(4) Water Treatment System

(a) Disinfection Facility

Disinfection facility with chlorination injection equipment shall be installed in the following borefield. The capacity of the disinfection plant shall have 120% of the production volume of each source.

Table B2.3-13 Disinfection Facility

Water Source	Capacity of Disinfection Plant (m^3/day)
Tasahe new borefield	3,850
Titinge new borefield	3,850
Skyline new borefield	3,850
Borderline new borefield	3,850
Mataniko existing borefield	3,100
Kombito existing EU borefield	2,400
Panatina existing borefield	4,400

Source : JICA Study Team

(b) Intermediate Water Treatment Facility

There are many complaints from the customers that turbidity of the tap water from the spring sources becomes high just after the heavy rain. In order to prevent spring water from such contamination, intermediate water treatment facility shall be installed inside the town boundary and near the intake point of each spring source. As the intermediate water treatment facility, inline filter shall be adopted as explained below. The capacity of the facility is shown bellow.

Table B2.3-14 Capacity of Intermediate Water Treatment Facility

Water Source	Treatment Capacity (m^3/day)
Konglai spring gravity system	4,300
Rove spring	2,000
Kombito spring	2,000

Source : JICA Study Team

As the intermediate water treatment facility to reduce turbidity, following systems are examined.

- Regulating tank
- Online filter

Regulating tank is designed to have a capacity of more than one day amount of the treatment capacity and to be constructed near the spring. It has a function to stabilize the water quality and reduce turbidity. This tank needs a rather large site (3,000 to 5,000m^2)

Online filter is designed to be set in a section of water transmission mains with mechanical filter or sand filter. It has a function to reduce not only turbidity but also other items such as algae, BOD, SS, etc. It will require 100 to 200m^2 for installation area and does not need a large site.

Therefore, online filter shall be applied in this Study. Reference data for the online filter is shown in S-10 of Supporting Report.

B2.3.3 Option J-2

Facility improvement plan to be proposed in Option J-2 is shown in Figure B2.3-7.

(1) Water Distribution District

Based on the basic policy, water distribution districts which have own water source and reservoir are selected as shown in Table B2.3-15.

Table B2.3-15 Water Distribution District in 2010 for Option J-2

No.	Water Distribution District	Water Source	Supply Area	Demand (m^3/day)
1	Konglai spring (gravity)	Konglai spring (gravity) + Konglai spring (pumping)	Point Cruz	7,478
2	Konglai spring (pumping)	Konglai spring (pumping)	Tasahe and Ngossi	4,631
3	Rove Spring	Rove spring	CBD	1,671
4	Mataniko	Mataniko existing borefield	China Town	3,058
5	Skyline - Mataniko	Skyline new borefield + Mataniko existing borefiield	West & East Kolaa	3,145
6	Borderline - Kombito	Borderline new borefield + Kombito existing borefield	Naha/Vura	5,437
7	Panatina - Kombito	Panatina existing borefield + Kombito spring	Panatina, Ranadi and Henderson	5,165
	Total			30,587

Source : Estimated by the JICA Study Team based on the data from SIWA

Location of each water distribution district and profiles of water supply facilities for Option J-2 are shown in Figure B2.3-8 and Figure B2.3-9 respectively.

