PORT VILA WASTE WATER TREATMENT ASSESSMENT

LONG GOD YUMI STANAP

REPORT

June 2025

Prepared By:

WWTF Assessment Team

Table of Content

Acknowledgements

The National Wastewater Taskforce extends its sincere appreciation to all individuals and institutions who contributed to the successful completion of this assessment.

We acknowledge the invaluable support and expertise of the following individuals:

- **Department of Water Resources**: Mr. Erie Sami, Mr. George Matariki, and Mr. Micheal Maniel
- **Port Vila Municipal Council**: Ms. Rebecca Vuta
- **Department of Public Health**: Mr. John Cleef
- **Department of Urban Affairs and Planning**: Mr. Robinson Dickson
- **Department of Environmental Protection and Conservation (DEPC)**: Mr. Rontexstar Mogeror and Mr. Damien Hinge

Special thanks are extended to the DEPC Director Ms. **Grace Naparau**, Mr. **Rontexstar Mogeror** (DEPC) and **Mr. Erie Sami** (DoWR) for their dedication and leadership in compiling and coordinating this report. Their commitment and technical guidance were instrumental in delivering this comprehensive assessment of Port Vila's wastewater treatment systems.

We further acknowledge the Honourable Minister **Ralph Regenvanu** and Director General **David Gibson** from the Ministry of Climate Change (MoCC) for their invaluable guidance and unwavering support throughout the assessment process.

Multi-Plant Wastewater Treatment Assessment Report
Assessment Dates: April – May 2025
Prepared By: National Wastewater Taskforce (NWWTF)
Organization: Department of Environmental Protection & Conservation
Contact Information: rmogeror@vanuatu.gov.vu

Disclaimer

Executive Summary

This report outlines the findings of a rapid technical assessment carried out by the National Wastewater Taskforce (NWWTF) on the Port Vila Urban Wastewater Treatment System. The assessment is aligned with the Government of Vanuatu's 100 Days Plan and was initiated in response to growing concerns surrounding wastewater management in the Central Business District (CBD) of Port Vila.

Following the 7.3 magnitude earthquake that struck on December 7, the CBD area experienced significant structural damage, especially to buildings and infrastructures constructed during the colonial period through to the 1980s and 1990s. Many of these buildings do not have Environmental Impact Assessment (EIA) records, thereby hindering regulatory checks and assessments of their wastewater treatment and discharge systems.

With ongoing demolition and reconstruction activities rendering the CBD area temporarily closed, this period presents a timely opportunity for the government to assess and address longstanding deficiencies in the urban wastewater infrastructure. The assessment specifically focused on identifying current system weaknesses, environmental risks, and opportunities for rehabilitation and upgrades.

Key observations indicated that:

- Many small and medium-sized buildings, particularly those built by Chinese contractors, rely primarily on septic tank systems.
- Larger infrastructure such as hotels and multi-storey buildings possesses their own wastewater treatment plants.
- Outside the CBD, institutions such as Vila Central Hospital and businesses like Holiday Inn also discharge untreated or poorly treated wastewater directly into the environment, with instances of raw effluent being released without appropriate filtration or treatment.

Comparative Performance Overview

The assessment revealed major performance gaps in wastewater handling practices, particularly in terms of:

- Inadequate treatment prior to discharge.
- Lack of standardization in system design and sanitation infrastructure.
- Absence of a coordinated monitoring framework

This report will outline and presents the following:

1. Institutional Assessment

This component focused on evaluating the existing institutional framework governing faecal sludge and wastewater management in Vanuatu. Key areas reviewed included:

- The roles and responsibilities of government agencies (e.g., DoWR, DEPC, Public Health, Urban Planning)

- Policy coherence and inter-agency collaboration mechanisms
- Capacity gaps in enforcement, monitoring, and service delivery
- Budget allocation and resource mobilization for sanitation infrastructure

Findings:

The assessment revealed fragmented roles and insufficient enforcement mechanisms. There was a need to strengthen legal mandates, inter-departmental coordination, and decentralization of responsibilities, particularly to municipal and provincial governments.

2. Faecal Contamination Risk Assessment

This component examined the environmental and health risks associated with poor faecal sludge management practices in urban areas. It included:

- Site-level assessment of containment, collection, transportation, treatment, and disposal of sludge
- Water quality monitoring of surrounding lagoons, harbors, and drainage systems
- Risk mapping of contamination pathways, particularly in densely populated zones

Findings:

High levels of contamination were linked to direct discharge of untreated or poorly treated wastewater into natural water bodies, poorly constructed septic systems, and illegal dumping. The risk to public health and the environment was found to be significant, especially in informal settlements and commercial zones.

3. Wastewater Effluent System Assessment:

The assessment identified significant variability in wastewater treatment system types and performance across commercial and institutional facilities. Many systems discharge untreated or partially treated effluent directly into the environment, posing risks to public health and marine ecosystems. The findings underscore the urgent need for regulatory enforcement, technological upgrades, and improved maintenance practices to ensure safe and sustainable effluent management.

4. Technological Recommendations to Mitigate Risks

Based on field data and stakeholder consultation, the taskforce proposed appropriate and cost-effective technological interventions, including:

- Improved septic system design and retrofitting
- Introduction of small-scale decentralized treatment systems (e.g., DEWATS)
- Safe sludge containment units for schools, health facilities, and public buildings
- Mobile desludging units and mechanical vacuum trucks to improve collection services

Recommendations were guided by:

- Environmental safety
- Technical feasibility in Vanuatu’s urban and geographic context
- Affordability and ease of maintenance
- Scalability for replication in other provinces

5. Political Economy Assessment

This component analysed the social, economic, and political factors that influence decision-making, investments, and public behaviour around sanitation. It investigated:

- Stakeholder interests and incentives
- Political commitment at national and municipal levels
- Public awareness and community engagement in sanitation practices
- Barriers to private sector participation in faecal sludge management

Findings:

Limited political prioritization and weak financial incentives for private operators hindered progress. Public perception and limited awareness also contributed to low demand for safe sanitation services. Strengthening accountability and integrating wastewater into broader urban planning was recommended.

6. Drafting of Wastewater Regulations

As a major outcome of the assessment, the Taskforce—with support from legal and technical experts—initiated the drafting of national Wastewater Regulations under the Pollution Control Act. Key objectives of the draft regulations include:

- Setting effluent discharge standards and penalties for non-compliance
- Licensing and permitting procedures for wastewater treatment and disposal
- Technical standards for septic tanks, sludge handling, and treatment systems
- Monitoring and reporting obligations for facilities and service providers
- Defining institutional responsibilities and enforcement mechanisms

The draft regulations are intended to provide a legal backbone for comprehensive wastewater governance and will undergo stakeholder consultation before final endorsement.

The Urban Faecal Sludge Management Assessment provided a critical evidence base to guide infrastructure investment, policy reform, and institutional strengthening. Through this initiative, the National Wastewater Taskforce established a platform for sustained coordination between health, environment, water, and urban planning sectors—paving the way for safer, more sustainable urban sanitation systems in Vanuatu.

7. Recommendations

The Summary of Recommendations outlines targeted actions to improve wastewater management, including regulatory enforcement, technological upgrades, risk-based monitoring, and priority interventions at high-risk sites. It emphasizes capacity building, public awareness, and the need to separate greywater from blackwater systems to reduce contamination and protect public health and the environment.

8. Appendices

The Appendix provides supporting materials including photos, geo-location map, wastewater standards and parameters table used for samplings, technical diagrams, risk classification models for treatment systems, and other detail information.

Background

Routine water quality testing conducted in 2018 and 2019 revealed elevated levels of *Escherichia coli* (*E. coli*), faecal streptococci, and enterococci in the recreational waters of Port Vila Harbour and the surrounding lagoons. These results raised serious public health concerns related to the risk of waterborne diseases.

In response, the Department of Water Resources (DoWR), in collaboration with other responsible government agencies—including the Department of Environmental Protection and Conservation (DEPC)—issued a public ban in 2019 on swimming and other recreational activities in Port Vila Harbour to protect public health.

Recognizing the urgent need for a coordinated response to wastewater issues, DEPC initiated the formation of a dedicated taskforce in 2019. This initiative was formalized in April 2020 with the official establishment of the National Wastewater Taskforce.

The Taskforce was mandated to develop wastewater discharge permits under the *Pollution Control Act* and to lead the formulation of national wastewater and recreational water quality standards. This marked a critical step forward in strengthening regulatory oversight, improving wastewater management, and safeguarding environmental and human health in urban coastal areas of Vanuatu.

Methodology

To ensure a comprehensive understanding of wastewater treatment conditions in Port Vila and its surrounding areas, a structured data collection approach was carried out under the coordination of the National Wastewater Taskforce (NWWTF). The assessment was conducted during the period from April – to May 2025.

1. Formation of Multi-Agency Assessment Team

A dedicated field assessment team was formed within the NWWTF, comprising representatives from the following key agencies:

- Department of Water Resources (DoWR)
- Department of Environmental Protection and Conservation (DEPC)
- Department of Public Health
- Department of Urban Affairs and Planning
- Port Vila Municipal Council

This inter-agency team collaborated to conduct site visits and evaluate the performance and compliance status of wastewater treatment facilities.

2. Data Collection Tools and Techniques

The following methods and tools were employed to collect relevant data and information:

- **KoboToolbox and KoboCollect Application:**

  Structured surveys were developed using KoboToolbox and deployed through the KoboCollect mobile application for real-time, geo-referenced data collection.

- **Direct Field Observation:**

  Observational tools and checklists were used to evaluate the structural integrity, operational status, and environmental risks associated with each treatment system.

- **Visual Documentation:**

  Photographs and video footage were captured during each site visit to document the physical condition and functionality of the facilities. This served as visual evidence for analysis and reporting.

3. List of Sites Assessed

The assessment covered a total of 25 septic systems and 16 wastewater treatment systems within the Port Vila Central Business District (CBD) and surrounding zones.

Note: One site, ABM Downtown and other buildings not mentioned, was excluded as these facilities had been demolished prior to the assessment.

4. Data Analysis and Validation

Data collected from surveys, observations, and visual records were reviewed, compiled, and analysed by the NWWTF team. The findings were cross verified to identify compliance gaps, infrastructure needs, and potential environmental and public health risks. Results will inform recommendations for regulatory enforcement and improvement plans.

Methodology of Assessment (Kobo tool & Collect Survey using phone and observations)

Showing the boundary in which assessment covers, and the methodology tools used to collect information.

1. Institutional Responsibilities for Wastewater

1.1 Institutional Responsibilities

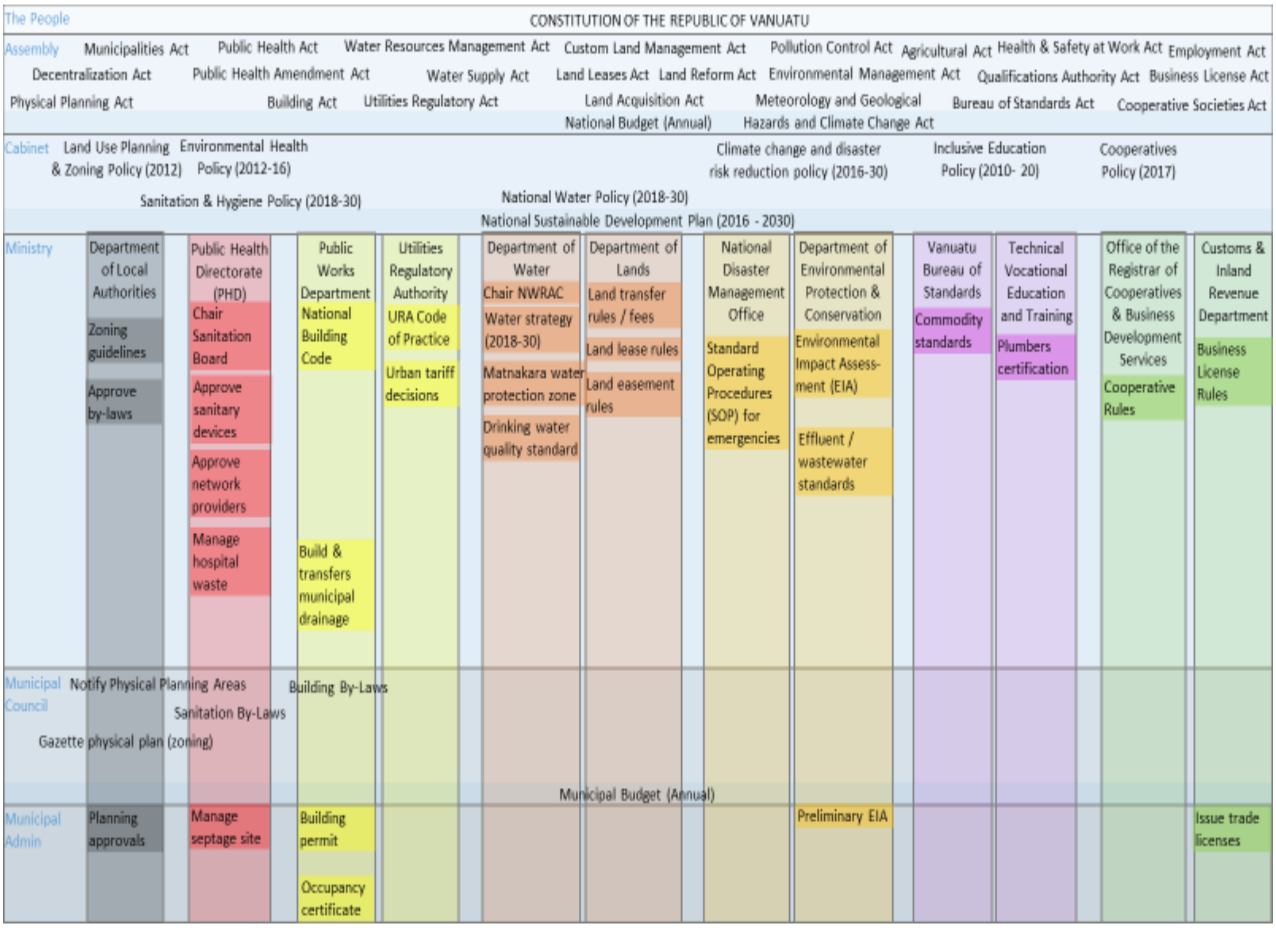


Figure 1.1: This short screen table summarizes the institutional responsibilities of various government departments, agencies, and municipal authorities involved in the management of wastewater in urban areas of Vanuatu. It outlines key roles and mandates from zoning and sanitation oversight to infrastructure development, regulatory enforcement, and environmental compliance. This coordinated approach is essential for effective and sustainable urban waste-water management aligned with national development policies and regulatory frameworks.

