Appendix 1O: Terrestrial Biodiversity and Habitat Assessment

Environmental Assessment Document

TA No: 6597 REG: Sustainable Capacity Development for Safeguards in the Pacific

Solomon Islands Urban Water Supply and Sanitation Sector Project

September 2022

Terrestrial Biodiversity and Habitat Assessment



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Contents

List of Figures

List of Plates

Acronyms

ADB	Asian Development Bank
GHA	Greater Honiara Area
GPS	Global Positioning System
NRH	National Referral Hospital
PS	Pumping Station
UWSSSP	Urban Water Supply and Sanitation Sector Project
WB	World Bank

EXECUTIVE SUMMARY

The Asian Development Bank (ADB), World Bank (WB) and Solomon Islands Government (the government) have financed the Solomon Islands Urban Water Supply and Sanitation Sector Project (UWSSSP). One of the component/Subprojects of the UWSSSP is the Honiara Wastewater Project which focuses on replacing existing waste water outfalls in a state of disrepair, installing sewers mains to expand and rehabilitate Greater Honiara Area (GHA) trunk Sever system and construction of new sewage pumping stations and rehabilitation of existing ones.

The subproject will include the laying of 15.0 km of pipes split between gravity main (12.6 km) and rising main (2.4 km), ranging from Nominal Diameter 200mm to a Nominal Diameter of 700mm and constructed from PVC and HDPE. The existing Point Cruz pumping station (PS) will be abandoned and bypassed. A new gravity main to connect to the Honiara Central Markets PS, and the construction of four small PS will be undertaken and this include the construction of two outfall pumping stations (PS the National Referral Hospital (NRH) and PS Ranadi Landfill Site) that will pump the effluent into the ocean through two possible outfall pipes with an internal diameter of 400 mm and 800 mm respectively and a length of 350m for NRH and 500m for Ranadi.

A baseline terrestrial and habitat assessment of the existing ecological conditions associated with the gravity and pressure mains, outfall and the new pump station sites was undertaken as part of the legal requirement of the subproject. The assessment was conducted with a combination of desktop review and field surveys. Field surveys of flora and fauna a were conducted at each of the PS sites, outfall sites and the gravity and pressure mains sites over a few days from 14th, 17th, 24th - 28th of June and again on the 14th and 29th of July. The sites were inspected by walking through the area of influence. A record was made of flora and fauna that are found and habitat types present during that time.

The subproject construction sites are all located in a highly modified and disturbed urban environment. The vegetation present are secondary regrowth with no traces of original vegetation. None of the threatened flora and fauna species are present including no terrestrial protected areas, historical sites or cultural significant areas within the vicinity of the subproject area of influence.

The subproject impacts during construction to the surface water quality, aquatic ecology and the terrestrial ecosystem are expected to be very minor, localized to the immediate footprint of the works, and easily managed through standard engineering good practice mitigation measures.

1. Introduction

1.1. Background to the Project

The Asian Development Bank (ADB), World Bank (WB) and Solomon Islands Government (the government) have financed the Solomon Islands Urban Water Supply and Sanitation Sector Project (UWSSSP). One of the component/Subprojects of the UWSSSP is the Honiara Wastewater Project which focuses on replacing existing wastewater outfalls in a state of disrepair, expanding and rehabilitating the Greater Honiara Area (GHA) sewerage network, construction of new sewage pumping stations and rehabilitation of existing ones.

The sewer network will consist of a mixture of gravity sewers and rising mains, together with six pump stations (PS) that will be installed together with two new ocean outfalls. The works will allow the disconnection of 15 existing short outfalls into the Mataniko river and foreshore areas of Honiara City. The subproject will include the laying of 15.0 km of pipes split between gravity mains (12.6 km) and rising mains (2.4 km), ranging from Nominal Diameter 200mm to a Nominal Diameter of 700mm and constructed from PVC and HDPE, abandoning and bypassing the existing Point Cruz PS by installing a new gravity main to connect to the Honiara Central Markets PS, and the construction of four small PS. Additional connections will include new sewered areas within Honiara City and communal septic tank outfalls at Tuvaruhu and Vara Creek along the Mataniko River.

It will also include the construction of two outfall pumping stations at the National Referral Hospital (NRH) and Ranadi Landfill Site that will pump wastewater into the ocean through two outfall pipes with an internal diameter of 400 mm and 800 mm respectively and a length of 350m for NRH and 500m for Ranadi. These two outfalls will discharge into water depths of approximately 12m and 40 m respectively.

1.2. Approach and Scope

This report documents the terrestrial biodiversity and habitat assessment of the proposed subproject. It has been conducted to provide baseline data of the terrestrial environment associated with the UWSSSP to identify the habitat types within the subproject influence area (modified, natural and/or critical), flora and fauna present and all endangered, vulnerable or threatened species that were encountered or expected to be present based on previous surveys and assessments. The boundaries for the study area for terrestrial assessment vary at each site location, at the coastal areas the boundary is from the high-water mark and immediate to the construction works within the subproject area of influence (as shown in **Figure 4-1, Figure 4-3, Figure 4-4, Figure 4-5 and Figure 4-6**).

2. Methods

2.1. Desktop Analysis

Initially, a desktop review was completed of the existing documents on studies previously undertaken on the terrestrial flora, fauna and habitats on the island of Guadalcanal and in the subproject area. This is to understand the type of vegetation present and the presence of any threatened or endangered flora and fauna species including their habitats. Subproject technical documents were also reviewed to provide information on the subproject area of influence and the locations of gravity and rising mains, pump stations and outfalls.

2.2. Field Inspection

Direct field observation and survey of the baseline terrestrial environment were undertaken in June and again on July 2022. The EIS Terrestrial survey team conducted this field inspection. Baseline surveys of the terrestrial environments associated with the 6 pumping station sites and the 2 outfall sites were undertaken over a few days from the 14th, 17th, 24th - 28th of June and again on the 14th and 29th of July. The sites were inspected by walking through the impact area. During this time, a record was made of flora and fauna that are found and habitat types present. Individuals that are present on-site during the inspection were also consulted for their knowledge about the area, particularly on the ownership, land use and any endemic or threatened flora and fauna known to be habiting the subproject area of influence. **Plates 2-1, 2-2 and 2-3** illustrate some of the local areas surveyed.

