PART D

CONDITIONS OF WATER SUPPLY AND SEWERAGE MANAGEMENT BY SIWA

PART D CURRENT MANAGEMENT CONDITIONS OF SIWA

D1 Tariff Structure and Water Sales

D1.1 Current Tariff Structure

Based on the recommendation of the study financed by the European Commission in 2003, SIWA introduced a tariff adjustment which brought SIWA's water tariffs to less inadequate levels, by raising the commercial/government tariff from SI$3.00 to SI$5.60 and SI$6.16 per m^3 respectively and the tariff for domestic consumers to a uniform tariff of SI$1.00 per m^3 from SI$1.30 per m^3 for the first 30m^3 and SI$2.42 per m^3 for consumption thereafter. SIWA also collects the sewerage service charge for half the water consumption in Honiara. Some 1,000 households and commercial/institutional set-ups are connected to the sewer network.

This measure would help in reducing SIWA's huge acute liquidity problems: especially, SI$17million in arrears and outstanding liabilities for SIEA.

The Solomon Islands Government (GIS) approved SIWA began billing customers new water tariffs, which were more than double the previous levels, since October 2003. This measure constitutes an encouraging beginning towards the restoration of SIWA's financial soundness.

Table D1.1-1 Fees and Charges

(Unit: SI$)

Classification		Effective from 1995	Effective from July 2001	Present Tariff (Effective from Oct. 2003)
Domestic (per 1m^3)	(<=30 m^3) Life line	0.65	1.30	1.00
	>30 m^3	1.30	1.30	2.42
Commercial	Per 1 m^3		3.00	5.60
Government	Per 1 m^3			6.16
Standing Charge	Per Month			6.20
Connection Fee (Less than 10m, more than 10m to be assessed)	Domestic	350.00		400.00
	Commercial			700.00
Deposit (Refundable, Trust Account)	Domestic		60.00	500.00
	Commercial		300.00	1,000.00

Source: Sales and Customer Service Dept., SIWA

D1.2 Number of Customers and Collection Efficiency

(1) Number of customers

The number of customers/users is around 6,800 on the basis of issued bills as of April 2005. Domestic (private houses) customers are in the majority, as shown in Table D1.2-1 and Table D1.2-2.

Large water customers are the commercial users and governmental institutions shown in Table D1.2-3.

Table D1.2-1 Number of Customers and Meter Status in April 2005

Customers	No. of Current Active Customers (*1)	No. of Disconnected Customers (*2)	No. of Vacated Premise (*3)	No. of Non-Functioning Meters (*4)	Total
- Commercial	617	240	87	22	966
- Domestic	5,434	869	728	344	7,375
- Government	198			10	208
- Police	107			3	110
Grand Total	6,356	1,109	815	379	8,659

Notes: 1. Number of customers with functioning meters.
2. Number of disconnected meters by April 2005.
3. Number of customers is not identified.
4. Number of non-functioning meters, but bills are issued on estimated (flat rates).

Source: First Quarter Report 2005, SIWA

Table D1.2-2 Number of Issued Bills by Area

Area charge	No. of Customers in 2005		
	January	February	March
Honiara	6,028	6,002	6,029
Auki	396	396	396
Tulagi	162	164	163
Noro	246	245	
Total	6,832	6,807	6,588

Source: First Quarter Report 2005, SIWA

Table D1.2-3 Number of Large Water Users in Honiara

Name	No. of Meter
SICHE	35
Solbrew	2
Soltaiyo	10
Solgreen	4
NBSI	10
SIEA	2
Honiara City Council	28
Honiara City Council-Institutions	11
Hotel (Number of connections)	20
Motels (Number of connections)	26
NPF	7
Ground Total (Functioning Meter)	154

Source: First Quarter Report 2005, SIWA

(2) Water Sales and Collected Amount

The amount of the average monthly revenue for water was recorded at about 410,000m^3 in FY2005, of which domestic sales and commercial sales accounted for 58% and 42% respectively. Water sales in Honiara accounted for more than 90% of the total water sales in Honiara, as shown in Table D1.2-4.