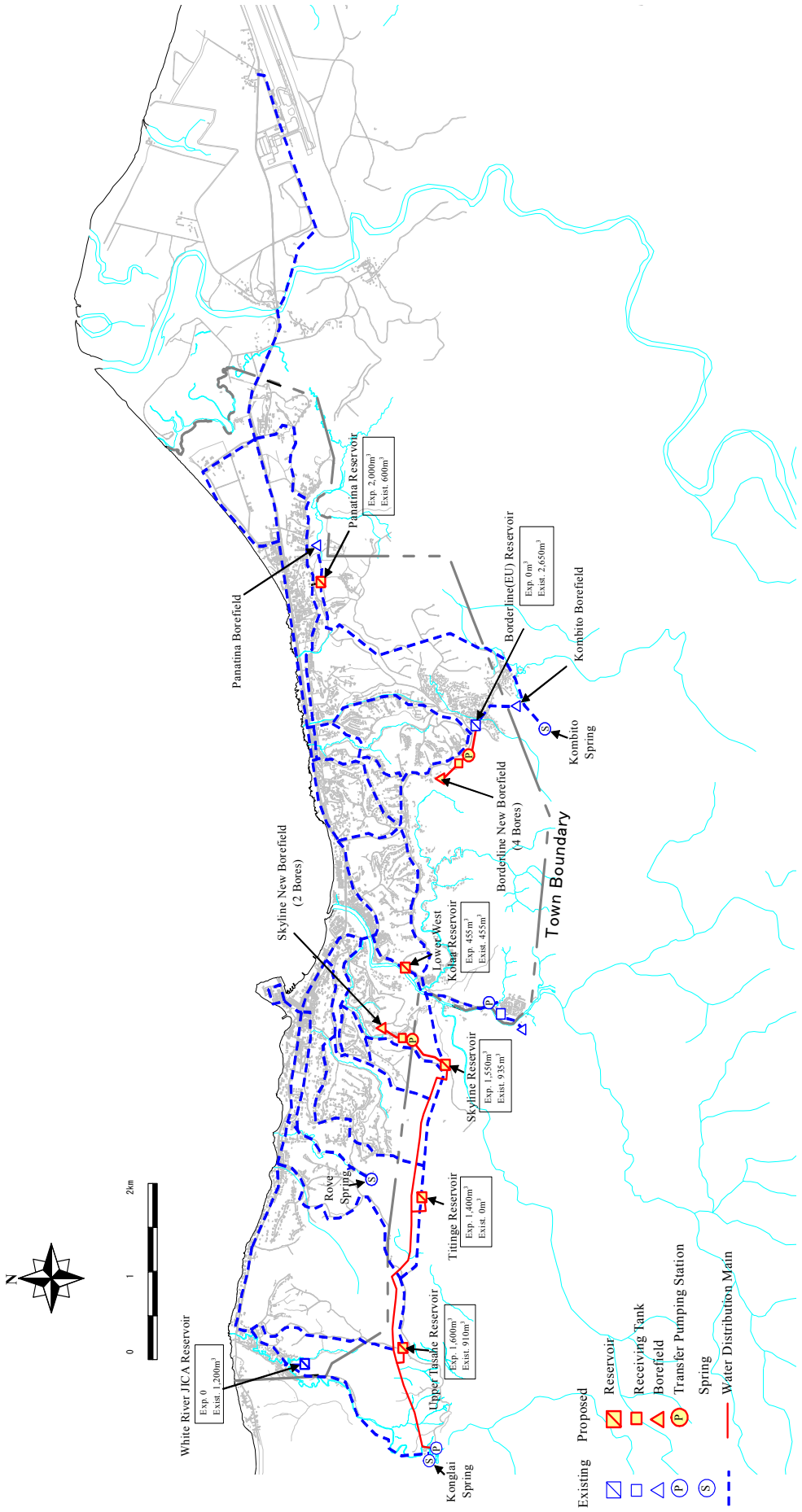


Figure B2.3-7 Option J-2 : General Layout of Water Supply Facilities in 2010