Plate 2-1:NRH and Ranadi landfill pipeline terrestrial site locations

Plate 2-2: Market PSs and Vara Creek Terrestrial Pipeline locations

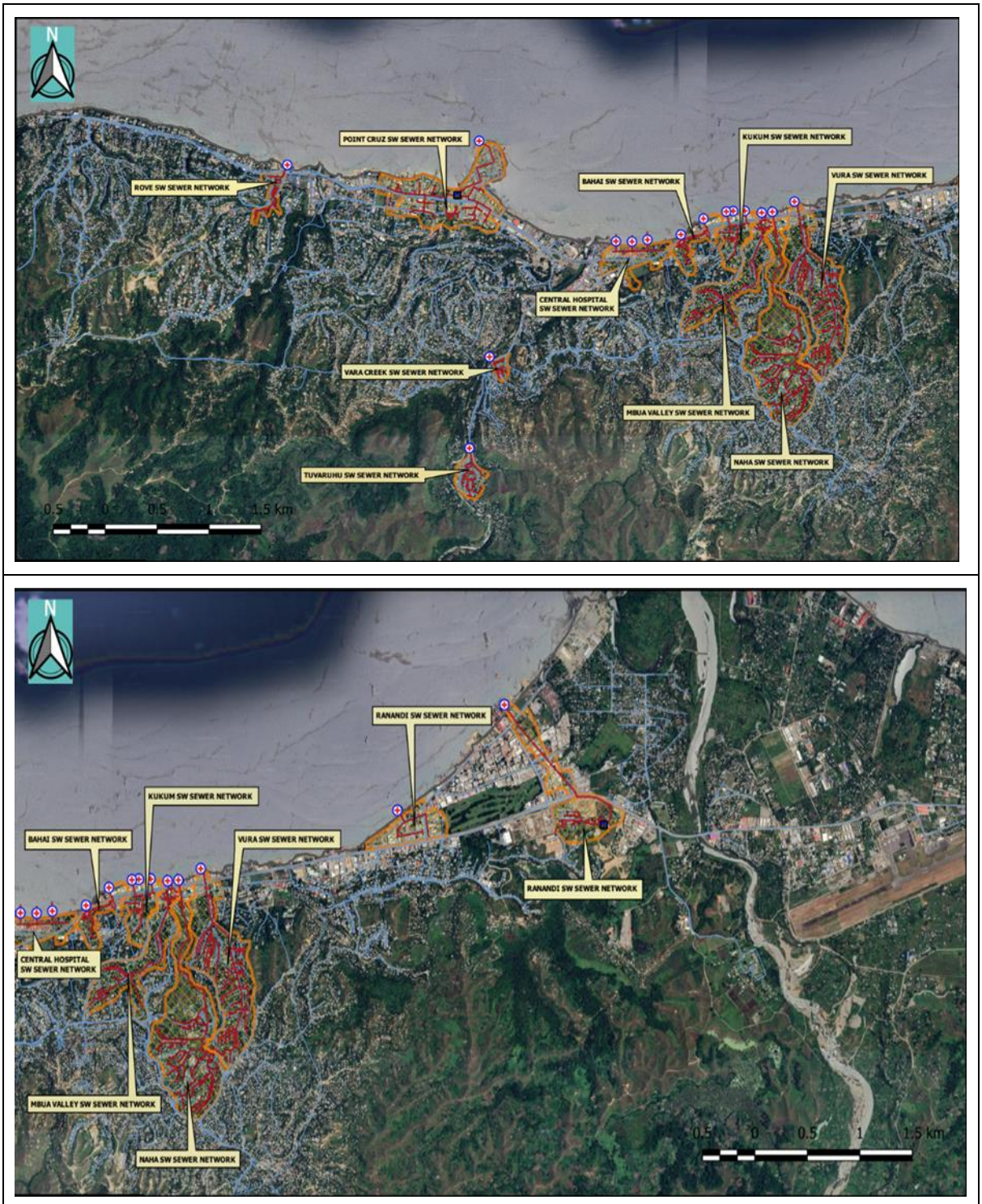
Plate 2-3: Naha PS and Ranadi PS terrestrial pipeline locations

3. Location and Site Description

The Honiara wastewater mains and outfall subproject is situated in Honiara with a sewer network beginning at Rove in the west and Ranadi in the east (**Figure 3-1**). Rove is a suburb in Honiara and is located about 2 km west of the City Center on the Tandai Highway and it borders the Honiara City Council ward of Nggosi and Rove-Lengakiki. Ranadi is a suburb of Honiara and is located West of Panatina and East of Honiara City. Ranadi is an industrial zone where heavy industrials are found and it is also where the landfill is located. Ranadi is within the Honiara City Council Ward of Panatina.

The directly impacted area of interest for this Terrestrial Biodiversity and Habitat Assessment is the outfalls, pumping station, gravity and rising mains sites (**Figures 3-2 and Figure 3-3**). A site location map is provided in **Figure 3-4** showing the sites surveyed for the assessment.

Figure 3-1: Location Map of the Sewerage Network in Honiara. Sewerage Network West Honiara (Top) and East Honiara, (below).



Souce: Google Earth

Figure 3-2: Location Map of the Pumping Stations and Outfall sites

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Figure 3-3: Map showing outfall locations, pumping stations and pressure mains route