Table 1.1 simplifies the above information

Institution	Key Responsibilities
Department of Local Authorities	Zoning guidelines; Approve by-laws
Public Health Directorate (PHD)	Chair Sanitation Board; Approve sanitary devices and network providers; Manage hospital waste
Public Works Department	Build & transfer municipal drainage; Enforce National Building Code
Utilities Regulatory Authority (URA)	Implement URA Code of Practice; Urban tariff decisions
Department of Water	Chair NWRAC; Water strategy; Water protection zones; Drinking water quality standard
Department of Lands	Land transfer rules/fees; Land lease and easement rules
National Disaster Management Office	Standard Operating Procedures (SOP) for emergencies
Department of Environmental Protection & Conservation	Conduct Environmental Impact Assessments (EIA); Set effluent/wastewater standards
Vanuatu Bureau of Standards	Set commodity standards
Technical Vocational Education and Training (TVET)	Issue plumbers certification
Office of the Registrar of Cooperatives	Apply cooperative rules
Customs & Inland Revenue Department	Issue trade licenses
Municipal Council	Notify planning areas; Enforce sanitation and building by-laws; Gazette zoning plans
Municipal Administration	Approve planning; Manage septage site; Issue building permits and occupancy certificates

1.2 Institutional Strengthening

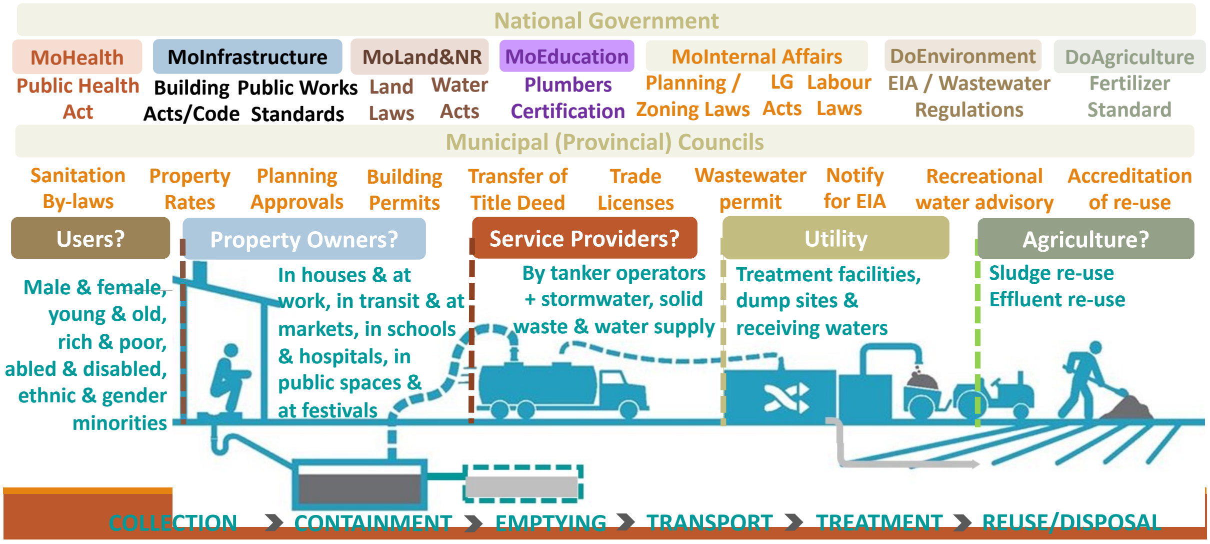


Figure 1.2: provides a visual overview of how various actors—government institutions, municipal councils, service providers, and users—interact across the sanitation chain, from waste generation to reuse. It maps out and clarifies institutional roles and responsibilities for better coordination, governance, and safe management of urban wastewater in Vanuatu—from the toilet to the treatment plant and beyond.

1. Governance Layers

- National Government:
  - MoHealth: Enforces the Public Health Act.
  - MoInfrastructure: Oversees building codes and public works.
  - MoLand & Natural Resources: Manages land and water laws.
  - MoEducation: Certifies plumbers.
  - MoInternal Affairs: Regulates planning and labor/zoning laws.
  - DoEnvironment: Regulates EIAs and wastewater standards.
  - DoAgriculture: Sets fertilizer reuse standards.
- Municipal/Provincial Councils: Implement local planning and sanitation regulations, including:
  - Sanitation by-laws
  - Property rates and building permits
  - Transfer of land titles
  - Issuing wastewater and trade licenses
  - Recreational water advisories
  - Accreditation of re-use practices

2. Stakeholders

- Users: All individuals (diverse demographics) who generate wastewater.
- Property Owners: Responsible for infrastructure in homes, workplaces, and public spaces.
- Service Providers: Tanker operators and utilities for stormwater, waste, and water services.
- Utilities: Manage treatment plants, dump sites, and effluent discharge.
- Agriculture: End-users of treated sludge/effluent for reuse in farming.

3. Wastewater Management Chain

This chain runs along the bottom of the diagram:

- Collection → Containment → Emptying → Transport → Treatment → Reuse/Disposal

Each step involves different institutions and stakeholders responsible for compliance, safety, and reuse potential.

2. Assessment of Faecal Contamination Risks

In Port Vila, the contamination risk is from effluent discharge to open (land or water) rather than discharge into the soil.

a. Septic Tanks: The secondary risk occurs from septic tanks with inadequate soak-aways that overflow to the open, or with no soak-away discharging effluent to drains, or having their effluent emptied and dumped in the open.

b. Sewage Treatment Plants (STPs): The primary risk occurs from poorly maintained STPs that either routinely (or occasionally) release pathogens via effluent to the surface water or land

Table 2.1
2. a). Facility Overview Table: Port Vila Septic System, Low priority

Plant ID	Name	Location (La)	Location (Lo)	Type of System (Aerobic/Unaerobic)	Design Capacity (users)	Operational (Y/N)
P1	Club Lit	-17.741485 168.31406 0 0	-17.741485 168.31406 0 0	Septic	100<	Y
P2	BSP Bank	-17.738254 168.313712 0 0	-17.738254 168.313712 0 0	Septic	100<	Y
P3	Wanfuteng Bank	-17.738434 168.31382 0 0	-17.738434 168.31382 0 0	Septic	100<	Y
P4	Laguna House	-17.741732 168.313912 72.9000015258789 48.57099914550781	-17.741732 168.313912 72.9000015258789 48.57099914550781	Septic	100<	Y
P5	Nautique Building	-17.742869 168.314002 0 0	-17.742869 168.314002 0 0	Septic	100<	Y
P6	Waterfront Quays, Port Vila	-17.743104 168.313943 0 0	-17.743104 168.313943 0 0	Septic	100<	Y
P7	Lalala Bar lounge	-17.742496 168.313996 0 0	-17.742496 168.313996 0 0	Septic	100<	Y
P8	Corona enterprise $ takeaway	-17.7291292 168.3112978 74.0 4.945	-17.7291292 168.3112978 74.0 4.945	Septic	100<	Y
P9	ABM downtown	-17.7408395 168.3140771 71.9000015258789 4.901	-17.7408395 168.3140771 71.9000015258789 4.901	Septic	100<	Y
P10	STP underground port	-17.7413871 168.3142069 73.30000305175781 4.05	-17.7413871 168.3142069 73.30000305175781 4.05	Septic	100<	Y
P11	The Port	-17.7422021 168.3143305 73.9000015258789 14.324	-17.7422021 168.3143305 73.9000015258789 14.324	Septic	100<	Y
P12	Calvo butchery	-17.7419218 168.3140155 71.9000015258789 6.546	-17.7419218 168.3140155 71.9000015258789 6.546	Septic	100<	Y
P13	Mahitahi, Municipal	-17.7368932 168.3121703 73.30000305175781 5.0	-17.7368932 168.3121703 73.30000305175781 5.0	Septic	100<	Y

P14	Melcoffe Building	-17.7310784 168.3114326 73.5 178.179	-17.7310784 168.3114326 73.5 178.179	Septic	100<	Y
P15	Banyan Beach Bar	-17.7314304 168.3113132 73.5999984741211 166.374	-17.7314304 168.3113132 73.5999984741211 166.374	Septic	100<	Y
P16	Sharper Image Building	-17.7320414 168.3114668 73.0999984741211 181.74	-17.7320414 168.3114668 73.0999984741211 181.74	Septic	100<	Y
P17	Central Inn	-17.7391074 168.3138207 73.5999984741211 4.137	-17.7391074 168.3138207 73.5999984741211 4.137	Septic	100<	Y
P18	ANZ Building	-17.7390341 168.3138024 73.5999984741211 3.953	-17.7390341 168.3138024 73.5999984741211 3.953	Septic	100<	Y
P19	Pay Development Building (Sound Centre)	-17.7377506 168.313612 97.19999694824219 4.296	-17.7377506 168.313612 97.19999694824219 4.296	Septic	100<	Y
P20	The Drug Store	-17.7386299 168.3140575 73.69999694824219 4.463	-17.7386299 168.3140575 73.69999694824219 4.463	Septic	100<	Y
P21	Pilioko House	-17.737518 168.3133635 74.9000015258789 4.781	-17.737518 168.3133635 74.9000015258789 4.781	Septic	100<	Y
P22	Central Bay Motel	-17.7356404 168.3116501 72.9000015258789 4.897	-17.7356404 168.3116501 72.9000015258789 4.897	Septic	100<	Y
P23	icount House	-17.7344499 168.3109991 73.4000015258789 4.951	-17.7344499 168.3109991 73.4000015258789 4.951	Septic	100<	Y

Summary of the Above table

This table presents listing of 23 buildings and businesses within the Port Vila Central Business District (CBD) that utilize septic systems for on-site wastewater management. These include financial institutions, retail shops, hospitality facilities, and municipal buildings.

Key Highlights:

- System Type: All listed facilities operate septic wastewater systems, which are low-maintenance, decentralized treatment options suitable for small-scale or standalone buildings.
- Operational Status: Except for ABM Downtown (P9), all systems are reported as currently operational. ABM Downtown has been demolished, and its septic system is no longer present, reducing the active systems in this list to 22.
- Design Capacity: All systems are designed for less than 100 users, indicating relatively low wastewater generation volumes. These systems are adequate for their respective facility sizes and daily usage.
- Geographic Distribution: The facilities are densely located within the CBD, with several clustered along key commercial streets and waterfront areas, such as around the Port, Melcoffe Building, and Central Bay Motel.

Assessment and Priority Ranking:

This group of buildings is assessed as low priority in the broader urban wastewater infrastructure strategy. The reasons include:

- All systems are individual septic units, which pose minimal immediate risk if properly maintained.
- Wastewater volumes are low, and systems serve mostly small to medium-sized buildings.
- The absence of complex aerobic systems or centralized treatment links reduces the likelihood of widespread environmental discharge.

However, it is recommended that these septic systems continue to undergo routine maintenance, desludging, and inspection to ensure compliance with environment pollution control act, and health standards.

Site	Septic	Soakaway	Comments
Basili Limited	4.5 yrs to fill. 38 yrs old but never emptied	Adjacent. Look for effluent discharge.	Direct discharge of blackwater to stormwater not permitted. Check GWL. Issue work order to separate grey & blackwater
Bingtong	31 yrs to fill Emptied every 10 yrs	Adjacent. Probably too small	Flooding? Direct discharge of blackwater to stormwater? Order to improve soakaway & separate grey + blackwater
Caillarcado Olympics Hotel	4 yrs to fill Emptied every 2 yrs	Adjacent	Check water table depth! Issue work order to separate grey & blackwater.
Caillarcado Olympics shops	1.5 yrs to fill. 10 yrs old & never emptied	Adjacent (no details)	Check that septic or soakaway is not discharging to drain. Issue fine if this is occurring.
Carllardo Bearness	8 yrs to fill. Missing details on emptying	Adjacent (no details)	Survey again. Check water table depth.
Charles Cheung	3 yrs to fill. Missing details on emptying	Probably too small!	Survey again. Emptying frequency missing
Christian Brune	1 yr to fill. Emptied every yr.	Adjacent	Black & grey water already separated. Check water table depth. Maybe separate soakaway!
Christian Brunette (Go 4 Food)	21 yrs to fill? Emptied yearly	Adjacent	Check septic dimensions. Check water table depth. Work order to separate black & grey water to separate soakaway
Fueng Kwei	8 yrs to fill. Emptied every 2 yrs	Adjacent	Black & grey water already separated. Need soakaway details Check water table depth. Maybe separate soakaway!
Go for Food	3 yrs to fill. Only 2 yrs old	Separate	Too early too tell!
Govant Joseph Coongoola cruise et	15 yrs to fill. 20 yrs old. Never emptied	Adjacent	Seems okay. Black & grey already separated. Due to be emptied. Issue order to empty.
Health Wise	16 yrs to fill. Emptied twice per year	Adjacent	Grey & blackwater already separate. Soakaway too small. Separate the soakaway. Issue work order.
Matt Mercy (Port LJ Hooker)	6 yrs to fill. Emptied every 2 yrs	Separate. Too small	Issue work order to increase size of soakaway
Matt Mercy (The Ports 2)	6 months to fill. Emptied @ 6 months	Soakaway details missing	Survey again for details of soakaway. Advise to separate greywater & blackwater

Figure 2.1 provides the priority ranking based on how the system is being built, as some connects to storm water, some black and grey water goes together, its capacity, while others their information was n/a.