Table D1.2-4 Operation Income for FY2003-FY2005

(Unit: SI$1000)

		FY2003		FY2004		FY2005	
	Income-Honiara (A+B)	14,853.7	93.5%	15,471.0	89.9%	19,367.4	91.7%
A	**Water Supply-Honiara**	14,062.7	88.5%	13,755.5	79.9%	17,406.4	82.4%
	Domestic Water	2,715.2	17.1%	2,167.5	12.6%	4,182.0	19.8%
	Commercial Water	10,694.5	67.3%	10,571.2	61.4%	11,206.0	53.1%
	Standing Charge	502.0	3.2%	514.7	3.0%	1,551.4	7.3%
	Other Income	151.0	1.0%	502.1	2.9%	467.0	2.2%
B	**Sewerage-Honiara**	791.0	5.0%	1,715.5	10.0%	1,961.0	9.3%
C	**Provinces**	1,034.5	6.5%	1,746.9	10.1%	1,753.0	8.3%
	Auki	8.6	0.1%	6.2	0.0%	145.0	0.7%
	Noro	820.0	5.2%	1,380.3	8.0%	1,137.0	5.4%
	Tulagi	205.9	1.3%	360.4	2.1%	471.0	2.2%
D	**Total Income(A+B+C)**	**15,888.2**	**100%**	**17,217.9**	**100%**	**21,120.4**	**100%**

Note : Value is actual data
Source : SIWA

(3) Billing Process and Disconnection of Water Meters

The billing process is as follows.

Each household unit has a separate meter. Water meters are read on a monthly basis for all water users/customers.

Bills are processed on a monthly basis on the meter or based on estimated (flat rates) of former consumption in the case of meter breakdown.

The Sales and Customer Services Department issues approximately 6,800 invoices monthly and the overall process absorbs a complete month of employment for the department

The SIWA billing process starts only after a full month of consumption by the clients and in addition to this pre-financing (advance received), the billing process takes another month before bills are handed over to the clients with another 30 days allowed for payment.

Payments of invoices are mostly processed in cash at SIWA's Headquarters counter, rather than through the bank account. Most foreigners, however, pay cash into SIWA's bank account.

Accounts are forwarded to all customers on a monthly basis. Properties that are connected to water and metered are forwarded accounts when the meters have been read. Accounts are also forwarded when there has been a change of postal address (PO Box). All accounts are subject to a settlement period of 30 days and become payable 30 days after the date of receipt. The recovery process allows 7 days after the initial due date prior to the commencement of following action, to allow for postal delays, etc. Where the account has not been paid by the due date, a reminder letter is sent. A reminder letter is therefore sent when the outstanding amount is over 37 days; allowing the customer to pay within 7 days. When the account is not paid within seven days, further recovery action will be taken. Interest for 30 days will be charged from the due date. The reminder letter is a standard letter which is ready to be printed for customers who do not settle their accounts by the due date.

A "Notice of Proposed Disconnection" will be sent to customers if a reminder letter has not been acted upon and the amount remains outstanding or the account is overdue and there has been previous recovery action within the last 12 months. The proposed disconnection notices are produced and sent to the customer by mail. If payment is made within 7 days, the next step of the recovery process, i.e., the disconnection of the water supply can be avoided.

The water supply may be disconnected in case the customer has not responded to the previous notice of proposed disconnection, or the customer has failed to meet any payment arrangement made with SIWA. The individual unit may have the water disconnected for non payment of the account. The fees

payable by the customer in this recovery process are as follows;

- Survey & Inspection fee – cost of visiting the property and water, not disconnection: SI$15.00
- Cost of disconnecting the supply: SI$50.00
- Reconnection fee – cost of restoring the supply upon payment or satisfactory payment arrangement: SI$50.00

Where customers have not responded satisfactorily to the previous recovery action steps, SIWA will undertake court action in an attempt to recover the debt. Each home unit has a separate meter

The actual billing-system is processed on newly installed Unix software (PUB: Public Utility Billing) in October 2001, which could be a very high performer. This billing system was upgraded to the Linux system from 27 April 2005. Software conversion from Unix to Linux meant it could be easily integrated with Windows-based products and made it much faster and easier to maintain.

Billing inputs were done using handheld PCs. This has given a digital twist to the meter reading which should improve them and accelerate the billing process. It has also been very helpful in producing the bills. The billing department can now concentrate on checking the bills before dispatching them to customers postal boxes. This was also done by uploading and downloading the reading then allocated to the customer account.

