30 YEAR
Strategic Plan
2017 - 2047

Solomon Water
Safe water for a healthy nation
Solomon Islands Water Authority

5 Year Action Plan
2017 - 2022

hunterh2o

CHAIRMAN'S FOREWORD

It is my pleasure to present the 30 Year Strategic Plan and the 5 Year Action Plan for Solomon Islands Water Authority, trading as Solomon Water.

Solomon Water is a State Owned Enterprise (SOE) that provides essential services in the areas of water and wastewater, and plays a big role in the delivery of these services. Presently, Solomon Water operates in Honiara, Auki, Noro and Tulagi but we anticipate Gizo will soon be managed by us as well, and other provincial centers in the future.

The 30 Year Plan is a guiding document that sets the long term strategic direction that Solomon Water needs to take, and the 5 Year Action Plan details the short to medium term plans which would ensure ongoing sustainable development of our water and wastewater services throughout the Solomon Islands.

It envisions a future whereby Solomon Water is able to meet its key objectives:

- Meeting forecast growth in Honiara's demand for water services including peri-urban areas;
- Developing and delivering a wastewater strategy, especially for Honiara;
- Meeting the needs of the other three urban centers: Auki, Noro and Tulagi;
- Growing Solomon Water's footprint in the Solomon Islands.

The most significant project in the plan is the development of a new water source for Honiara to enable Solomon Water to manage the rapid growth. Couple with this is reduction of non-revenue water to reduce losses through theft and leakage from old pipes.

The overall success of this Strategic Plan will require strong support from the Solomon Islands Government (SIG), donor partners and stakeholders at large. I therefore take this opportunity to appeal to all our partners and stakeholders to support and assist us for the benefit of the people of Solomon Islands and its future generations.

I commend this document to you.

Phil Bradford
Chairman

GENERAL MANAGER'S OVERVIEW

The completion of the 30 Year Strategic Plan and 5 Year Action Plan has been long awaited and this marks a very important milestone in moving Solomon Water towards meeting its overall mission and vision for our future.

Vision: *Safe Water for a healthy nation*

Mission: *To provide reliable and safe water supply and sewerage systems within our area of operations in Solomon Islands, while working in partnership with the community to plan, deliver and operate infrastructure in a manner that seeks to minimise the social and environmental impacts of our activities.*

The strategic plan is an overarching document providing clear direction for Solomon Water in the short, medium and longer term. This is a living document which will be reviewed every 3 to 5 years (depending on the dynamics and changes taking place within the internal and external operating environment), while keeping in focus Solomon Water's key objectives of providing sustainable water and wastewater services, meeting forecast growth demands, expanding its footprint in existing areas of operations, and gradually expanding services to other provincial centers as mandated under the legislation.

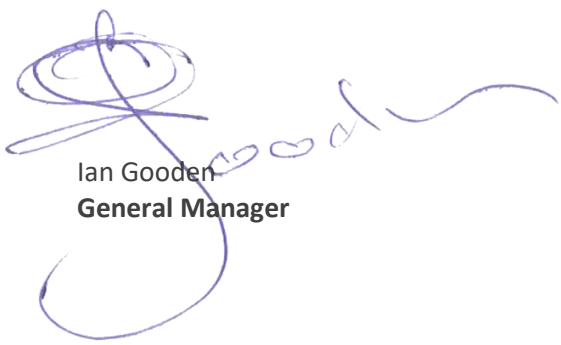
In the next 5 years Solomon Water will be rolling out some major projects which will mostly be funded by Donors, with contributions from Solomon Water and the Solomon Islands government. Some of the key investments will include:

- Upgrading of pipeline networks
- Construction of a new water treatment plant for Honiara
- Increase in customers as network extensions and improvements occur.
- Ongoing reduction in Non-Revenue Water.
- Construction of additional reservoirs
- Expansion of Solomon Water's footprint towards east Honiara
- Implementation of pre-paid Water meter System - Cash Water
- Implementation of the Wastewater strategy

This document gives Solomon Water the Confidence to move forward into the future. I hope the government, donor partners, and other stakeholders will embrace and support us.

I would like to acknowledge HunterH2O Holdings Pty Ltd for producing this very important document for Solomon Water and the people of this Country.

Lastly I would like to thank my staff and the Solomon Water Board of Directors for their unwavering support in producing this plan.



Ian Gooden
General Manager

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1 INTRODUCTION

This Action Plan provides the detail of the work required over the next 5 years to ensure the ongoing sustainable development of alignment with the long term strategic direction for Solomon Water's (SW's) water and wastewater services throughout Solomon Islands, in alignment with the long term strategic direction.

The plan incorporates Solomon Water's:

Vision *Safe Water for a healthy Nation*

Mission *To provide reliable and safe water supply and sewerage services within our area of operations in Solomon Islands*

This study was prepared by Hunter H2O Holdings Pty Ltd on behalf of SW in parallel to the preparation of a strategic plan, tariff review and social assessment. The following documents have been submitted concurrently:

- Solomon Water 30 Year Strategic Plan – Main Report
- Solomon Water 30 Year Strategic Plan – Recommendations and Implementation Plan
- Solomon Water 5 Year Action Plan (this document)
- Cost of Service and Tariff Review
- Social and Consumer Assessment

1.1 Objectives and Scope

The objectives of this study are to maintain a sustainable organisation with a sound financial position improving quality, reliability and inclusive access of services. The study outlines a strategy to meet forecast short term growth in Honiara's demand for water and wastewater services to 2022, including peri-urban areas, as well as meeting the needs of other major urban centres in Solomon Islands.

The scope of works is outlined in the 30 Year Strategic Plan – Main Report.

1.2 Context

The Solomon Islands Water Authority (SW) is a state owned enterprise created under the Solomon Islands Water Act 1992 to:

> *"make provision for the establishment of a water authority for Solomon Islands, to provide for the proper management and development of urban water resources and sewerage services in Solomon Islands and for other matters connected therewith or incidental thereto"*

SW has an independent Board of Directors responsible to the Ministers of Mines, Energy and Rural Electrification (MMERE) and of Finance and Trade (MOFT) for oversight of the organisation. SW has around 145 staff, 3 advisors funded by the Australian Department of Foreign Affairs and Trade (including General Manager and Finance and Administration Manager), and turnover of approximately SBD 110m. SW operates water supply systems in Honiara, Auki, Noro and Tulagi, as well as a wastewater system in Honiara, as shown in Figure 1-1.

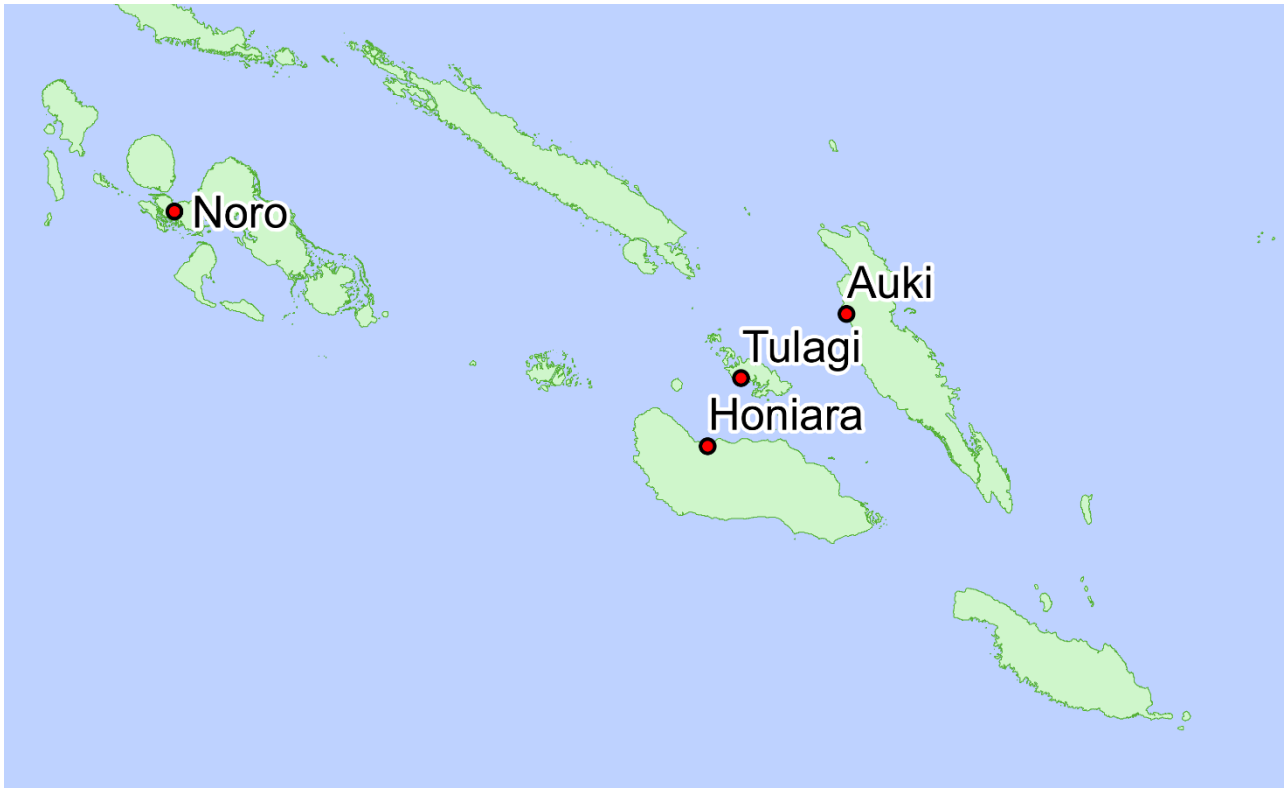

Figure 1-1 SW Area of Operations

By mid-2010 it was apparent that SW was in a state of near financial and operational collapse. Due to weak governance by the previous board, poor management with limited skills and inappropriately low tariffs, SW was unable to pay its electricity bills and accumulated a substantial debt to the Solomon Islands Electricity Authority (SIEA). There was a serious risk that the already poor water and sanitation services in Honiara would largely cease to function with significant adverse impacts on human health and the local economy.

In August 2010 the Solomon Islands Government (SIG) replaced the SW Board and in April 2011 an interim General Manager and an interim Finance and Administration Manager were appointed with the support of the Pacific Infrastructure Advisory Centre (PIAC).

The two senior managers prepared a Short-Term Recovery Strategy and Action Plan (RAP) (Solomon Islands Water Authority, 2011) to guide urgent reforms to SW's organisation, finances and operations. The RAP was presented to SIG and development partners and endorsed by the SW Board in May 2011. The primary objectives of the RAP were to improve service levels and increase revenue through the implementation of a series of individual, but often inter-related strategies to:

- Improve the reliability of water supply and improve service levels by replacing key pumping equipment and performing urgent maintenance work;
- Reducing the number of illegal connections;
- Improve meter reading accuracy, billing efficiency and the management of debt collection;
- Improve the safety of drinking water by replacing chlorine dosing equipment and improving the control and monitoring of water quality, including the provision of facilities for water quality analysis;
- Reducing physical water losses (leakage) from the water transmission and distribution network and through the implementation of a suitable leakage reduction strategy involving finding and fixing the leaks. Leakage detection equipment will be procured for use by a special team, and a strategic stock of pipes and fittings will be procured to enable the leaks to be repaired;
- Develop the standards of Customer Service provision and improve the image of SW;
- Improve the reliability of financial systems and improve HR management.
- Prepare a proposal for an increase in the tariff of water charges for approval by the responsible Minister(s).

A two-year development plan (Solomon Islands Water Authority, 2013) was then prepared by SW to build on the RAP, targeting a number of critical issues to ensure the sustainable development of the business into the future. The overall objective of the Plan was to move SW forward to a position where its infrastructure was capable of supporting an acceptable quality of service to the population and which was based on a firm financial position.

As part of the Two Year Development Plan, it was proposed that an action plan be formulated to map out and define Solomon Water's development over the next 5 years. Development of the plan was delayed until 2016 due to staff changes.