Table 2.2 Waste Water Treatment Plants
2. b). Facility Overview Table: Port Vila WWTP High Priority

Plant ID	Name	Location (La)	Location (Lo)	Type of System (Aerobic/Anaerobic)	Design Capacity (users)	Operational (Y/N)
P1	Bread Bank (Rosi)	-17.73611976	168.3118435	Anaerobic	90+	Y
P2	Nambawan Café	-17.73688746	168.3120633	Anaerobic	150+	Y
P3	Seafront (Pikinini Playground)	-17.73925644	168.3137142	Anaerobic	150+	Y
P4	Iririki Ishand Resort	-17.74854795	168.3083167	Aerobic	1000+	Y
P5	Ramada	-17.75478182	168.3176984	Anaerobic	300+	Y
P6	VCH	-17.74359714	168.3240058	Aerobic	2000+	N
P7	VMF Facility	-17.72325699	168.3175756	Anaerobic	500+	Y
P8	Holiday Inn	-17.7401764	168.3237646	Aerobic	1000+	N
P9	Tana Russet	-17.72849463	168.3117643	Anaerobic	500+	Y
P10	Vanuatu Brewing Ltd (Tusker)	-17.70633133	168.307527	Aerobic	150+	Y
P11	Warwick	-17.7675443	168.306816	Aerobic	500+	Y
P12	Port Vila Municipal Market	-17.7403016	168.3140793	Anaerobic	1000+	N
P13	Moorings Hotel	-17.7305893	168.3111303	Anaerobic	500+	N
P14	Erakor Island Resort	-17.7725941	168.3108952	Septic	150+	Y
P15	Grand Hotel	-17.7422464	168.3142188	Anaerobic	1000+	N
P16	USP	-17.7339350	168.3234571	Anaerobic	1500+	Y

Summary of the Above Table

This table presents an updated overview of wastewater treatment systems operational across key facilities in Port Vila and peri-urban areas, including commercial businesses, resorts, hospitality establishments, and public infrastructure. The data includes geolocation coordinates, system type (aerobic, anaerobic, or septic), design capacity, and operational status.

Out of the 16 listed facilities:

- 11 systems are anaerobic,
- 4 systems are aerobic,
- 1 system is septic (Erakor Island Resort), and

Operational Status:

- 11 systems are currently operational.
- 5 systems are non-operational, including:
  - Vila Central Hospital (P6)
  - Holiday Inn (P8)
  - Port Vila Municipal Market (P12)
  - Moorings Hotel (P13)
  - Grand Hotel (P15)

    (Note: VCH and Grand Hotel have the highest design capacities among non-operational facilities)

System Capacity:

- Capacities range from 90+ to over 2000+, with major facilities such as:
  - VCH (P6): 2000+ (non-operational)
  - USP (P16): 1500+
  - Iririki Island Resort (P4) and Holiday Inn (P8): 1000+ each
  - Grand Hotel (P15) and Municipal Market (P12): 1000+ each (both non-operational)

Observations:

- Many smaller commercial buildings continue to rely on anaerobic systems.
- Modern aerobic systems are primarily found in large institutions and international resorts (e.g., Iririki, Warwick, Tusker Brewery).
- The inoperability of high-capacity plants, particularly in health, hospitality, and public market settings, presents serious environmental and public health concerns.
- Facilities without operational systems are potential sources of untreated or poorly treated wastewater being discharged into sensitive environments, including coastal and marine areas.

Note: *Definition and description of aerobic and Anaerobic systems refer to appendix page 55 – 56.*

Table 2.3
Operational Observations:

Good	**Meaning the conditions, handling, control system and maintenance were professionally managed and implemented**
Satisfactory	**Meaning the system conditions, handling, control system and maintenance were not professionally managed and handle (not 100% functioning)**
Poor	**Meaning the system conditions, handling, control system and maintenance were not up to environmental standards to operate (50%) and is in violation to the environmental laws.**
Very poor	**Meaning the system conditions, handling, control system and maintenance are broken down, and is no longer in operation.**

Results: Mechanical Condition, Sludge Handling, Chemical use, Control system and Maintenance routines

Building Name	Mechanical/electrical equipment condition (status, very good, good, poor, very poor)	Sludge handling practices (status, very good, good, poor, very poor)	Chemical use Yes or no	SCADA/control system status (status, very good, good, poor, very poor)	Maintenance routines (status, very good, good, poor, very poor)
VMF Facility	Good	Good	Yes	Good	Good
Tana Russet	Good	Good	Yes	Good	Good
Bred Bank (Rossi)	Good	Good	Yes	Satisfactory	Good
Ramada	Good	Good	Yes	Satisfactory	Good
USP	Good	Satisfactory	No	Poor	Good
Vanuatu Brewing Ltd (Tusker)	Good	N/Applicable	Yes	Good	Satisfactory
Port Vila Municipal Market	Under maintenance	Satisfactory	N/A	N/A	Satisfactory
Moorings Hotel	Under maintenance	Satisfactory	N/A	N/A	Satisfactory
Erakor Island Resort	Septic	Satisfactory	N/A	N/A	Satisfactory
Grand Hotel	Under maintenance	Satisfactory	N/A	N/A	Satisfactory
Nambawan Café	Poor	Satisfactory	No	Poor	Poor
Seafront (Pikinini Playground)	Poor	Satisfactory	No	Poor	Poor
Warwick	Poor	Poor	No	satisfactory	Poor
Holiday Inn	Poor	Poor	No	Poor	Poor
Iririki Ishand Resort	Very Poor	Satisfactory	No	Very Poor	Poor
VCH	Very Poor	Very Poor	no	Very Poor	Very Poor

Summary of Facility Assessment

- Top Score: 13
- Bottom Score: 0
- Average Score: 6.75
- Total Facilities Assessed: 16

Key Observations:

- Highest scoring facilities (VMF Facility, Tana Russet) performed consistently well across all criteria.
- Lowest scoring facilities (e.g., VCH) showed critical deficiencies in multiple areas, including poor mechanical condition and lack of control systems.
- Facilities with "Under maintenance" or "Septic" conditions tended to have lower scores due to limited or non-operational systems.

Facility Assessment Total Scores

The bar graph presents the total assessment scores for 16 facilities based on five evaluation criteria.

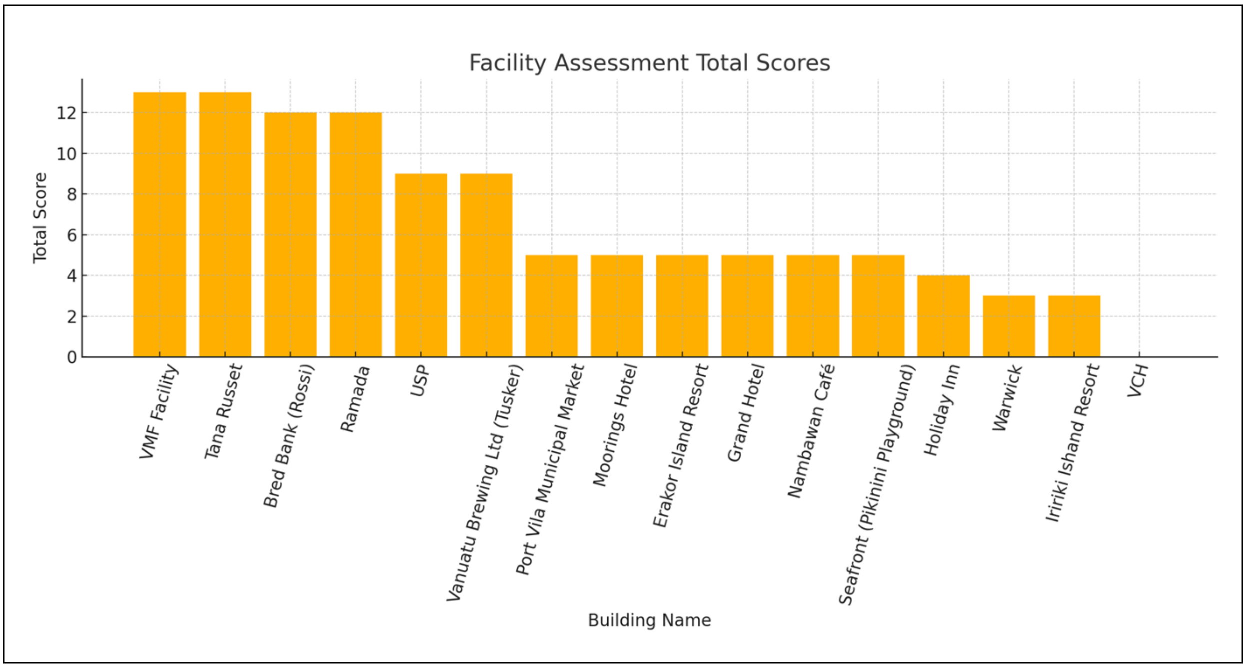


Figure 2.2: Facility Assessment Total Scores

Top Performing Facilities

- VMF Facility and Tana Russet achieved the highest total score (13 points), indicating:
  - Consistently good mechanical/electrical conditions
  - Sound sludge handling practices
  - Proper chemical usage
  - Functional SCADA/control systems
  - Well-established maintenance routines

These facilities likely have well-maintained and efficiently managed wastewater systems.

Mid-Range Performers

- Facilities like USP, Tusker, and Municipal Market scored in the 9–5 range.
  - Issues varied from lack of chemical use, basic sludge handling, or maintenance in progress.

- These systems are partially functioning but may require targeted improvements (especially in SCADA systems and mechanical conditions).

Low Performing Facilities

- Holiday Inn, Warwick, Iririki Resort, and VCH are at the bottom of the chart with scores as low as 0–4.
  - Common deficiencies include:
    - Very poor mechanical/electrical condition
    - No SCADA system
    - Poor maintenance
    - No chemical usage
  - These facilities likely present high environmental risks and are in urgent need of upgrades or regulatory intervention.

General Observations:

- There is a wide performance gap across facilities, from nearly perfect systems to those barely functioning or inactive.
- Preventive maintenance and monitoring (via SCADA) are critical to better scoring and system performance.
- Facilities under maintenance or septic systems were scored conservatively, which impacted their ranking.

Table 2.4

Environmental and Safety Observations:

Good	**Meaning the system is well maintained, clean and no unpleasant smell including safe working condition and no environmental risk to nearby settlement (Low Risk)**
Satisfactory	**Meaning the system produces unpleasant smell, which likely to have impact on workers' health and that the system is not 100% functioning (Medium Risk)**
Poor	**Meaning the system is not well maintain and is about 50% functioning (High Risk)**
Very poor	**Meaning the system is not operational. (Critical)**

Building Name	Odor control	Worker Safety	Environmental risks
VMF Facility	Good	Good	Good
Bred Bank (Rosi)	Satisfactory	Good	Satisfactory
USP	Good	Good	Satisfactory
Ramada	Good	Good	Satisfactory
Erakor Island Resort	Good	Good	Satisfactory
Nambawan Café	Good	Good	Poor
Seafront (Pikinini Playground)	Good	Good	Poor
Tana Russet	Satisfactory	Satisfactory	Satisfactory
Vanuatu Brewing Ltd (Tusker)	Poor	Satisfactory	Satisfactory
Warwick	Poor	Poor	Poor
Holiday Inn	Poor	Poor	Very Poor
Iririki Ishand Resort	Poor	Satisfactory	Very poor
VCH	Very poor	Very poor	Very poor
Port Vila Municipal Market	Under maintenance	Not applicable	Not applicable

Moorings Hotel	Under maintenance	Not applicable	Not applicable
Grand Hotel	Under maintenance	Not applicable	Not applicable

Summary of the Environmental & Safety Assessment Table

The assessment table evaluates 16 facilities based on three key criteria:

1. Odor Control
2. Worker Safety
3. Environmental Risks

Each criterion is scored using a qualitative scale (Very Poor to Good), which was converted into a numerical value to compute a Total Score (maximum possible score = 9).

High Scorers (Scores 8–9):

- VMF Facility (Score: 9) – Achieved the highest score, indicating strong performance across all areas.
- USP, Ramada, and Erakor Island Resort (Score: 8 each) – Scored well across the board, showing effective odor management, safe working conditions, and moderate environmental risk.

Moderate Scorers (Scores 6–7):

- Bred Bank (Rosi) (Score: 7) – Slightly weaker in odor control and environmental risk.
- Nambawan Café and Seafront (Pikinini Playground) (Score: 7 each) – Good safety and odor control, but poor environmental risk ratings.
- Tana Russet (Score: 6) – Consistent but only “satisfactory” ratings in all areas.

Low Scorers (Scores 2–5):

- Tusker, Warwick, Iririki Island Resort, and Holiday Inn – Marked by poor to very poor performance, especially in environmental risk and worker safety.
- Environmental risk was particularly problematic for these facilities.

Minimal/Unavailable Data (Scores 0–1):

- Port Vila Municipal Market, Moorings Hotel, Grand Hotel – Marked as “Under maintenance” or “Not applicable”, receiving very low or no score.
- VCH scored 0, indicating very poor performance in all assessed areas.

Key Observations:

- There is a clear gap in performance between top and bottom facilities.
- Worker safety and environmental risk are the most common areas of weakness.
- Facilities with low scores should be prioritized for regulatory review, technical support, or operational improvements.

The bar graph presents the Environmental and safety assessment scores for 16 facilities

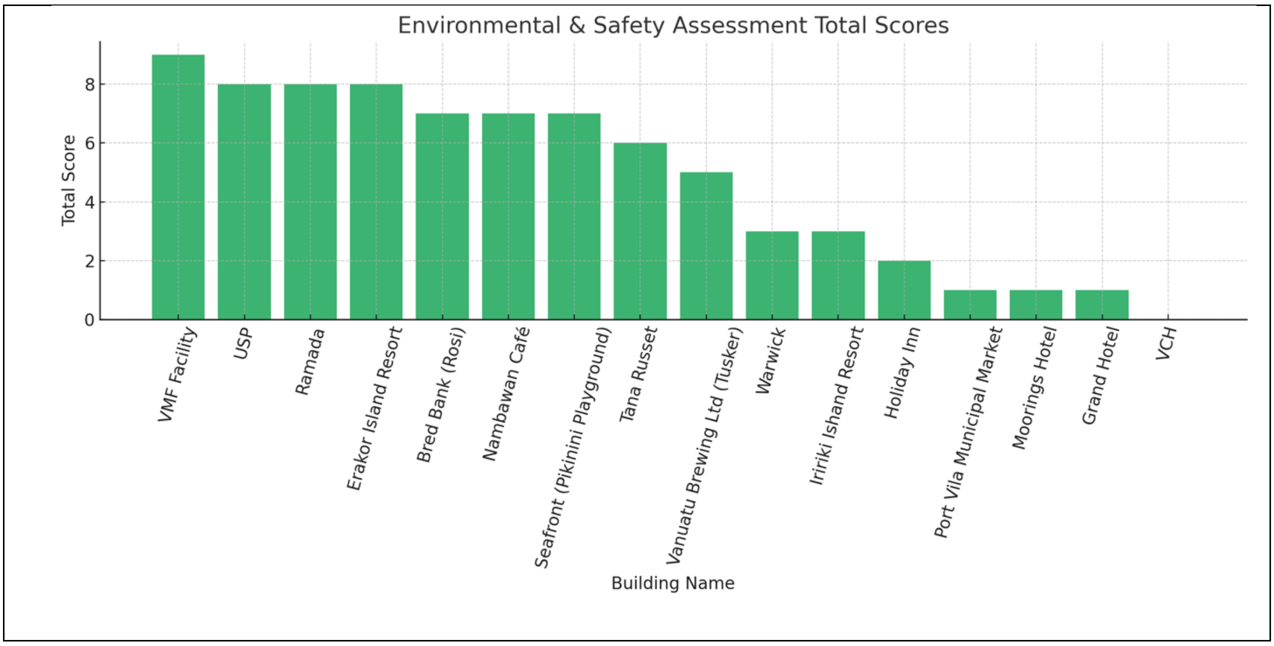


Figure 2.3: Summary of Environmental & Safety Assessment

- Top Score: 9
- Bottom Score: 0
- Average Score: 4.75
- Total Facilities Assessed: 16

Key Insights:

Top Performing Facilities:

- VMF Facility (Score: 9) leads in odor control, worker safety, and minimal environmental risks, indicating excellent operational standards.

