B2.3 Plan for Water Supply Facility Improvement

B2.3.1 Policy for Water Supply Facility Improvement in Honiara

(1) Proposed Options

For the facility improvement plan for water supply, AusAID gave technical assistance to Solomon and the feasibility study (F/S) report was prepared in 2000. In the present Study, unit prices for materials and equipment of the AusAID report have been applied in the cost estimation in the Study.

In this Study, three (3) options shall be examined taking into account utilization of the existing water sources and development of the new groundwater sources as shown in Table B2.3-1. And finally these options are compared in view of technical viability, financial aspect and operation & maintenance aspect.

Table B2.3-1 Options for Water Supply Facility Improvement Plan in JICA Study

Option	Outline of Plan
J-1	◆ At present (2005), water from Konglai Spring is distributed through gravity system and pumped system. ◆ High lift pumping station of the pumped system is now distributing about 67% of water from this spring source to the west side of the city which accounts for 47% of the total water distribution in Honiara. ◆ In order to shift the water source from unstable Konglai Spring to stable groundwater inside the city boundary, the high lift pumping station which consumes much electric power is cancelled. ◆ As a result, the distributed water amount from Konglai Spring in this option becomes 14 percent of the total water production in Honiara. ◆ This reduction shall be compensated by the new groundwater sources to be newly developed inside the city boundary. ◆ In this option, sixteen (16) new boreholes will be developed.
J-2	◆ It is proposed that Konglai Spring be still utilized with the current intake amount which accounts for 40 percent of the total water production for 2010 in Honiara ◆ In this option, six (6) new boreholes will be developed to cover the shortage against the current capacity of water sources.
J-3	◆ This option is similar in principle to Option J-1. ◆ It is proposed that White River JICA Borefield, used as a reserve in Option J-1, be utilized so that the needs for new groundwater development can be reduced. ◆ The distributed water amount from Konglai Spring in this option accounts for 17 percent of the total water production for 2010 in Honiara. ◆ In this option, twelve (12) new boreholes will be developed.

Source : JICA Study Team

The plan includes following components:

- Development of new boreholes
- Construction of water transmission pump stations
- Expansion of water distribution reservoirs
- Expansion of main water distribution pipelines
- Construction of intermediate water treatment facility for spring water sources

(2) Basic Policy for Facility Improvement Plan

For the facility improvement plan for the year 2010, major issues facing SIWA and the basic policy for formulating the plan are shown in Table B2.3-2.

According to the results of the socio-economic survey in the Study, major concerns of the people for water supply system in Honiara are as follows;

1. Tap water shows high turbidity after heavy rain.
2. Water pressure is low.
3. Old pipes should be replaced.

Therefore, the facility improvement plan for water supply system in Honiara shall be formulated so that the countermeasures can be taken to solve above major issues and the problems facing SIWA.

Table B2.3-2 Basic Policy for Facility Improvement Plan

Issue to be solved	Current Situation	Countermeasures for Improvement
Water source	More than 50% of water sources in Honiara rely on Konglai Spring. This source is subject to sudden suspension of water supply due to blockage by natural calamity or intentional blockage by the residents. More over, it is located in the customary land, so that the Government has to pay the landowners 25% of the water revenue from this source. Therefore, SIWA is desirous of shifting this spring source to the groundwater sources inside the town boundary.	Three (3) options mentioned above shall be examined.
Water distribution district	Water transmission pipeline and distribution pipeline are not separated so that the water distribution reservoir can not work with its original functions such as absorbing peak demand, supplementing water supply in emergency case, etc.	Water distribution district shall be separated in such a way that the distribution facilities work independently as much as possible which has own water source and water reservoir with enough storage capacity (see Figure B1.4-x).
Water pressure	Many areas are suffering from low water pressure at the peak demand.	Water is supplied from each independent water reservoir in each district. By this, the water pressure can be stabilized.
Pipe diameter	Pipe diameters are too small to transfer the required water to customers. Inadequate pipe diameter is also the cause of low water pressure.	Enough pipe diameters shall be adopted after the examination by hydraulic analysis of water network.
Storage capacity of reservoir	Currently, nine (9) reservoirs are being operated and their capacity is about 6,000m^3 corresponding to less than 6 hour-volume of daily maximum water demand.	Storage capacity shall have 12 hour-volume of daily maximum water demand, taking into account a peak demand, emergency case and fire fighting activity.
Turbidity of spring water	Tap water often shows high turbidity after heavy rain in the catchment area of each spring source.	Intermediate water treatment facility shall be installed inside the town boundary and near the intake point of each spring source.
Water supply to the unserved areas	Unserved water supply area accounts for 30% of water distribution districts of SIWA.	Water distribution mains are expanded to the unserved areas.

