Not applicable, not a supply focused option	£20k-£50k	Uses local materials and labour; low-tech nature-based solution with minimal OPEX.
Rainwater harvesting	**Low regret:** Policy guidance, pilot installations at schools/public buildings **Short term:** Incentivised uptake in new developments **Medium term:** Incentivised retrofitting	High, contributes to leakage and demand reduction efforts.	£20k-£60k (public pilots)	Private household installations not included; assumes enabling policy and demonstration projects.
New storage - Longwood	**Short term:** Feasibility, land and planning **Short/medium:** Construction of new or expanded storage	Medium delivers both local scale and total system scale (only if combined with enhanced connectivity) benefit	£0.5m-£1.5m	Earth-fill or embankment storage; cost depends on land availability and connection works.
Storage enhancement - Harpers Valley	**Medium term:** Raise Harpers 2 and/or new upstream storage cell	Medium/Low, delivers on a local scale particularly around enhancing drought resilience.	£1m-£3m	Strategic drought buffer; phased delivery possible.
Storage enhancement - Levelwood	**Medium term:** Cascaded or local storage to improve resilience, linked to WTW upgrades	Medium/Low, delivers drought resilience benefits on a local scale.	£0.8m-£2m	Assumes treatment capacity constraints addressed in parallel.
Enhanced	**Short term:** Hutts Gate-Longwood,	Medium, delivers benefits	£0.5m-£1.5m	Includes pipelines,

Option	Actions by timescale	Water resources benefit	Indicative cost (£)	Cost assumptions / notes
connectivity (east-west transfers)	Hutts Gate-Redhill, Redhill-Jamestown links **Medium term:** Integration with new storage and groundwater	on a total system scale and provides enhancement to drought resilience.		pumps, and control upgrades in steep terrain.
Groundwater rehabilitation (existing boreholes)	**Low regret:** Borehole rehabilitation, sealing, monitoring, groundwater study **Short term:** Controlled re-use subject to testing	Potential medium, not individually assessed due to large uncertainties.	£80k-£150k	Focused on protecting existing aquifer and preventing further losses.
Groundwater development (staged)	**Short term:** Short pumping tests **Medium term:** Further borehole development if sustainable	Potential medium/high, not individually assessed due to large uncertainties.	£100k-£250k (tests) £0.5m-£1.5m (development)	Progression dependent on yield, water quality, and sustainability evidence.
Water Treatment Works upgrades	**Medium term**: Capacity and process upgrades (incl. coagulation as standard in new WTWs)	Not applicable, not a supply focused option. May have some benefits in terms of reducing treatment losses.	£0.5m-£2m+	Assumes replacement or major upgrade rather than retrofit where feasible.
Desalination (Youngs Valley / Breakneck Valley)	**Long term:** Construction if required	High, delivers both local scale and total system scale benefit.	£5m-£15m+	High-cost, energy-intensive option retained as resilience backstop only.

8.4.2 Link to drought planning

The shortlisted options have all been assessed and classed based on their contribution to both supply and drought resilience. There is a separate document on drought planning produced as part of this commission which recommends one integrated drought plan for St Helena and revised triggers.

8.5 Preferred plan and adaptive pathway

Figure 8-4 summarises the outcome of the options appraisal and best value planning process and presents the preferred water resources and drought management plan as an adaptive pathway across the planning horizon (2025-2065). The figure brings together two linked elements:

3. Future water availability (top panel): an illustration of how the supply-demand balance may evolve under low, moderate and high future scenarios, highlighting the points at which deficits may emerge or grow.
4. Preferred options pathway (bottom panel): the staged programme of interventions grouped into Low regret, Short term, Medium term, and Long-term actions.