Mid-Range Facilities (Score: 5–8):

- Facilities like USP, Ramada, Erakor Island Resort, and Bred Bank show acceptable safety and environmental performance.
- Improvements can focus on minimizing environmental risks and enhancing odor management.

Low Performing Facilities (Score: 0–4):

- Warwick, Holiday Inn, Iririki Island Resort, and VCH display significant concerns across all criteria—particularly in worker safety and environmental risk.
- These sites may pose threats to public and environmental health and require urgent attention.

Non-Operational/Under Maintenance:

- Municipal Market, Moorings Hotel, and Grand Hotel received minimal scores due to non-applicability or maintenance status—indicating data gaps or temporarily inactive systems.

3.Wastewater Effluent System Assessment

Sample ID	Location	Ammonia (mg/L)	Nitrate (mg/L)	Total Phosphorus (mg/L)	Chemical Oxygen Demand (COD) (mg/L)	Biological Oxygen Demand (BOD) (mg/L)	Turbidity (NTU)	Temperature (℃)	pH	Dissolved Oxygen (mg/L)
P1	Bred Bank	1.36	13.7	5.87	324	108	235	27.8	8.37	6.87
P2	Nambawan Cafe	0	0.156	13.9	88	12	17.4	29.6	7.10	0.23
P3	Seafront (Stage Play Ground)	1.57	11.2	7.01	1	0.2	1.28	30.2	7.58	0.44
P4	Iririki Island Resort	0.742	5.96	8.90	192	64	58.5	31.2	7.75	2.19
P5	Ramada Resort	3.5	0.422	7.66	78	26	68.3	29	7.24	0.23
P6	Vila Central Hospital (VCH)	1.386	6.351	9.37	540	220	61.64	27.7	7.58	4.58
P7	Cooks Barracks (VMF)	0.034	3.12	0.240	86	23	24.4	29.2	10.90	21.23
P8	Holiday Inn	2.94	0.341	5.75	126	39	26.2	27.5	7.63	0.29
P9	Tana Russet	2.59	0.038	5.86	138	35	11.9	31	7.85	2.12
P10	Tusker Factory	0.457	2.10	10.7	3246	1940	61.9	27.3	6.27	3.50
P11	Warwick Le Lagoon	0.668	0.196	10.9	712	421	231	27.1	8.28	7.71

Figure 3.1 wastewater sampling results from 11 locations of waste water Treatment Plants (P1–P11) across Port Vila.

3.1 Parameters Monitored

The following parameters were analyzed for each sample:

- Ammonia (mg/L)
- Nitrate (mg/L)
- Total Phosphorus (mg/L)
- Chemical Oxygen Demand (COD) (mg/L)
- Biological Oxygen Demand (BOD) (mg/L)
- Turbidity (NTU)
- Temperature (°C)
- pH
- Dissolved Oxygen (DO) (mg/L)

3.2 Summary of Key Findings

3.2a). High-Risk Locations

Location	Key Issues
Tusker Factory	COD (3246 mg/L), BOD (1940 mg/L) – suggests untreated industrial discharge.
Warwick Le Lagoon	High COD (712), BOD (421), TP (10.9) – very poor effluent quality, Damaged by Earthquake).
Vila Central Hospital	High COD (540), BOD (220) – likely high organic load from healthcare waste.
Holiday Inn	Elevated ammonia (2.94), very low DO (0.29) – indicates septic conditions, (Damaged by Earthquake).
Nambawan Café	High phosphorus (13.9), very low DO (0.23) – stagnant or untreated discharge, (Non – Operational).

3.2b) Moderate-Concern Locations

Location	Comments
Ramada Resort	High ammonia (3.5), elevated turbidity (68.3).
Iririki Resort	Moderate nutrient levels; BOD data missing.
Tana Russet	Low nitrate, but moderate organic loading.

3.2c) Low-Risk or Well-Treated Sites

Location	Comments
Cooks Barracks (VMF)	Low ammonia, nitrate, phosphorus; very high DO (21.23 mg/L) – excellent quality.
Seafront (Stage Playground)	Low BOD (0.2), turbidity (1.28), and moderate nutrients – likely diluted or treated, (Non – Operational).

3.2d). Non -Operational system

Location	Comments
USP	Undergo maintenance
Market House	Undergo maintenance
Grand Hotel	Undergo maintenance
Moorings	Undergo maintenance

3.3. Interpretation of Parameters

- **Ammonia:** Indicates organic contamination. High at Ramada (3.5 mg/L), Holiday Inn (2.94 mg/L).
- **Nitrate:** Highest at Bred Bank (13.7 mg/L), generally low across others.
- **Total Phosphorus:** Very high at Nambawan Café, Warwick, and Tusker – eutrophication risk.
- **COD & BOD:** Extremely high at Tusker, Warwick, and VCH – serious pollution.
- **Turbidity:** Highest at Ramada (68.3 NTU) and VCH (61.64 NTU).
- **Dissolved Oxygen:** Critical levels at Holiday Inn, Nambawan Café, Seafront.
- **pH and Temperature:** Generally, within safe tropical ranges.

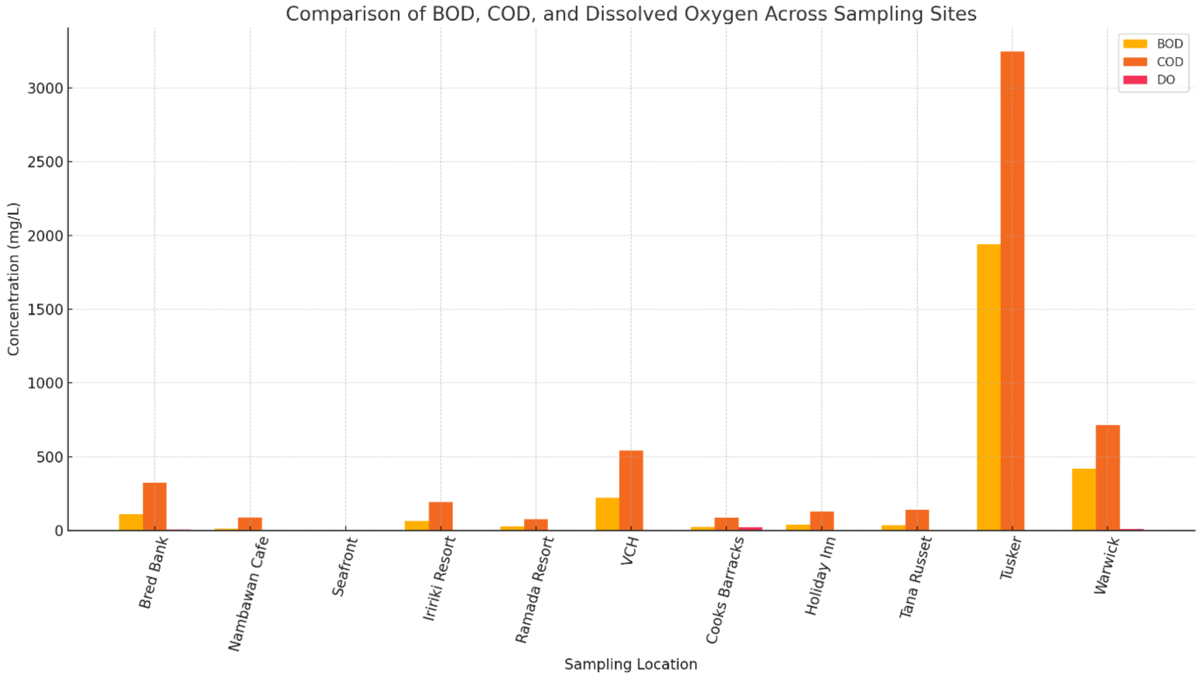


Figure 3.2. The visual comparison shows **Biological Oxygen Demand (BOD)**, **Chemical Oxygen Demand (COD)**, and **Dissolved Oxygen (DO)** concentrations across all sampling locations:

Key Insights:

- **Tusker Factory** has the **highest pollution levels** by far (BOD ~1940 mg/L, COD ~3246 mg/L), suggesting severe organic waste discharge.
- **Warwick**, **VCH**, and **Iririki Resort** also show **elevated BOD and COD**, indicating poor treatment or heavy waste input.
- **Cooks Barracks** is a standout positive with **low BOD/COD and very high DO (21.23 mg/L)**, suggesting well-treated effluent.

4. System Type Recommendations

4.1. Improve the Operation and Maintenance of Commercial Sewage Treatment Systems

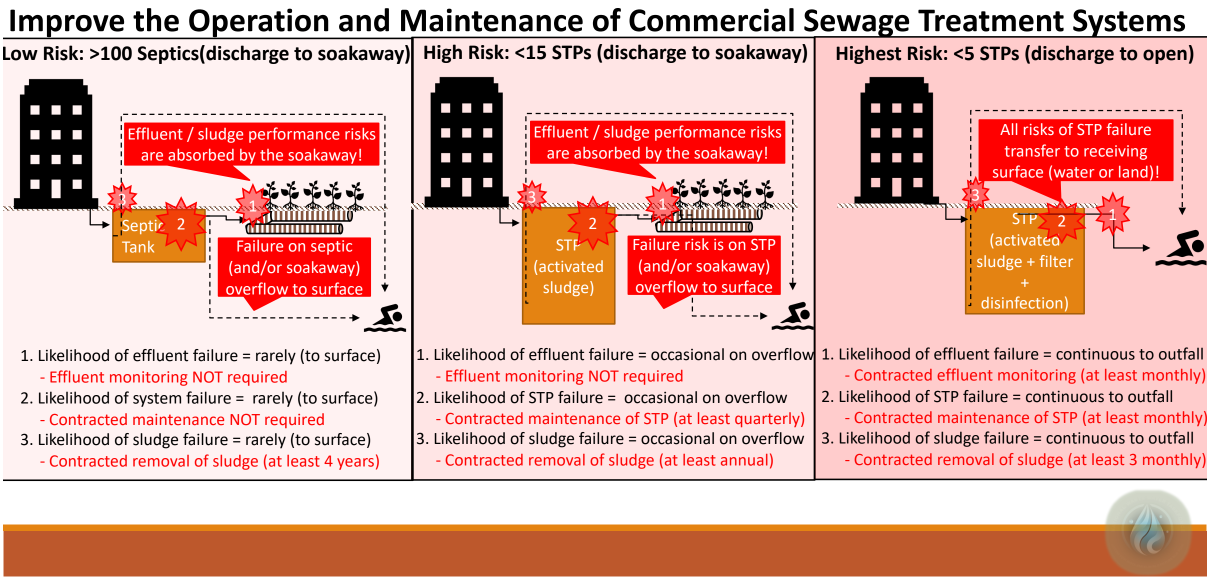


Figure 4.1 This model presents a **risk-based classification of commercial sewage treatment systems** based on the **type of discharge and maintenance requirements**, with the goal of improving operations and minimizing environmental risks.

Risk-Based Technology Recommendations for Commercial Sewage Treatment Systems

This outlines a tiered risk assessment model for commercial sewage treatment systems (STPs) to inform regulatory monitoring, system design, and contracted maintenance requirements. The model categorizes systems by discharge type and operational risk to help mitigate environmental contamination and public health threats.

4.1a). Overview of Risk Categories

The model categorizes sewage treatment systems into three distinct risk levels based on their type, discharge pathway, and operational behavior:

A. Low Risk Systems

System Type: Septic Tanks
Discharge Pathway: Soakaway
Typical Deployment: >100 units

Key Characteristics:

- Soakaway systems buffer against failure, reducing surface overflow risk.
- Minimal mechanical components; simple passive systems.

Risk Assessment & Requirements:

- **Effluent Failure:** Rare occurrence → **Monitoring not required**
- **System Failure:** Rare → **Contracted maintenance not required**
- **Sludge Failure:** Rare → **Sludge removal recommended every 4+ years**

Implication: These systems are appropriate for low-density or decentralized developments where minimal oversight is feasible.

B. High Risk Systems

System Type: Small-Scale STPs (Activated Sludge)
Discharge Pathway: Soakaway
Typical Deployment: <15 units

Key Characteristics:

- Failure risks are absorbed by the soakaway, but mechanical treatment introduces moderate risks.
- Periodic overflow risk to surface during peak failure.

Risk Assessment & Requirements:

- **Effluent Failure:** Occasional → **Monitoring not required**
- **STP Failure:** Occasional → **Contracted maintenance at least quarterly**
- **Sludge Failure:** Occasional → **Sludge removal at least annually**

Implication: These systems require moderate attention and scheduled oversight to prevent failure. Often deployed in resorts and institutions.

C. Highest Risk Systems

System Type: STPs with Filters + Disinfection
Discharge Pathway: Direct to surface (open land or water)
Typical Deployment: <5 units

Key Characteristics:

- No soakaway buffering. All failures result in direct discharge to environment.
- Continuous exposure to human and ecological receptors.