Source : SIWA

B2.3.2 Option J-1

Facility improvement plan to be proposed in Option J-1 is shown in Figure B2.3-1.

(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 B2.3-3.

Table B2.3-3 Water Distribution District in 2010 for Option J-1

No.	Water Distribution District	Water Source	Supply Area	Demand (m^3/day)
1	Konglai spring (gravity) - Tasahe	Konglai spring (gravity) + Tasahe new borefield	Point Cruz	6,471
2	Tasahe	Tasahe new borefield	Tasahe and Ngossi	1,007
3	Titinge - Skyline	Titinge new borefield + Skyline new borefield	Titinge and Vavae	2,798
			Bokonavera	1,833
4	Rove Spring	Rove spring	CBD	1,671
5	Mataniko	Mataniko new borefield	China Town	3,058
6	Skyline - Mataniko	Skyline new borefield + Mataniko existing borefiield	West & East Kolaa	3,145
7	Borderline - Kombito	Borderline new borefield + Kombito existing borefield	Naha/Vura	5,437
8	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-1 are shown in Figure B2.3-2 and Figure B2.3-3.

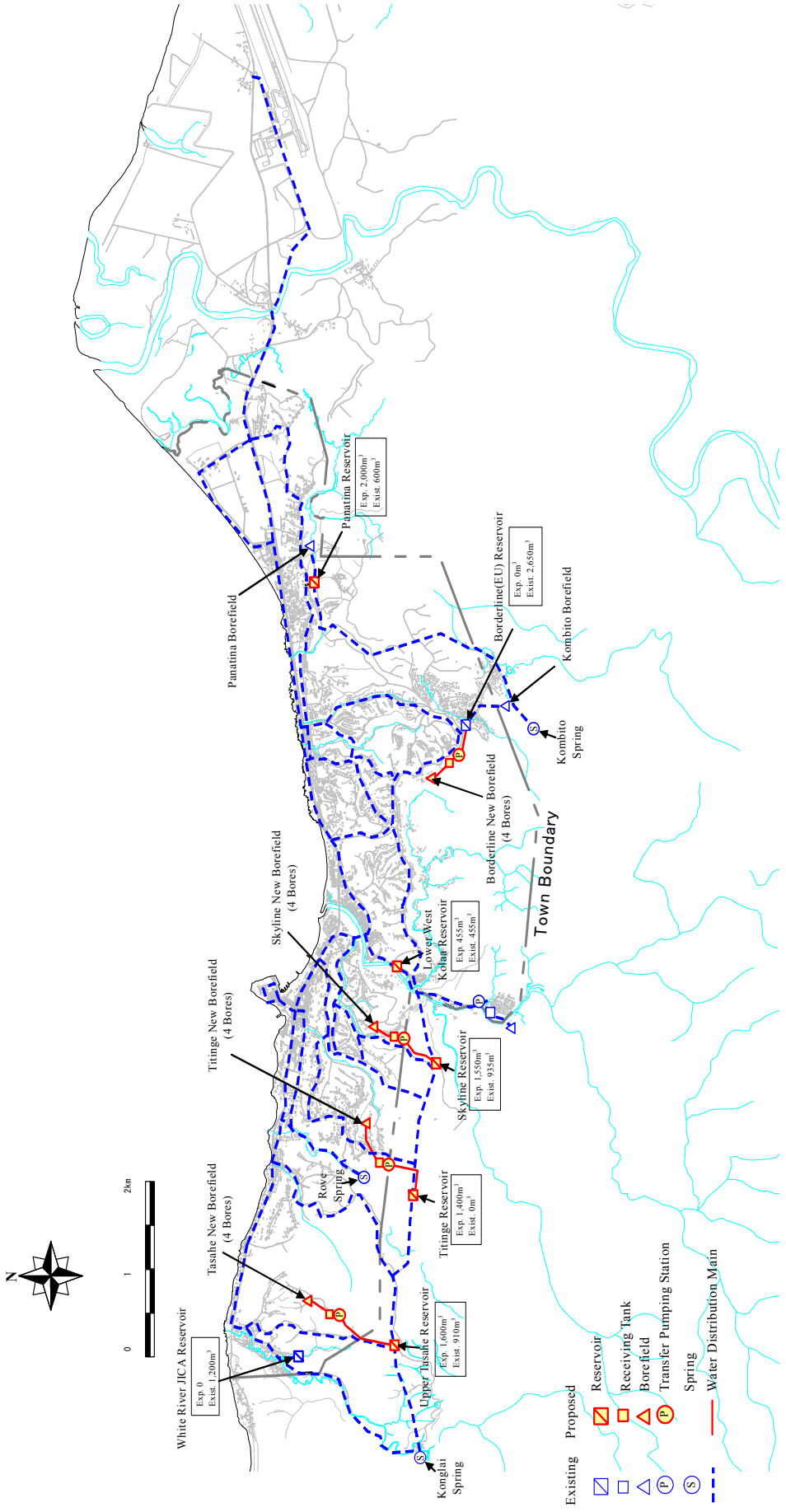


Figure B2.3-1 Option J-1 : General Layout of Water Supply Facilities in 2010

Source : JICA Study Team

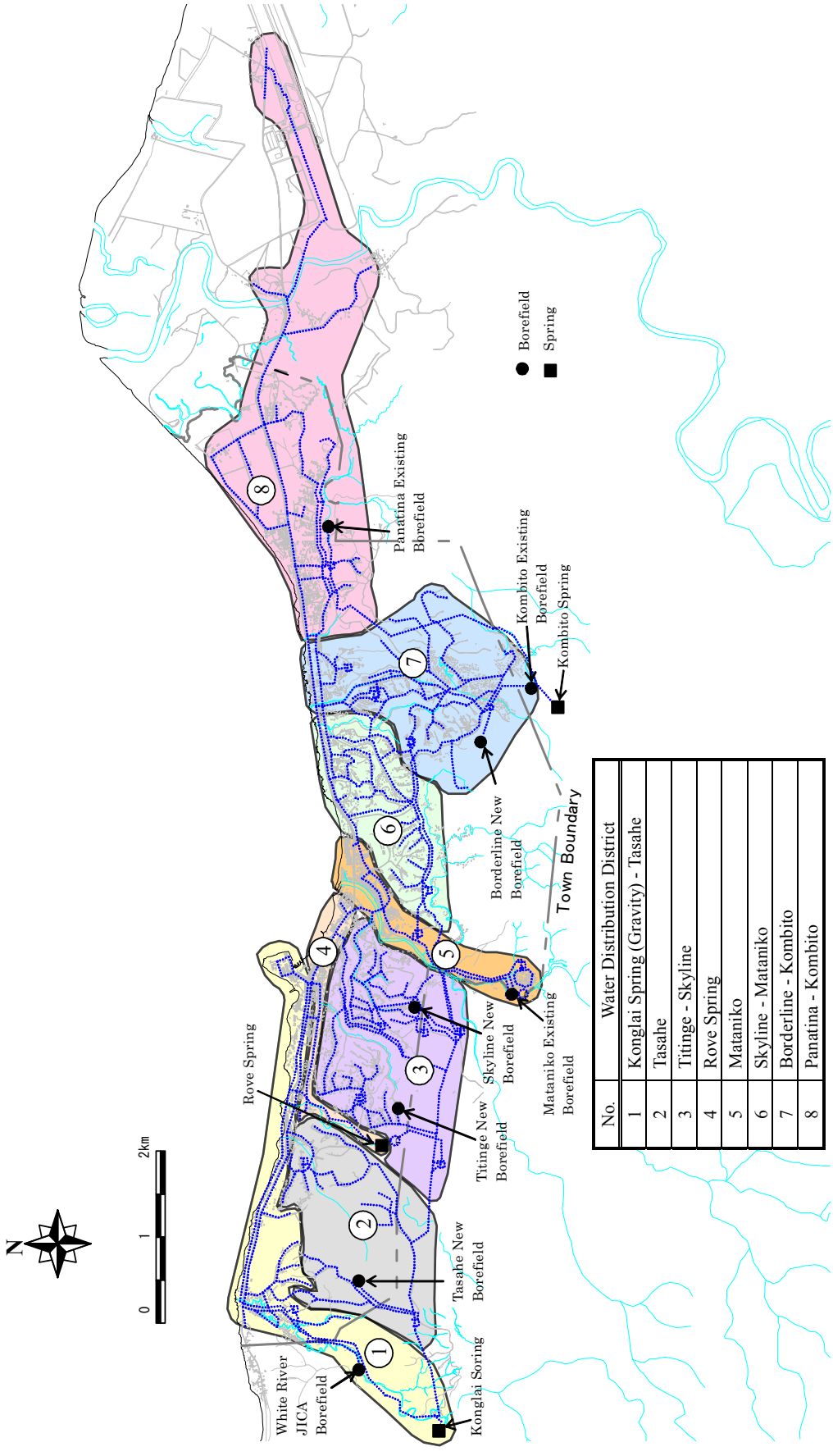


Figure B2.3-2 Option J-1 : Water Distribution District in 2010

Source : JICA Study Team

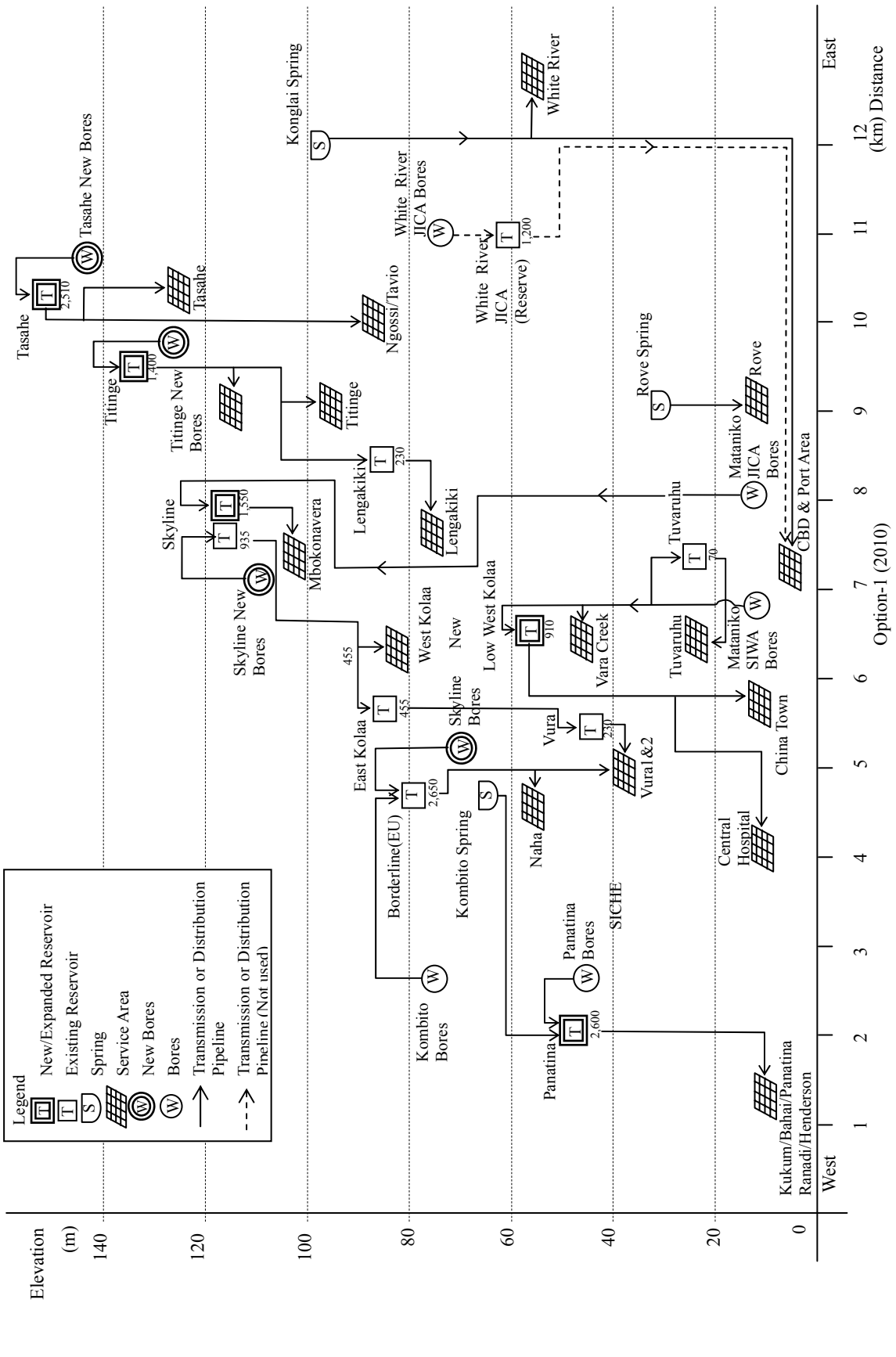


Figure B2.3-3 Option J-1 : Profiles of Water Supply Facilities in 2010

Source : JICA Study Team

(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 B2.3-4. 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 B2.3-4.

Table B2.3-4 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	0		
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**	**-7,849**	**17,870**	**12,717**	**16**