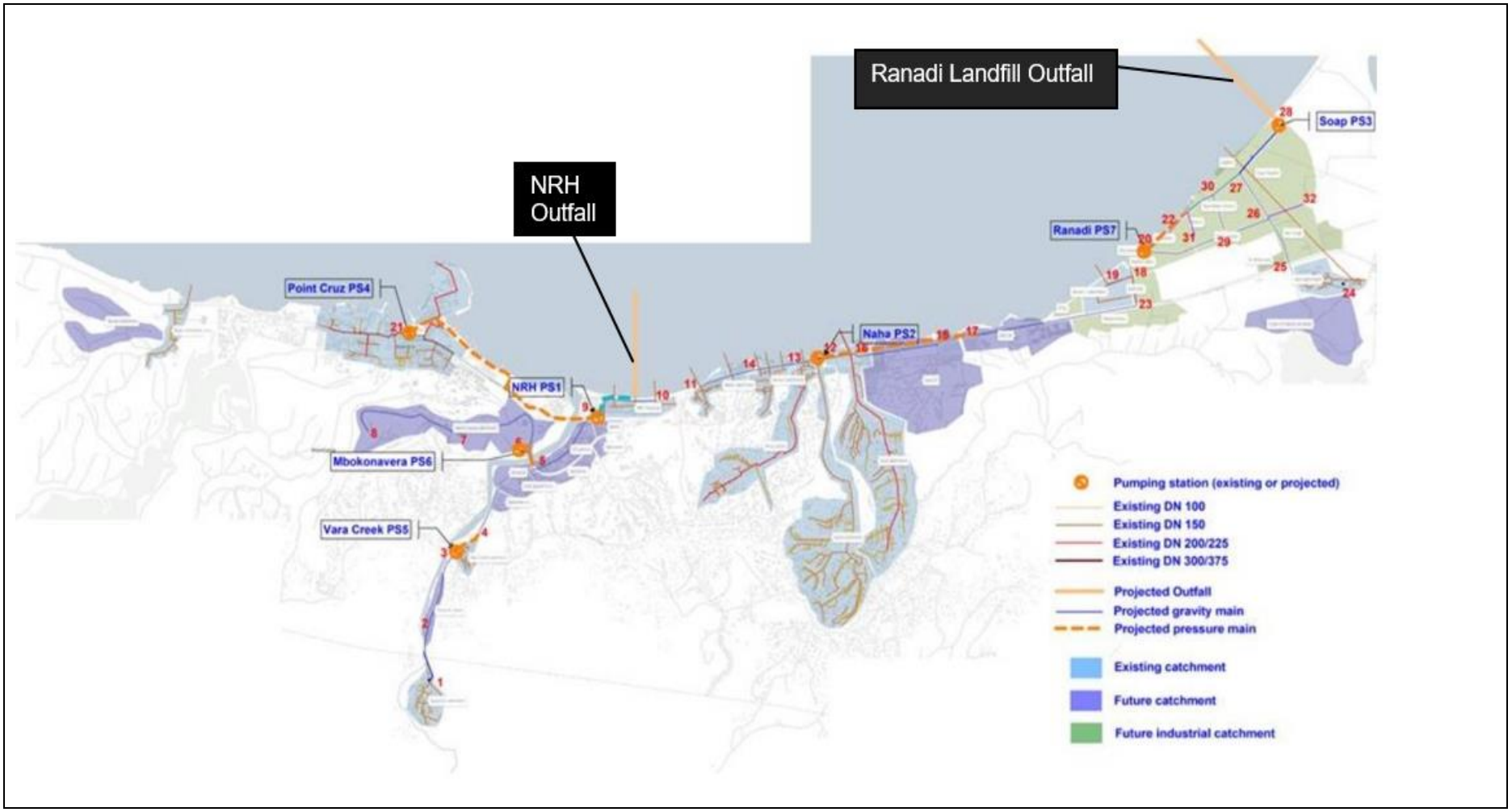


Figure 3-4: Map of survey sites for terrestrial assessments

Souce: Google Earth

3.1. Pumping Stations and Outfall Sites

3.1.1. NRH Site PS and Outfall

The NRH outfall and PS are located in highly built-up areas in Chinatown at the NRH Compound in Central Honiara. The PS site is on GPS coordinates 9° 26.137'S, 159° 58.097'E and the outfall site is on GPS coordinates 9° 26.078'S, 159° 58.306'E. The overall site is situated on the Mataniko River Delta. On the southern side is China Town which was recently extensively burnt during the "April" riots. Adjacent to the PS is the Lord Howe Settlement and the main highway. The Outfall site is on the foreshore in front of the hospital's eastern wing. The pumping station collects the wastewater from Point-Cruz, Mataniko and Mbokonavera catchments and also collects the discharge from Tuvaruhu, Vara Creek, and China Town areas. The wastewater is to be discharged through a single Outfall served by the NRH PS.

Figure 3-5: Site location of NRH PS and Outfall in relation to its surrounding environments

Souce: Google Earth

3.1.2. Market PS

The new Market PS (also called SIPA PS) is located at the Solomon Ports land on GPS coordinates 9° 25.954'S and 159° 57.674'E. The site is in front of the Hyundai Building and shares a boundary with the Kosol property. Solomon Ports is currently reclaiming the foreshore for its port development expansions for new jetties on the eastern end towards the Central Market. The pumping station will collect wastewater from Point Cruz and Mokonavera's catchments and discharge through a single rising main into NRH PS.

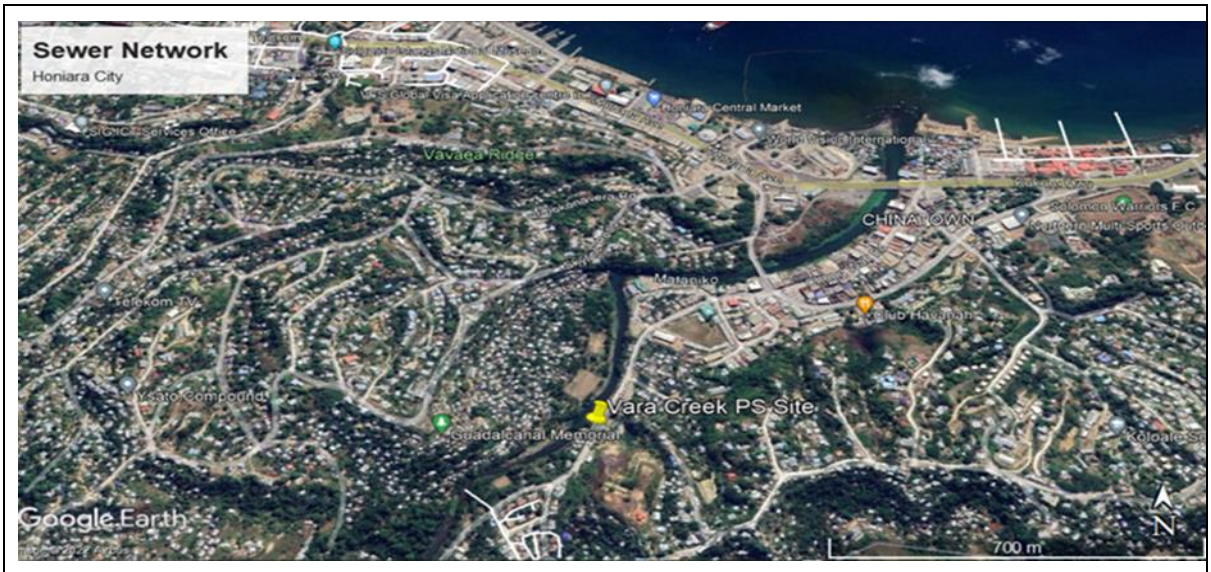
Figure 3-6: Site location of Market PS in relation to its surrounding environment

Souce: Google Earth

3.1.3. Vara Creek PS

The Vara Creek PS is located at the beginning of Chung Wah Road at GPS coordinates 9° 26.659'S and 159° 57.524'E. The site is on vacant government land adjoining Vara Creek. The PS collects wastewater from Vara Creek and Tuvaruhu catchments, and the sub-catchments upstream. Wastewater will discharge through a single rising main into NRH PS.