Risk Assessment & Requirements:

- **Effluent Failure:** Continuous → **Contracted monitoring at least monthly**
- **STP Failure:** Continuous → **Contracted maintenance at least monthly**
- **Sludge Failure:** Continuous → **Sludge removal at least every 3 months**

Implication: These systems require the highest level of operational control, compliance monitoring, and contracted services to avoid environmental degradation.

4.1b). Summary Table

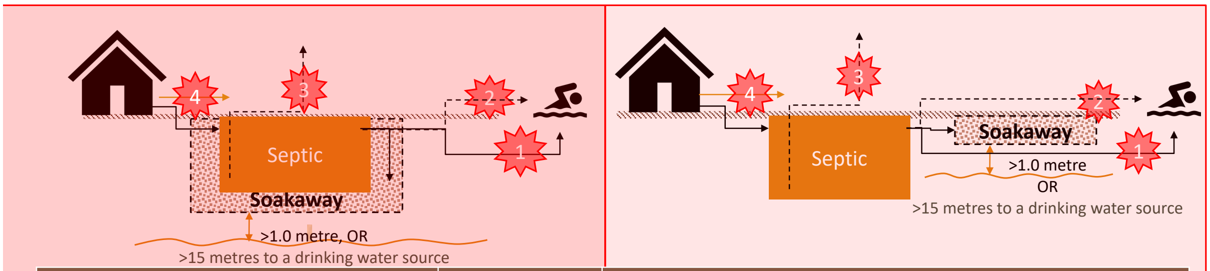
Risk Level	System Type	Discharge To	Monitoring	Maintenance	Sludge Removal
Low Risk	Septic Tank	Soakaway	Not required	Not required	Every ≥4 years
High Risk	STP (Activated Sludge)	Soakaway	Not required	Quarterly	Annually
Highest Risk	STP + Filter + Disinfection	Open land/water	Monthly	Monthly	Every ≤3 months

Recommendations

- Enforce contracted service levels for STPs discharging directly to surface waters or land.
- Mandate quarterly or annual sludge removal for activated sludge systems.
- Promote routine monitoring and performance audits, particularly for high-risk STPs.
- Use the risk framework to guide infrastructure approvals, compliance inspections, and resource allocation.

4.2. Upgrade septic Soak-aways (separate the greywater & the soak-away)

Upgrade septic Soakaways (separate the greywater & the soakaway)



CAUSE	CONSEQUENCE	SOLUTIONS
1. Septic tanks routinely discharging blackwater to surface / stormwater	Continuous pathogen risk	- Remove blackwater connections to stormwater / outfall - Prevent storm/rainwater ingress to septic tanks - Remove greywater from septic tanks - Upgrade from integrated to separate soakaways - Extend separate soakaways (wrap in geo-textile fabric) - Empty septic sludge at least every 8 years (4 yrs. in CBD) - Remove greywater connections to stormwater / outfall - Discharge greywater to separate soakaways - Fit grease traps to greywater from kitchens
2. Septic tanks occasionally discharging blackwater to surface / stormwater	Occasional pathogen risk	
3. Septic tanks being emptied (sometimes too often) and dumped indiscriminately	Possible pathogen risk	
4. Premises discharging greywater to surface / stormwater	Low pathogen risk	

Figure 4. 2 This diagram presents a strategy to improve the performance and safety of septic tank systems by separating greywater from soak-aways, thereby reducing contamination risks to surface water and stormwater systems.

4.2a). Upgrading Septic Soak-aways by Separating Greywater

This brief outlines the environmental and public health risks associated with poorly managed septic soak-away systems and provides targeted engineering and operational solutions. The primary recommendation is to separate greywater from blackwater to improve system performance and reduce contamination risks.

Many existing septic systems combine both greywater and blackwater into a single soak-away system. This design increases the risk of system overload, surface discharge, and environmental contamination, particularly during rainfall events or poor maintenance cycles.

b). Common Failure Causes

#	Cause
1	Septic tanks routinely discharging blackwater to surface/stormwater
2	Septic tanks occasionally discharging blackwater to surface/stormwater
3	Septic tanks being emptied and sludge dumped indiscriminately
4	Premises discharging greywater directly to surface/stormwater

c). Consequences of System Failures

Failure Mode	Pathogen Risk
Routine blackwater discharge	Continuous (high)
Occasional blackwater discharge	Moderate
Improper sludge dumping	Possible
Greywater discharge to stormwater	Low

d). Recommended Solutions

Engineering and Management Actions:

- Remove blackwater connections to stormwater and outfall systems.
- Prevent stormwater/rainwater ingress into septic tanks.
- Disconnect greywater from septic tanks and discharge to separate soak-aways.
- Upgrade from integrated (combined) to separate soak-away systems.
- Extend soak-aways and wrap with geo-textile fabric for better dispersion and structural support.
- Empty septic tanks on a fixed schedule:
    - At least every 8 years for general use.
    - Every 4 years in urban/CBD areas.
- Fit grease traps to kitchen greywater discharges to reduce fats/oils.
- Ensure greywater is directed to separate stormwater pathways or soak-aways.

e). Design Criteria for Soak-away Systems

- Soak-away should be placed at least 1.0 metre below ground or 15 metres away from any drinking water source.
- Greywater should be clearly separated from blackwater pathways to reduce load and risk of overflow.

Upgrading soak-away systems by separating greywater significantly reduces pathogen risks and system overloads. This cost-effective intervention enhances both environmental protection and system longevity, especially in high-density or flood-prone areas. Implementation should be coupled with public education and regulatory guidance to ensure compliance and performance.

5. Political Economy Assessment and Recommendations

5.1. Interest & Influence in Regulation of Faecal Contamination Risks

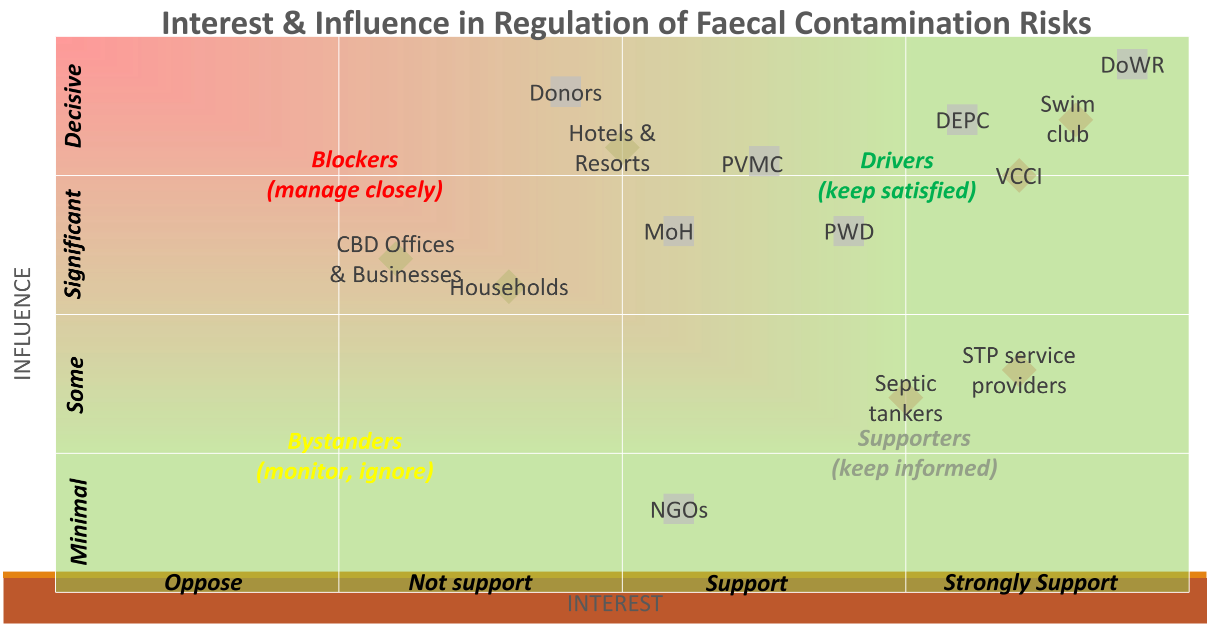


Figure 5.1 **Stakeholder Matrix for Regulating Faecal Contamination Risks**

5.1a). Stakeholder Influence & Interest in Regulating Faecal Contamination Risks

This brief presents a stakeholder influence-interest matrix to guide engagement strategies for the regulation and reduction of faecal contamination risks. Understanding each group's stance and capacity helps prioritize actions and communication pathways for policy implementation.

b). Overview of Stakeholder Mapping

The matrix plots stakeholders based on two axes:

- Interest**:** Level of support or resistance toward faecal risk regulation (Oppose to Strongly Support).
- Influence**:** Degree of power or impact on decision-making and enforcement (Minimal to Decisive).

This categorization helps align engagement strategies to stakeholder priorities and their ability to shape outcomes.

c). Stakeholder Categories & Engagement Approaches

A. Blockers (High Influence, Low Interest)

Engagement Strategy: Manage Closely
Examples: Donors, Hotels & Resorts

- These actors can significantly affect policy implementation.
- They may resist changes perceived as costly or burdensome.
- Require tailored outreach, negotiation, and evidence-based communication.

B. Drivers (High Influence, High Interest)

Engagement Strategy: Keep Satisfied
Examples: DoWR, DEPC, Swim Club, VCCI

- These are critical allies in regulatory advancement.
- Support capacity-building, joint initiatives, and co-leadership on campaigns.

C. Supporters (High Interest, Moderate Influence)

Engagement Strategy: Keep Informed
Examples: STP Service Providers, Septic Tank Operators

- Operational actors that directly manage faecal waste.
- Require technical updates, guidelines, and recognition of their role in system improvement.

D. Bystanders (Low Interest, Low Influence)

Engagement Strategy: Monitor or Ignore
Examples: NGOs (in this context)

- Currently disengaged but may evolve into allies or challengers.
- Light engagement through reports or information sharing may suffice.

E. Middle Group (Moderate Influence and Interest)

Engagement Strategy: Strategic Support & Dialogue
Examples: PVMC, Ministry of Health, Households, CBD Offices & Businesses

- Potential to shift towards higher interest or influence with the right incentives.
- Requires advocacy, public awareness, and institutional engagement.

d). Recommendations

- Prioritize Drivers for strategic partnerships and co-leadership roles.
- Invest in managing Blockers through consultation, data sharing, and incentive structures.
- Keep Supporters regularly informed via technical briefs, newsletters, and workshops.

- Monitor Bystanders and explore capacity-building opportunities where interest increases.
- Engage the Middle Group with awareness campaigns and participatory dialogue forums.

Effective faecal contamination risk regulation depends on targeted stakeholder engagement. By aligning communication and policy strategies with stakeholder interest and influence levels, regulators can ensure more robust adoption, compliance, and long-term success.

6. Wastewater Regulations Development Recommendations

6.1 Summary of the Minimum Requirements for Sewage Treatment Systems

Environmental Permits: shall be obtained prior to the **construction** of any sewage treatment system in accordance with the Environment Impact Assessment (EIA) Regulation.

Table 1: Summary of the Minimum Requirements for Sewage Treatment Systems

Sewage Treatment System	Category of Risk	Minimum Design	Environmental Permit	Maintenance Contracts	Wastewater Permit
Commercial Septic Tank (discharging to a soakaway)	High	Engineered soakaway	23,000 VT (at planning)	1 contract (as detailed)	10,000 VT (5 yearly)
Sewage Treatment Plant (discharging to a soakaway)	Very high	Must never fail to open	23,000 VT (at planning)	2 contracts (as detailed)	15,000 VT (2 yearly)
Sewage Treatment Plant (discharging to open)	Extreme	Filtration & disinfection	23,000 VT (at planning)	3 contracts (as detailed)	23,000 VT (annual)

Wastewater Permits: shall be obtained periodically for the **operation and maintenance** of all sewage treatment systems in accordance with an Environmental Management and Monitoring Plan (EMMP).

Figure 6.1 Summary of Minimum Regulatory Requirements for Sewage Treatment Systems

6.1a) Minimum Regulatory Requirements for Sewage Treatment Systems

This brief summarizes the environmental permitting and compliance requirements for different categories of sewage treatment systems in accordance with the Environment Impact Assessment (EIA) Regulation and Environmental Management and Monitoring Plan (EMMP).

b). Regulatory Framework Overview

Environmental Permits:
Required prior to the construction of any sewage treatment system. Issued under the EIA Regulation.

- Cost: 23,000 VT (at planning stage)

Wastewater Permits:
Issued periodically for the operation and maintenance of sewage systems under the EMMP.