Hunter H2O developed the longer-term strategic plan (Hunter H2O, 2017), setting out SW's longer-term investment needs for improved and expanded service delivery and coverage in urban centres over the next 30 years. This document complements the 30 Year Strategic Plan and maps out SW's suggested development during the 5-year period from 2017 to 2021.

1.3 Current Water Supply Systems

A summary of the water supply systems that are currently operated by SW is shown below in Table 1-1. The Honiara water supply system is a large urban system with multiple surface and groundwater sources, while the three smaller water supply systems service provincial centres that are located on other islands and only have one or two primary sources.

Table 1-1 SW Water Supply Systems Summary

System	Number of Connections*	Current Daily Supply - Estimate (ML/d)**	Water Supply Source/s	Water Treatment
Honiara	8,478	32.5	▪ Kongulai Spring (38%) ▪ Rove Spring (10%) ▪ Kombito Spring (11%) ▪ Tasahe / Titinge / Skyline bores (13%) ▪ Mataniko / Tuvaruhu bores (10%) ▪ Kombito / Borderline bores (12%) ▪ Panatina bores (6%)	Chlorination only
Auki (Malaita)	468	0.4	▪ Kwaibala Spring (?%) ▪ Auki bores (?%)	No treatment
Tulagi (Central)	209	0.1	▪ Maliali River (100%)	No treatment
Noro (Western)	449	1.1	▪ Ziata Creek (100%)	WTP (rapid sand filter) and chlorination

Notes: ** Number of connections supplied by SW (April 2016 RFP)*

*** Current daily supply estimate for Honiara is based on SW water production data for 2015/16. Data for provincial systems supplied by SW (April 2016 RFP)*

A map of the existing water supply system is provided in Figure 1-2. Further details of the existing systems are provided in the 30 Year Strategic Plan.

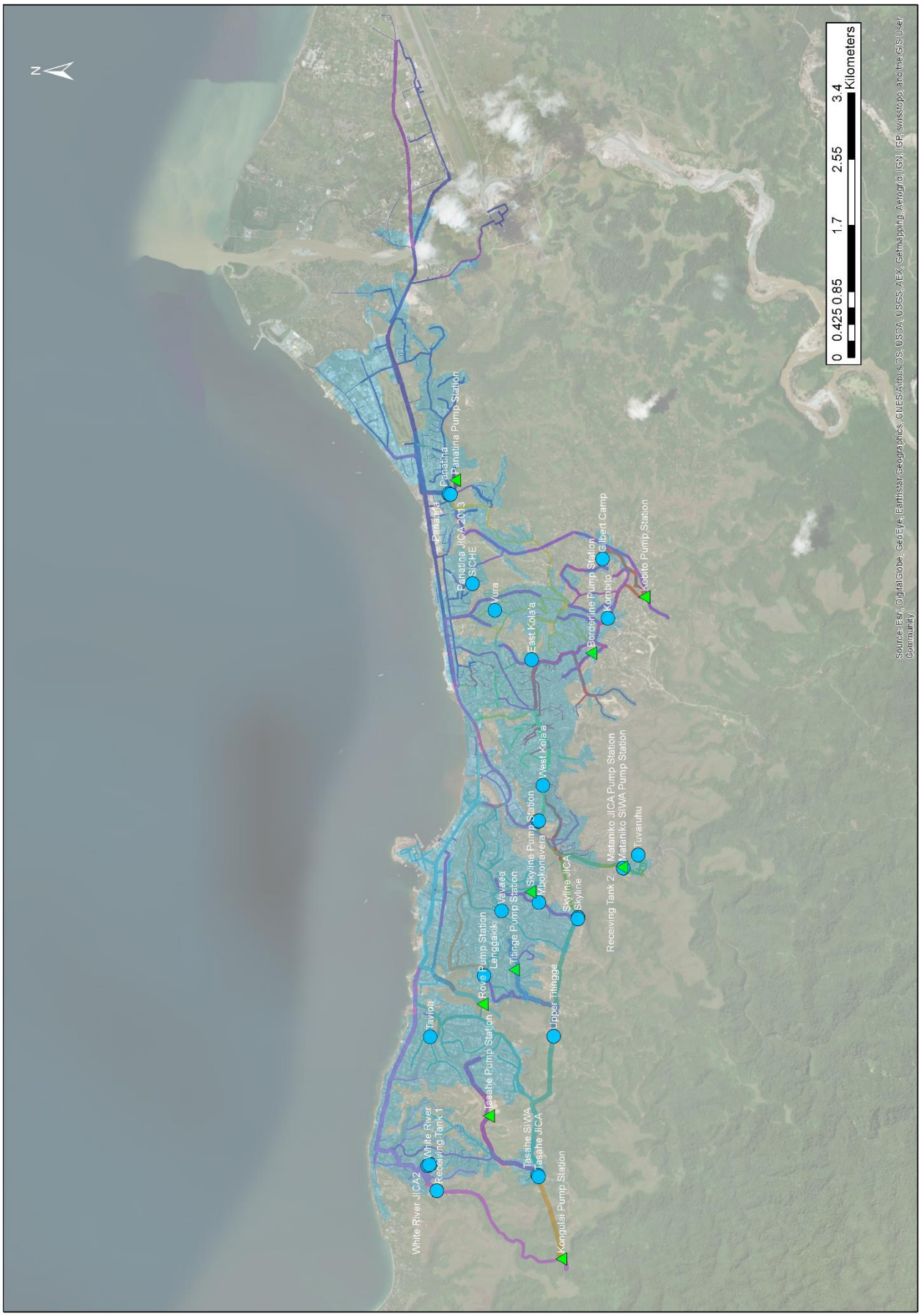

Figure 1-2 Existing Honiara Water Supply System

1.4 Current Wastewater System

A wastewater network operated by SW services some parts of Honiara, largely servicing commercial and government areas. The system serves about 30% of Honiara's water supply customers (~1000 connections) and consists of 13 discrete gravity collection systems. 11 sub-systems discharge to ocean outfalls, 2 sub-systems discharge to river outfalls. 2 sub-systems boost flows to the outfalls via pumping stations, the remainder discharge under gravity. There are no treatment facilities. SW does not operate wastewater systems in other provincial centres.

A summary of the existing network is provided in Table 1-2, and a map is provided in Figure 1-3. Further Details of the existing systems are provided in the 30 Year Strategic Plan.

Table 1-2 SW Wastewater Systems Summary

System	Number of Connections*	Current Daily Wastewater Production - Estimate (ML/d)**	Wastewater Catchments	Wastewater Treatment
Honiara		2.5	▪ Bahai ▪ Central Hospital ▪ KGVI ▪ Kukum ▪ Mbua Valley ▪ Naha ▪ Point Cruz ▪ Ranadi ▪ Rove ▪ Tuvaruhu ▪ Vara Creek ▪ Vura	None

Notes: ** Number of connections supplied by SW (April 2016 RFP)*

*** Current daily supply estimate for Honiara is based on SW water production data for 2015/16. Data for provincial systems supplied by SW (April 2016 RFP)*

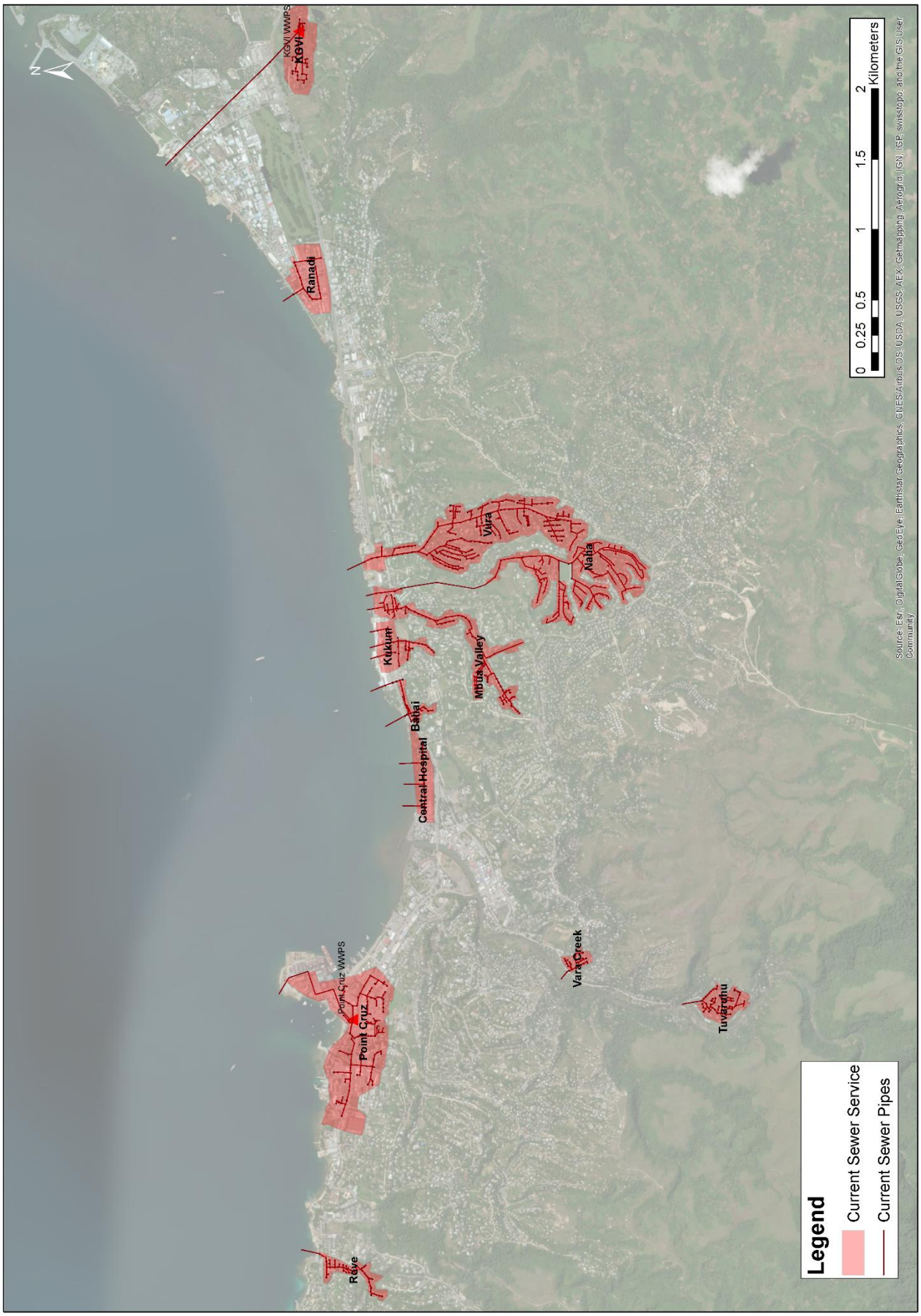

Figure 1-3 Existing Honiara Wastewater Network

2 SERVICE STANDARDS

Service Standards are a set of objectives and targets that drive the quality of service provided by a water utility. Appropriate Service Standards are necessary to ensure that corporate, customer and environmental requirements are met cost effectively. SW does not currently have formal Service Standard requirements across all of its business; however, some specific objectives, targets and standards are detailed in various corporate and external documentation.

A detailed analysis of current and proposed Service Standards is provided in Section 3 of the Strategic Plan (Hunter H2O, 2017). The three main types of Service Standards that are considered, in order of importance, are:

1. Corporate Objectives
2. Levels of Service
3. Design Standards

Details of these service standards are provided in the following sections, including current performance, the proposed medium term objectives (through the life of this action plan to 2022), and the impacts of improving these service standards.

2.1 Corporate Objectives

Corporate Objectives are the specific targets and drivers that are set by the SW Board and/or the SI Government to drive improvements in service delivery over time. They may include high-level targets and objectives related to international standards such as WHO guidelines for water supply and sanitation and the UN Sustainable Development Goals, as well as SI Government and SW Board targets and objectives related to health standards, environmental protection, treatment of informal settlement areas and coverage area.

Corporate objectives are summarised in Table 2-1 below. Current Corporate Objectives have generally been sourced from the SW Two-Year Plan (Solomon Islands Water Authority, 2013) and the SI National Infrastructure Investment Plan (Ministry of Development Planning and Aid Coordination, 2012). Proposed 5 year objectives are detailed in Section 3 of the Strategic Plan (Hunter H2O, 2017).