Figure 3-7: Site location of Vara Creek PS in relation to its surrounding environment



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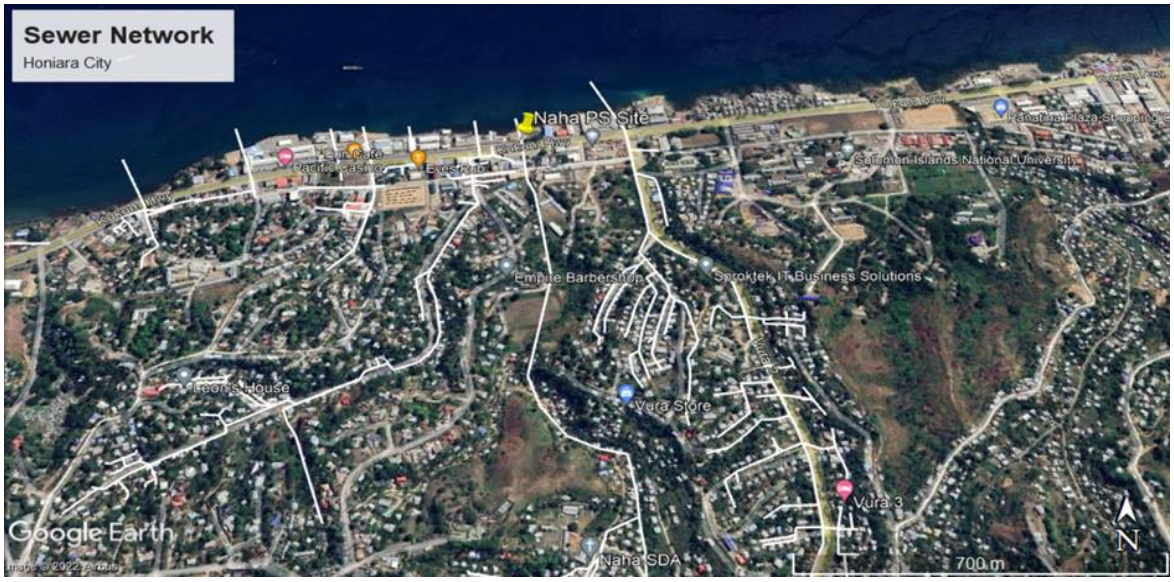
3.1.4. Naha PS

The Naha PS is located at Kukum and is adjacent to the main road on the northern coast at GPS Coordinates 9° 25.922'S and 159° 58.982'E. The site is a highly built-up area with shops on both the eastern and western approaches and the Kukum Highway adjacent. In phases 1A

and 1B, the pumping station collects wastewater from Naha and Vura sub-catchments and from the sub-catchments covering the coastal highway (Kukum, Bahai, and Sinu).

Figure 3-8: Site location of Naha PS in relation to its surrounding environment

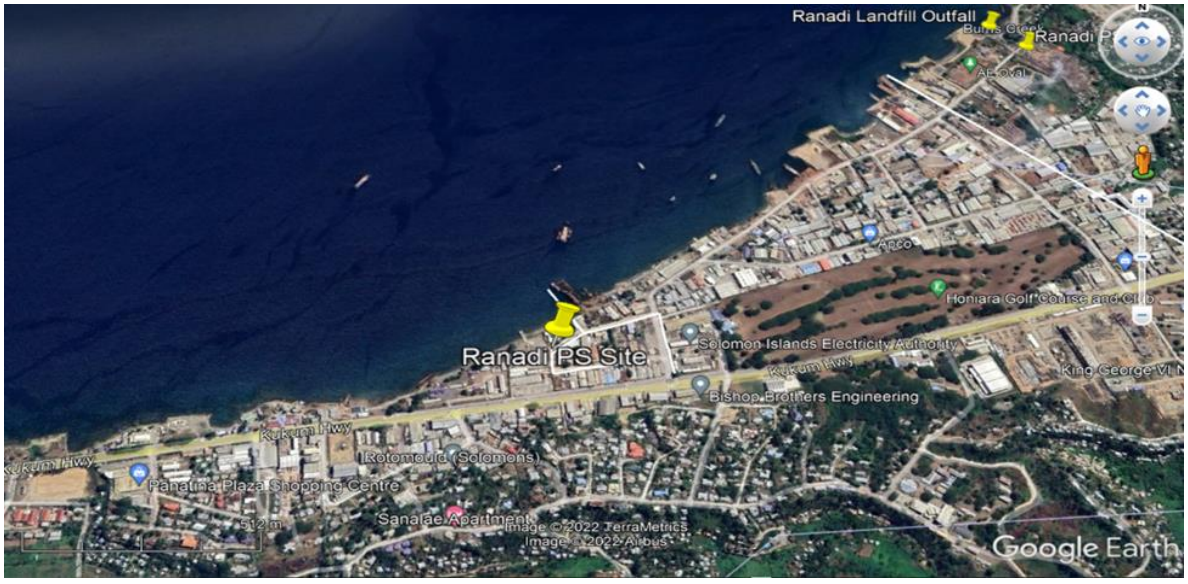


Souce: Google Earth

3.1.5. Ranadi PS

The new Ranadi PS is adjacent to Sol-green Properties in Ranadi. The PS is located at GPS coordinates 9° 25.565'S and 160° 0.268'E. The site is about 100m north d from the Ranadi roundabout on the street fronting the Electricity Authority building. The new PS will collect wastewater from the western-most part of the Honiara industrial area. It handles a mixture of trade and industrial wastewater of organic and chemical origins from various types of activities including petroleum facilities. Currently, the existing network discharges directly onto the beach.

Figure 3-9: Site location of Ranadi PS in relation to its surrounding environment



Souce: Google Earth

3.1.6. Ranadi landfill site and outfall

The Ranadi landfill outfall/PS is located east of Honiara, downstream of the sewer network on the coast at Burns Creek. They are located at GPS coordinates 9° 25.009'S, 160° 0.829'E and 9° 25.055'S, 160° 0.883'E respectively. The pumping station collects wastewater from Ranadi PS and King George VI catchment and discharges the effluent to the Ranadi outfall to the sea.

Figure 3-10: Site location of Ranadi landfill PS in relation to its surrounding environment

Souce: Google Earth

4. Terrestrial Flora and Habitat Assessment

4.1. NRH outfall and PS site

The NRH outfall and PS site are located at lower Mataniko on the eastern side of the Mataniko River delta and approximately at coordinates 9° 26.137'S, 159° 58.097'E and 9° 26.078'S, 159° 58.306'E **(Figure 3-5)** respectively**.** Adjacent to the area is the National Referral Hospital (eye clinic) and the densely populated village 'Lord Howe Settlement' where people from Ontong Java have settled. With limited land available, houses are built less than a meter from each other in a crowded environment.

The inland coastal vegetation recorded at the NRH outfall/PS are highly disturbed and tolerant to a highly modified environment. The vegetation recorded at the proposed new pumping station is non-native and the natural vegetation associated with the subproject's direct area of influence (pipeline corridor) has been modified and cleared previously for the existing main road and various buildings. The current development areas support trees and shrubs such *Spathodea companulata (*African tulip*), Broussonetia papyrifera (*paper mulberry*) and* macaranga sp *and including creepers and, grasses such as Sida acuta, Cenchrus calycultus and Milkania micrantha (*cyclone rope). Vegetation directly adjacent to the pumping station includes garden crops planted by residents from the settlement. These includes*; Musa sp (*Banana*), Xanthosoma spp (*Hongkong Taro*), Colocasia esculenta sp (*Taro*) Saccharum officinarum (*Sugar cane*) Manihot esculenta (*Cassava*)* and *Ipomoea batatas* (Sweet Potato).