- Frequency and cost vary by system type and risk category.

c). Minimum Requirements by System Type

Sewage Treatment System	Risk Category	Minimum Design Standard	Environmental Permit	Maintenance Contracts	Wastewater Permit
Commercial Septic Tank (to soak-away)	High	Engineered soak-away	23,000 VT (planning)	1 contract (as detailed)	10,000 VT (every 5 years)
Sewage Treatment Plant (to soak-away)	Very High	Must never fail to open	23,000 VT (planning)	2 contracts (as detailed)	15,000 VT (every 2 years)
Sewage Treatment Plant (discharge to open)	Extreme	Filtration and disinfection	23,000 VT (planning)	3 contracts (as detailed)	23,000 VT (annually)

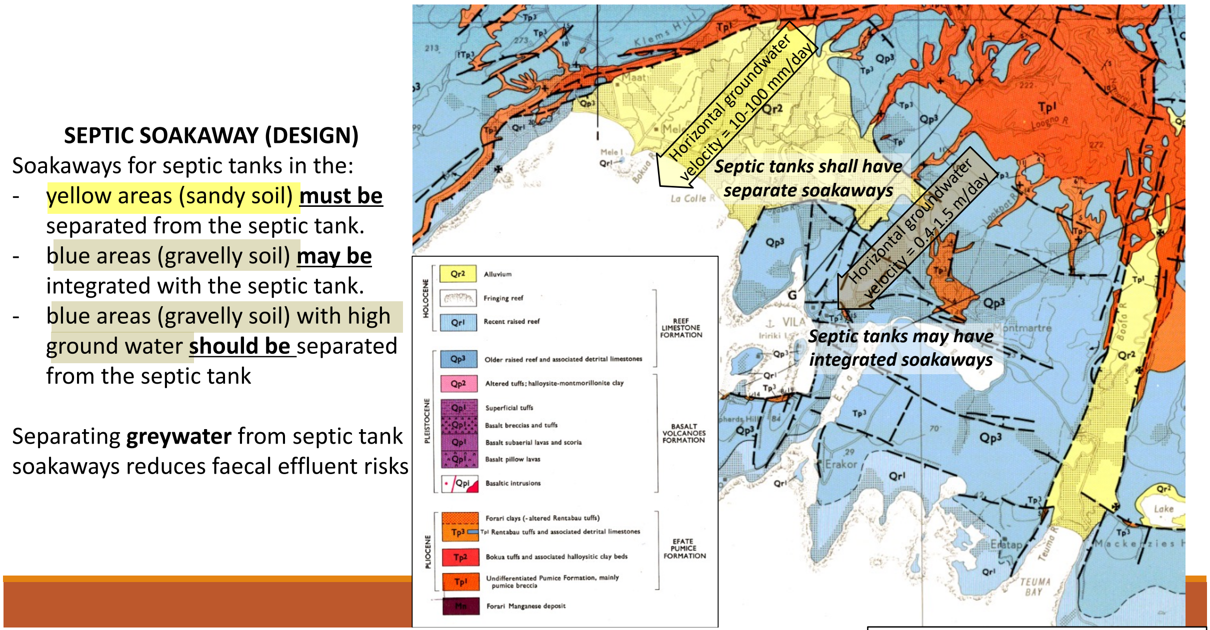
d). Interpretation and Compliance Notes

- Higher-risk systems (i.e., STPs discharging directly to surface water or land) face stricter requirements for both design and operation.
- Commercial septic systems**,** while lower in risk, must still implement engineered soak-aways and maintain documented servicing.
- Maintenance contracts are tailored to the system's complexity and potential environmental impact:
    - 1 contract for septic tanks
    - 2 contracts for soak-away STPs
    - 3 contracts for open-discharge STPs

e). Recommendations

- Ensure all systems undergo environmental assessment and obtain an Environmental Permit before construction**.**
- Develop an Environmental Management and Monitoring Plan (EMMP**)** as part of operational readiness.
- Plan and budget for contracted maintenance services and periodic wastewater permit renewals**.**
- Encourage upgrades from legacy systems to meet minimum design and compliance thresholds**,** especially for high-risk discharging facilities.

6.2. Draft Municipal Council Septic Soak-away By-Law



Source: Geology & Mines Unit.

Figure 6.2.1. Septic Soak-away Design Guidance Based on Soil and Groundwater Conditions

6.2a). Septic Soak-away Design Requirements Based on Soil and Groundwater Conditions

This brief provides technical guidance for the design of septic soak-aways based on local soil types and groundwater velocities. The aim is to reduce faecal effluent contamination risks by ensuring appropriate separation or integration of soak-aways with septic tanks.

Soil type and groundwater flow significantly influence the effectiveness and safety of septic soak-aways. Improperly sited or integrated soak-aways can lead to pathogen transport to drinking water sources and surface waters. These brief supports decision-making for compliance with wastewater safety standards.

b). Design Requirements by Area Type

A. Yellow Areas – Sandy Soil (Alluvium: Qr2)

- Risk: High permeability and rapid horizontal groundwater movement (>10–100 mm/day).
- Requirement: Soak-aways must be separated from septic tanks.
- Rationale: Prevents rapid faecal pathogen movement into groundwater and sensitive water sources.

B. Blue Areas – Gravelly Soil (Reef Limestone: Qp3, Qr1)

- Risk: Moderate permeability with lower groundwater velocity (0.4–1.5 m/day).
- Requirement: Soak-aways may be integrated with septic tanks.

- Rationale: Soil and water conditions provide limited natural treatment capacity.

C. Blue Areas with High Groundwater

- Risk: Gravelly soils with elevated groundwater height or velocity.
- Requirement: Soak-aways should be separated from septic tanks.
- Rationale: Even in gravel soils, high groundwater increases faecal migration risks.

c). Key Design Principle

Separating greywater from septic tank soak-aways reduces faecal effluent risks and enhances the long-term safety and sustainability of onsite sanitation systems.

d). Map Application

- Use the accompanying geotechnical map to identify site-specific zones.
- Apply design rules accordingly:
    - Yellow = Separate soak-away required
    - Blue = Integration possible unless groundwater is high
- Consider local groundwater velocity annotations to inform risk level.

e). Recommendations

- Conduct a site-specific soil and groundwater assessment before septic system installation.
- Ensure compliance with regulatory guidelines on soak-away separation.
- Promote separation of greywater and blackwater systems in high-risk zones.
- Use the geological map to assist planners, developers, and regulators in site selection and approval processes**.**
- This guideline must be integrated and adapted into Municipal and Provincial by-laws.

6.3. Draft Recreational Water Safety Standard

Classification matrix for faecal pollution of recreational water environments*

		Microbial Assessment Category (95th percentile intestinal enterococci/100 ml)				Exceptional circumstances[3]
		A ≤40	B 41-200	C 201-500	D >500	
Sanitary Inspection Category (susceptibility to faecal influence)	Very low	Very Good	Very Good	Follow up[1]	Follow up[1]	ACTION
	Low	Very Good	Good	Follow up	Follow up[1]	
	Moderate	Good[2]	Good	Poor	Poor	
	High	Good[2]	Fair[2]	Poor	Very Poor	
	Very high	Follow up[2]	Fair[2]	Poor	Very Poor	
Exceptional circumstances[3]		ACTION				

Safe Recreational Water Guidelines; WHO (2003), Pg. 84

Coastal Water Quality Vanuatu Monitoring Program // coastalwater.vu

Enterococci cfu/100 ml	Port Vila Recreational Risk Classification		
<41	****	Good	Exposure risks are safe for swimming
41-200	***	Fair	Avoid swimming after heavy rainfall
201-500	**	Poor	Increased risk of disease for swimmers with poor immune function
>501	*	Bad	Avoid swimming at this location

[1] Implies non-sewage or unidentified sources of faecal indicators (e.g. livestock) which need to be verified.
[2] Indicates possible discontinuous/sporadic contamination (often driven by results such as rainfall). These results should be investigated further, and initial follow-up should include analytical results, review possible analytical errors.
[3] Exceptional circumstances are known periods of higher risk (e.g. a rupture of a sewer in a recreational water catchment). Under such circumstances, the classification matrix may not fairly represent risk/safety.
* In certain circumstances, there may be a risk of transmission of pathogens associated with more severe health effects of recreational water use. Public health authorities should be engaged in the identification of such conditions.

Figure 6.3.1. Draft Recreational Water Safety Standard – Faecal Contamination Risk Classification

This brief outlines a draft classification framework for evaluating recreational water quality based on faecal contamination risk. The matrix integrates microbial monitoring with sanitary risk inspections and aligns with WHO's Safe Recreational Water Guidelines.

6.3a). Classification Matrix Overview

The framework uses a dual approach combining:

- Microbial Assessment Category (MAC): Based on the 95th percentile of intestinal enterococci concentrations (cfu/100 mL).
- Sanitary Inspection Category (SIC): Rates the susceptibility of a water site to faecal contamination based on surrounding sources and environmental conditions.

These two indicators are used together to determine water safety classifications and necessary public health actions.

b). Microbial Assessment Categories (MAC)

Category	Enterococci Level (cfu/100mL)	Microbial Quality
A	≤ 40	Very Good
B	41–200	Good to Fair
C	201–500	Poor
D	>500	Very Poor

c). Sanitary Inspection Categories (SIC)

Rates the risk of faecal influence from Very Low to Very High:

- Evaluates factors like sewer overflows, runoff, livestock access, and waste discharge.
- Affects the interpretation of microbial data and necessary follow-up.

4. Interpretation Matrix

Sanitary Risk \ Microbial Risk	A (≤40)	B (41–200)	C (201–500)	D (>500)
Very Low	Very Good	Very Good	Follow-up[1]	Follow-up[1]
Low	Very Good	Good	Follow-up[1]	Follow-up[1]
Moderate	Good[2]	Good	Poor	Poor
High	Good[2]	Fair[2]	Poor	Very Poor
Very High	Follow-up[1]	Fair[2]	Poor	Very Poor

[1] Follow-up: Indicates potential non-sewage contamination or testing errors. Requires further analysis.
[2] Possible sporadic contamination (e.g., rainfall-related) – requires targeted investigation.

---

d). Port Vila Recreational Water Risk Classification

Enterococci (cfu/100mL)	Rating	Action
<41	****	Good – Safe for swimming
41–200	***	Fair – Avoid swimming after heavy rainfall
201–500	**	Poor – Higher disease risk for immunocompromised swimmers
>501	*	Bad – Avoid swimming; risk of disease transmission

e). Exceptional Circumstances

In situations such as sewer ruptures or pollution spikes, the standard classification may not apply. These periods require:

- Immediate public notification
- Intensified monitoring
- Possible closure of recreational sites

f). Recommendations

- Conduct regular microbial monitoring and sanitary inspections in accordance with this matrix.
- Communicate classification results to the public using a star-rating system.
- Investigate sites rated as "Follow-up," "Poor," or "Very Poor" to identify pollution sources.
- Integrate this matrix into local Coastal Water Quality Monitoring Programs (e.g., coastalwater.vu).

7. Summary of Recommendations

Priority Action Site

- **Vila Central Hospital, Iririki Island resort, and Warwick Hotel** were identified as a critical high-risk discharge sites. Immediate government and related organisation attention and intervention are recommended due to the volume and public health sensitivity of its effluent.

Effluent Discharge Guidelines

- All final treated effluent must not be discharged directly into lagoons, rivers, or harbors.
- Use natural filtration systems (e.g., soak-aways).
- If discharge is unavoidable, release only into open sea areas, subject to environmental safeguards.

Strengthen Regulatory Framework

- The Ministry of Climate Change under the Department of Environment should urgently develop and enforce national wastewater discharge standards and work closely with DoWR for implementation.
- The Ministry of Health, Department of Public Health should urgently develop and be responsible for Uniform facilities under Sanitation infrastructure guidelines.
- The Department of Environmental Protection & Conservation (DEPC) must finalize and enforce the Wastewater Regulations under the Pollution Control Act (2013).

Risk-Based System Types Controls and Monitoring

- Adopt a **tiered risk framework** for commercial STPs to guide compliance, maintenance schedules, and monitoring:
    - **Low Risk: Septic tanks with soak-aways – monitor sludge every ≥4 years.**
    - **Medium Risk: Activated sludge systems – quarterly maintenance, annual sludge removal.**
    - High Risk: STPs with direct surface discharge – monthly contracted monitoring, sludge removal every ≤3 months.

Contracted Service Requirements

- Enforce contracted operational and maintenance services for high-risk STPs.
- Introduce performance audits and routine inspections, prioritizing systems with surface discharge risks.

Upgrades to Septic Soak-away Systems

- Separate greywater from blackwater in existing systems.
- Upgrade soak-aways using proper placement (≥1m below ground, ≥15m from water sources) and geo-textile wraps to improve filtration.

- Install grease traps for kitchen greywater and ensure stormwater is directed away from septic systems.
- Empty septic tanks regularly: every 8 years for general areas, every 4 years for urban/CBD zones.

Capacity Building

- Provide targeted training for provincial and national officers in wastewater infrastructure design, maintenance, and compliance oversight.

Public Awareness and Compliance

- Conduct public education campaigns to promote safe greywater disposal and the risks of untreated effluent discharge.
- Encourage community-level responsibility and local government enforcement.

Recommended Wastewater System Compliance Schedule

Facility Name	System Condition	Recommended Action Timeline
Vila Central Hospital	Very Poor	Immediate (0-3 months)
Holiday Inn	Very Poor	Immediate (0-3 months)
VMF Facility	Good	Routine Monitoring (12 months)
Bred Bank (Rosi)	Satisfactory	Follow-up Review (6-12 months)
USP	Satisfactory	Follow-up Review (6-12 months)
Ramada	Satisfactory	Follow-up Review (6-12 months)
Erakor Island Resort	Satisfactory	Follow-up Review (6-12 months)
Nambawan Café	Poor	Corrective Action (6 months)
Seafront Toilets	Very Poor	Immediate (0-3 months)
Municipal Market	Very Poor	Immediate (0-3 months)

This schedule outlines prioritized actions for monitoring and upgrading wastewater treatment systems across key facilities in Port Vila. Facilities are categorized based on system condition—Good, Satisfactory, Poor, and Very Poor—with recommended follow-up timelines ranging from immediate intervention (0–3 months) to routine monitoring (12 months). The schedule is designed to guide the Compliance Team in planning inspections, enforcement actions, and technical support.

Considering the structural impacts from the December 17 earthquake, this monitoring period also presents a critical window for conducting necessary maintenance and system upgrades while many facilities are undergoing repairs or reconstruction. This timing allows for coordinated improvements in wastewater infrastructure, ensuring enhanced environmental protection and public health resilience.