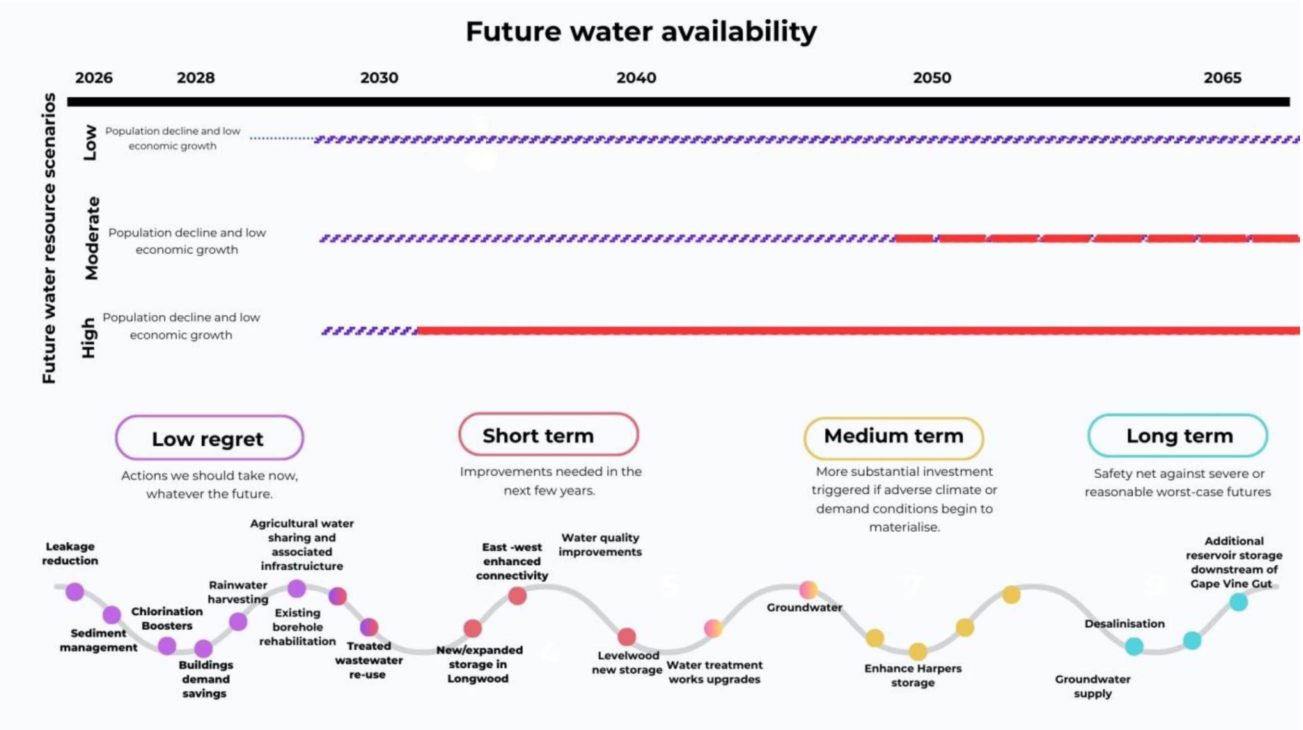


Figure 8-4: Summary of the future water availability and preferred options pathway

Figure 8-4 demonstrates that the WRMP does not rely on a single solution. Instead, it adopts a portfolio approach, where:

- Low regret and quick-win measures are progressed immediately because they improve resilience, efficiency, and service under almost all plausible futures (e.g., leakage reduction, chlorination optimisation, sediment management, demand savings).
- Short-term options address emerging vulnerabilities and improve system performance in the next few years, including improved connectivity, targeted new/expanded storage, and practical demand management measures (e.g., rainwater harvesting in new buildings).
- Medium-term options represent more substantial investment that is triggered if adverse climate or demand conditions begin to materialise, such as larger storage enhancements and treatment works upgrades.
- Long-term strategic resilience options provide a credible safety net against severe or sustained deficits, including desalination and major additional storage where feasible.

Importantly, the pathway shown is adaptive: moving options into delivery is not based on time alone, but on the evidence from modelling, monitoring and scenario testing, and on affordability and deliverability considerations. Selecting options to progress through modelling and appraisal does not predetermine which schemes will ultimately be built. The preferred plan shown demonstrates how St Helena can act now to reduce risk, while keeping flexibility to scale up investment only if and when it is justified by future conditions.