Table 2-1 Corporate Objectives

Service Area	Current Objective	Current Progress	Proposed 5 Year Objective	Impact of Improved Standard
Coverage of Water Supply Systems	80% urban population connected to the SW network by 2015 (Ministry of Development Planning and Aid Coordination, 2012)	55% of customers within service area have access to network	70% of properties within all service areas have access to network.	Increased population with access to improved water supply, improved water security and reliability
Drinking Water Quality Standard	Meet WHO microbiological standards for Drinking Water Quality (Ministry of Development Planning and Aid Coordination, 2012) (former prescriptive standards)	Chlorine disinfection in Honiara and Noro only (no treatment for other provincial centres)	Implement a risk-based drinking water management framework with appropriate health-based targets and water safety plans in accordance with current WHO Guidelines for Drinking Water Quality	Improved reliability to protect against waterborne disease
Water Supply to Informal Settlements / Peri-Urban	Ensure clean water and proper sanitation is available in all communities (Ministry of Development Planning and Aid Coordination, 2012)	79% of population have access to improved water supply	Seek SIG direction on appropriate supply options for informal settlements / peri-urban areas Contribute to UN Sustainable Development Goals improved water supply targets	Improved water supply access to low income households
Coverage of Wastewater Systems	20% increase in coverage of sanitation by 2015, and a further 20% increase in coverage for sanitation by 2020 (Ministry of Development Planning and Aid Coordination, 2012)	9% of population within service area connected to wastewater system in Honiara, 0% for other provincial centres	Approximately 20% of residential and majority of non-residential customers within Honiara service area have access to wastewater network	Increased population with access to adequate sanitation, less reliance on aging septic systems, improved environmental and health impacts
Sewage Treatment Standard	Investigate municipal sewerage and treatment/disposal (Ministry of Development Planning and Aid Coordination, 2012)	No treatment of sewage	Screening and effective dilution of all sewage pumped from wastewater network to waterways	Improved environmental and health impacts
Energy Consumption	Not currently assessed		All capital decisions with electrical energy requirements above 20kW will be assessed on a net present value assessment taking into account capital and operating costs	Increased efficiency, reduced operating costs, improved energy sustainability
Emergency Management	Not currently assessed		Risk assessments carried out and emergency response plans prepared for all risks identified that cannot be addressed by remedial action	Improved emergency preparedness

Service Area	Current Objective	Current Progress	Proposed 5 Year Objective	Impact of Improved Standard
Financial Sustainability	Not currently assessed		SW meets full financial requirements of SOE Act, with contribution from donors and CSOs	Improved financial performance, less reliance on external funding
Lifecycle Management	Not currently assessed		Develop lifecycle management targets as part of an asset management plan. Adopt and implement a maintenance management system to manage all routine and breakdown maintenance.	Improved operational and maintenance efficiency, reduced ongoing costs
Climate Change / Resilience	Not currently assessed		Identify and assess extreme climate and climate change risks and commence development of mitigation and adaptation strategies	Improved system resilience
Strategic Planning	Not currently assessed		Implement 5 Year Action Plan and review 30 Year Strategic Plan	Improved ability to deliver future works

2.2 Levels of Service

Levels of Service can be defined as the standard of performance that is to be provided by a water supply system or wastewater system as perceived by the customer. They are sometimes described as 'customer service standards' or a 'customer charter'. They are generally established by the water utility, sometimes in association with the community, and may relate to broader Corporate Objectives and/or regional benchmarks.

Table 2-2 Levels of Service

Service Area	Indicator	Current Performance	5 Year Target	Impact of Improved Standard
Drinking Water Quality	Compliance with required drinking water guidelines (% of samples complying)	48%	95%	Improved reliability to protect against waterborne disease
Water Supply Service Continuity	Continuity of service (Hrs/day) at minimum pressure	22	24	Maximised availability of water to customers
	Customers with continuous supply (%)	93%	95%	Maximised availability of water to customers
	Frequency of water main breaks (breaks/km/yr)	2.6	2.2	Reduced disruption to customer service
Water Loss Management	Non-Revenue Water - NRW (%)	62%	45%	Improved efficiency of supply, reduced operating costs
	Extent of water metering (%)	88%	95%	Improved billing income, reduced NRW
Water Supply System Pressures	Minimum pressure at water meter (m)	Unknown	10	Improved reliability of water supply
	Maximum pressure at water meter (m)	Unknown	70	Reduced losses and damage to fittings etc.
Demand Management	Residential water consumption (L/person/d)	177	170	Improved efficiency of supply
Water Security	Frequency of water restrictions and/or rationing due to raw water capacity limitations	Unknown	1 month per year	Reduced impacts on continuity of service
Wastewater Service Continuity	Frequency of sewer main blockages (blockages/km/yr)	6.7	5.0	Reduced environmental, health and customer impacts due to wastewater overflows
Wastewater Effluent Quality	Compliance with required effluent quality targets (% of samples complying)	Unknown	Develop targets	Reduced environmental, health and customer impacts due to effluent discharge
Financial	Collection period (average days for collection)	146	90	Improved billing collection
	Collection ratio (income as % of billed revenue)	84%	90%	Improved billing collection
	Staff per 1,000 water & wastewater connections	18.0	12	Improved efficiency of operation
Customer Complaints	Customer complaints / 1,000 connections	Unknown	200	Improved customer impacts

2.3 Design Standards

Current design criteria for new, non-trunk water assets are set out in the recently developed SW Water Supply Design & Construction Code (Solomon Islands Water Authority, 2016), which also includes approved materials, specifications and standard drawings. The code is based on a South East Queensland adaptation of the Water Supply Code of Australia (Water Services Association of Australia, 2011). The code currently only covers water supply assets and does not include wastewater standards. A similar design and construction code will need to be developed for wastewater in the short-term and both the water and wastewater codes would then be subject to refinement over time in order to further tailor the standards to Solomon Island conditions.

3 POPULATION AND GROWTH

The extent of population connected to water supply and wastewater systems is important in determining the capacity of existing assets and the sizing of new assets.

This section summarises existing and future customers, with an analysis of the number of customers connected to major sub-systems, assessment of future connections, and forecast water supply demands and wastewater loadings. A detailed analysis of population and growth is provided in the 30 Year Strategic Plan.

3.1 Forecast 2022 Water Supply Demands

The future water demands for each SW system were estimated based on current connections, with consideration of expansion of the systems to supply currently unserviced premises and future growth. The adopted areas expected to be connected to the SW Honiara system over the next 5 years are shown in Figure 3-1.

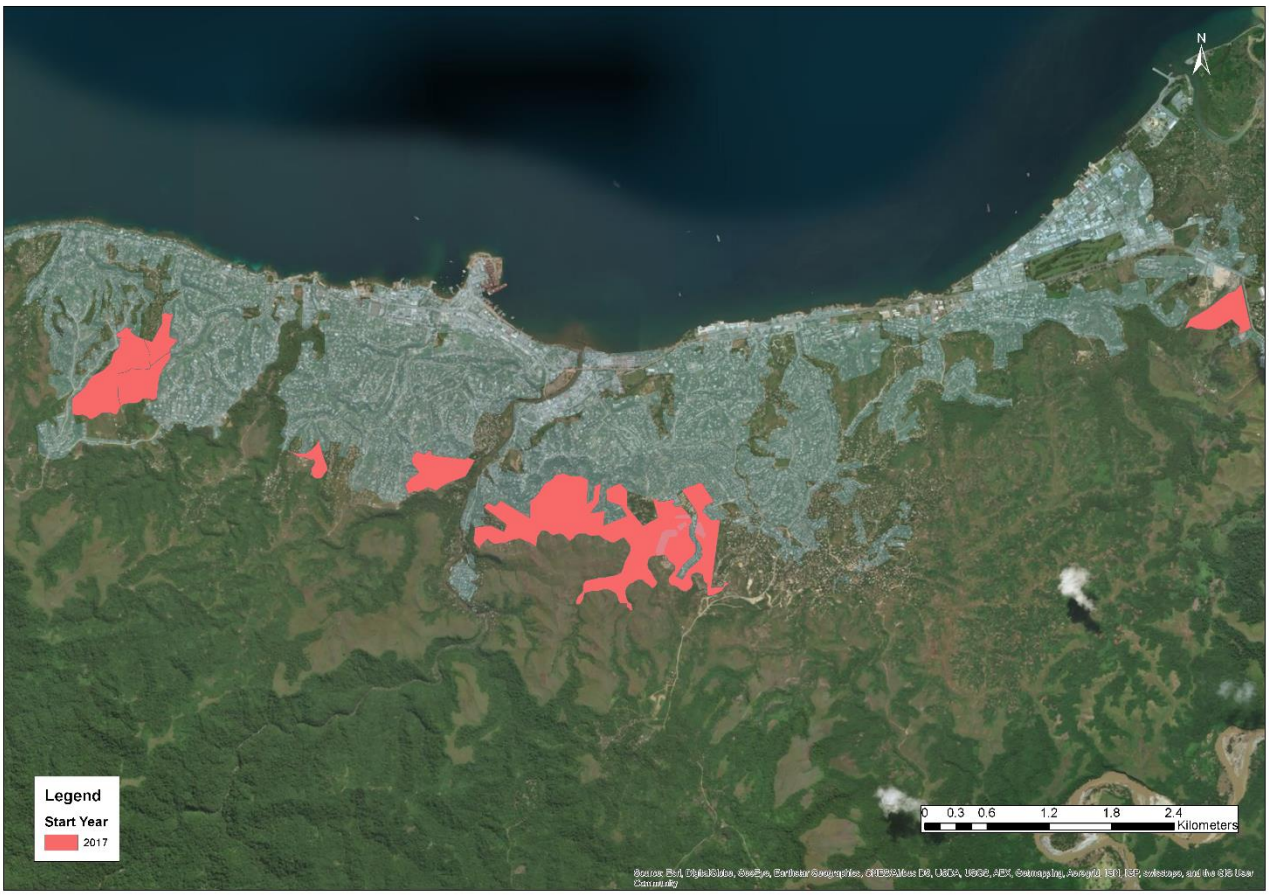

Figure 3-1 Future Water Connections 2017-2022

Water supply demands between 2017 and 2022 have been forecast based on existing demands, future connections, and demand reduction measures.

For the period 2017 to 2022 in Honiara:

- NRW is projected to decrease linearly from 60% to 46%
- Per capita demand is projected to decrease linearly from 177 L/person/day to 172 L/person/day
- The population connected to the Honiara water supply system is projected to increase from 57,999 to 83,832
- The average day demand is forecast to decrease from 40.7 ML/d to 40.3 ML/d
- The peak day demand is forecast to increase from 44.7 ML/d to 45.7 ML/d

Details of the forecast demands, including the location of adopted future connections and low/medium/high forecasts are provided in the Strategic Plan (Hunter H2O, 2017).

Table 3-1 Existing and Forecast Water Demands Connected to SW Honiara System

	ADD (ML/d)		PDD (ML/d)	
Category	**2017**	**2022**	**2017**	**2022**
Domestic	10.3	14.5	12.8	18.1
Commercial	3.6	4.3	4.5	5.3
Government	2.4	2.9	3.0	3.6
NRW	24.4	18.7	24.4	18.7
TOTAL SYSTEM	**40.7**	**40.3**	**44.7**	**45.7**

A summary of the adopted existing and projected demands for other provincial centres is shown in Table 3-2, Table 3-3 and Table 3-4.