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 B2.3-5 Specification of Bores and Borehole 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 B2.3-6.

Table B2.3-6 Water Conveyance Mains

Route	Diameter (mm)	Length (m)
Tasahe new borefield	150	1,550
Titinge new borefield	150	1,600
Skyline new borefield	150	1,100
Borderline new borefield	150	2,000
Total length		6,250

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 B2.3-7 Receiving Tank for New Water Sources

Source Name	Tank Capacity (m^3)	Reservoir to Transfer
Tasahe new borefield	150	Tasahe reservoir
Titinge new borefield	150	Titinge reservoir
Skyline new borefield	150	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 B2.3-8 below.

Table B2.3-8 Water Sources in Honiara for the year 2010

Water Source	Production Capacity (m^3/day)	Remarks
[Spring]		
Konglai spring	4,246	Existing
Rove spring	1,795	Existing
Kombito spring	1,620	Existing
Spring Total	7,661	
[Borefields]		
White River borefield	(2,480)	Existing (for reserve)
Mataniko borefield	4,614	Existing
Kombito borefield	1,931	Existing
Panatina borefield	3,664	Existing
Tasahe new borefield	3,200	Newly developed
Titinge new borefield	3,200	Newly developed
Skyline new borefield	3,200	Newly developed
Borderline new borefield	3,200	Newly developed
Borefield Total	23,009	
Total (duty)	30,670	This amount meets the water demand in 2010.
For reserve	2,480	
Total (potential)	(33,150)	

Source : JICA Study Team

Figure B2.3-4 shows the locations and production capacity of each water source in 2010. For the current situation of water source, refer to Figure B2.1-1.