Figure 8-4 therefore provides the “story” of the preferred plan: immediate actions to reduce losses and stabilise service; near-term storage and connectivity to address system vulnerabilities; and longer-term resilience measures held in reserve for worst-case futures.

9 Roadmap to implementation

9.1 Outcomes of the best value planning

The programme appraisal translates the outcomes of the options appraisal and best value planning process into a deliverable, phased programme of actions for the St Helena Water Resources Management Plan (WRMP). The objective of this stage is to confirm how the preferred portfolio of measures can be implemented over time in a way that is affordable, justifiable and proportionate, and resilient to future uncertainty.

The best value planning process has resulted in a programme that:

- Prioritises low-regret and quick-win actions that deliver immediate benefits under all future scenarios.
- Sequences infrastructure investment so that capital-intensive schemes are only progressed when justified by evidence.
- Avoids premature commitment to high-cost or high-risk solutions.
- Retains flexibility to respond to changes in climate, demand, operational performance, and funding availability.

This approach is particularly important for St Helena, given the island's small customer base, high logistics costs, and exposure to climate variability.

9.2 Recommended implementation of the adaptive strategy

The recommended implementation approach is summarised in the WRMP roadmap (Table 9-1 and Figure 8-4) and can be described as follows.

Phase 1: Low-regret actions (2026-2028)

The first phase focuses on reducing existing vulnerabilities and improving the performance of the current system. Key actions include leakage reduction, pressure management, chlorination optimisation, operator training, sediment management measures in the Jamestown catchment, and targeted demand savings (including rainwater harvesting in new developments and public buildings, providing enabling incentives to increase/accelerate implementation). These measures are prioritised because they deliver strong best value, reduce operational strain, and improve public confidence in the water supply.

Phase 2: Short-term system strengthening (2028-2035)

The second phase addresses emerging supply-demand pressures and reduces reliance on reactive drought operations. This includes new or expanded storage at Longwood, enhanced east-west connectivity between supply zones, rehabilitation of existing boreholes (subject to testing), treated wastewater reuse for non-potable demands, and continued catchment management. These actions are expected to be required under the central planning scenario and can be phased to match observed trends.

Phase 3: Medium-term resilience upgrades (2035-2050)

If adverse climate or demand conditions begin to materialise, the programme progresses to more substantial infrastructure upgrades. These include storage enhancements at Harpers Valley and Levelwood, water treatment works upgrades to remove operational constraints, and further groundwater development following staged investigation. These measures strengthen the core system and provide resilience under sustained stress.

Phase 4: Strategic resilience options (post-2050)

Long-term strategic options, such as desalination and major additional reservoir storage, are retained as a safety net against severe or worst-case futures. These options are not required under moderate scenarios but provide confidence that security of supply can be maintained even if climate impacts or demand growth exceed current projections.

9.3 Roadmap

Table 9-1 gives the roadmap for implementation of the preferred plan showing how the different groups of option families can be scaled up as time progresses as necessary.

Table 9-1: Road map for implementation of the preferred plan

Option family	Low-regret actions (2025-2028)	Short-term actions (2028-2035)	Medium-term actions (2035-2050)	Strategic / long-term actions (Post-2050)
Operational efficiency & demand management	Leakage reduction and operational leakage management; pressure management; improved monitoring and staff training	DMA roll-out and optimisation	Ongoing optimisation and refinement	Ongoing
Water quality & treatment	Chlorination optimisation; operator training; sediment management measures in Jamestown catchment (e.g. check dams / sediment traps)	Enhanced water quality monitoring and operational control	Water Treatment Works upgrades, including capacity and process improvements (e.g. coagulation as part of new WTWs)	Advanced treatment measures if required
Catchment & nature-based measures	Sediment traps and runoff management in priority	Expansion of catchment protection and management	Ongoing maintenance and enhancement	Ongoing