Source : JICA Study Team

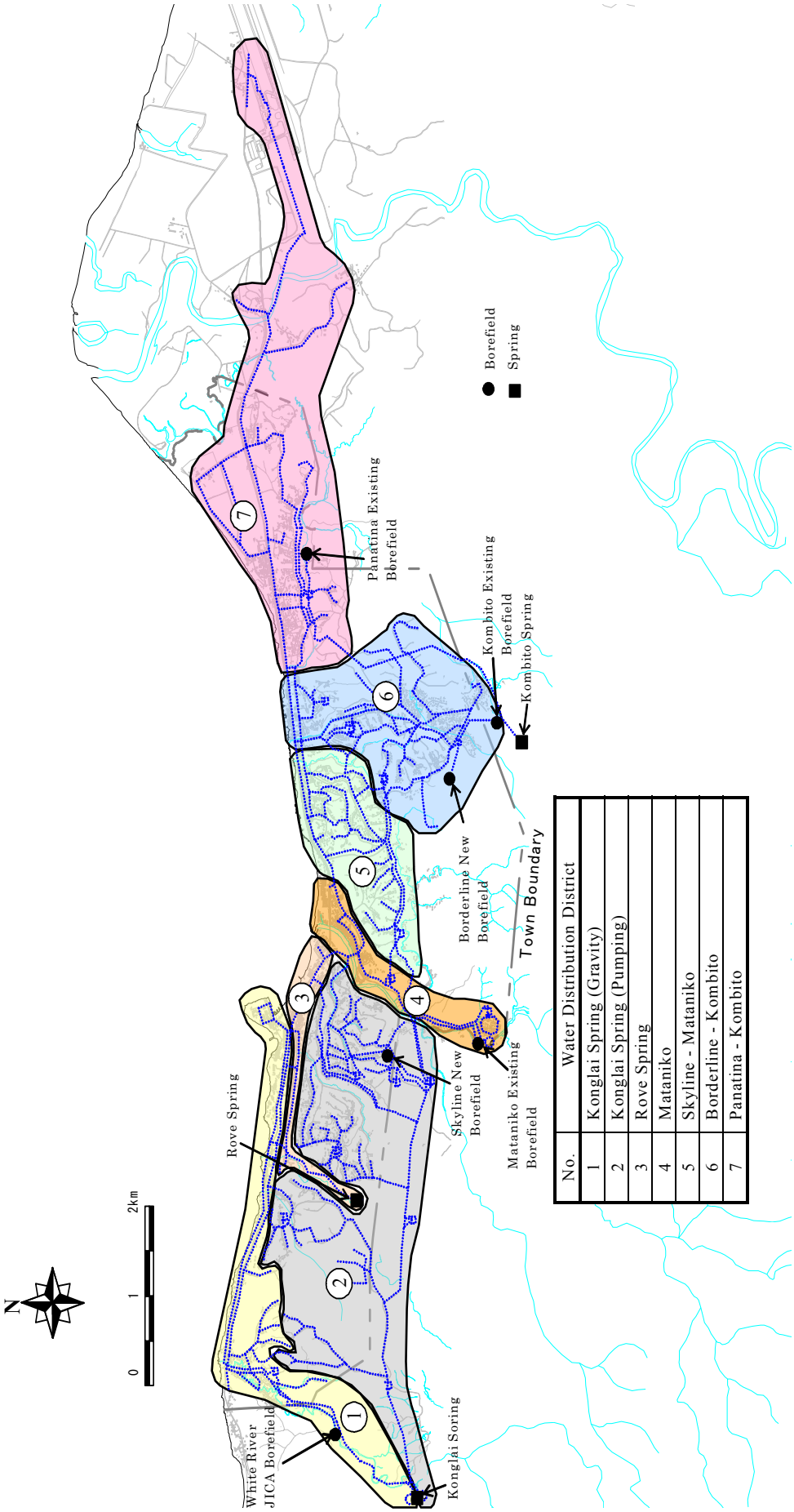
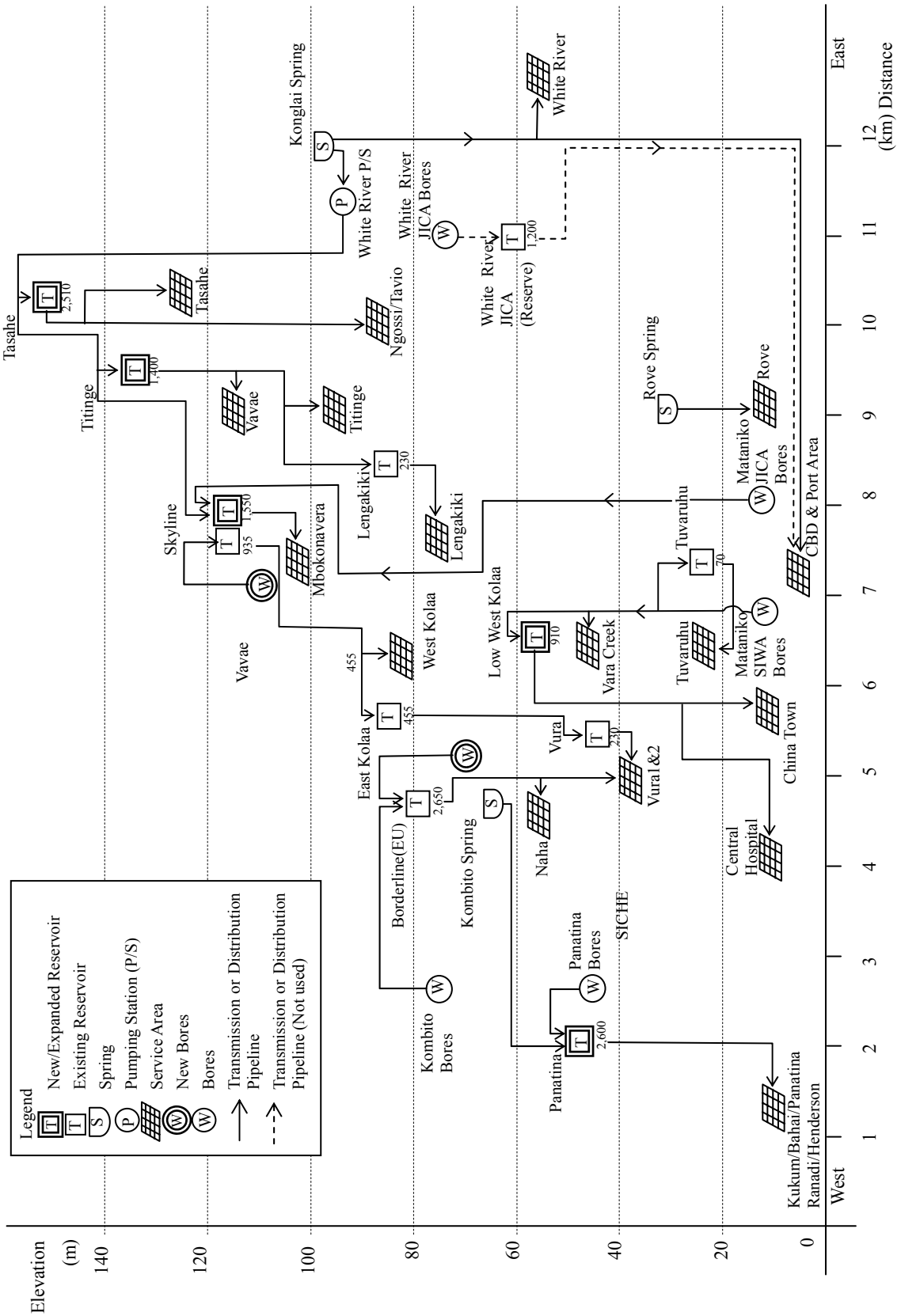