Table 3-2 Existing and Forecast Water Demands Connected to SW Auki System

	ADD (ML/d)		PDD (ML/d)	
Category	**2017**	**2022**	**2017**	**2022**
Domestic	0.47	0.57	0.58	0.72
Non-Domestic	0.12	0.14	0.15	0.18
NRW	0.58	0.58	0.58	0.60
TOTAL SYSTEM	**1.17**	**1.32**	**1.31**	**1.50**

Table 3-3 Existing and Forecast Water Demands Connected to SW Noro System

	ADD (ML/d)		PDD (ML/d)	
Category	**2017**	**2022**	**2017**	**2022**
Domestic	0.41	0.46	0.52	0.58
Non-Domestic	0.10	0.12	0.12	0.15
SolTuna	0.56	0.56	0.71	0.70
Industrial growth	-	0.08	-	0.10
NRW	1.07	1.07	1.07	1.07
TOTAL SYSTEM	**2.15**	**2.25**	**2.42**	**2.55**

Table 3-4 Existing and Forecast Water Demands Connected to SW Tulagi System

	ADD (ML/d)		PDD (ML/d)	
Category	2017	2022	2017	2022
Domestic	0.14	0.15	0.17	0.18
Non-Domestic	0.04	0.04	0.05	0.06
NRW	0.18	0.16	0.18	0.16
TOTAL SYSTEM	**0.36**	**0.35**	**0.40**	**0.40**

3.2 Forecast 2022 Wastewater Loadings

The future wastewater loadings for SW's Honiara system were estimated based on current connections and likely catchment areas, with consideration of expansion of the systems to supply currently unserviced premises. The adopted areas expected to be connected to the SW Honiara system over the next 5 years are shown in Figure 3-2.

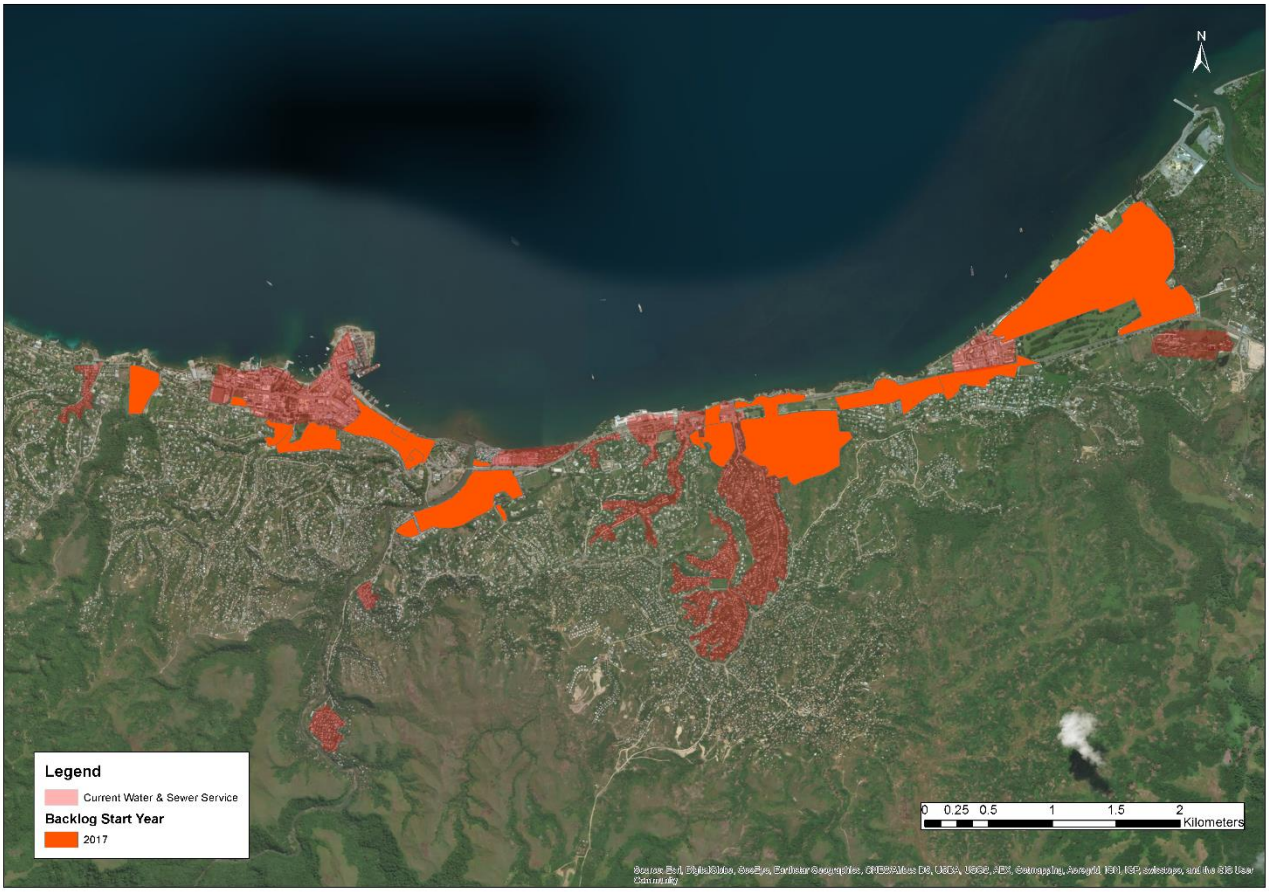

Figure 3-2 Future Wastewater Connections 2017-2022

For the period 2017 to 2022 in Honiara:

- Per capita discharge is projected to remain steady at 200 L/person/day
- The population connected to the Honiara water supply system is projected to increase from 5,656 to 12,253
- The connection of non-domestic users is projected to triple from 30% to 90%
- The average dry weather flow is forecast to increase from 2.2 ML/d to 5.2 ML/d

Current and forecast wastewater loadings for the SW network are summarised in Table 3-5 below.

Table 3-5 Existing and Forecast Wastewater Loadings Connected to SW System

Year	Area (ha)	Connections	EP	ADWF (L/s)	PDWF (L/s)	PWWF (L/s)
2017	190.1	**1,150 total** *(808 domestic)* *(284 commercial)* *(58 government)*	**11,087 total** *(5,656 domestic)* *(3,235 commercial)* *(2,196 government)*	25.9	93.3	178.8
2022	385.4	**1,345 total** *(1,750 domestic)* *(1,160 commercial)* *(189 government)*	**24,727 total** *(12,253 domestic)* *(9,363 commercial)* *(3,111 government)*	60.0	168.8	342.3

4 CAPITAL WORKS

A capital works program was identified in the Strategic Plan, outlining the works required to augment the existing systems and construct new assets to service future customers. This section details the works required in the period 2017 to 2022.

4.1 Summary of Capital Works

A summary of the proposed augmentation program is provided in Table 4-2, including asset details, timing, cost estimates and population served.

Assets have been sized based on achieving the service standards outlined in Section 2. Where design standards do not currently exist for some assets, international standards have been adopted for planning purposes. Consideration has been given to the design life of asset classes, as summarised in Table 4-1.

Table 4-1 Typical Asset Design Life

Asset Class	Design Life
Water and sewer mains	100 years
Wastewater maintenance structures	100 years
Reservoirs	50 years
Wastewater pumps	25 years
Water pumps	20 years
Valves	30 years
SCADA	15 years

Table 4-2 Summary of Capital Works

Type	Item	Details	Timing	Capital Cost (USD)	Annual O&M (USD/yr)	Population Served
Wastewater (Honiara)	Temporary Ocean Outfalls x 5	Kukum, Vura, Ranadi	2017	$1,000,000	$32,500	120,000
Wastewater (Honiara)	Ocean outfall (Planning/Design)	Outfall planning/design	2017	$1,100,000		40,000
Wastewater (Honiara)	Sewer pumping stations (Stage 1a)	Ranadi 2	2017	$1,100,000	$63,820	40,000
Wastewater (Honiara)	Sewer rising mains and trunk mains (Stage 1a)	Kukum, Mataniko, Vura	2017	$2,200,000	$14,300	40,000
Wastewater (Honiara)	Sewer reticulation (Stage 1a)	Mataniko, Ngossi, Panatina, Point Cruz, Ranadi 2, Vura	2017	$8,200,000	$53,300	10,000
Sub-total Wastewater				**$13,600,000**	**$163,920**	
Water Supply (Honiara)	Additional Bores	White River Bores Recommission	2017	$300,000	$208,200	25,000
Water Supply (Honiara)	Additional Bores	Mataniko Bores	2017	$800,000	$455,600	25,000
Water Supply (Honiara)	Water Treatment Plant (Planning/design) - Lungga	WTP Planning/design	2017	$8,200,000		66,400
Water Supply (Honiara)	Raw Water Intake Pumping Station (Stage 1)	40 ML/d	2017	$2,300,000	$2,269,714	33,200
Water Supply (Honiara)	Raw Water Transfer Pipeline (Stage 1)	Raw Water Transfer Pipeline (3.7km DN600)	2017	$4,100,000	$26,650	33,200
Water Supply (Honiara)	Water Treatment Plant (Construction Stage 1) - Lungga	40 ML/d	2017	$27,100,000	$542,000	33,200
Water Supply (Honiara)	Network Storage (Stage 1a)	2x 6 ML Reservoir	2017	$5,700,000	$14,250	40,000
Water Supply (Honiara)	Additional Bores	White River Trunkmain (3.15km DN250)	2017	$1,400,000	$9,100	40,000
Water Supply (Honiara)	Water trunkmain (Stage 1a)	Mataniko Trunkmain (2.5km DN300, 3km DN375)	2017	$2,900,000	$18,850	40,000
Sub-total Water Supply				**$52,800,000**	**$3,544,364**	
Provincial Towns	Auki Water Supply Upgrades	Auki investigations, recommission high tank, pumps and pipeline from Gallery	2017	$2,700,000		3,100
Provincial Towns	Tulagi Water Supply Upgrades	Tulagi investigations, standby pump, AIV	2017	$500,000		900
Provincial Towns	Noro Water Supply Upgrades	Noro investigations, groundwater assessment	2017	$600,000		2,700
Provincial Towns	Gizo Water Supply Upgrades	Gizo investigations, groundwater assessments, secure Leoko pipeline	2017	$800,000		6,000
Sub-total Provincial Centres				**$4,60,000**		
Total All Projects				**$71,000,000**	**$3,708,285**	

4.2 Development of Raw Water Sources

4.2.1 Lungga River Source

The 30 Year Strategic Plan has identified the Lungga River as the preferred long-term primary supply source for Honiara. However, due to the nature of this large river source, substantial field investigation will be required in order to confirm the viability of using the Lungga River as a primary supply source. It is proposed that field investigation, feasibility studies and concept design work is undertaken over the next few years. This initial planning and design work is critical to ensuring that extracting and treating water from the Lungga River is viable, having fully considered technical, environmental, land, social and financial aspects of the project. It is proposed that construction of the Lungga River source and associated treatment plant is included late in this 5 Year Action Plan. It is anticipated that preliminary work could take years to complete (particularly land acquisition), therefore this process should be started immediately in order for construction to be completed around 2022/23.

The Lungga River source will include a river intake and pump station, raw water rising mains from the river intake to the WTP, a WTP located adjacent to the intake, and water pump station and trunk mains to deliver treated water into the existing water supply system (see Figure 4-1 below). Depending on land availability, the WTP may alternatively be located within the city boundary, with raw water pumped from the river to the WTP. The intake and WTP are proposed to be developed in three stages – with a design capacity of around 40 ML/d required to satisfy demands to around 2029, 60 ML/d required to satisfy demands to around 2038 and 80 ML/d required to satisfy 2047 demands to 2047.

Two preliminary locations have been identified based on limited desktop data (Google Earth) as shown in Figure 4-1. The preferred location characteristics of the river intake include:

- Structurally stable – intake structure needs to be able to withstand moderate to major flood events and the riverbank needs to be naturally stable (e.g. rocky outcrop), otherwise riverbank stabilisation would need to be included in the design. Pump motors (unless submersible) and electrical gear needs to be located above the 100 year flood level.
- Not be prone to sediment build-up / blockage – intake structure should ideally be located on an outside bend of the river where natural pools are likely to occur and have higher velocities (inside bends should be avoided due to lower flow velocities and deposition of sediments).
- Access to full range of river flows – intake structure needs to be able to draw water from the across the full range of flow events, including dry flows in drought periods and high flows in flood events.

Detailed flood levels along the Lungga River are unknown; however, indicative flood levels were obtained from a 1989 Flood and Landslide Hazard Study (United Nations Technical Cooperation for Development, 1989). The indicative flood levels suggest the non-submersible components of the river intake may need to be located at least 10 – 15m above normal river levels, which appear to be around RL15m in the region of the proposed intake location (based on levels in Google Earth), therefore the intake would likely be located around RL25-30m.