Option family	Low-regret actions (2025-2028)	Short-term actions (2028-2035)	Medium-term actions (2035-2050)	Strategic / long-term actions (Post-2050)
	catchments; early catchment protection actions	measures		
Storage & system capacity	Feasibility and planning for additional storage	New or expanded storage at Longwood	Storage enhancements at Harpers Valley and Levelwood	Additional large-scale reservoir storage where feasible
Connectivity & system integration	Improved operational transfers between zones	Enhanced east-west connectivity (Hutts Gate-Longwood; Hutts Gate-Redhill; Redhill-Jamestown)	Integration of connectivity with new storage and groundwater schemes	Ongoing
Groundwater resource management	Borehole rehabilitation; groundwater monitoring and conceptual studies	Short-duration pumping tests and controlled re-use of rehabilitated boreholes	Further groundwater development following staged investigation	Strategic groundwater abstraction if sustainable
Waste water re-use (non-potable)	Feasibility assessment and safeguarding of priority non-potable re-use opportunities (e.g. agriculture, landscaping).	Pilot non-potable wastewater re-use schemes linked to existing treatment assets to offset potable demand.	Expansion of non-potable re-use where pilots demonstrate technical, environmental and economic viability.	Ongoing (roll to the entire island where possible)
Strategic resilience options	Safeguarding of sites and feasibility studies	Safeguarding and monitoring	Safeguarding	Desalination (e.g. Youngs Valley / Breakneck Valley) and other contingency options

10 Impact assessment

The implementation of the preferred Water Resources Management Plan (WRMP) options will generate a range of environmental, institutional, economic, and social effects. This chapter summarises the potential impacts and outlines measures to manage them. Detailed assessments and technical appendices provide supporting evidence.

10.1 Environmental impacts

The preferred WRMP actions will influence the natural environment both positively and negatively. The key considerations are:

10.1.1 Positive environmental impacts

- Reduced leakage and improved efficiency will lower abstractions from stressed sources, reducing pressure on ecosystems and groundwater recharge zones.
- Sediment control measures such as check dams and upstream erosion management will reduce turbidity and sediment load into streams and springs, with benefits for aquatic habitats and downstream water quality (see Appendix D).
- Catchment protection and forest conservation activities will enhance biodiversity, support soil stabilisation, and strengthen natural resilience to climate variability.
- Nature-based solutions, including sediment traps and erosion control, provide co-benefits for habitat enhancement and reduced risk of downstream flooding.

10.1.2 Potential adverse impacts

- New or expanded storage reservoirs and connectivity infrastructure require land-take and may alter local drainage patterns and habitat. Appropriate siting, landscape integration, and ecological mitigation will be necessary.
- Construction activities for storage and connectivity carry risks of disturbance, dust generation, and temporary sediment mobilisation; these can be mitigated through best construction practices.
- Groundwater development must be carefully managed to avoid over-abstraction, drawdown impacts on springs, and inter-aquifer leakage pathways. Hydrogeological studies and monitoring frameworks set out mitigation triggers to safeguard resource sustainability.
- Overall, the WRMP emphasises solutions that integrate environmental co-benefits and minimise negative impacts through phased appraisal, staged implementation, and adaptive monitoring.

Full environmental impact assessments are provided in Appendix D.

10.2 Institutional adjustments

Delivery of the WRMP requires targeted institutional and regulatory adjustments that support implementation of the preferred bundle of options. In particular, this includes:

- clearer coordination between SHG, CSH, and URA to align long-term water resources planning with operational delivery, performance monitoring and tariff regulation, especially for leakage reduction, pressure management, connectivity improvements and phased investment decisions
- targeted investment in skills and operational capacity within CSH and relevant SHG directorates to support enhanced monitoring, asset management, groundwater testing, water quality control and operation of a more integrated and resilient supply system
- strengthened abstraction and groundwater governance including improved monitoring, reporting and adaptive control of groundwater sources, to support borehole rehabilitation, staged groundwater development and protection of drought resilience in line with the WRMP pathway
- alignment with planning and land-use processes to ensure that future development, agricultural activity, rainwater harvesting and potential non-potable wastewater re-use are managed in a way that avoids unmanaged pressure on potable supplies and supports water-efficient development
- improved monitoring and adaptive review mechanisms enabling SHG and the URA to track leakage, demand, water quality and system performance and to trigger progression between WRMP phases in response to emerging risks.