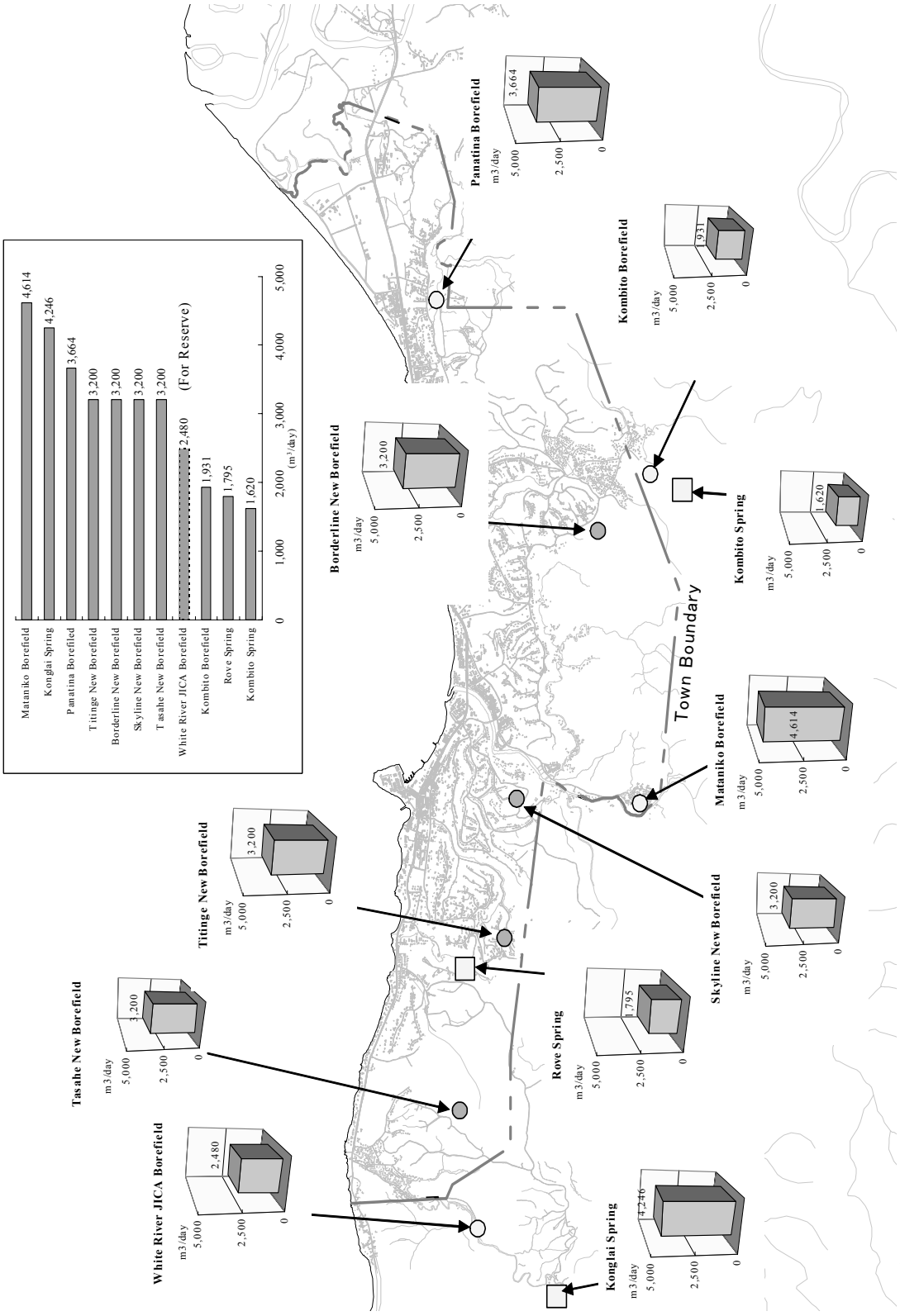


Figure B2.3-4 Water Sources in 2010 for Option J-1

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 B2.3-9.