The soil type found in this site in general is loam soil. Loam soil is a mixture of clay, sand and silt and is fertile, high in nutrients, provides good drainage and is good for plant growth. This is evident on site as the garden crops and associated flora tend to be growing well.

Plate 4-1: Garden crops and other associated terrestrial vegetation found at the PS Site, NRH

At the outfall site, the surrounding secondary vegetation has been previously cleared in the past for the construction of the National Referral Hospital and staff housing. However, further clearances of the remaining secondary vegetation continue for development expansions. Recently, secondary vegetation east of the outfall site was cleared away completely (**Figure 4-3**). The shoreline has also changed over time due to ongoing and extensive coastal development. The Hospital previously constructed a barrier along the shoreline to prevent the shore from being eroded during cyclones or storm surges due to its close proximity to the sea. Recently, a developer started reclaiming the foreshore near the outfall site and will reportedly continue with the reclamation activities for about 230m seaward and 635m along the coastline. Much of the shoreline had been covered with coronous materials and boulders.

Discussions with the developer and MECDM indicated that the development does not have the requisite approvals and is now in court, but reclamation works are continuing regardless. There is also a concern that the developer does not have an agreement with the correct traditional owners in any case.

Plate 4-2: Extensive coastal developments along the outfall site

The coastal strand vegetation along the areas inland from high water mark which are indirectly impacted consists mainly of *Macarange sp*, *Barringtonia asiatica* (fish poison tree)*, Annona muricata* (Soursop), *Morinda citrifolia* (noni), *Barringtonia edulis* (Cut-nut), *Jatropha curcas* (poison nut), *Premna serratifolia (headache tree)*. Vines and grasses include *Antigonon leptopus*, *Paspalum vaginatum*, *Ipomoea triloba* (littlebell, *Eleusine indica* and Digitaria *sanduinalis*. Towards the eastern side of the outfall, vegetation is dominated by *Terminallia catappa* (Alite), *Premna serratifolia* (Headache Tree) and *Impomoea littoralis*.

Plate 4-3: Showing the typical coastal strand vegetation prior to clearances and recent vegetation clearances at the eastern side of the outfall site, NRH

The coastal vegetation along the site and which could have acted as a buffer zone from the sea has been changed dramatically due to anthropogenic developments occurring in the area leaving no trace of the original vegetation. And with such occurring, it has potentially affected the abundance and distribution of plant community and also fauna habiting the area. No evidence was recorded of any threatened or endangered flora observed during the site assessment.

Figure 4-1: Typical vegetation found at the NRH outfall and PS sites

Souce: Google Earth

4.2. Market PS Site

The Market PS (also called the SIPA PS in some documents) is situated at the Solomon Islands Ports Authority (SIPA) land at Point Cruz which shares a boundary with Kosol Ltd Company **(Figures 3-5 and Figure 4-2).** The PS is on reclaimed land at GPS coordinates 9° 25.954'S and 159° 57.674'E. Recently, Solomon Ports are reclaiming the foreshore for its port development expansions. The site is highly disturbed with surrounding vegetation supporting only secondary regrowth. The original coastal vegetation in the area was cleared more than a decade ago for business expansion. Since then, the area has continued to be disturbed with more infrastructure development along the coastline with the remaining original flora completely removed. The recolonizing vegetation species established in the PS site include invasive grasses and creepers comprising of *Passiflora sp* (sweet rope), and *Coccinia grandis (l.), Voight* (Ivy Gourd), *lepturus repens* (grass sp) and *Paspalum Vaginatum* (seashore paspalum). Ornamental plants such as Plumeria sp (frangipani) and *Jatropha integerrima* (peregrina) and including *Cocos nucifera* (coconut) are grown along the area boundary line. None of the vegetation observed is of significant value and the majority of plants recorded are introduced and invasive species recolonizing the reclaimed land.

Plate 4-4: Typical coastal vegetation at the reclaimed area at Point Cruz (at SiPA land) where Market PS is situated.

Figure 4-2: Typical Vegetation found at the surveyed area at SIPA land, Market PS Site

Souce: Google Earth

4.3. Vara Creek PS

The Vara Creek pumping station site is situated at GPS coordinates 9° 26.659'S and 159° 57.524'E (**Figure 3-7**) about 25m from the creek bank. Vara Creek catchment supports an informal settlement located in a flood-prone zone. During 2014, the settlement was badly flood-affected. Vara Creek is a tributary of the Mataniko River. The river and the creek are in poor condition and are heavily polluted with both solid and liquid waste being dumped therein.

The PS site is highly disturbed and vegetation is secondary regrowth as it was previously cleared with no original flora and fauna now present. Adjacent to the PS site, vegetation has been recently cleared for a community hall. Fringing the creek and riverside, several *Metroxylon salomonense* (Sago) trees were located while *Macaranga sp*, *Samanea saman* (rain tree), *Leucaena leucocephala* (white lead tree) and *Musa sp* (banana) dominated. *Manihot esculenta* (cassava) is also found among other regrowth areas. The dominant species of grass is Panicum maximum and vines including *Merremia peltate* (Peltate morning glory) and *Mikania micrantha* (cyclone rope) are common. The majority of vegetation on the site is highly tolerant to disturbance and no threatened or endangered flora species were observed during the site assessment. The soil type present is sandy loam, which is very fertile and rich in nutrients, therefore plant growth on this site is well established.

Plate 4-5: Typical vegetation at the Vara Creek PS site and its surrounding areas.

Figure 4-3: Map showing typical vegetation found at area surveyed at Vara Creek PS site

Souce: Google Earth

4.4. Naha PS Site

The Naha Pumping Station site is adjacent to the main road along Kukum Highway on the northern coast at GPS Coordinates 9° 25.922'S and 159° 58.982'E (**Figure 3-8**). The site is highly disturbed by recent land reclamation activities along the shoreline. An existing sewer manhole and outfall are also located on this site. The soil type associated with this site consists of backfill materials mostly of limestone mixture with river gravels and sand. Soil fertility on this site is very low therefore the vegetation community comprises of secondary regrowth mainly scattered trees, creepers, weeds and grasses that are recolonizing the area. Towards the east of the site adjacent to the main road, vegetation recorded comprises of *Samanea saman* (rain tree), and *Cocos nucifera* (coconut). On the bare surface of the reclaimed area are grasses such as *Leucaena leucocephala, Commelina benghalensis*, and *Imperata cylindrica.* A creek is located east of the PS and it is very polluted with solid waste being dumped into it. Vegetation found along the creek edge is dominated by *Starchytapheta jamaicensis* (Blue rat's tail), panicum virgatum (switch grass), and *Pennisetum polystachion* (mission grass). The vegetation record on this site has no significant value and no threatened or endangered flora were noted during the site assessment.