D1.3 Special Circumstances

(1) Lease Agreements with Landowner

Currently about 50% of SIWA's water sources depend on Konglai Spring, where a lease agreement is concluded between the Department of Lands and the landowners. The Department is paying a few landowners 25% of the water sales revenue from the Konglai Spring source, corresponding to the distributed amount per month at the Skyline tank, as calculated by SIWA.

For example, water distribution from Konglai Spring for April 2005 is estimated at 60,773 m^3 per month (the amount deducted 64,800m^3 distributed by Mataniko borefield from 125,573m^3). This means total water sales from Konglai are estimated at SI$114,062 of which SI$26,515 (25%) is due to landowners.

(2) Small Revenue from Auki

Revenue from Auki is very small due to insufficient water distribution volume. Although a water supply facility rehabilitation project is under construction by the Asian Development Bank (ADB) in Auki, to upgrade existing water distribution facilities, groundwater development as a new water source is indispensable.

D1.4 Technical Assistance by Foreign Donors

(1) The World Bank

The World Bank carried out the technical assistances for power and water utilities restructuring, management and regulation at the request of the Solomon Islands Government (SIG).

The following paragraphs are extracted from "The Final Report: Implementation of Management Contract - the Solomon Islands Electricity Authority (SIEA) and the Solomon Islands Water Authority (SIWA)" prepared by the consultants in September 2005.

In February, 2005 the World Bank (WB) and the Solomon Islands Government (SIG) initiated a project to prepare a financial restructuring plan for SIEA and to formulate various private sector participation (PSP) options for the SIEA. The PSP study was to review the industry structure and PSP options,

including the potential for a multi-utility PSP option involving SIEA and the Solomon Islands Water Authority (SIWA), recommend a PSP option and develop an implementation plan for that option. the Consultant (PricewaterhouseCoopers in association with Allens Arthur Robinson) were engaged by the World Bank to carry out this project.

In Phase 1 of the project, the Consultants prepared a diagnostic review of the power sector, including a description of the current institutional and regulatory framework, in particular, policy-formulation and tariff-setting/implementation, procedures for establishing and monitoring quality standards currently in place in the country; and the extent and nature of subsidization in the electricity sector.

In Phase 2 of the project, the Consultants assessed the power and water industry structure and PSP options. The Consultants concluded that there were substantial efficiency gains to be realised by operating a single electricity and water authority. Of the PSP options, a concession arrangement ranked the highest in terms of achievement of Government objectives, particularly because it provides access to private capital investment in the power sector and offers an attractive mix of private sector capital and management expertise. However our discussions with private sector parties indicate no interest from the private sector in a concession arrangement. Five companies from Australia and one company in the Solomon Islands have indicated an interest in bidding for a management contract. The Consultants recommended that a five year management contract be implemented for both SIEA and SIWA where the management contractor would be expected to initially run the two authorities separately during a transition period before they were legally merged into one authority. A management contract, if properly implemented, can prepare SIEA and SIWA for the future application of a fuller form of PSP (e.g. a concession in 5 years time).

The objectives of the management contract will be to establish an efficient and reliable operation and management of the electricity and water sectors in current service locations and to achieve full localisation of both authorities.

The management contract procurement process should consist of a pre-qualification phase to identify a shortlist of suitable companies and a tender phase to select the best company. The entire procurement process may take anywhere from five to seven months. The detailed project plan for the procurement process will need to be prepared as part of the next stage of the project, in close consultation with the funding agency and SIG.

(2) Asian Development Bank

The Government has agreed to the provision of ADB's technical assistance, co-financed by the Government of Australia, to examine PSP options for the nation's State-Owned Enterprises (SOE). SIG has 17 SOEs, including SIWA. The purpose of the assistance is to improve the SOE ownership arrangements, accountability and performance with the goal of improving the environment for the private sector and rehabilitating the economy. It will include four (4) main components that are closely linked. These are 1) SOE ownership policy, strategy, and a legal and regulatory framework, 2) SOE reporting and performance monitoring, 3) Examination of possible privatization options, and 4) Capacity building for local counterparts at the Department of Finance and Treasury, other relevant ministers, and SOEs.

The assistance consists of a total of 24 person months with both international and domestic consultants, and will be implemented over the 24 month period from March 2005 until February 2007. A steering committee will be established with selected senior officers from relevant government departments to help build consensus and drive the reform process.