The preferred intake design type would be subject to detailed site assessment (including more accurate flood levels) but may include:

- Either submersible pumps (either in a well or within an installation tube) or vertical turbine pumps (where the pumps are located down in the well/river and the motors are located at the surface level)
- A screened inlet that is protected from impact by debris being carried down the river
- A concrete structure or well with a surface level above the 100-year flood level where electricals / motors can be located.

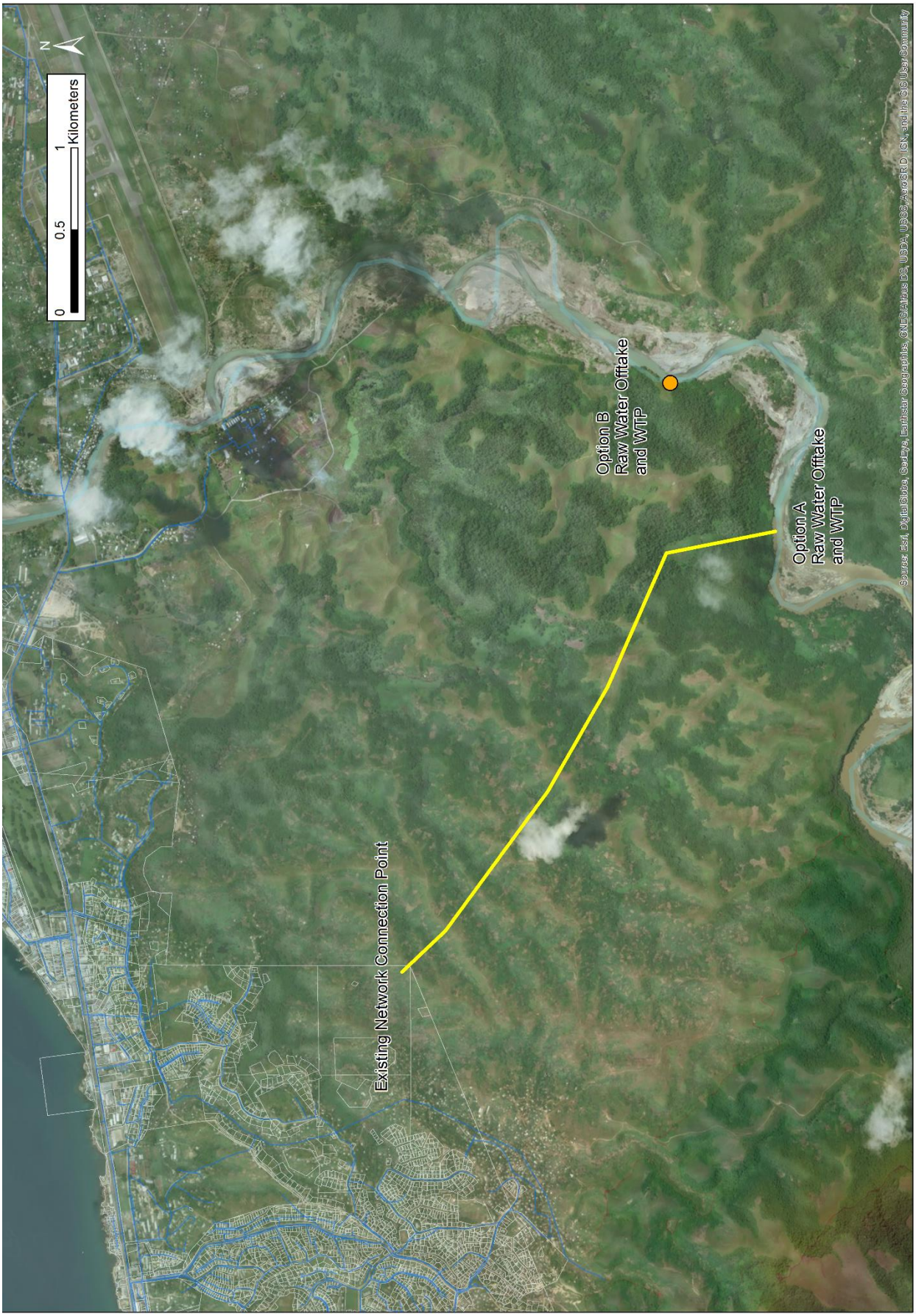

Figure 4-1 Lungga River Source – Preliminary River Intake and WTP Locations

The pumps would need to be sized to deliver the required duty flow of between 40 ML/d initially and 80 ML/d ultimately. It is likely that a bank of up to six pumps may be required at ultimate duty, with three of these pumps being installed initially to achieve the 40 ML/d duty. The pumps would deliver flows to the WTP via two parallel raw water rising mains at ultimate duty, with only one rising main required initially. Both rising mains would need to be around DN600.

The proposed WTP area is approximately 250m by 250m (based on the ultimate design capacity of 80 ML/d). This should allow for sedimentation, filtration, chemical dosing and backwash handling, as well as room for a reservoir (clear water storage), treated water pumping station and any associated electrical substation.

Raw water quality is currently unknown, but based on typical river water quality, some form of the following conventional treatment process is likely to be required:

1. Raw water is pumped from the river intake works to the WTP
2. The water would be coagulated in the pipeline just before the plant inlet and then flocculated in a dedicated flocculation zone. Additional dosing may be applied at this point to address various water quality issues, depending on the quality of the raw water.
3. A settling process would be used to remove the bulk of raw water solids and provide a low turbidity feed to the filters
4. Gravity dual media filters would be used to achieve a low filtered water turbidity
5. Chlorine disinfection would be used as a final barrier to pathogens
6. A Clear Water Tank (CWT) would be used for chlorine contact and treated water storage
7. Sludge produced by the process would be stored in sludge lagoons or dewatered using mechanical dewatering

A general process flow chart for the WTP is provided below:

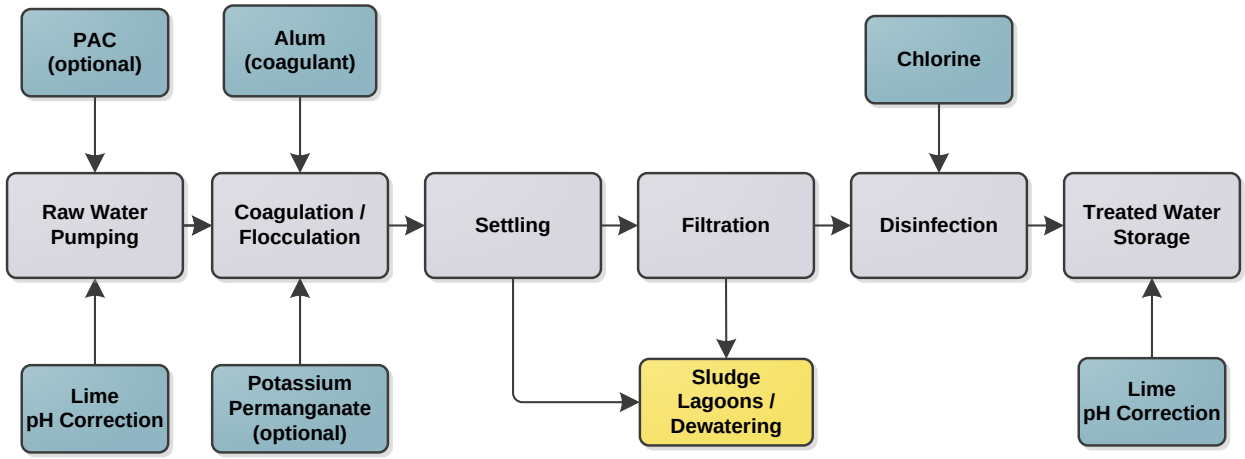

Figure 4-2 Process Flow Chart – WTP for Lungga River

The proposed staging of the WTP is as follows:

- Stage 1: 40 ML/d – construction around 2022/23
- Stage 2: 60 ML/d – construction around 2029/30 (could be combined with Stage 1 subject to funding)
- Stage 3: 80 ML/d – construction around 2038/2039

Investigations and planning work that needs to be undertaken before proceeding with construction of the Lungga River water source and treatment plant includes:

- Hydrogeological study of groundwater sources around Honiara to confirm whether there is sufficient yield to supply long term demands, particularly around Mataniko River, Eastern Honiara and Mount Austin.
- Raw water quality analysis at multiple locations on the Lungga River to confirm treatability of water source.
- Detailed assessment of the full range of river flows to identify minimum flows and levels, maximum flood levels (at least to the 1 in 100 year flood event) and average flow conditions.
- Field assessment of the current saltwater interface zone within the Lungga River and desktop assessment of the likely upstream movement of the saltwater interface under future climate change scenarios due to increases in ocean levels.
- Field investigation of viable locations for the river intake and pump station structure, including assessment of geotechnical conditions, bank stability and riverbed stability.
- Field investigations of viable locations for the WTP, including assessment of geotechnical conditions and flood levels (if relevant).
- Regulatory and stakeholder liaison, including Department of Environment, Climate Change, Disaster Management and Meteorology, Department of Health and Medical Services and the Ministry of Mines, Minerals, Electricity and Rural Electrification.
- Options assessment of river intake and pump station and WTP.
- Preliminary assessment of power and access requirements, including liaison with power and roads authorities.
- Preliminary environmental and social impact assessments.
- Assessment of land acquisition requirements and any resettlement impacts.
- Concept design, including confirmation of design capacity requirements and key infrastructure sizing, location, material and construction type. Concept design would also include preliminary site layouts, treatment process selection, control philosophy and construction methodology taking into account future capacity upgrades.

4.2.2 Short-term Source Capacity Improvements

With the Lungga River source likely to take 5 years to develop, additional source capacity is required in the short term. Current source capacity is estimated to be around 32.5 ML/d, while existing (2017) and five-year (2022) demands are estimated to be around 40 ML/d. Therefore, there is a 7.5 ML/d shortfall in source capacity. It is proposed that this additional source capacity would be achieved through a combination of reconditioning of existing supply sources that are underperforming, re-establishment of the White River bores, and expansion of the borefields in the Mataniko area.

Reconditioning of Existing Groundwater Bores

The majority of the existing Honiara groundwater bores are not performing to the original design duty and the reason for this underperformance is not currently understood by SW. Cleaning by air scouring is carried out by SW to improve flows. Many of the new JICA bores are not producing to design capacity which may be due to the ground conditions in which the screens were located. All existing groundwater sources should be investigated in order to assess any capacity limitations associated with the actual boreholes (well casings and screens), bore pumps and downstream pump stations. Blocked screens are a common reason for poor bore performance. Whilst air scouring is currently used, consideration may need to be given to chemical cleaning where long term deterioration in yield is noticed. Another common reason is poor pump performance due to hydraulic conditions not being suitable for the pump. The operating conditions associated with the downstream water supply system and how the bores are used to top-up reservoirs also needs to be considered.

Reinstatement of White River Bores

The White River Borefield and associated infrastructure was originally developed in 1998 under a Japanese aid project and was seriously damaged during the ethnic tensions in early 2000s. The borefield has not been in operation since the early 2000s and requires a full refurbishment of boreholes, bore pumps, power supply, disinfection system and associated housing facilities. There are four bores located in the White River borefield and it is understood that at least three of these bores could be refurbished to provide around 2.5 ML/d of additional source capacity. Actual production would have to be carefully managed as one of the old wells is now used as a 'spring' by the local community and would not want that supply discontinued. Costs to re-establish would be in the order of US$450k based on the estimate for new bores at Panatina.

Expansion of Mataniko Borefield

The 30 Year Strategic Plan identified the Mataniko River as a potential short to medium supply source, with a potential source capacity of at least 25 ML/d. However, this is not sufficient to support medium to long term demands and therefore the Lungga River was identified as the preferred long term primary supply source.

While it would not be economical to develop the Mantaniko River as a supply source in addition to the Lungga River, there may be some merit in investigating the feasibility of expanding the Mataniko borefields, with the potential for increasing the combined source capacity up to around 10 ML/d (including existing Mataniko JICA and Tuvaruhu SW borefields). The upstream river catchment area is around 58 km^2 and typical river flows around 100 ML/d (JICA, 2006). The river flows down a relatively tight valley upstream of Mataniko and it is likely that existing bores located near Mataniko are accessing groundwater from a relatively shallow alluvial aquifer that is fed from the upstream river.