The preferred bundle of options does have regulatory implications, but these are largely incremental and enabling. Most options, including leakage reduction, pressure management, connectivity enhancements, storage development and staged groundwater schemes, can be delivered within existing legal and licensing arrangements, provided that existing regulatory powers are applied in a more coordinated and proactive manner.

However, implementation of non-potable wastewater re-use is likely to require additional regulatory clarification prior to delivery. While existing public health, environmental and planning legislation provides a partial framework, further work would be required to define permitted uses, water quality standards, monitoring requirements, roles and liabilities. This is expected to be addressed through secondary legislation, licence conditions or formal guidance, rather than through new primary legislation, and is consistent with the phased and adaptive approach set out in the WRMP.

Overall, the regulatory and legislative impact of the preferred options bundle is proportionate to the scale and nature of the interventions proposed. The WRMP can be implemented largely within existing institutional structures, provided that regulatory bodies are supported to apply existing powers more strategically to improve efficiency, affordability and long-term system resilience. Further detail is provided in Appendix C. Details on Appendix C.

10.3 Impacts to tariffs

The WRMP does not propose immediate or automatic changes to water tariffs. Instead, it provides a phased and adaptive framework that links potential future tariff impacts to demonstrated need, system performance and regulatory oversight. This approach reflects the importance of maintaining affordability for customers while supporting the long-term financial sustainability and resilience of the water supply system.

For the purposes of this WRMP, any discussion of tariff impacts is indicative and cost-based, and does not attempt to calculate net tariff outcomes. In particular, the assessment focuses on the potential cost implications of interventions, and does not explicitly account for offsetting benefits such as efficiency gains, reductions in leakage, avoided operating costs, deferred capital investment, or improvements in asset performance and resilience. Nor does it assume that investment would be funded solely through customer bills.

In the near term, in practice the preferred low-regret actions, such as leakage reduction, pressure management, improved monitoring and operational efficiency, are expected to reduce avoidable costs and improve the efficiency of existing assets. These measures are therefore more likely to mitigate upward pressure on tariffs than to increase them, by reducing non-revenue water, energy use and reactive maintenance costs.

In the medium to longer term, some infrastructure options identified in the WRMP (including additional storage, water treatment works upgrades, enhanced connectivity and potential wastewater re-use) could have implications for tariffs if and when they are required. However, these options are only intended to be implemented under specific future conditions, such as sustained demand growth or adverse climate impacts. Any resulting tariff implications would depend on the scale, timing and funding arrangements of the schemes, and would be subject to regulatory approval.

All future tariff changes remain subject to Utilities Regulatory Authority (URA) oversight, including affordability assessment and public consultation. The WRMP does not assume that capital investment will be funded solely through customer bills. Instead, it recognises the importance of a diversified funding strategy, including non-tariff mechanisms such as government funding, grants, phased investment, efficiency savings and demand reduction, as set out in Section 10.4.

Overall, the WRMP supports a balanced approach to tariffs, prioritising efficiency improvements and cost control in the short term, while ensuring that any future tariff impacts are proportionate, justified and aligned with service improvements and long-term resilience objectives.

Table 10-1: Indicative tariff implications of the preferred WRMP option phases

WRMP phase	Primary focus	Indicative impact on tariffs
Low-regret actions (2025–2028)	Leakage reduction, pressure management, operational efficiency, monitoring	No direct increase anticipated; potential to reduce cost pressures
Short-term actions (2028–2035)	Targeted storage, connectivity improvements, treatment optimisation	Limited potential impact; subject to regulatory review and funding approach
Medium-term actions (2035–2050)	Expanded storage, groundwater development, wastewater re-use (non-potable)	Possible tariff implications if implemented; dependent on scheme scale and funding
Strategic / long-term actions (Post-2050)	Major resilience options (e.g. desalination)	Significant tariff implications likely; implementation only under high-impact scenarios