(3) Coordination with Technical Assistance by Foreign Donors

Mutually compatible technical assistance has been provided and implemented by the World Bank, ADB and JICA Study to improve public sectors in the Solomon Islands.

Once this technical assistance ends, SIWA management is expected to be smoothly implemented by

SIWA's staff, from senior management to employees, as an autonomous organization, focusing on securing its financial autonomy.

D2 Financial Situation

D2.1 Financial Performance

SIWA's Annual Budget is drafted by the end of the previous year. The draft budget is prepared by each department, starting with provincial departments, before subsequent internal adjustment is made by senior management staff (the general manager and 3 division managers). Finally SIWA's board approves the budget. Daily expenses are also accounted and controlled at a division level. The main reason is to facilitate control of all expenses.

SIWA's financial performance from the FY2003 to FY2005 (estimated) is shown in Table D2.2-5.

The total balances for the years 2000 and 2001 went into the red due to insufficient performance activities of SIWA, when affected by ethnic tension (the end of 1998 to October 2000). Since FY2003 however, the total balance shows some profits have been made against total income. In FY2004, total revenue was some SI$17.2 million and total expenditure, including capital costs (not including depreciation) some SI$12 million, meaning a profit of some SI$5.1 million, equivalent to 29% of total revenue, was achieved. One of the main reasons is due to changes in the tariff and bill structure from October 2003 and the fact that SIWA's revenue account increased more than the previous year.

D2.2 Performance in FY2005

As for the budget in FY2005, total expenditures (SI$26.2 million), including capital costs, exceeded total income (SI$7.9 million). However, total income was more than recurrent expenses (SI$18.3 million), even though electricity arrears were taken into account as a debt to settle with SIEA.

(1) Operating Income

Total income in FY2005 is expected to be some SI$21 million, representing an increase of 16% on the SI$17.2 million of FY2004. The income consists of water charges, such as water consumption, standing charge, connection and disconnection fees, etc., and sewerage from house unit (domestic customers), commercial and government. The commercial water bills account for more than 50%, because of water tariffs and consumptions, while sewerage income accounts for some 10% of total revenue.

SIWA's service covers Honiara and three provincial centers, such as Noro, Auki and Tulagi. The income from Honiara accounts for about 90% of total income, while that from the provincial centers accounts for a very small proportion. It should be noted, however, that income from Auki is quite small when the customer numbers are compared, 246 customers in Noro, 396 customers in Auki, and 162 customers in Tulagi at the end of January 2005.

Other income consists of monthly standing charges, connection and disconnection fees, meter testing fees, plumbing investigation fees, deposits, etc.

It should be noted that debt and arrears were accumulated to SI$17.7million up to the end of April 2005. This amount is nearly equivalent to the amount of electricity debt and arrears owed to SIEA. Receivables from government institutions accounted for some 35%, of which some 49% from domestic customers and some 16% from commercial customers of the total debt amount, as of 31 December 2004. The government institution started to pay water bills and charge since October 2003.

Water sales for domestic and commercial customers accounted for 22% and 58% respectively, as shown in Table D2.2-1. Water sales value was about SI$1.6 million per month, as shown in Table D2.2-2.

The water bill collection ratio (the actual collected amount/monthly revenue target) shows 88% as a monthly average for FY2005, as shown in Table D2.2-3.

Table D2.2-1 Water Sales Unit in FY2005

		Unit per Month (1000K Litter)												Average	Estimated	Share
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	/month	/Year	(%)
Honiara	Domestic	224	217	198	179	298	292	141	197	281	301	167	158	221	2,653	59%
	Commercial	180	349	127	111	154	206	43	128	160	151	136	100	154	1,845	41%
	Total	404	566	325	290	452	498	183	325	441	452	303	258	375	4,498	100%
Auki	Domestic							6	2	3	3	2		3	38	76%
	Commercial							1	1		1	1		1	12	24%
	Total							7	3	3	4	3		4	50	100%
Tulagi	Domestic	5	6	6	7	6	6	6	15	8	6	5	6	7	82	64%
	Commercial	5	4	5	5	4	3	4	3	2	5	4	3	4	47	36%
	Total	10	10	11	12	10	9	10	18	10	11	9		11	129	100%
Noro	Domestic	8	10		17	12	13	12	11	16	10	10	7	11	137	46%
	Commercial	10	17		31	13	13	8	11	10	11	12	9	13	158	54%
	Total	18	26		48	25	26	20	22	26	21	22	16	25	296	100%
	Domestic	237	233	204	203	316	311	165	225	308	320	184	171	240	2,877	58%
Total	Commercial	195	370	132	147	171	222	56	143	172	168	153	112	170	2,041	42%
	Total	432	603	336	350	487	533	221	368	480	488	337	283	410	4,918	100%