Table B2.3-9 Specifications of Transmission Pump

Water Source	Pump Specification (per unit)			Reservoir to Transfer
	Capacity (L/sec)	Head (m)	Power (kW)	
Tasahe new borefield	18.5	80	30.0	Tasahe reservoir
Titinge new borefield	18.5	60	22.0	Titinge reservoir
Skyline new borefield	18.5	60	22.0	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 B2.3-10 Water Transmission Mains

Route	Diameter (mm)	Length (m)
Tasahe new borefield to Tasahe reservoir	250	950
Titinge new borefield to Titinge reservoir	250	700
Skyline new borefield to Skyline reservoir	200	800
Borderline new borefield to Borderline reservoir	200	300
Total Length		2,750

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 B2.3-11. 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 B2.3-11 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)	Tasahe New Borefield	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 existng Tasahe reservoir site .
2	Tasahe New Borefield		Tasahe and Ngossi	1,007	504	910	Tasahe reservoir shall be utilized.	407		
				7,478	3,739	2,110		-1,629		
3	Titinge New Borefield	Skyline New Borefield	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.
4	Rove Spring		CBD	1,671	836	900	Rove spring is functioned as a reservoir.	64	0	Near Rove Spring site.
5	Mataniko Existing Borefield		China Town	3,058	1,529	455	Tuvaruhu reservoir shall be utilized and one of Lower West Kolaa reservoirs shall be replaced.	-1,074	455	In the premises of Lower West Kolaa Reservoir site. No space for the required expansion.
6	Skyline New Borefield	Mataniko Existing Borefield	West & East Kolaa	3,145	1,573	455	SIWA revervoir shall be utilized.	-1,118	1,100	In the premises of Skyline SIWA reservoir site.
7	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.
8	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	7,650		-7,644	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 B2.3-12.

Table B2.3-12 Water Reservoirs for Option J-1 (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
Tasahe	Tasahe	910	1,600	2,510
Titinge-Skyline	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

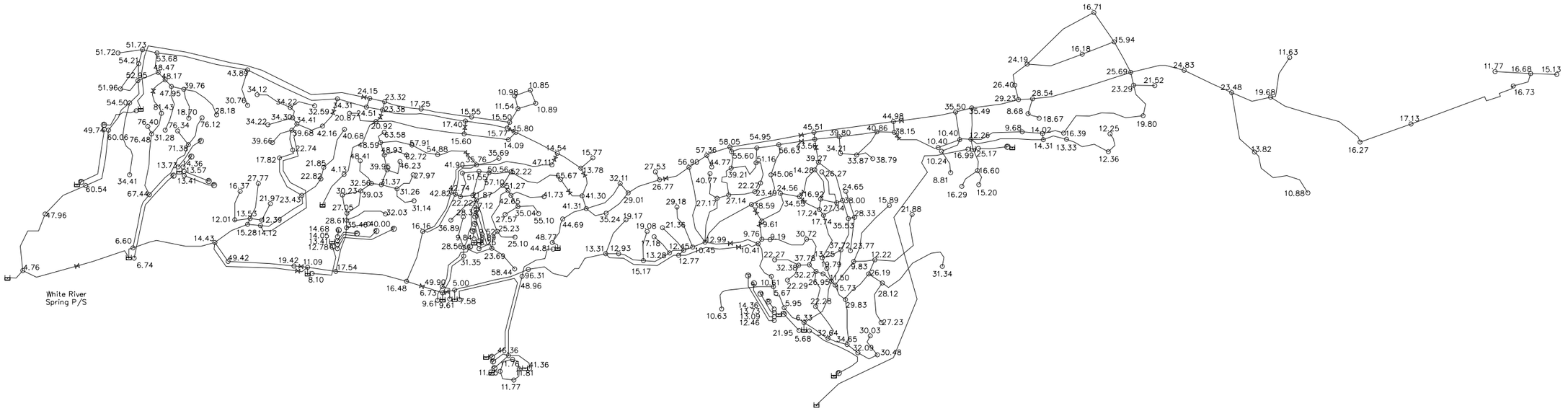
All the data for the network analysis is compiled in S-6 of Supporting Report.