Plate 4-6: Typical vegetation found in the vicinity of Naha PS site.

Figure 4-4: Map showing typical vegetation found at the surveyed area at Naha PS site

Souce: Google Earth

4.5. Ranadi PS Site

The Ranadi PS is located at East Honiara at GPS coordinates 9° 25.565'S and 160° 0.268'E **(Figure 3-9).** Ranadi is an Industrial zone where most manufacturing and processing industries are located in Honiara. It is a highly disturbed area and much of the surroundings were modified, cleared and backfilled decades ago to accommodate industrial buildings and factories, roads and berthing ramps for landing craft vessels. Since the area is highly disturbed, there are no traces of the original vegetation and ecosystem as it was previously cleared leaving only grasses to recolonize. The type of soil present consists mostly of sand with some river gravels which were backfill materials and is a hostile environment for plant growth and establishment due to its high salt levels, intense heat and light and lack of moisture retention. Therefore, vegetation that has adapted to survive in such conditions is mostly grasses and these include species *Brachiaria mutica (*signal grass*)*, *Eleusine indica (*wiregrass*)* and *Axonopus compressus* which are dominating and a few individual trees such as *Terminallia catappa* (Alite), *Premna serratifolia (*headache tree*)* and Cocos nucifera (coconut) which are seen within private properties or roadside along the coast.

Plate 4-7: Typical vegetation associated with the Ranadi PS site

Figure 4-5: Map showing typical vegetation found at the surveyed area at Ranadi PS site

Souce: Google Earth

4.6. Gravity and Rising Main Routes

The gravity and rising main routes are located within the road corridor in the subproject boundaries along Mendana Avenue, China Town, Kukum Highway and Ranadi. All of these areas are situated in a highly built-up environment with ongoing developments and disturbances to its surrounding environments. The surrounding vegetation along the pipeline corridor is secondary regrowth as it was previously cleared with no traces of original flora present. The vegetation recorded along the mains route has no significant value and none of the threatened or endangered flora was noted during the site assessment.

Typical Vegetation along the pipeline route from Vara Creek to the NRH PS comprises of *Samanea saman* (raintree), *Metroxylon sagu* (sago), *Broussonetia papyrifera* (paper mulberry), *Mangifera indica* (mango), *Leucaena leucocephala* (white lead tree), *Tabebuia rosea (*pink trumpet tree*) and Musa sp (*banana*).* Ornamental plants are grown along property boundaries and this includes *Pulmeria sp* (Frangipanies), *Bougainvillea sp (bougainvillea), Hibiscus rosa-sinensis* (Hibiscus*), Ixora chinensis* (Ixora) and *Jatropha integerrima* (Peregrina).

Plate 4-8: Typical Vegetation along the pipeline route along the start of the Chung Wah Road.

Along the pipeline route from the Market PS through to the NRH PS/Outfall site, the coastal vegetation includes *Terminalia catappa* (Alite), *Cocos Nucifera* (coconut), *Premna serratifolia*

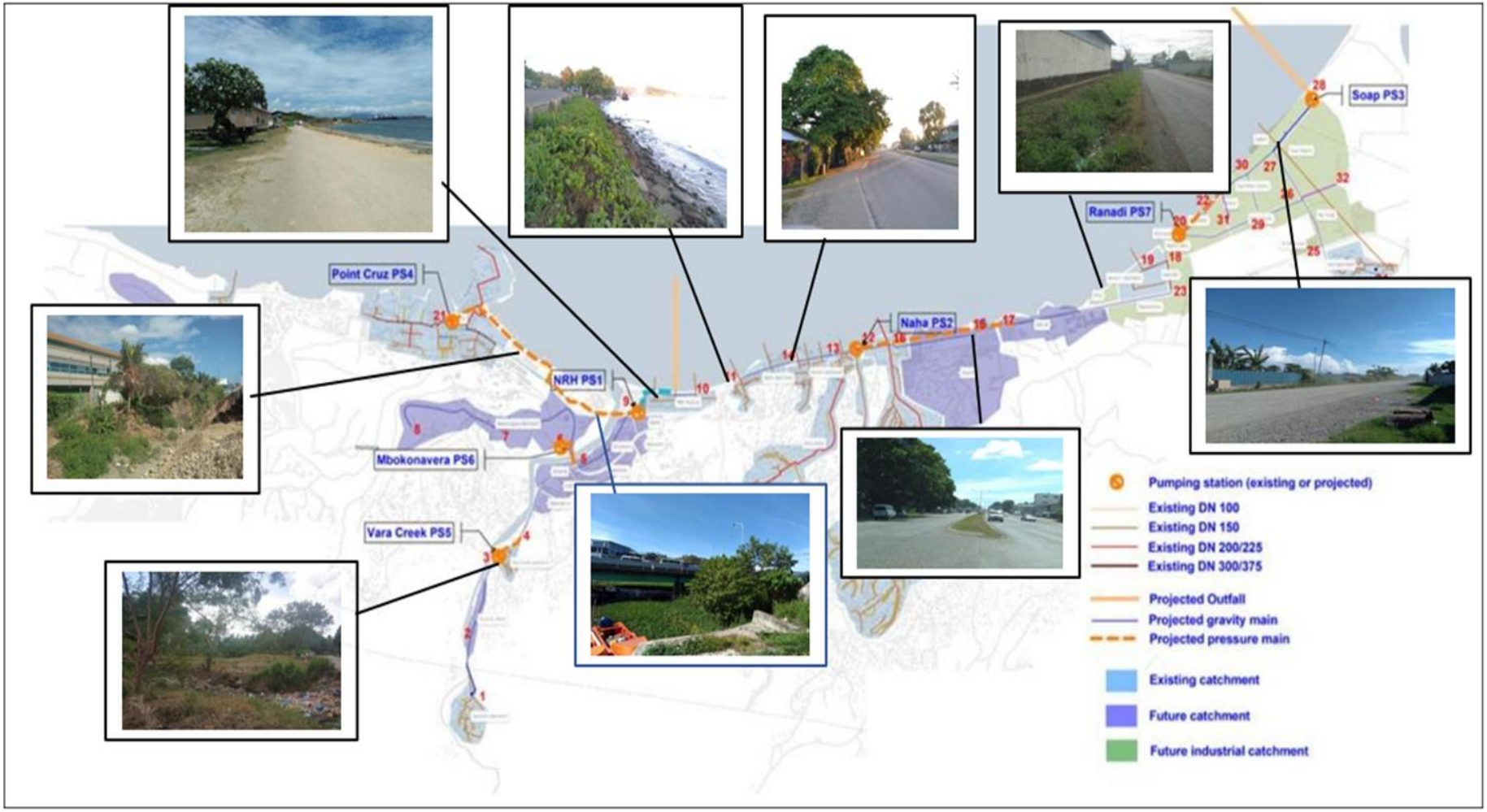
(Headache tree), *Barringtonia asiatica* (fish poising tree) and shrubs. At the lower Mataniko River, particularly immediate to the bridge, vegetation is dominated by salt-tolerant plants.