Source: DSCS Monthly Quarter Report 2005, SIWA

Table D2.2-2 Water Sales Value in FY2005

		Value per Month (SI$1000)												Average	Estimated	Share
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	/month	/Year	(%)
Honiara	Domestic	341	318	320	277	485	525	176	282	476	510	260	212	349	4,182	23%
	Commercial	1,006	1,961	709	623	953	1,308	348	816	1,019	964	860	639	934	11,206	63%
	Sewerage	118	126	137	96	211	377	104	155	186	168	161	122	163	1,961	11%
	Others	38	38	38	29	48	38	39	40	41	40	40	38	39	467	3%
	Total	1,503	2,443	1,204	1,025	1,697	2,248	667	1,293	1,722	1,682	1,321	1,011	1,485	17,816	100%
Auki	Domestic	3	3	3	3			39	13	17	26	13	1	12	145	44%
	Commercial	3	3	3	3			47	18	12	6	15		12	147	44%
	Others	3	3	3	3			8	3	3	3	2		3	41	12%
	Total	9	9	9	9			94	34	32	35	30	1	26	333	100%
Tulagi	Domestic	8	12	11	17	13	12	13	39	16	12	17	12	15	182	39%
	Commercial	28	21	28	28	25	18	24	18	13	30	26	19	23	278	59%
	Others	1	1	1	1	1	0	1	1	1	1	1	1	1	11	2%
	Total	37	34	40	46	39	30	38	58	30	43	44	32	39	471	100%
Noro	Domestic	14	17		17	20	24	23	20	31	18	19	12	20	235	21%
	Commercial	55	93		31	73	73	43	61	55	59	66	52	60	721	63%
	Others	1	2		153	2	1	1	1	2	1	1	1	15	181	16%
	Total	70	112		201	95	98	67	82	88	78	86	65	95	1,137	100%
	Domestic	366	350	334	314	518	561	251	354	540	566	309	237	395	4,744	24%
Total	Commercial	1,092	2,078	740	685	1,051	1,399	462	913	1,099	1,059	967	710	1,029	12,352	63%
	Sewerage	118	126	137	96	211	377	104	155	186	168	161	122	163	1,961	10%
	Others	43	44	42	186	51	39	49	45	47	45	44	40	58	700	4%
	Total	1,619	2,598	1,253	1,281	1,831	2,376	866	1,467	1,872	1,838	1,481	1,109	1,645	19,757	100%

Source: DSCS Monthly Quarter Report 2005, SIWA

Table D2.2-3 Monthly Bills and Receipt Comparison

	Value per Month (SI$1000) FY2005												Average	Estimated	Ratio of
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	/month	/Year	A (%)
A. Revenue Target	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670	1,670	20,040	100%
B. Billed Amount	1,619	2,598	1,253	1,281	1,831	2,376	866	1,467	1,872	1,838	1,481	1,109	1,633	19,757	99%
C. Actual Receipts	1,500	1,668	1,269	1,339	1,319	1,518	1,543	1,577	1,687	1,767	1,928	1,494	1,551	18,609	94%

Source: DSCS Monthly Quarter Report 2005, SIWA

Table D2.2-4 Government Arrears (January- April 2005)

Customer	SI$ (thousand)	Share
Government	2,516	37%
Royal Solomon Islands Police	2,464	36%
SICHE (College of Higher Education)	1,839	27%
Total	6,819	100%

Source : DSCS Quarterly Report 2005, SIWA

(2) Recurrent Expenses

Recurrent expenses amounted to some SI$10 million (excluding depreciation) in FY2004 and were estimated at some SI$16.7 million for FY2005. Recurrent expenses comprise i) employee costs, including NPF contributions and various kinds of allowances, ii) administration costs, including board members' allowances, computer and office equipment, stationery and postal charges, telephone and travel expenses, etc., and iii) operational costs, including electricity, motor vehicle repair costs and fuel, chemicals for water purification, land rental/compensation, etc.