8. *Appendix*

8.1. Water Quality standards adopted from department of Environment & Heritage Protection. (2009)

Department of Environment and Heritage Protection. (2009). *Queensland water quality guidelines* (Version 3, updated 2022). Queensland Government

Parameter	Standard
Ammonia	≤1.0 mg/L
Nitrate	≤10mg/L
Total Phosphorus	≤2mg/L
Chemical Oxygen Demand (COD)	≤100mg/L
Biological Oxygen Demand (BOD)	≤20mg/L
Turbidity	≤20 NTU
pH	6.5 – 8.5
Dissolved Oxygen	>2mg/L

Figure 8.1.1. Water quality standard and parameter used for the sampling test

Bred Bank

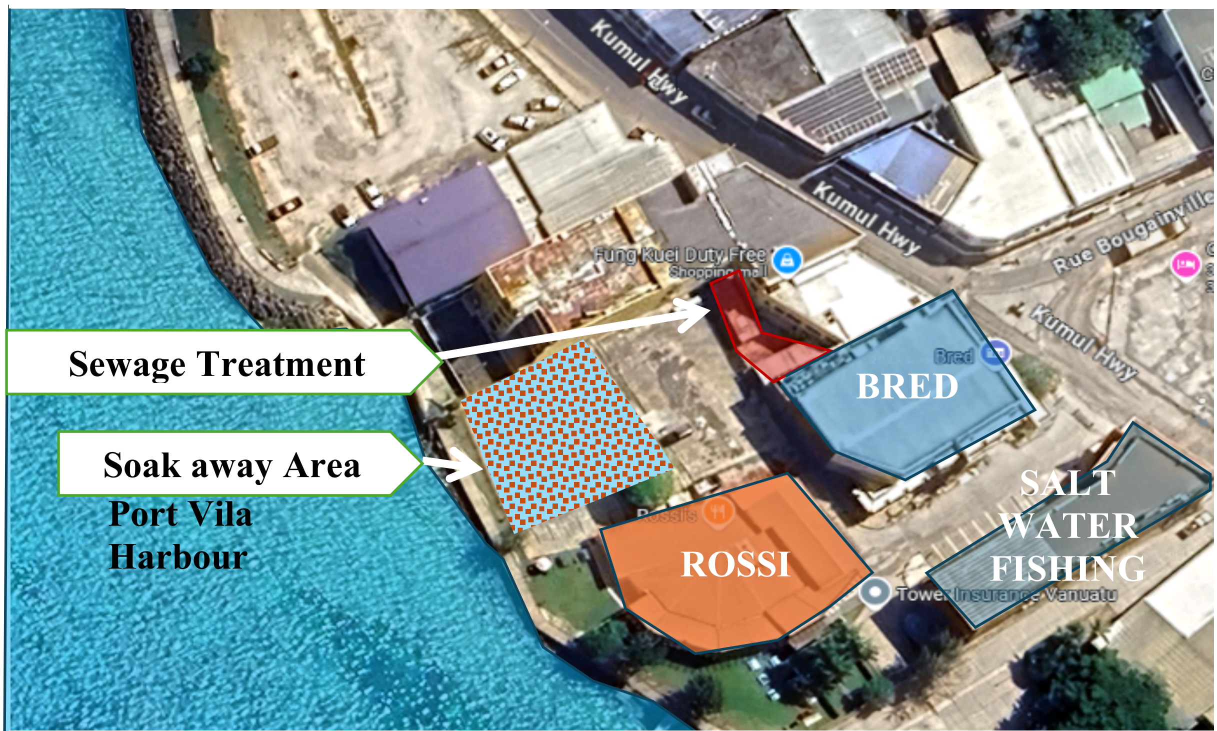


Figure 8.1.2 Annotated aerial view of Bred Bank STP infrastructure location identifying location of STP and soak away system located close to waterfront.

Iririki Island Resort

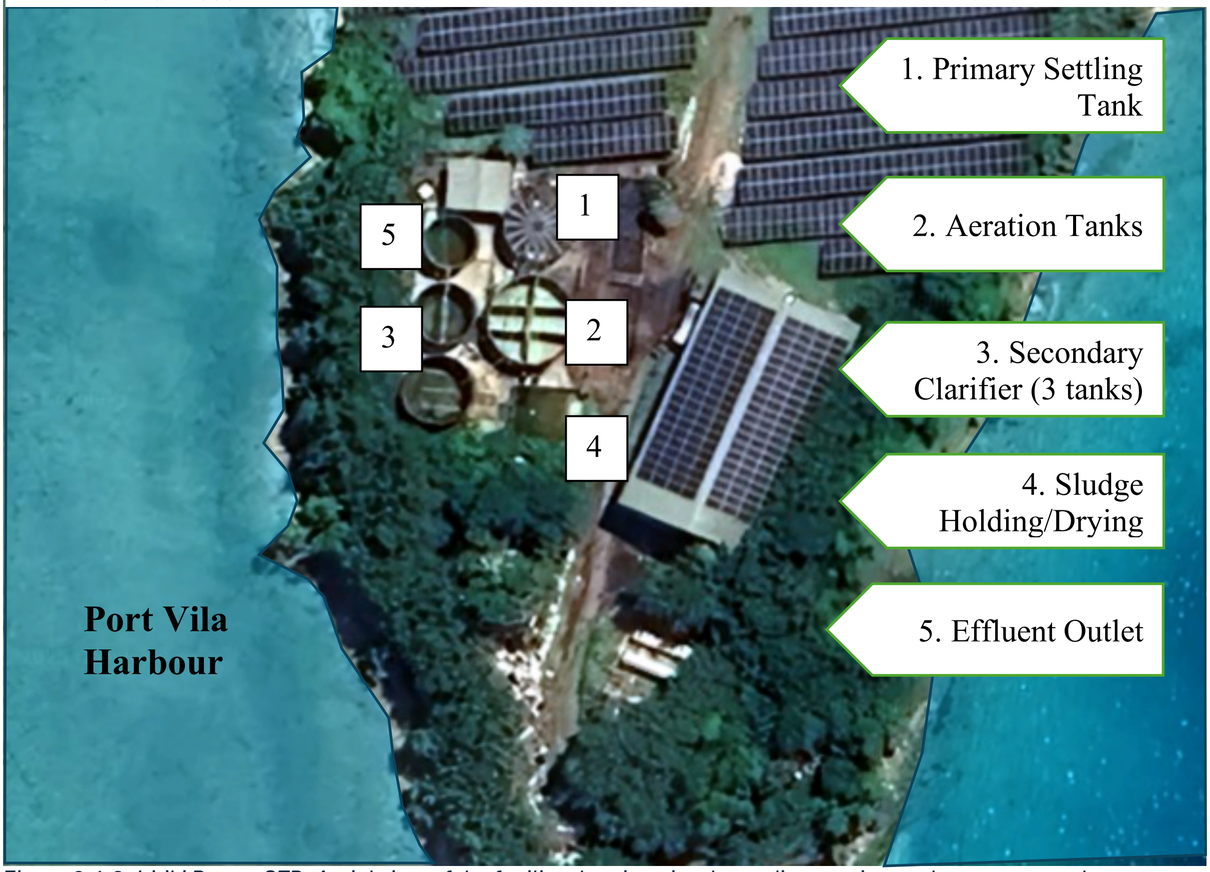


Figure 8.1.3. Iririki Resort STP: Aerial view of the facility showing circular sedimentation and treatment tanks

Figure 8.1.4: Aerial map of Ramada STP location using Eloy wastewater treatment system

Tana Russet

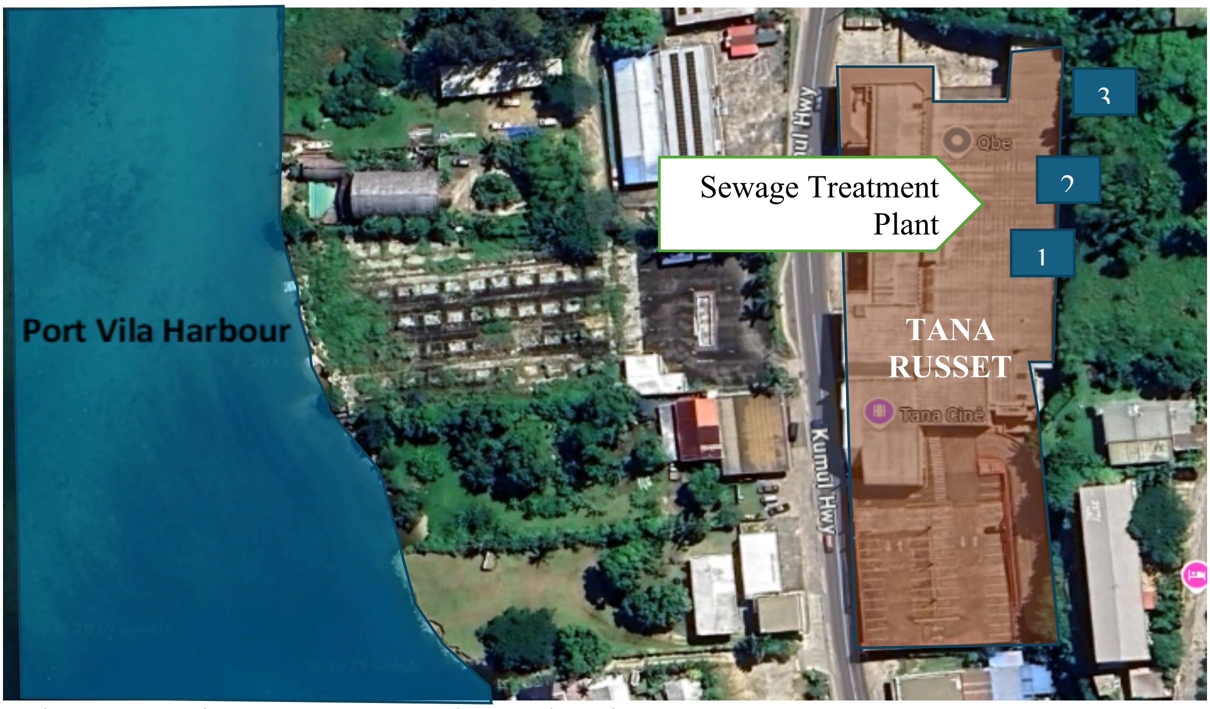
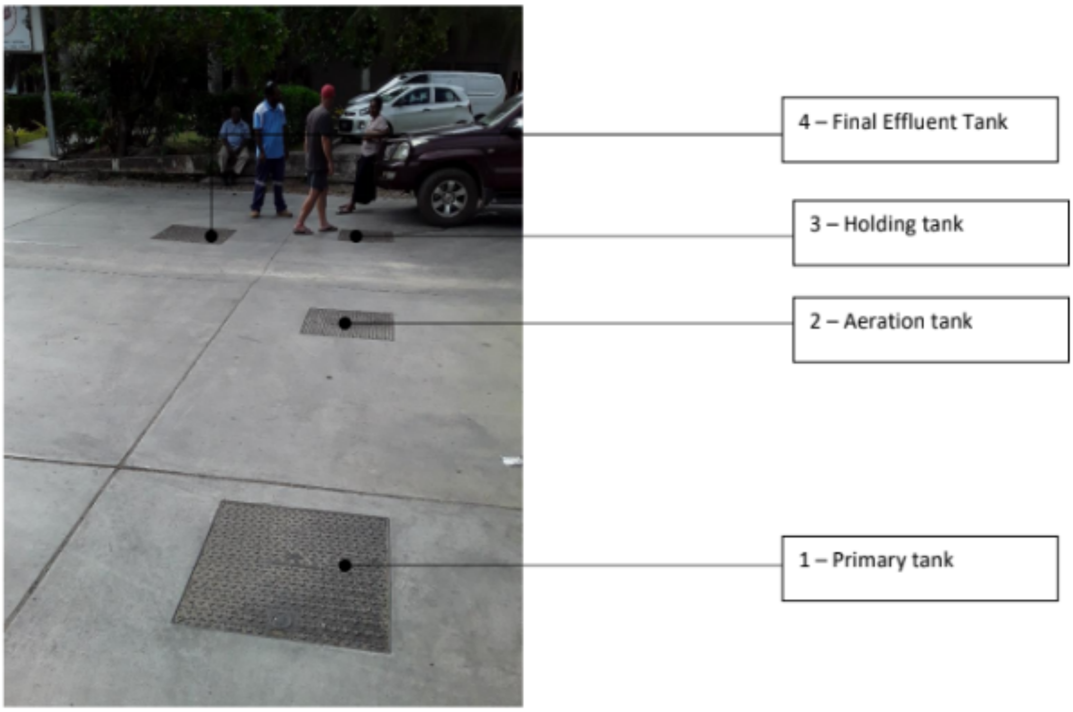


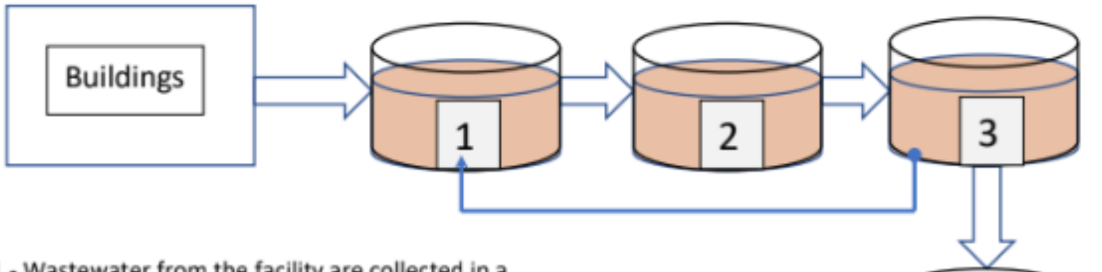
Figure 8.1.5: Aerial map of Tana Reusset STP location using Eloy wastewater treatment system

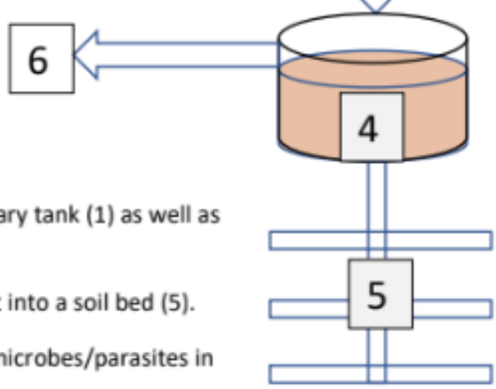
The Eloy Oxyfix® system comprises three sequential treatment chambers:

1. Primary settling – separates solids from incoming wastewater
2. Biological Reaction (Aerobic digestion) – Degradation of organic pollutants using microorganisms
3. Clarification – Residual particles settle to bottom and re-circulated back to primary chamber for further treatment. The clarified water can be discharged to environment

Nabawan Café







1 - Wastewater from the facility are collected in a **primary tank**.

2 - The wastewater then goes into an **aeration tank**.

3 - After being treated it goes into a **Holding tank**.