10.4 Non-tariff mechanisms to funding

Given the unique financial constraints of a small island economy, non-tariff funding mechanisms are essential to support WRMP implementation in a sustainable and equitable way. Key mechanisms include:

- **Government budget allocations and subsidies:** Direct budget support from the St Helena Government can target priority investments in storage, connectivity, and capacity building, while maintaining affordability for households and industry.
- **Targeted subsidies:** Subsidy frameworks can be designed to assist vulnerable customer groups or essential public services without broadly diluting cost-reflective pricing signals.
- **External grants and concessional finance:** International development partners, climate adaptation funds, and infrastructure grants may be pursued to support capital-intensive interventions such as storage enhancements or groundwater development.
- **Public-private partnerships and service contracts:** Collaborations between Connect Saint Helena and specialist providers (e.g., for training, technical services, or equipment) can leverage private sector expertise while managing risk and cost exposure for the public sector.
- **Non-revenue water savings:** Cost savings from reduced leakage, improved pressure management, and more efficient operations represent endogenous funding through improved system performance.

A diversified funding strategy using multiple mechanisms will support the phased implementation of WRMP actions without over-reliance on any single revenue source.

11 Conclusions

11.1 Overview

The St Helena WRMP has assessed current and potential future pressures on the island's water supply system and sets out an action plan and roadmap of interventions required to address these challenges. The WRMP is the first in depth assessment of supply and demand on the island and has prioritised establishing a reliable baseline of existing water resources and infrastructure using established and simple methods and techniques. In doing this we have established a level of service of 1 in 100-years for the St Helena water supply system (1% chance of failure to supply in any given year) and formed a plan that allows this current level of service to be improved. Best efforts have been made to account for the high uncertainties inherent within this assessment, however, some still remain. This supply and demand forecast therefore represents a starting point, which can be improved upon as needed as better tools, methods and data become available.

The approach selected has prioritised demand management in the short term, recognising that this has some of the greatest potential for both improving the supply demand balance and drought resilience. This should therefore be done before any supply-side interventions, which are reserved for the short to medium term. Options have not only been selected that improve supply, and the plan has also prioritised options which address some of the other issues within the supply system (e.g., water quality).

The WRMP does not rely on a single solution; instead, it adopts a portfolio-based approach in which low-regret and quick-win measures are progressed immediately to improve resilience, efficiency, and service performance under almost all plausible futures. Short-term options are identified to address emerging vulnerabilities and enhance system performance over the next few years, including improved system connectivity, targeted new or expanded storage, and practical demand management measures such as rainwater harvesting in new developments. Medium-term options involve more substantial investment that would be triggered if adverse climate or demand conditions begin to materialise, including larger storage enhancements and upgrades to treatment works. Long-term strategic resilience options provide a credible safety net against severe or sustained supply deficits, with measures such as desalination and major additional storage retained where feasible.

The preferred pathway is adaptive: decisions to progress options into delivery are driven not by time alone, but by evidence from modelling, monitoring, and scenario testing, alongside affordability and deliverability considerations. Progressing options through modelling and appraisal does not predetermine which schemes will ultimately be constructed; rather, the preferred plan demonstrates how St Helena can act now to reduce risk while retaining flexibility to scale up investment only if and when future conditions justify it.

The WRMP provides a structured and precautionary approach to considering future tariff impacts. It does not assume immediate or automatic increases in customer charges and recognises the importance of affordability in a small, remote island context. Any indicative tariff implications presented in the plan are cost-based and conservative, and do not account for efficiency gains, avoided costs or alternative funding mechanisms. In practice, the preferred strategy prioritises actions that improve system efficiency and reduce long-term cost pressures, with any future tariff changes subject to regulatory oversight, affordability assessment and public consultation. This approach supports long-term financial sustainability while protecting customers from unnecessary or premature impacts on bills.

11.2 Next steps and recommendations

The WRMP establishes a strategic framework for securing St Helena's water supply under uncertainty. To translate this strategy into delivery, a series of sequenced and proportionate next steps is recommended. These steps are designed to progress options gradually, allowing risks, costs, and impacts to be better understood before committing to major investment. The emphasis is on detailed studies, monitoring, and early enabling actions, rather than immediate construction of large infrastructure. These are detailed in Appendix B.