Field investigations would be required in order assess the viability of expanding the Mataniko borefields, including assessment of potential yields and typical water quality parameters. Disinfection of the groundwater would be required as a minimum level of treatment. The potential risks associated with contamination from urban pollution sources (including sewage) would also need to be considered.

Costs per new bore would be of the same order as for Panatina (US$150k per bore)

4.3 Water Supply System Improvements

The 5 year plan includes additional source capacity from the re-established White River bores and additional bores at Mataniko. This results in some minor system changes to make best use of the additional source capacity and also make best use of the augmented trunk mains between Tasahe Reservoir and East Kola'a Ridge. These proposed system changes are shown below in Table 4-3 and Figure 4-3.

Table 4-3 Honiara Water Supply System – Proposed Water Supply Zones (5 Year Plan)

Primary Water Supply Zone	Source/s	2017 Demand Estimate ML/d	System Changes
1. Kongulai	- Kongulai Spring - White River bores	2.3	White River bores re-established and feeding into Kongulai gravity zone, with excess supplied to Rove gravity zone
2a. Tasahe	- Kongulai Spring - Tasahe bores	3.7	No change
2b. Titinge	- Kongulai Spring - Titinge bores	6.3	No change
2c. Skyline	- Kongulai Spring - Skyline bores	5.3	No change
3. Rove	- Rove Spring - Kongulai Spring / White River bores	5.9	Additional demands supplied from Kongulai gravity zone
4. Mataniko	- Tuvaruhu bores - Mataniko bores (existing + additional)	2.9	Additional borefield in Mataniko established to support additional demands
5. Borderline	- Kongulai Spring - Borderline bores	3.0	Additional supply from Kongulai after trunkmain augmentation
6a. Kombito	- Kombito Spring - Kombito bores	3.7	Kombito bores used as additional supply source
6b. Panatina	- Panatina bores - Mataniko bores	7.6	Additional demands supplied from Mataniko supply zone
TOTAL		**40.7**	

The hydraulic water model for Honiara is still under development and was not suitable for use in this study for either assessing existing system performance or for modelling proposed network configuration changes and augmentations that are needed to cater for future growth. Therefore, analysis of the water supply network was unable to be undertaken and proposed augmentations are indicative only and will need to be refined once the Honiara water model has been further development and verified.

4.3.1 Reservoir Storage

Additional reservoir storage is required, with current combined storage around 13 ML, which is just under one third of current average day demands. Two 6 ML reservoirs are proposed under the 5 year plan to increase combined reservoir storage to 25 ML, with an additional 15 ML reservoir storage proposed when the WTP is constructed around 2023/24. It has been assumed that the two new 6 ML reservoirs would be located at Titinge (to provide additional storage to areas supplied from Kongulai pumped system) and Lower West Kola'a (to provide additional storage to areas supplied from the expanded Mataniko borefield). A new or augmented water pump station would also be required to transfer additional flows from the expanded Mataniko borefield to the new 6 ML reservoir at Lower West Kola'a.

4.3.2 Trunk Mains

In addition to trunk main augmentations required to improve existing system performance and alleviate low pressure problems (not identified due to water model limitations), additional trunk main capacity will be required between the expanded Mataniko borefield and the coast. A DN300/375 trunk main augmentation has been assumed from Mataniko, along the Mataniko River to the coast and then along the coast to Panatina (see Figure 4-4 below).

4.3.3 Reticulation

Approximately 45% of existing properties in Honiara are not currently connected to the water supply system. The 30 Year Plan identifies the need to target connection of 95% of Honiara properties to the water supply network within 30 years. Over the first 5 years, the main focus is to connect domestic users near the existing network.

In order to service these users, reticulation systems would need to be retrofitted. This would involve construction of minimum size mains in road and drainage reserves, as well as construction of laterals to connect to the new reticulation. A nominal allowance of 20m of new pipework per property has been allowed for cost estimation, however actual reticulation layouts will depend on land use and constructability.

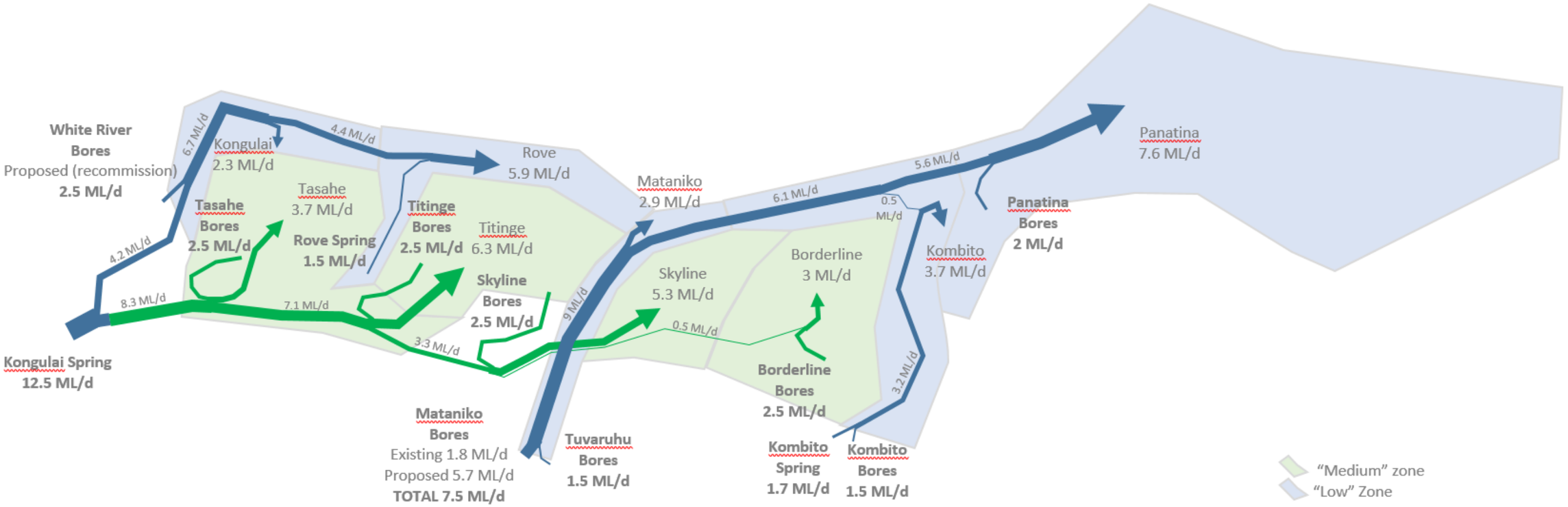

Figure 4-3 Honiara Water Supply Sources & Distribution – 5 Year Plan

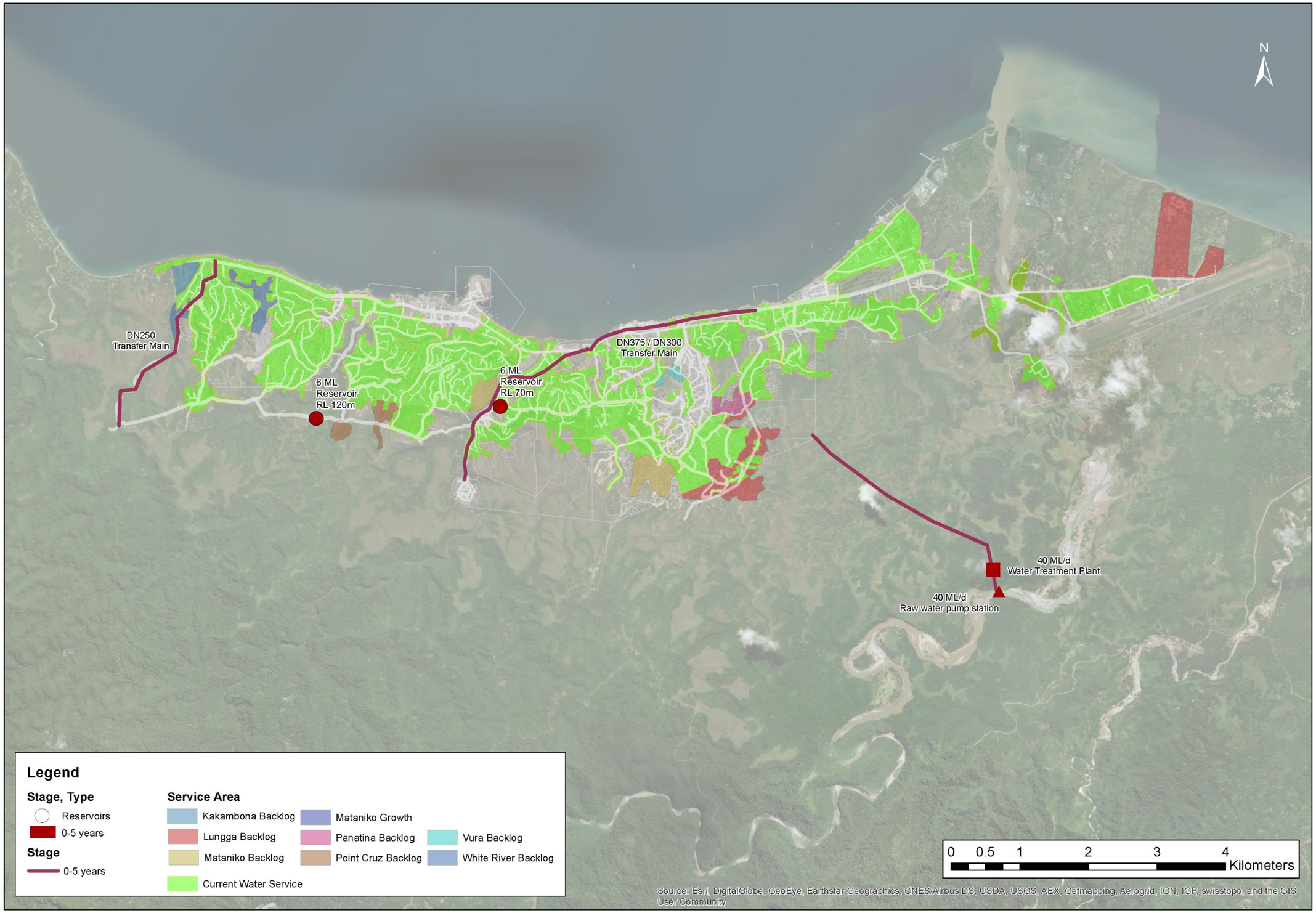

Figure 4-4 Honiara Water Supply – 5 Year Action Plan Capital Works

4.4 Wastewater Treatment Investigations and Design of Outfall

The 30 Year Strategic Plan identifies the need for treatment facilities to service Honiara, however there are higher short term priorities, including expansion of the network to service more customers and construction of a trunk transfer network to a centralised collection point.

A new ocean outfall in Honiara is required to replace the existing 13 outfalls, which are damaged and discharging near shore. The location of the discharge facilities will largely be driven by the location of proposed future treatment facilities. Therefore, it is prudent to begin investigations now in order to secure appropriate land and prepare for the construction of a new outfall.

Preliminary assessments in the 30 Year Strategic Plan have identified Panatina as the preferred location of the new outfall, however alternative options may be viable, depending on the level of treatment required prior to discharge, discharge depth required for effective dilution, and length of the outfall.

While it is not proposed to include the full development of these works in the 5 Year Action Plan, it is proposed that field investigation, feasibility studies and concept design work is undertaken over the next few years. This initial planning and design work is critical to ensuring that long term ocean discharge of sewage/effluent is viable, having fully considered technical, environmental, land, social and financial aspects of the project. It is proposed that construction of the outfall is included early in the next 5 Year Action Plan (i.e. 2022 – 2027). It is anticipated that preliminary work could take years to complete, therefore this process should be started immediately in order for construction to be started by 2022.