Figure B2.3-8 Option J-2 : Water Distribution District in 2010

Source : JICA Study Team



Source : JICA Study Team

Figure B2.3-9 Option J-2 : Profiles of Water Supply Facilities in 2010

(2) Water Source Facilities

(a) Borehole Development

Based on the policy for water sources mentioned in Table B2.3-2, new groundwater sources have been developed for the year 2010 as shown in Figure B2.3-10. The groundwater volume and number of boreholes to be developed have been examined with the production volume of existing water sources and water demand in 2010 as shown in Table B2.3-16

Table B2.3-16 Groundwater to be Developed and Number of Boreholes

Water Source	Production Volume in 2005 (m^3/day) [A]	Water Demand in 2010 (m^3/day) [B]	Reduction or Addition (m^3/day) [C]	Production Volume after cancel (m^3/day) [D]=[A]－[C]	Groundwater to be newly developed (m^3/day) [E]=[B]-[D]	Required Additional Borehole (Nos.) [F]=[E]/800
Konglai Spring Gravity System	4,246			4,246		
Konglai Spring Pumped System	7,849			7,849		
Panatina Borefields	3,664			3,664		
Kombito Spring Source	1,620			1,620		
Kombito Borefields	1,931			1,931		
Mataniko JICA Borefield	2,569			2,569		
Mataniko SIWA Borefield	2,045			2,045		
Rove Source	1,795			1,795		
Total	**25,719**	**30,587**	**0**	**25,719**	**4,868**	**6**

Source:Calculated by the JICA Study Team using SIWA's data (production volume in January to May 2005)
Note : Production capacity of one borehole is estimated as 800m^3/day.

(b) Specification of Bores and Bore Pumps

The lifting capacity of bore pump has been determined by the pumping test of the boreholes constructed under the previous Japan's grant aid and data for safe yield of the bores obtained from SIWA. The specifications of bores and bore pump shall be as follows.

Table B2.3-17 Specification of Boreholes and Pump

Item	Specification
Depth of bore	100m
Casing size	200mm
Lifting capacity of pump	800 m^3/day/unit
Head of pump	45m
Power consumption	7.5kW/unit

Source : JICA Study Team

(c) Water Conveyance Mains

Water conveyance mains are the pipeline to transfer water from the borehole to the receiving tank. The diameter and length of the pipeline are shown in Table B2.3-18.

Table B2.3-18 Water Conveyance Mains

Route	Diameter (mm)	Length (m)
Skyline new borefield	150	500
Borderline new borefield	150	2,000
Total length		2,500

Source : JICA Study Team

(d) Receiving (or Collector) Tank

Receiving tank serving as a suction tank for water transmission pump shall be installed in the site near the water source. Its capacity shall have at least one-hour volume of the total discharging capacity of the pump station. Thus, following receiving tanks will be constructed in each new water source.

Table B2.3-19 Receiving Tank for New Water Sources

Source Name	Tank Capacity (m^3)	Reservoir to Transfer
Skyline new borefield	100	Skyline reservoir
Borderline new borefield	150	Borderline (EU) reservoir

Source : JICA Study Team

(e) Water Sources in 2010

As mentioned above, four borefields will be developed for the proposed water supply system in 2010. Therefore, water sources in Honiara for the water demand in the year 2010 are summarized in Table B2.3-20 below.