11.2.1 WRMP implementation, review and governance

The Water Resources Management Plan (WRMP) should be treated as a live, adaptive planning framework, rather than a static document. Effective delivery of the preferred WRMP pathway therefore requires clear governance, regular monitoring, and periodic review, consistent with established UK water resources management planning practice and applied proportionately to the St Helena context.

A key proposed action is to establish or confirm WRMP Steering Group and produce WRMP implementation guidance (ToR, roles, meeting cycle, decision gates). Strategic responsibility currently sits with SHG, while CSH is responsible for operational delivery under regulation by the Utilities Regulatory Authority (URA). SHG would therefore has a lead role on the board with supporting bodies including CSH, URA, Planning, Health and Finance. In future, CSH could take on a greater implementation role if its operating licence, funding mechanisms and regulatory incentives are strengthened to support long-term investment and WRMP delivery.

The adaptive pathway adopted by the WRMP relies on monitoring to inform adaptive decision-making and to understand which future trajectory the island is following. It is therefore recommended that:

- Population and demand trends continue to be monitored and compared against the WRMP demand scenarios.
- Supply performance monitoring is enhanced and automated (e.g., through implementation of telemetry and SCADA), including inflows, reservoir behaviour, borehole operation, and system losses.
- Climate indicators, such as rainfall, temperature, and drought frequency, are tracked alongside water system performance.

- Groundwater levels and abstraction volumes are monitored to protect sustainability.

In the UK, statutory Water Resources Management Plans are subject to a formal review and update cycle, typically every four to five years, supported by annual monitoring and reporting. While St Helena is not subject to UK statutory requirements, the same principle of periodic review is considered good practice because water resource systems are dynamic, and the assumptions underpinning long-term plans can change over time. It is recommended that the WRMP is reviewed annually at a high level through a WRMP implementation statement or equivalent document to confirm that assumptions, triggers and delivery schedules remain appropriate; and a more comprehensive review and update of the WRMP is undertaken at an appropriate strategic interval (for example every five years), or earlier where monitoring indicates that assumptions are no longer valid or where significant changes occur (e.g. prolonged drought, demand shifts, policy or regulatory changes).

Please see Appendix C for more detail.

11.2.2 Progressing low-regret and enabling action

The following actions are recommended for immediate progression, as they deliver benefits under all future scenarios and support later decision-making:

- Implementation of leakage reduction and pressure management, including staff training and improved operational practices.
- Chlorination optimisation and water quality improvements, supported by enhanced monitoring and operator training.
- Sediment management measures in priority catchments (e.g. Jamestown), using small-scale, locally delivered interventions.
- Development of policy guidance for rainwater harvesting in new developments and public buildings.

These actions will improve system performance, build institutional capability, and increase public confidence, while also generating better data for future planning.

11.2.3 Detailed studies to de-risk short-term options

Before progressing short-term infrastructure options, a number of targeted technical and feasibility studies should be undertaken:

- Storage feasibility studies for the Longwood area, including land availability, environmental constraints, constructability, and connection requirements.
- Connectivity and transfer assessments, focusing on priority links between Hutts Gate, Longwood, Redhill and Jamestown, including energy and operational implications.
- Groundwater technical studies, including borehole rehabilitation assessments, conceptual hydrogeological review, and design of staged pumping tests.

- Water quality and treatment assessments, to inform the scope, timing and design of future WTW upgrades.

11.2.4 Staged progression of infrastructure options

Major infrastructure options should only be progressed through defined stages, with clear decision points:

- Feasibility and optioneering - confirm technical, environmental, and planning viability.
- Outline design and cost refinement - improve cost certainty and delivery planning.
- Environmental assessment and permitting - ensure compliance and mitigation.
- Funding and procurement strategy - identify funding sources and delivery routes.
- Construction and commissioning - only once earlier stages are satisfactorily completed.

Technical appendices