Plate 4-9: Typical vegetation found along the pipeline route from the Market PS through to the NRH PS/Outfall site

From NRH to Ranadi Landfill along the Kukum highway, vegetation on the road corridor along the pipeline route shares similarities with the other sites assessed. Typical vegetation found along this area includes *Samanea saman* (raintree), *Broussonetia papyrifera* (paper mulberry), *Elaeis guineensis sp* (palm tree), *Mangifera indica* (mango), *Calophyllum inophyllum* (Koilo), *Cocos nucifera* (coconut), and *Pandanus tectorius* (pandanus) and including grasses and weeds.

Plate 4-10: Typical vegetation along the pipeline route from NRH to Ranadi Landfill Outfall site.

Figure 4-6: Typical vegetation found at various locations along the gravity and mains route along the subproject area of influence



Souce: Google Earth

5. Terrestrial Fauna and Habitat Assessment

During the field surveys, observations were made of the presence of wildlife and different faunal groups throughout the subproject area and proposed footprint. Along the subproject sites, much of the vegetation has been degraded and modified with non-native trees and invasive grasses and vines dominating. As a result, the quality of habitats and ecological functions are consequently declining, and this determined the species composition, abundance and distribution of fauna. The water bodies within the sites are highly polluted and this minimizes ecosystem capacity to fully support aquatic wildlife. The sandy shorelines along the NRH have been significantly altered and disturbed with ongoing reclamation activities and such minimizes the presence of organisms that need to burrow in sand to even survive. This is also the same for the sandy shores at the Ranadi site.

The terrestrial habitats found within the subproject area of influence at each PS and Outfall sites were observed to still provide habitats for birds, reptiles/lizards, amphibians, domesticated animals and other vertebrates. On the trees, rooftops or along the paved footpath, birds such as *Acridotheres tristis* (Common Myna), *Rhipidura leucophrys* (Willie Wag Tail), and Swifts are found to be interacting and feeding. Other vertebrates and amphibians were also found and these include *Oryctes rhinoceros* (Coconut Rhinoceros beetles), Anisoptera (dragon flies), Tettigoniidae (Bush crickets) *Achatina fulica* (Giant African snails) and *Bufo marinus* (Cane toad). The Giant African snail is an invasive species affecting many parts of Honiara. Domesticated and feral animals found in communities along the subproject sites include dogs, cats, rats, chickens and pigs. Other fauna observed habiting the waterways along the subproject area of influence include many unidentified species of insects (grasshoppers, moths, beetles and dragonflies) and some fish species. Field observations did not show any significant wildlife species within the subproject area and the PS and Outfall sites and including the pipeline corridor in a highly modified urban environment.

Plate 5-1: Terrestrial fauna found at the NRH PS site.

6. Freshwater Ecology

Freshwater systems are very important in the Solomon Islands as people depend on them for their livelihood. Freshwater is used for a range of purposes including household uses (such as drinking and washing), sanitation, agriculture, industry, and hydropower generation and it also supports local biodiversity.

The northern coastal strip of Guadalcanal at Honiara has several surface waters ranging from creeks and streams to rivers. Lungga River which is about 7.5km east of Honiara City Council

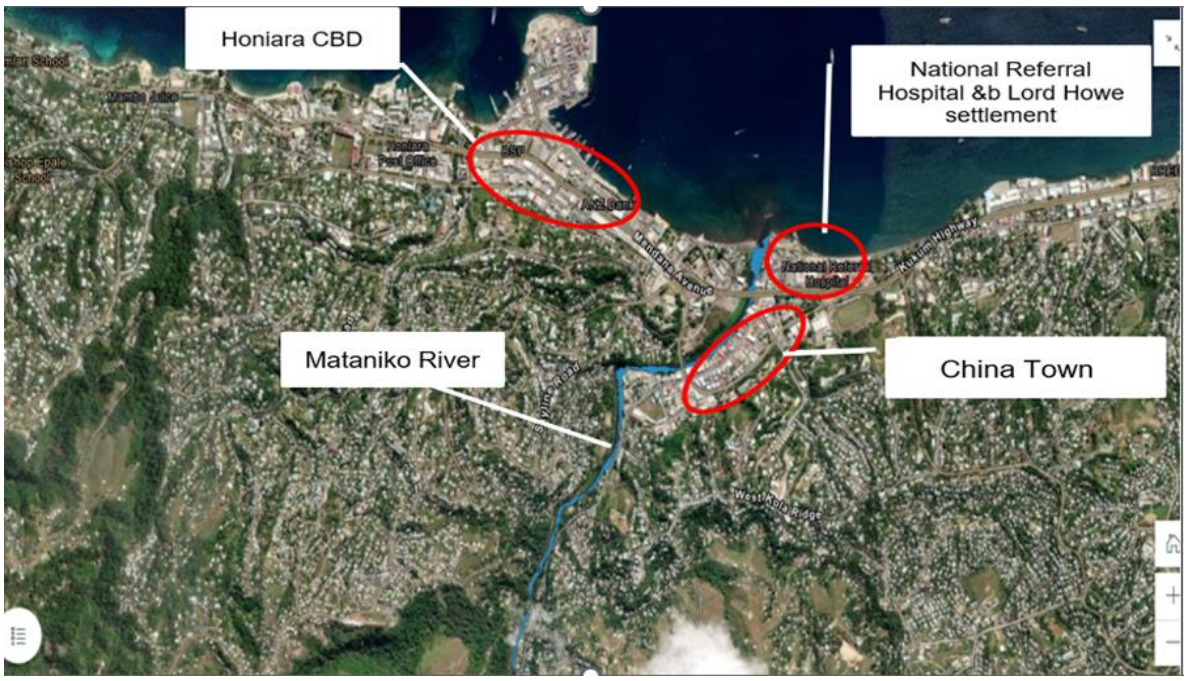
is the biggest river and has the largest water catchment. Mataniko River is the second largest and is located in Central Honiara within the Honiara City Council boundary. Within the subproject area of influence, there are several surface water systems which include the Mataniko River, Vara Creek, Kukum Creek and Burnscreek Stream. Freshwater habitats play an important role in the ecological function and biodiversity of Mataniko River and also the creeks and streams which the subproject will pass through.