Table B2.3-20 Water Sources in Honiara for the year 2010

Water Source	Production Capacity (m^3/day)	Remarks
[Spring]		
Konglai spring (gravity)	4,246	Existing
Konglai spring (pumping)	7,849	Existing
Rove spring	1,795	Existing
Kombito spring	1,620	Existing
Spring Total	15,510	
[Bores]		
White River JICA borefield	(2,480)	Existing (for reserve)
Mataniko borefield	4,614	Existing
Kombito borefield	1,931	Existing
Panatina borefield	3,664	Existing
Skyline new borefield	1,600	Newly developed
Borderline new borefield	3,200	Newly developed
Bores Total	15,009	
Total (duty)	30,519	This amount almost meets the water demand in 2010.
For reserve	2,480	
Total (potential)	(32,999)	

Source : JICA Study Team

Figure B2.3-10 shows the locations and production capacity of each water source in 2010. For the current situation of water source, refer to Figure B1.4-3.

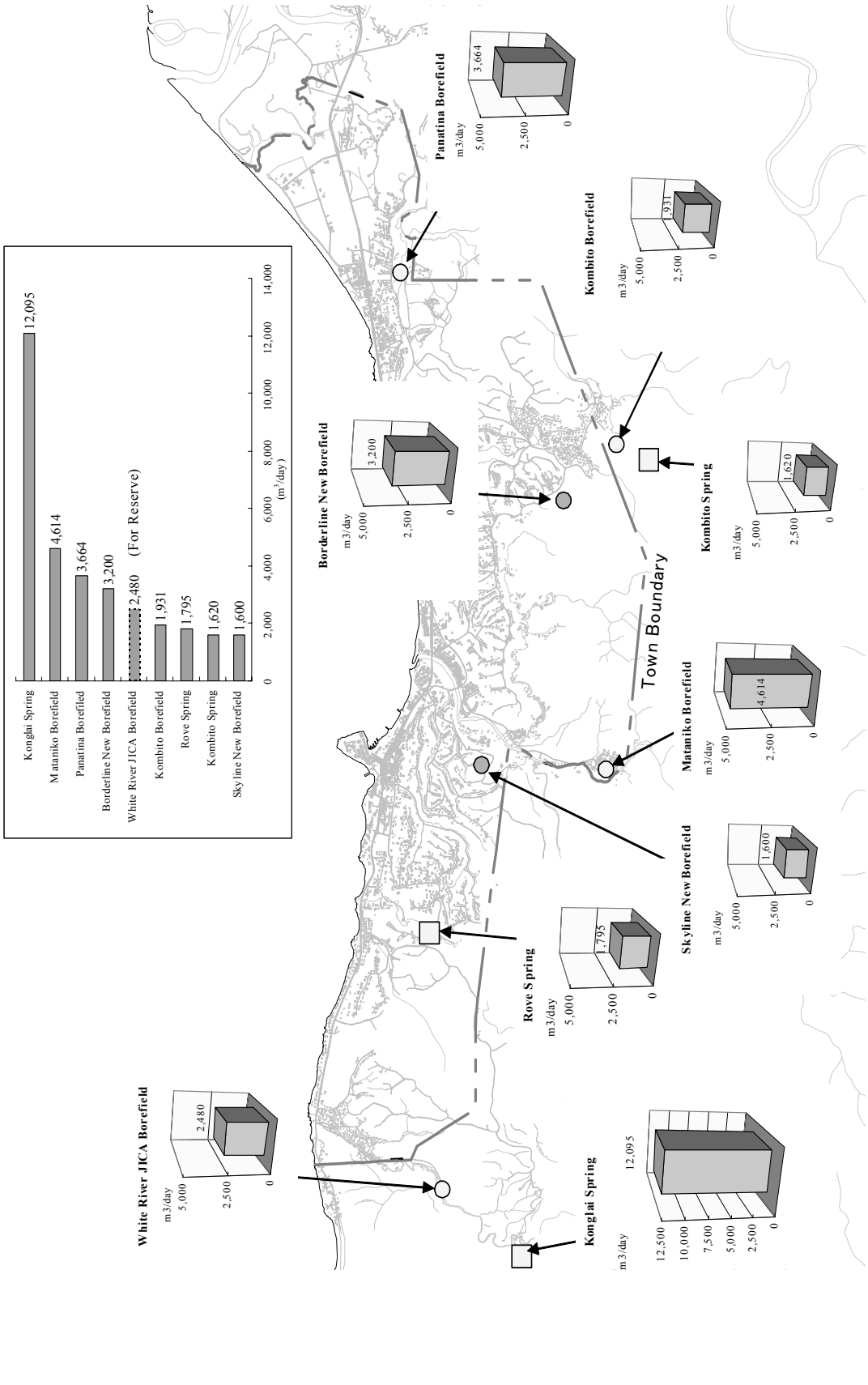


Figure B2.3-10 Water Sources in 2010 for Option J-2

Source : JICA Study Team

(3) Water Transmission and Distribution System

(a) Transmission Pumping Station

Transmission pumping station serves as transmitting water from the water source to water distribution reservoir. The specification of each pumping station is as shown in Table B2.3-21.