4.4.1 Construction Techniques

Any ocean outfall requires a high degree of structural integrity due to exposure to the potentially destructive impacts of waves forces, particularly near the shore line. High density polyethylene is the most common ocean outfall pipeline construction material due to its availability in large diameters, structural integrity and low corrosive properties. Construction could involve pulling from in place off the shore line, flotation and towing within the ocean, or directional drilling from onshore.

Options to pull or float the pipe would require significant underwater construction to anchor the pipe to the sea floor. Protection of the pipe from wave impacts is also required, particularly at and around the shore line.

Directional drilling is a viable construction method, however there are space constraints as the pipe needs to be constructed onshore prior to being jacked. Due to the non-homogenous nature of coral formations, the loss of drilling fluid for lubrication would be a significant risk. This option would also still involve substantial underwater work in installing the diffusers on the pipeline.

4.4.2 Location

The location of the outfall will largely be driven by the preferred location of a future sewage treatment plant. Various sites were investigated in the Strategic Plan, with the preferred locations at Panatina and Ranadi. Further investigations are required to determine the best site, and will largely be driven by the preferred location of the treatment plant.

Outfalls at Panatina and Ranadi are both feasible. An admiralty chart of Honiara sea front indicates shallow depths off shore between Point Cruz and Kukum. The depth gradient increases to the east towards Ranadi.

Discharge to a depth between 20m and 50m is required in order to achieve an effective screened sewage dilution of 100:1, which is expected to achieve the desired health and environmental targets for effluent. A review of shipping charts indicates that an outfall of approximately 500m-1000m would be required off Panatina to achieve this depth. A shorter outfall of approximately 300m-600m would be required off Ranadi, however additional transfer mains would be required to discharge at this location.

A preliminary investigation indicated that a significantly shorter outfall could be achieved if discharging in Western Honiara near Poha, however any savings would be offset by the additional transfer cost to discharge

flows from central and eastern Honiara to the west. Various options for multiple outfalls were also considered, however were not found to be preferable when considering whole of life costs.

An outfall in Central Honiara off Panatina in the vicinity of Panatina Plaza / USP campus is recommended, on the basis that this central location minimises network transfer costs. This may require an outfall up to 1km long, depending on the outcomes of bathymetric survey and a dilution study. Alternative locations at Ranadi should be considered if preliminary investigations at the Panatina site indicate that an outfall is not feasible.

A major constraint to construction in central Honiara is that much of the foreshore has been developed, and there are limited corridors for construction of a pipeline. Based on review of aerial photography, a preferred location shown in Figure 4-5 was selected.

Figure 4-5 Preferred Ocean Outfall Location

4.4.3 Size and Staging

Due to the high capital cost of constructing outfalls, it is proposed that the new outfall is sized to discharge projected flows over the next 30 years. The pipe will initially discharge all PWWF collected within the catchment. Beyond 2037, lower flow rates may be adopted by taking advantage of storage and flow attenuation relating to the construction of a new sewage treatment plant. Projected catchment flow rates and required outfall discharge rates are summarised in Table 4-4

Table 4-4 Projected Ocean Outfall Discharge Rates

Year	ADWF (L/s)	PWWF (L/s)	Discharge Type	Outfall Discharge Requirement	Outfall Discharge Rate (L/s
2017	22	140	Pumped	PWWF	140
2022	60	342	Pumped	PWWF	342
2027	94	513	Pumped	PWWF	513
2037	167	912	Gravity	3x ADWF	501
2047	276	1444	Gravity	3x ADWF	828

Options to defer capital investment were considered through construction of smaller pipe sizes in stages, however it was determined that this would result in higher whole of life costs, therefore a single pipe is preferred.

Based on the design discharge rates in the above table, a 750mm pipe is required.

4.4.4 Cost Estimates

Costs are very difficult to determine at this stage, with high uncertainty around discharge depth, required pipeline length, diffuser design, anchoring and construction techniques. A per metre preliminary estimate has been prepared based on total project costs of recent outfalls in the Pacific. Further studies are required to refine costs.

4.4.5 Further Investigations

A full concept design and specification of the outfall needs to be prepared, which would require additional studies to be undertaken prior to implementation of the new outfall:

- Investigation of preferred long term sewage treatment plant site
- Regulatory and stakeholder coordination, including Department of Environment, Climate Change, Disaster Management and Meteorology, and Department of Fisheries and Marine Resources
- Bathymetric survey, including shore, intertidal and offshore levels for the proposed route(s)
- Benthic morphology survey, to identify organisms living along the proposed route(s)
- Current study, to determine likely current movements in the receiving waters
- Wave buoy survey, to assist in wave force analysis
- Dilution modelling, to determine the effectiveness of dilution at the proposed discharge location and assist in design of diffusers
- Environmental impact study, including impact on coral and ocean life
- Geotechnical study, to determine the extent of anchoring required along the proposed route(s)
- Detailed design

4.4.6 Interim Disposal Strategy

It is anticipated that construction of the new outfall would not start within the period of this 5 Year Action Plan. In the interim, it is proposed to continue to discharge through existing outfalls. These would need to be repaired and extended at most locations in order to remove raw sewage from the shore line, particularly in recreational areas. These outfalls may be used in the future as emergency relief discharge points to discharge sewage away from built up areas when the capacity of pump stations is exceeded during low frequency wet weather events and unplanned shutdown. Screening of flows at existing and proposed pump stations would also remove gross pollutants and improve environmental performance.

4.5 Wastewater Reticulation

Over 90% of existing properties in Honiara are not currently connected to the wastewater system. The 30 Year Plan identifies the need to move away from onsite septic systems, with a target of connecting 30% of Honiara properties to the centralised wastewater network within 30 years. Over the first 5 years, the main focus is to connect existing non-domestic users for the following reasons:

- Sewage quality can vary significantly from a typical sewage customer profile, therefore dilution via ocean outfall would provide significant health and environmental benefits
- Non-domestic users account for the majority of the top water users, therefore wastewater discharge volumes are very high
- Most non-domestic users are located along the coast line and would require minimal new assets to connect to the existing system

In order to service these users, reticulation systems would need to be retrofitted. This would involve construction of minimum size mains in road and drainage reserves, as well as construction of laterals to connect from existing septic tanks to the new reticulation. A nominal allowance of 15m of new pipework per property has been allowed for cost estimation, however actual reticulation layouts will depend on topography, land use and constructability.

The location of areas identified for construction of new wastewater reticulation over the next 5 years are shown in Figure 4-6. Catchment areas and estimated length of reticulation mains are shown in Table 4-5.

Table 4-5 New Wastewater Reticulation Areas

Catchment	Area (ha)	Length of Reticulation
Kukum	10.1	1.5km
Lungga	40.8	6.1km
Mataniko	35.6	5.3km
Panatina	4.5	0.7km
Rove	10.0	1.5km
TOTAL	**101.0**	**15.1km**

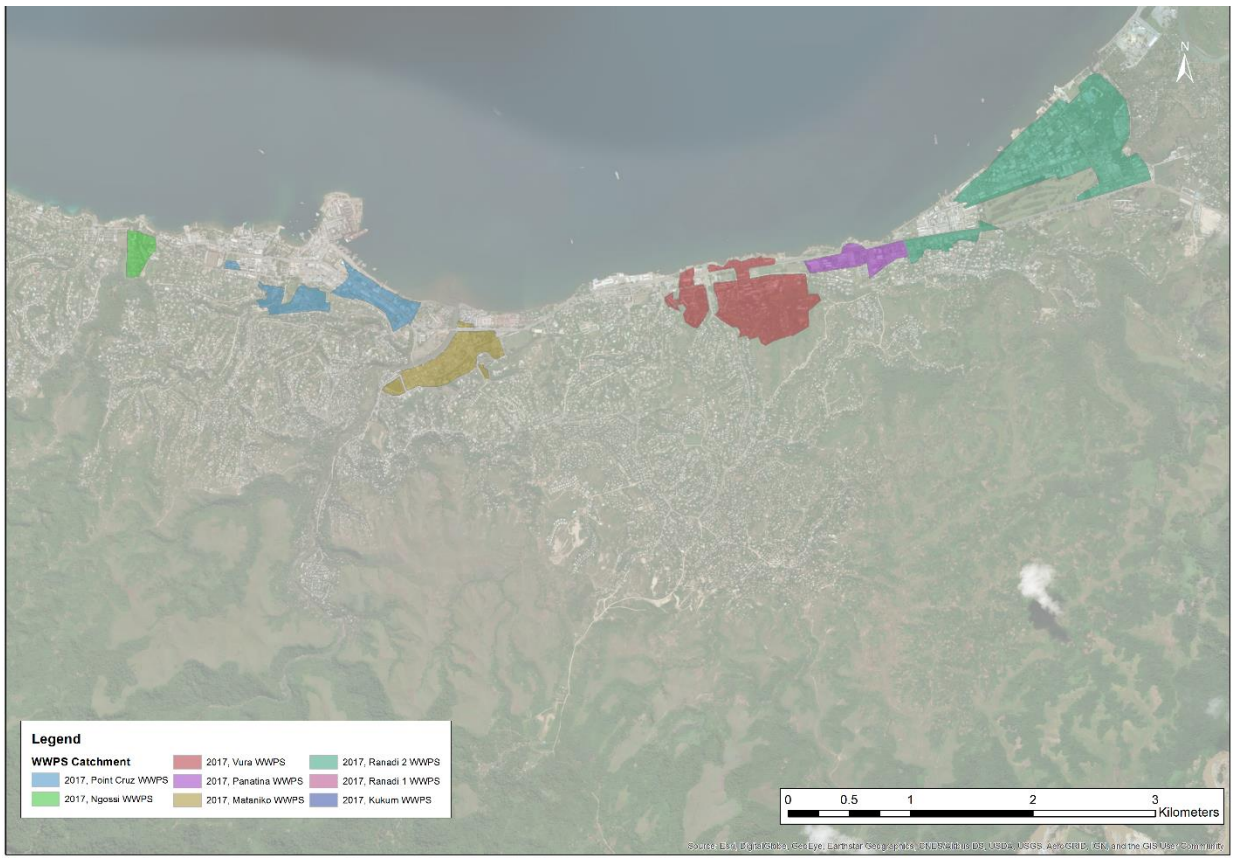

Figure 4-6 Location of New Wastewater Reticulation

4.6 Wastewater Network

New wastewater pump stations, rising mains and trunk mains are required to connect the existing system to the new ocean outfall, and provide capacity for future flows to be diverted to a centralised wastewater treatment plant. However, this trunk network is not required within this 5 Year Action Plan, therefore the short term focus of the wastewater network is in expanding the service area by providing reticulation to commercial and industrial customers along the coast, and repairing existing ocean outfalls. New trunk mains are also required to connect new reticulation to existing outfalls, as well as providing additional capacity in areas that are currently overloaded.

All new assets have been sized to transfer all projected flows up to 2047. The location of the proposed works are shown in Figure 4-7.