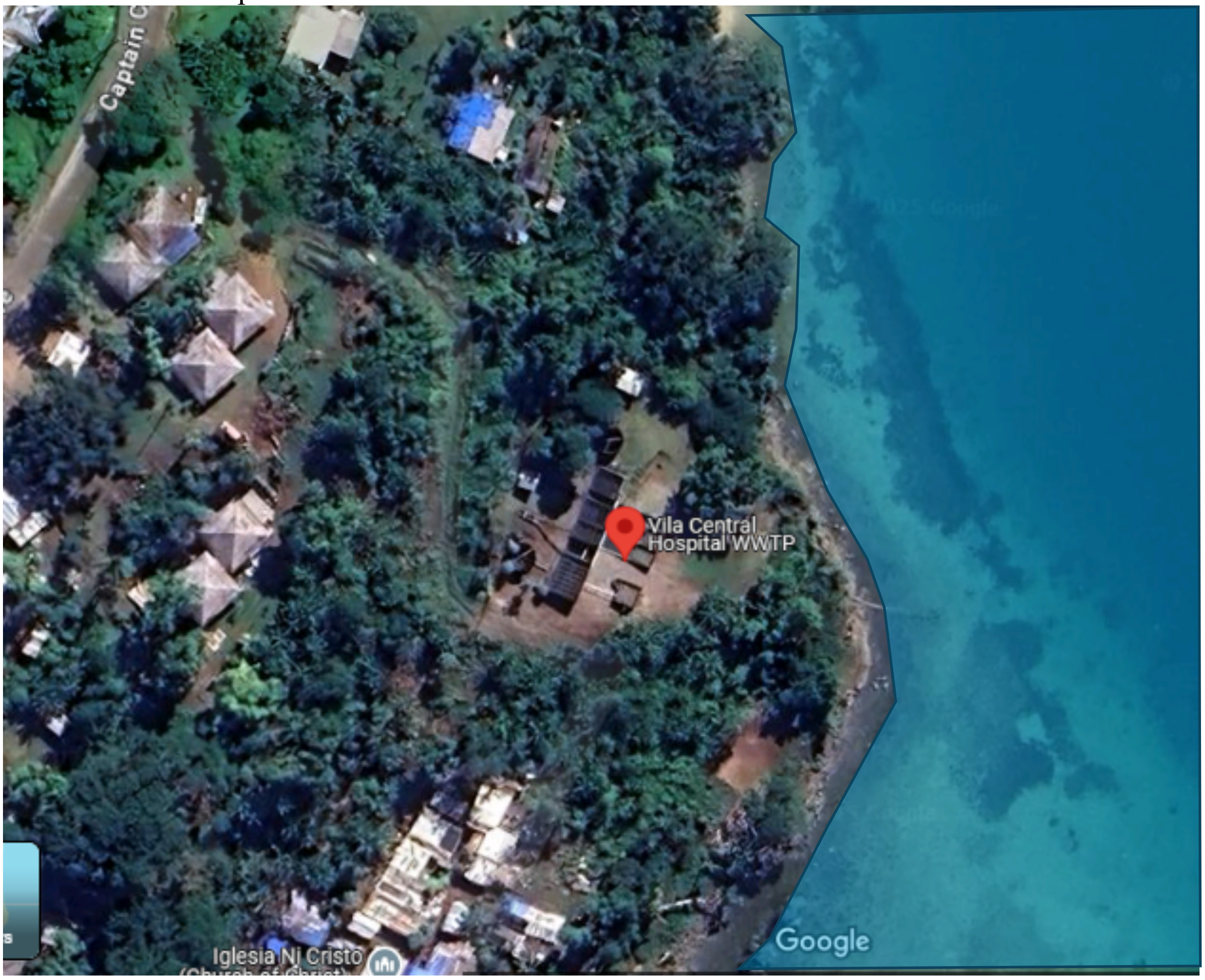
The holding tank re-circulates wastewater back to the primary tank (1) as well as into a final tank (4).

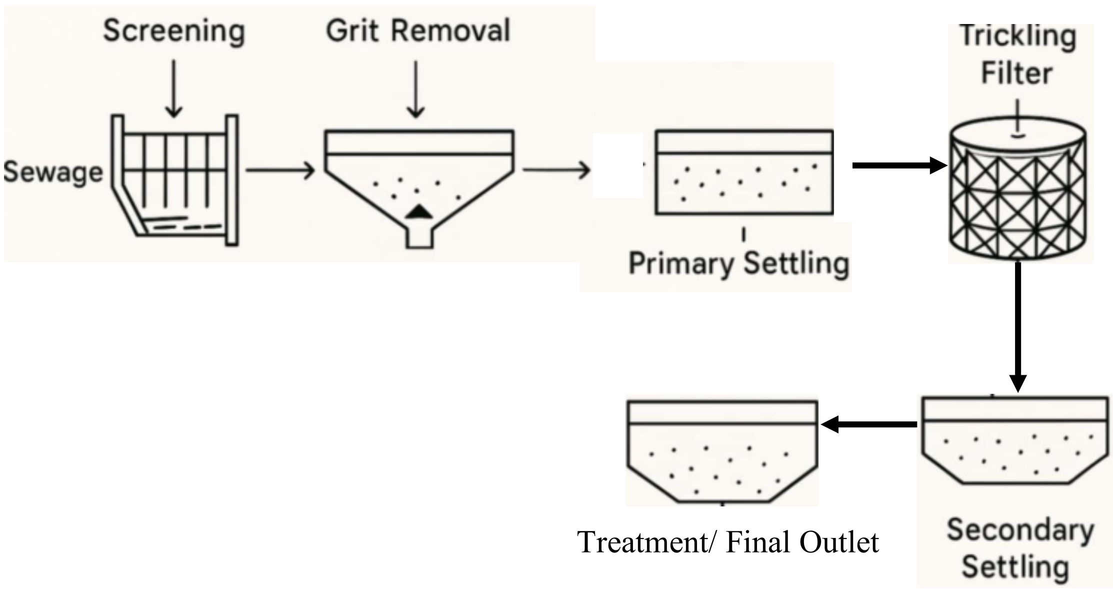
4 – The **final tank** collects the treated effluent and pumps it into a soil bed (5).

5 – **Soil bed** absorbs the final effluent and deactivates the microbes/parasites in the final effluent.

6 - In case of pump fail, wastewater is prevented from flooding onto the carpark by **overflow drain** that flows into the Harbour.

Vila Central Hospital





Aerial view of the Vila Central Hospital (VCH) STP site with overlay of the Dégremont Sewage Treatment Plant (STP) process flow diagram. Representative of the typical layout and operation of the VCH STP.

8.2 VCH Operational Status

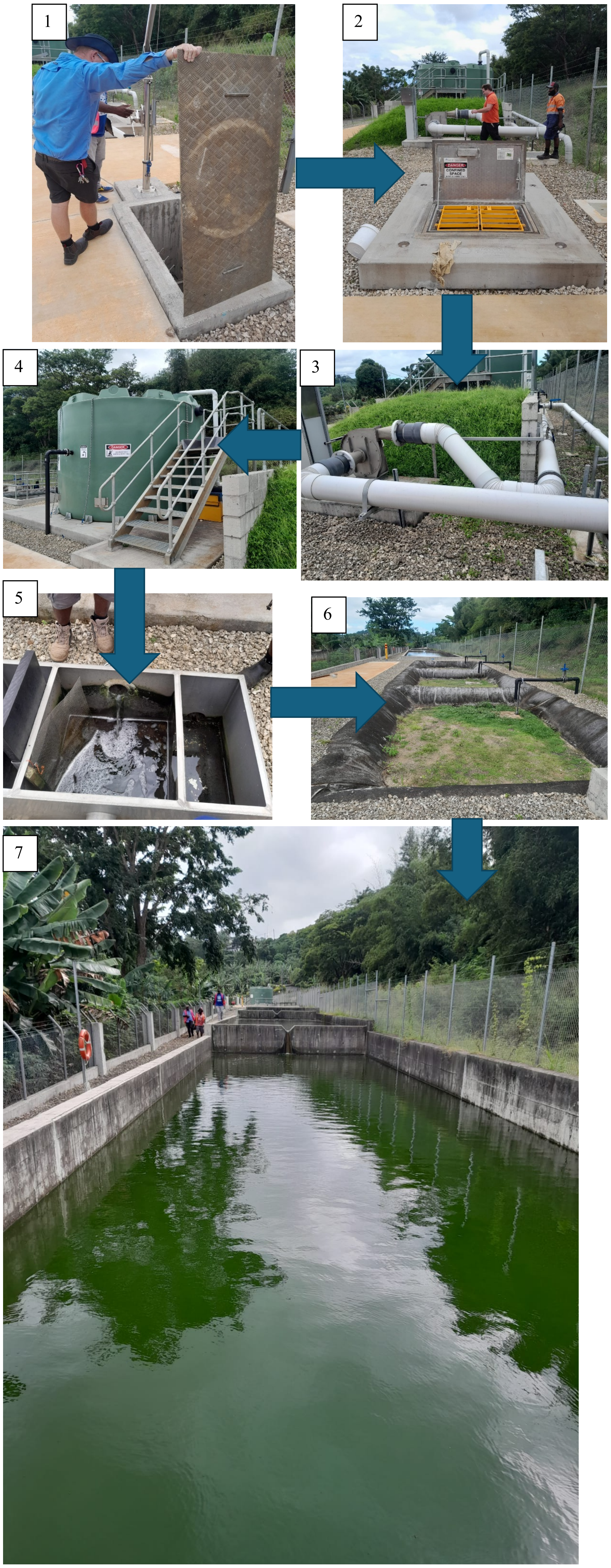
Screening clogged – no visible signs of routine upkeep or operator attendance

Trickling filter – Condition rating: Poor. Non-operational, been out of service for years

Stagnant water with algal growth, deteriorated pipework, tank wall's structure appears good

VMF Camp

1 2	**Inlet and Screening Chamber** – Initial chamber for grit removal and coarse screening. Confined space
3	**Odour control unit** – Air vented into soil mound for biofiltration
4	**Trickling Filter (Biological)** – Large green tank is a trickling filter. Wastewater is distributed over media bed where aerobic microbes degrade organic matter
5	**Intermediate settling tank** – collects partially treated water from trickling filter. May act as a clarifier removing biomass sloughed off the trickling filter media
6	**Sludge drying beds** – Separated sludge from trickling filter or clarifier is dried here. Beds allow water to drain or evaporate leaving behind solids for removal
7	**Maturation Ponds** – 3 large concrete tanks connected in series via overflow structures, allowing gravity fed flow for extended retention time and improving effluent treatment



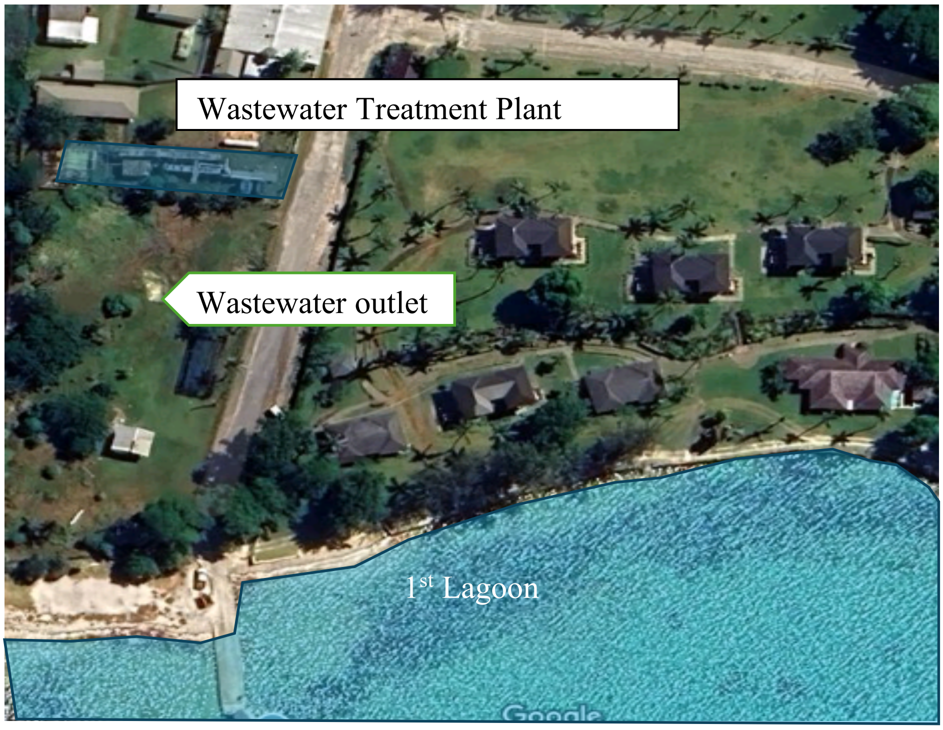
Tusker

Location of Premises & layout of Wastewater treatment plant

Observations

- Significantly reduced odour levels compared to the previous inspection conducted in 2020.
- Treatment pond appears notably smaller in size
- A substantial decrease in wastewater discharge volume was observed attributed to the replacement of the old bottle washer with a new, more water-efficient unit
- According to the Industrial Manager, plans are underway to construct a dedicated wastewater treatment facility (refer to attached document below)

Warwick Resort



Likely a packaged modular system - prefabricated and installed as a complete unit. System was damaged by the earthquake and current setup is containing sludge and wastewater overflow into an empty lot owned by Warwick.

Holiday In Resort

8.3 Assessment Team A and B

	Team A – Photo taken after Day 1 of the assessment. Team A focused primarily on septic systems and sewage treatment operations within the CBD area, gathering general information and assessing operational status.
	Team B – photo taken during fieldwork for wastewater sample collection. Team B focused on collecting wastewater samples and conducting observational assessments of the overall status of the Wastewater Treatment Plant.

8.4 Definition and differences between Aerobic & Anaerobic WWTP System

 Example, VCH WWTP system	Aerobic: Aerobic Wastewater Treatment System An **aerobic wastewater treatment system** uses **oxygen** and **aerobic microorganisms** (bacteria that require oxygen) to break down and digest organic matter in the wastewater. These systems typically involve aeration tanks where air is mechanically supplied to maintain oxygen levels, promoting efficient biological activity. **Key Characteristics:** • Requires mechanical aeration or air pumps • Produces less odor compared to anaerobic systems • Generates more biological sludge • Suitable for high-strength wastewater and where space is limited
 Example, VMF WWTP system	Anaerobic: Anaerobic Wastewater Treatment System An **anaerobic wastewater treatment system** operates **without oxygen**, using **anaerobic bacteria** to digest organic pollutants in the wastewater. The process occurs in sealed tanks or chambers, where organic material is broken down and **biogas** (mainly methane and carbon dioxide) is often produced as a by-product. **Key Characteristics:** • Operates in sealed, oxygen-free environments • Generates less sludge than aerobic systems • Typically, slower process but more energy-efficient • Produces biogas, which can be captured for energy use