Table B2.3-21 Specifications of Transmission Pump

Water Source	Pump Specification (per unit)			Reservoir to Transfer
	Capacity (L/sec)	Head (m)	Power (kW)	
Skyline new borefield	9.3	60	11.0	Skyline reservoir
Borderline new borefield	18.5	40	15.0	Borderline (EU) reservoir

Source : JICA Study Team

(b) Water Transmission Mains

Water transmission mains (or reservoir rising main) shall be installed from the transmission pumping station to the water distribution reservoir. The diameter and length of the water transmission mains are shown below.

Table B2.3-22 Water Transmission Mains

Route	Diameter (mm)	Length (m)
Konglai spring to Tasahe reservoir	400	1,350
Konglai spring to Titinge reservoir	250	1,870
Konglai spring to Skyline reservoir	200	3,110
Skyline new borefield to Skyline reservoir	150	680
Borderline new borefield to Borderline reservoir	200	300
Total Length		7,310

Source : JICA Study Team

(c) Water Distribution Reservoir

1) Policy for Water Storage

Water storage capacity of water distribution reservoir shall be determined with the following taken into account.

- To meet the water demand for the related water distribution district.
- To absorb the peak demand in the water distribution district.
- To supplement water in case of emergency.
- To supply enough water in case of fire.

In general, storage capacity of the reservoir shall have 8 to 12 hour-volume of the maximum daily water supply. In this Study, 12 hour-volume of the water supply shall be adopted taking into account that Honiara city is located in the island where it will take much time for restoration work in case of emergency.

2) Expansion of Water Distribution Reservoir

Based on the above-mentioned policy, the expanded capacity of water distribution reservoir has been determined as shown in Table B2.3-23. There are two kinds of reservoir – source reservoir and intermediate reservoir. Since water storage of intermediate reservoirs is depending on the consumption pattern in the water distribution area, their capacity is not counted in the total capacity of the reservoirs.

Table B2.3-23 Expanded Capacity of Water Distribution Reservoir in 2010

No.	Water Distribution District		Area Distribution	Max. Daily Demand (m^3/day)	Required Capacity (m^3)	Existing Capacity (m^3)		Required Expansion (m^3)	Design Capacity of Reservoir (m^3)	Location of Reservoir
	(Main Water Source)	(Additional Water Source)		[1]	[1] x 12/24=[2]	[3]		[3]－[2]		
1	Konglai Spring (Gravity)	Konglai Spring (Pumping)	Point Cruz	6,471	3,236	1,200	White River JICA reservoir shall be utilized	-2,036	1,600	This reservoir cover District 1 and 2 and is constructed in the premises of existing Tasahe reservoir site .
2	Konglai Spring (Pumping)		Tasahe and Ngossi	1,007	504	910	Tasahe reservoir shall be utilized.	407		
				7,478	3,739	2,110		-1,629		
			Titinge and Vavae	2,798	1,399	0	Existing reservoir shall be replaced.	-1,399	1,400	In the premises of Titinge reservoir site.
			Bkonavera	1,833	917	480	Skyline JICA shall be utilized.	-437	450	In the premises of Skyline reservoir site.
3	Rove Spring		CBD	1,671	836	900	Rove spring is functioned as a reservoir.	64	0	Near Rove Spring site.
4	Mataniko Existing Borefield		China Town	3,058	1,529	525	Tuvaruhu reservoir shall be utilized and one of Lower West Kolaa reservoirs shall be replaced.	-1,004	455	In the premises of Lower West Kolaa Reservoir site. No space for the required expansion.
5	Skyline New Borefield	Mataniko Existing Borefield	West & East Kolaa	3,145	1,573	455	SIWA reservoir shall be utilized.	-1,118	1,100	In the premises of Skyline SIWA reservoir site.
6	Borderline New Borefield	Kombito Existing Borefield	Naha/Vura	5,437	2,719	2,650	Kombito EU reservoir shall be utilized.	-69	0	No expansion of reservoir is required in District 7.
7	Panatina Existing Borefield	Kombito Spring	Panatina, Ranadi and Henderson	5,165	2,583	600	JICA reservoir shall be utilized.	-1,983	2,000	In the premises of Panatina reservoir site.
	Total			30,587	15,294	7,720		-7,574	7,005	

Note : CBD = Central Businees District
Source : JICA Study Team

New water reservoirs for Option J-1 with the existing ones are listed in Table B2.3-24.