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 B2.3-5. 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

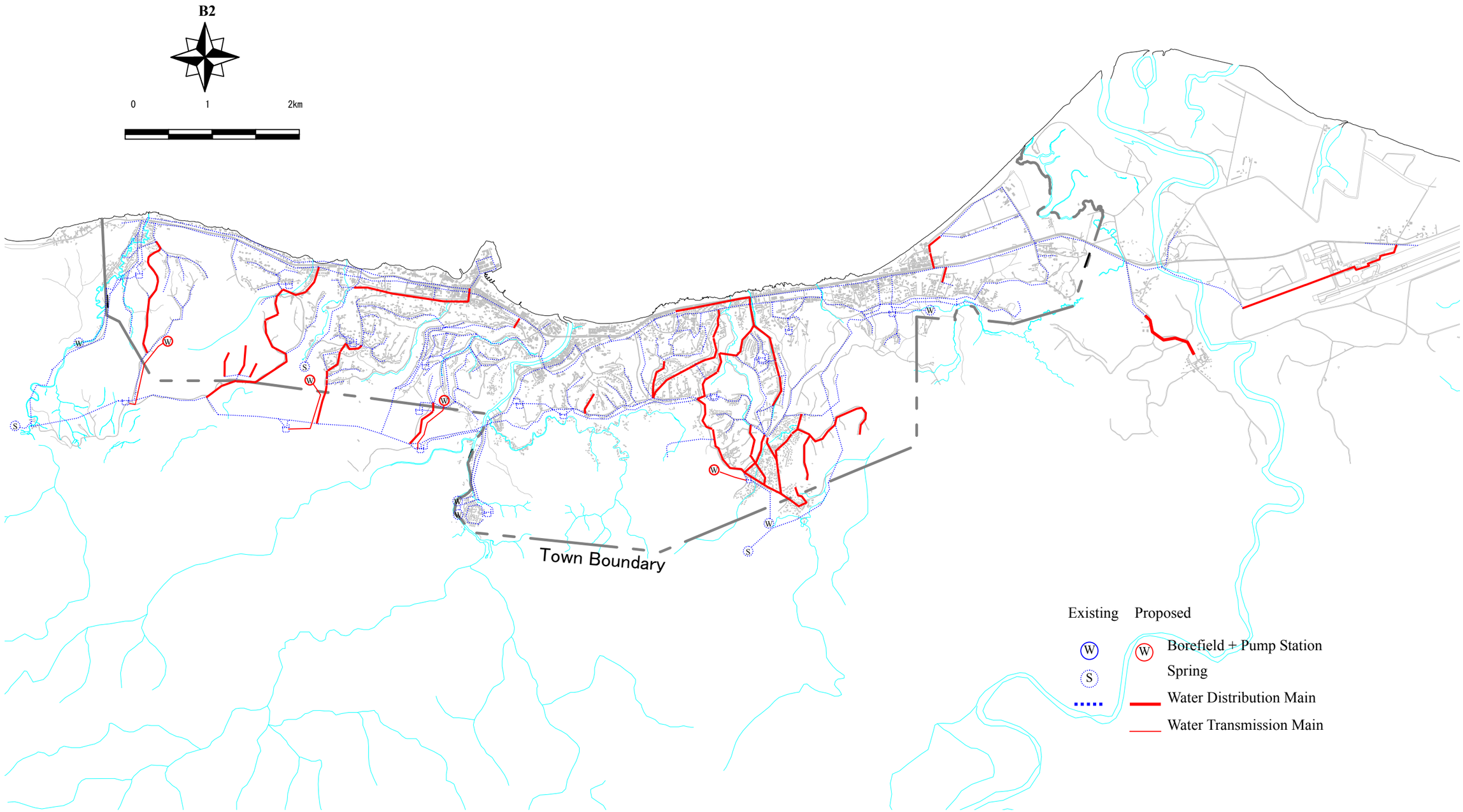
According to the hydraulic analysis, it is found that diameters of some of the water distribution mains are not enough for the design peak flow. Therefore, the water distribution mains shall be replaced as shown in Figure B2.3-6. The total length of the replacement including expansion in Kombito area is about 26km with diameters of 50mm to 300mm.



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

Source : JICA Study Team

Figure B2.3-5 Effective Water Pressure in 2010 (Option J-1)



Source : JICA Study Team

Figure B2.3-6 Replacement and Expansion of Water Distribution Main for Year 2010 (Option J-1)