Figure 6-1: Map showing two main river systems along the northern coastal strip. Mataniko River is within the subproject area of influence and Lungga River is further east from the Ranadi landfill site.

Souce: Google Earth

Mataniko River runs roughly south to north with a catchment of some 20 km^2 in area and has several tributaries from about 100 kilometers inland. Mataniko river separates the Central Business Area from China Town and the National Referral Hospital. Along the Mataniko River Catchment are hamlets, villages, informal settlers, and formal residential areas like Tuvaruhu, Vara Creek, Number 3 and China Town then the Lord Howe and Mamana water settlements.

Figure 6-2: Mataniko River in relation to its surrounding environment with the subproject area of influence.



Souce: Google Earth

The freshwater habitats at the upper catchment of the Mataniko River are dominated by riparian plants distributed along the riverbanks and the flood plains. Much of the vegetation is still intact despite being threatened by anthropogenic activities and residential settlements. The riparian vegetation at the upper catchment includes herbs, ferns, palms and trees.

The lower sections of the Mataniko River system, specifically at Tuvalu and Vara Creek, lack any habitats suitable for significant aquatic flora and fauna as these areas were highly disturbed by anthropogenic activities. Activities include residential settlement, farming and waste disposal (sewage, household solid wastes etc), and these have altered the water quality and aquatic flora and fauna composition. Typical riparian vegetation includes but is not limited to *Delonix regia* (flamboyant), *Bambusa sp* (bamboo), *Metroxylon salonesnse*, *ficus sp, Cocos nucifera* (coconut tree), *Macaranga sp*, *Musa sp* (banana), *Crytosperma merkusii* (giant swamp taro) and invasive plants species such as the *Brussonetia papyrifera* (paper mulberry tree) and *Spathodea campanulate* (African Tulip Tree). Riverside grasses dominate the river bank.

Plate 6-1: Typical riparian vegetation at Tuvaruhu, lower section of Mataniko River.

At the upper and lower Mataniko Bridge sites in China Town, the dominant aquatic flora is *Ipomoea aquatica* (kangkong) and is covering much of the river banks whereas vegetation at the lower bridge includes common reeds and other salt-tolerant species. Algae blooms are also occurring in this section of the river as evident in the greenish colour of the river. The anthropogenic disturbances associated with the lower reaches of the river system may have triggered or accelerated the blooms and this includes farming upstream (nutrients from fertilisers), sewage and household waste and other pollution sources such as piggery wastewater. It is a very common practice in Honiara where residents or businesses illegally dump solid wastes or wastewater into the water systems, contaminating and degrading the water quality and ecosystem.

Plate 6-2: Showing aquatic flora and algae blooms at upper Mataniko Bridge and the estuarine flora at lower Mataniko Bridge, China Town

Despite the river being very polluted and disturbed, freshwater fauna habitate the aquatic environment. The aquatic fauna observed include *Rinella marina tadpole* (giant marine toad), *Neurothemis sp* (Red dragonfly), *Melanoides* tuberculate (freshwater snail) and fish species such as *Khuliidai sp* (flagtail) and *Sicyopus sp* were also observed. The freshwater species live and spawn in the rivers and larvae drift to the ocean to live as pelagic/oceanic marine larvae before returning to freshwater as juveniles to mature.

Plate 6-3: Freshwater fauna species found at Tuvaruhu, Mataniko River

The freshwater habitats at Vara Creek, Kukum Creek and the Burnscreek stream are also highly polluted and the quality of water is very poor. Vara Creek drains into the Mataniko river and the creek is also used as a dump site by the settlers.

Plate 6-4: Showing Vara Creek joining Mataniko River and the household wastes disposed into Vara Creek.

Kukum Creek is east of the Naha PS and like Vara Creek, it is also very polluted. Solid wastes and sewage from households and other shops are directly dumped into this creek.

Plate 6-5: Kukum Creek at the vicinity of the Naha PS site.

Typical vegetation on the creek edges is mostly grass such as *Starchytapheta jamaicensis* (Blue rat's tail), *panicum virgatum* (switch grass), and *Pennisetum polystachion* (mission grass). Aquatic fauna species observed are *Rinella marina* (giant marine toad tadpoles).

Burnscreek stream is east of the Ranadi Landfill PS/Outfall. The stream was also polluted with untreated fecal sludge/septage being dumped at the Ranadi Landfill and leaks into the stream affecting the water quality. Aquatic flora and fauna were observed habiting the water body and it was noted the *water hyacinth* (Water lily) and *Ipomoea aquatica* (Kangkong) are the dominant aquatic flora. The fish species observed was *Kuhliidae sp* (flagtail). Settlers also farmed tilapia fish species. None of the freshwater flora and fauna species found are threatened or vulnerable.

Plate 6-6: Burns Creek stream, Ranadi Landfill site/Outfall site

7. Field Assessment Findings

7.1. Critical Habitats

There are no critical terrestrial habitats associated with the project area of influence. The subproject area of influence has been previously modified and disturbed by intense development including settlements, infrastructure developments and Town expansions. Flora and fauna found habiting the modified environment have adapted and are tolerant to the disturbances. There is no evidence of endangered flora or fauna species nor endemic species.

7.2. Endemic, Threatened and Vulnerable Species

Vegetation found at each of the subproject sites is secondary regrowth with no traces of original vegetation at each of the subproject sites assessed. The island of Guadalcanal is home to some of the country's endemic, threatened and vulnerable species, but no threatened, endemic or rare flora or fauna species were found within the subproject area of influence.

7.3. Protected Areas

There are no protected and conservation areas plus critical habitats within the vicinity of the subproject area of influence that would be affected by the proposed development. Protected areas in the Island of Guadalcanal are outside of the subproject's area of influence mainly towards the western and eastern ends of the Island.

8. Conclusion

Overall, it is considered the impacts of the subproject on terrestrial ecology to be very low and localized to the direct footprint of the proposed construction works. The subproject area of influence is a modified urban environment which is highly disturbed. There are no native or significant vegetation present but only secondary regrowth which are highly tolerant to disturbances, which also reflects low occurrences of fauna. The majority of vegetation cover within the subproject area are grasses and shrubs and few tall trees particularly along Kukum – Panatina areas. No flora or fauna species of significant value were observed at any of the sites surveyed.

Subproject impacts on the terrestrial environment, its ecology, flora and fauna populations and biodiversity within and around the proposed subproject's terrestrial sites are expected to be very minor, localized to the immediate footprint of the works, and easily managed through standard engineering good practice mitigation measures. It is envisaged the subproject will not impact any marine, coastal or terrestrial conservation and/or protected areas and critical habitats, sites of cultural, customary or heritage significance nor any national or international terrestrial and/or coastal endangered or protected species.

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