Table B2.3-24 Water Reservoirs for Option J-2 (Existing and Expanded)

Water Distribution District	Name of Tank	Existing in 2005 (m^3)	Expanded in 2010 (m^3)	Total Capacity (m^3)
Konglai Spring (Gravity)	White River JICA	1,200	0	1,200
Konglai Spring (Pumping)	Tasahe	910	1,600	2,510
	Titinge	0	1,400	1,400
	Skyline JICA	480	450	930
Rove Spring	Rove Spring	900	0	900
Mataniko	Lower West Kolaa	455	455	910
	Tuvaruhu	70	0	70
Skyline-Mataniko	Skyline SIWA	455	1,100	1,555
Borderline-Kombito	Borderline (EU) Tank	2,650	0	2,650
Panatina- Kombito	Panatina	600	2,000	2,600
Total		7,720	7,005	14,725

Source : JICA Study Team

(d) Water Distribution Mains

1) Data for Network Analysis

Peak factors for hydraulic analysis are as follows.

- Peak daily factor : 1.0
- Peak hourly factor for domestic users: 1.4
- Peak hourly factor for large water users : 1.3

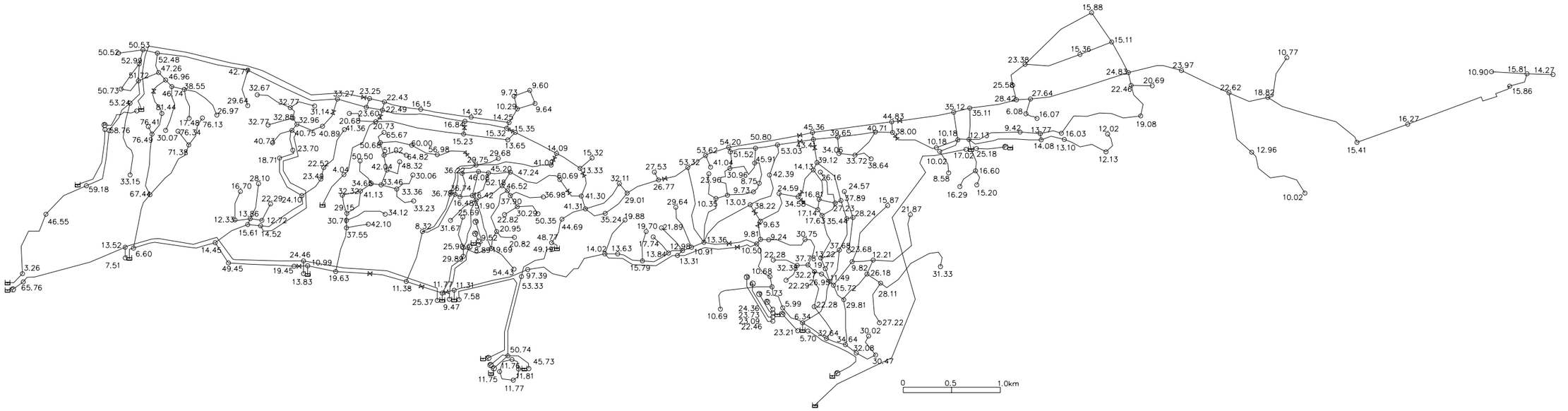
All the data for the network analysis is compiled in S-6 of Supporting Report.

2) Result of Network Analysis

Through hydraulic analysis of the water supply network in 2010, effective water pressure has been obtained as shown in Figure B2.3-11. As shown in the figure, low pressure areas (water head less than 1.0kg/cm2) in 2005 have been almost eliminated in 2010 by upgrading of the water supply system. All the results from the hydraulic analysis are attached in S-6 of Supporting Report.