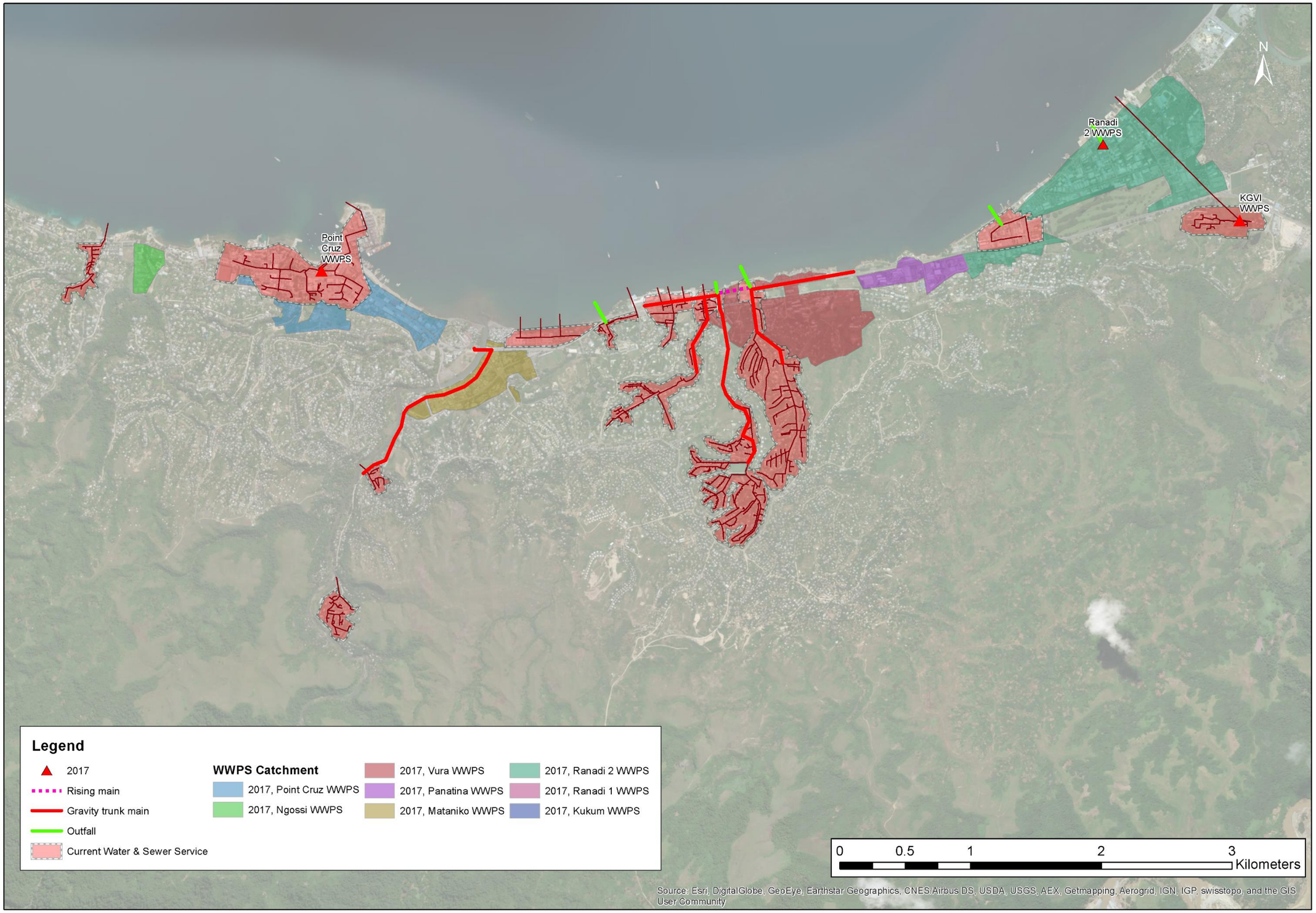

Figure 4-7 Honiara Wastewater System – 5 Year Action Plan Capital Works

4.6.1 Point Cruz WWPS, Rove and Tuvaruhu

The existing Point Cruz WWPS currently discharges to the ocean via a nearby outfall. Under the 30 Year Strategic Plan, this station is ultimately to be diverted to a new outfall at Panatina via Mataniko. In the interim, the existing station and outfall may be largely maintained until future loadings exceed capacity, which is expected to occur around 2027. Short term additional loadings are expected from the expansion of the reticulation network to the south and east of Point Cruz, as well as wastewater flows tankered from Rove and Tuvaruhu.

These catchments currently discharge to communal septic tanks. Due to the remoteness of these sites from the existing network, it is unfeasible to connect the sites until the network is expanded in 10-30 years. In the short term, it is proposed to improve local environmental/health performance by transferring all sewage flows from the communal septic tanks to Point Cruz WWPS via a tanker. This allows for flows to be screened and discharged to depth allowing for dilution of effluent and sludge. Both sites could be serviced by several round trips per day.

This requires upfront capital investment in a tanker (US$150k), and ongoing operational costs in the diesel related pumping and cost of operators (US$25k/yr).

4.6.2 Mataniko, Bahai, Kukum and Vura

Key areas for short term extension of the wastewater reticulation include along the eastern side of Mataniko River (around Chinatown) and the area between Vura and Panatina.

Eight ocean outfalls in this area could be consolidated into three temporary outfalls, as shown in Figure 4-7. This requires new trunk mains at the following locations to service new areas and connect to the new outfalls:

- Eastern side of Mataniko River to Kukum Highway
- Kukum Highway between Mataniko and Vura
- Kukum Highway between Panatina and Vura

The temporary outfalls would be constructed of DN150 PVC or similar and are intended to be operated as outfalls in the short term (<10 years). Beyond this time the areas would be serviced by new pump stations and the temporary outfalls would be converted to emergency overflows to relieve the network during pump station failure. The outfalls require significant concrete or rock reinforcement at the shore line to avoid future damage.

4.6.3 Ranadi and KGVI

Two pump stations are ultimately required in Ranadi to transfer existing and future connections to the STP and ocean outfall at Panatina. Ranadi 2 WWPS would be located in the north east of the industrial estate, collecting gravity flows from the east of the estate, as well as flows discharged from KGVI. This would require the existing KGVI outfall to be abandoned, and the existing rising main to be diverted into the Ranadi 2 WWPS gravity system. A 3m diameter station is required, with two pumps totalling 30kW. Ultimately, a rising main would transfer flows to a new Ranadi 1 WWPS located off Kukum Highway in the western part of the industrial estate, which would in turn transfer flows to the STP/outfall.

In the short term, it is proposed to abandon the existing damaged outfalls servicing Ranadi and KGVI, to be replaced with a new outfall near the proposed Ranadi 1 WWPS. The WWPS would be constructed to service the area and would initially discharge screened flows directly to the temporary outfall. Similar to the Vura, the temporary outfalls would eventually be converted to emergency overflow locations once the Panatina outfall is constructed.

4.7 Servicing Provincial Centres

Limited data is available for the provincial centres, particularly with regard to asset condition and performance. A number of capital upgrades are recommended in the 30 Year Strategic Plan to improve supply in these areas and cater for future growth, however additional investigations are required in order to confirm recommendations for provincial centres, particularly with regard to new water sources.

Recommended investigations include: inspection of the condition, operability and capacity of existing key assets; installation of flow meters at water sources, bores and pump stations; review of the feasibility of SCADA systems; and assessment of current demands and NRW.

Priority works in the provincial centres to improve existing services are summarised in

Table 4-6 Priority Works in Provincial Centres

Location	Works
Auki	Recommission the existing high tank.
Auki	Install pumps (duty and standby) and pipeline to pump from the gallery reservoir to the high level tank. Connect the high tank to the high level distribution system.
Auki	When demand on the middle tank reaches the capacity of the bores install another pump station (duty and standby) to pump from the gallery reservoir to the middle tank.
Noro	Increase raw water storage and operate Ziata pumps on level control
Noro	Investigate ground water options in the Noro area.
Tulagi	Install a standby pump in the existing pump facility, operate the pump on level control from the high level storage, install an automatic inlet valve on the low storage to prevent overflow.
Tulagi	Investigate operational performance of the bulk supply system and undertake rectification works to ensure that supply is maintained to the pumped system during dry periods.
Gizo	Conduct a visual survey of the pipeline from Leoko to ascertain where the current water is being used and determine if some can be made available for Gizo. Ascertain if the adjacent source could be connected to the Leoko source pipeline to provide water to Gizo.
Gizo	Connect the existing unused dam to the treatment plant raw water tank.
Gizo	Request Department of Mines and Energy undertake groundwater surveys to ascertain potential groundwater sources in Gizo (downstream of old dam?).
Gizo	Recommission the treatment plant.
Gizo	Undertake a feasibility study of alternative supply options, including desalination and pipeline from Kolombangara Island. Consider application for support from the Green Climate Fund.

5 SUMMARY

The proposed works to be undertaken as part of this 5 year action plan are summarised in Table 5-1. The table summarises all capital works detailed in Section 4, as well as lifecycle management and institutional improvement recommendations detailed in the Strategic Plan – Main Report (Hunter H2O, 2017). Preliminary cost estimates are detailed in the Strategic Plan – Recommendations and Implementation Plan (Hunter H2O, 2017).

Table 5-1 5 Year Action Plan Capital Works Summary

Item	Current Issues	Proposed Works	Project Effect	Cost Estimate (USD)
Honiara Water				
Water sources	Current demand exceeds supply capacity	Recommission White River bores, expand bore extraction at Mataniko	System yield increased from < 30 ML/d to 60 ML/d, with the ability to supply projected demands to 2028	$1.1m + $0.66m p.a.
		Planning/design of WTP, construction of Stage 1A (40 ML/d), raw water pump station and transfer main		$41.7m + $2.84m p.a.
Water network pressure	Insufficient transfer capacity to deliver water from sources to customers	New trunkmains at Mataniko and White River	Ability to supply customers with adequate pressure 24/7	$4.3m + $0.03m p.a.
System Redundancy	Insufficient backup during supply interruptions and inadequately maintained assets	Additional Reservoir Storage and ongoing maintenance to improve operational lifespan	Ability to supply customers during operational interruptions, and reduction of interruptions due to better maintenance	$5.7m + $0.01m p.a.
Honiara Wastewater				
Environmental and Health Improvement	Multiple near-shore outfalls	Temporary outfalls	Improved dilution and reduced human contact with sewage	$1.0m + $0.03m p.a.
		Planning/design of long term outfall		$1.1m
Reticulated Wastewater Collection	Extensive un-serviced areas	Progressive rollout of reticulated sewage to all existing water customers	Improved health and environmental outcomes- lower risk of contaminating local aquifers	$11.5m + $0.13m p.a.

Item	Current Issues	Proposed Works	Project Effect	Cost Estimate (USD)
Provincial Towns Water				
Auki	Inadequate provision of secure water service	Investigations, improved storage and pumping capacity	Secure, sustainable water supply	$2.7m
Tulagi				$0.5m
Noro				$0.6m
Gizo				$0.8m
Lifecycle Management and Institutional Improvements				
NRW reduction	High levels of non-revenue water	Leakage detection, operational improvements, disconnections	Ongoing, measurable reduction in NRW, improved system capacity, increased revenue, reduced operational costs.	$0.6m p.a.
Urban WASH programs	Significant population without access to improved water supply and sanitation, challenges in supplying reticulation	Communal standpipes, septic management program	Increased access to improved water supply and sanitation	TBD
Maintenance improvements	SW staff participating in unsafe maintenance practices, aging/failing customer meters, requirement to service new customers	Air valves, customer meters, maintenance equipment, CCTV	Improved billing collection, better network performance	$0.54m p.a.
Existing asset replacements	Aging/failing infrastructure limiting supply, causing sewage overflows	Water main and sewer main renewals	Improved supply to customers, reduced risk of failure, reduced impact of sewage overflows	$2.4m p.a.
Operational improvements	Pumps not operating at design level, lack of redundancy and risk of failure, threat to raw water source	Pump station refurbishment, backup power, PRVs, zoning and cross connection, wastewater screening, Tuvaruhu tankering	Improved reliability of major assets, reduced system failure, reduced discharge of gross pollutants, reduced health and environmental threats	$0.3m p.a.
Maintenance facilities	Aging/lacking office accommodation and storage facilities, lack of capacity for increasing staff	Workshop, maintenance depot and office	Improved workforce performance	$2.15m

Item	Current Issues	Proposed Works	Project Effect	Cost Estimate (USD)
Institutional reform, corporate policy and planning	Lack of planning, ineffective reactive responses to issues, inefficient collection of revenue, inaccurate information about assets and customers	Disaster management, catchment management, climate risk, drought management, demand management, climate change adaption planning, design and construction standards, developer contribution policy, liquid trade waste management, asset management	Better preparedness, more efficient maintenance and operations, reduced operating costs, increased revenue	$0.3m p.a.
Data management	Inaccurate information about assets and customers	SCADA integration, hydraulic modelling, monitoring	Improved ability to track asset performance and customer records	$0.17m p.a.
Project management unit	Inability of SW staff to deliver capital works	Project Manager, environmental, financial, land, community specialists, preliminary design and planning of WTP	Ability to deliver capital works and meet desired goals	$0.6m p.a.
Capacity building	Lack of technical capacity of SW staff	Institutional reform, demand management, NRW, data management, maintenance	Improved performance of SW staff, increased efficiency	$0.25m p.a.

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