3) Replacement of Water Distribution Mains

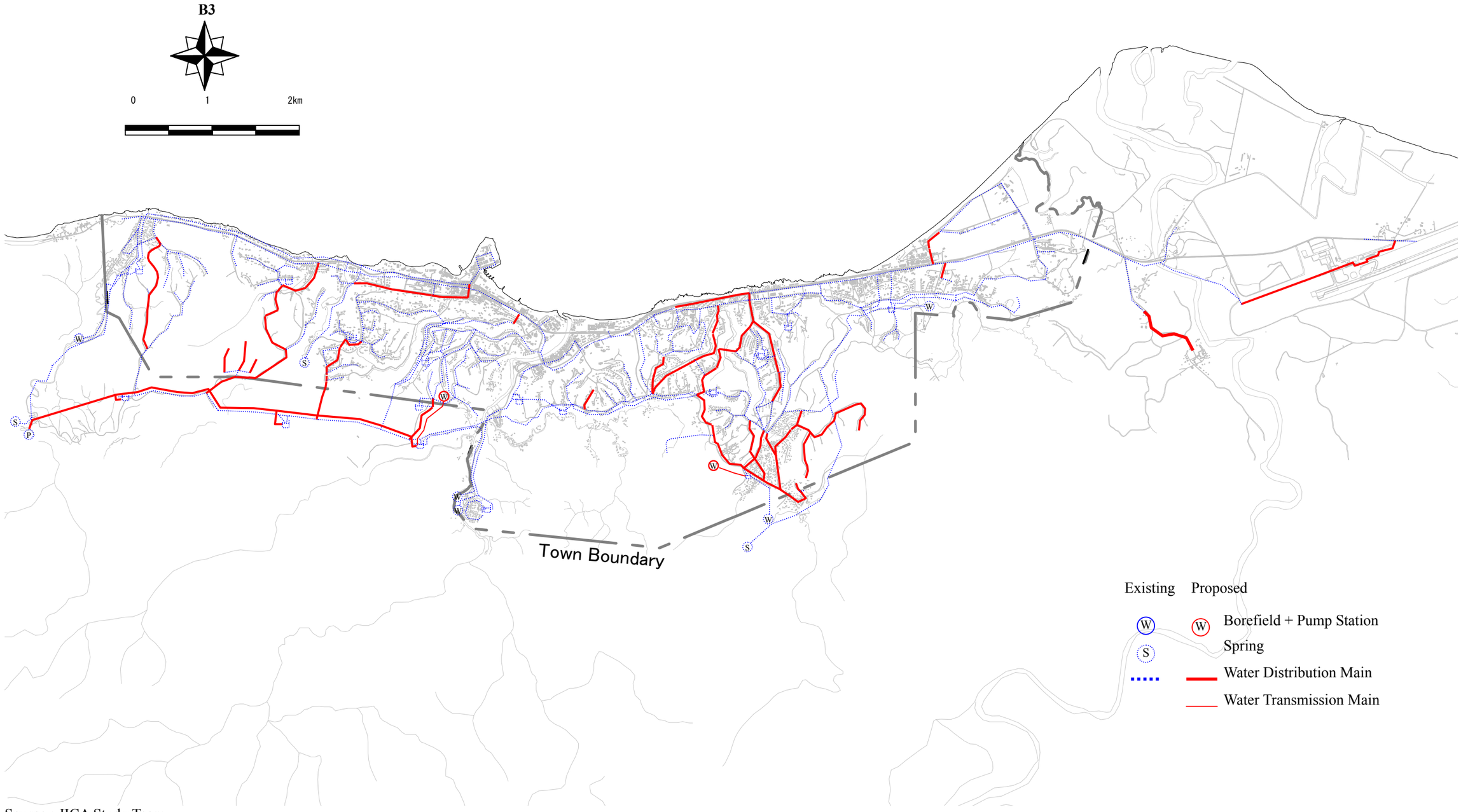
According to the hydraulic analysis, it is found that diameters of some of the water distribution mains are not enough for the design peak flow. Therefore, the water distribution mains shall be replaced as shown in Figure B2.3-12. The total length of the replacement including expansion in Kombito area is about 27km with diameters of 50mm to 300mm.



Note: All figures are in meters and indicate effective water head.

Source : JICA Study Team

Figure B2.3-11 Effective Water Pressure in 2010 (Option J-2)



Source : JICA Study Team

Figure B2.3-12 Replacement and Expansion of Water Distribution Main for Year 2010 (Option J-2)

(4) Water Treatment System

(a) Disinfection Facility

Disinfection facility with chlorination injection equipment shall be installed in the following borefield. The capacity of the disinfection plant shall have 120% of the production volume of each source.

Table B2.3-25 Disinfection Facility

Water Source	Capacity of Disinfection Plant (m^3/day)
Skyline new borefield	1,950
Borderline new borefield	3,850
Mataniko existing borefield	3,100
Kombito existing EU borefield	2,400
Panatina existing borefield	4,400

Source : JICA Study Team

(b) Intermediate Water Treatment Facility

There are many complaints from the customers that turbidity of the tap water from the spring sources becomes high just after the heavy rain. In order to prevent spring water from such contamination, intermediate water treatment facility shall be installed inside the town boundary and near the intake point of each spring source. As the intermediate water treatment facility, inline filter shall be adopted as mentioned in B2.3.2-(4). The capacity of the facility is shown bellow.

Table B2.3-26 Capacity of Intermediate Water Treatment Facility

Water Source	Treatment Capacity (m^3/day)
Konglai spring gravity system	4,300
Konglai spring pumping system	7,900
Rove spring	2,000
Kombito spring	2,000

Source : JICA Study Team

For the outline of intermediate water treatment facility to reduce turbidity, refer to Option J-1.

B2.3.4 Option J-3

Facility improvement plan to be proposed in Option J-3 is shown in Figure B2.3-13.

(1) Water Distribution District

Based on the basic policy, water distribution districts which have own water source and reservoir are selected as shown in Table B2.3-27.