Table D2.2-5 SIWA Financial Data

(Unit: SI$1000)

		FY2003		FY2004		FY2005	
I	**Total Income**	**15,888.2**	**100%**	**17,217.9**	**100%**	**21,120.4**	**100%**
II	**Recurrent Expenses (1+2+3)**	**6,068.2**	100.0%	**10,014.0**	100.0%	**16,771.7**	100.0%
1	**Employee Costs**	2,544.6	41.9%	2,911.3	48.0%	3,024.1	49.8%
	Salaries & Wages	1,862.1	30.7%	2,039.2	20.4%	2,170.0	12.9%
	Allowances	547.9		684.2		624.0	
	NPF Contributions	113.2		157.9		197.2	
	Others	21.4		30.1		33.0	
2	**Administration Costs**	2,009.6	33.1%	2,590.8	25.9%	5,966.1	35.6%
	Board Members Allowances	139.4		133.6		140.0	
	Audit & Accounting Fees	64.3		10.7		265.0	
	Awareness & Public Relations	59.0		140.2		10.0	
	Education/Training	30.0		18.0		286.0	
	Accommodations & Housing	841.1	13.9%	1,039.4	10.4%	1,194.0	7.1%
	Computer & Office Equipment	164.4		640.5		1,229.0	
	Printing, Stationery & Postage	96.8		309.1		473.5	
	Telephone	88.3		133.6		152.8	
	Transport & Travel	115.7		128.7		474.2	
	Others	410.6		37.1		1,741.6	
3	**Operation Costs**	1,514.0	25.0%	4,511.8	45.1%	7,781.5	46.4%
	Electricity	671.6	11.1%	3,150.3	31.5%	5,649.5	33.7%
	Motor Vehicles & Machine Repairs	263.9		963.0		1,009.0	
	Fuel & Lubricants	295.6		276.5		572.0	
	Chemicals	34.2		42.1		225.0	
	Land Rental/Compensation	58.6		40.6		208.5	
	Others	190.1		39.4		117.5	
III	**Balance (I-II)**	**9,820.0**	**61.8%**	**7,203.9**	**41.8%**	**4,348.7**	**20.6%**
IV	**Capital Costs**	718.5	_	2,062.5	_	7,922.3	_
	System Maintenance	591.3		1,379.2		3,081.5	
	Project Works	0.1		492.9		4,670.0	
	Tools & Equipments	127.1		190.3		170.8	
V	**Balance before Grants Aid (III-IV)**	**9,101.5**	**57.3%**	**5,141.4**	**29.9%**	**-3,573.6**	**-16.9%**
VI	**Government/Grants Aid**			**1,795.4**		**8,852.9**	
VII	**Total Balance (V+VI)**	**9,101.5**	**57.3%**	**6,936.8**	**40.3%**	**5,279.4**	**25.0%**

Note 1. Values in FY2003 and Fy2004 are recalculated based on the data by the SIWA department and values in FY2005 are estimated by the Study Team based on the 2006 Annual Budget.
2. Percentages of balance mean percentage of total income and other percentages are based on recurrent expenses.
Source : SIWA

(3) Employee Costs

SIWA has a total of 76 employees, including 4 senior management staff, comprising 1 General

Manager and 3 Departmental Managers. The senior management staff are engaged to perform their duties on a contractual basis, while other staff are employed on a salary basis.

Employee costs consist of 1) salaries and wages, 2) allowances, 3) NPF contributions and others. The salary scale depends on their position from level 1 to level 9, senior staff are positioned at level 8 and field workers, drivers, cleaners and gardeners are level 2, according to SIWA's Employment Regulations.

Allowances consist of i) overtime allowance, ii) acting allowance, iii) industrial allowance and iv) housing allowance.

NPF contribution is 7.5% of the basic salary.

Table D2.2-6 2004 Revised Salary Structure (SI$)

Grades	Annual Basic	Basic per F/N	Hourly Rate
1	9,673.95	372.08	4.96
2	13,142.42	505.48	6.74
3	17,932.20	689.70	9.20
4	24,350.04	936.54	12.49
5	29,399.37	1,130.75	15.08
6	37,846.38	1,455.63	19.41
7	45,609.14	1,754.20	23.39
8	52,758.42	2,029.17	27.06
9	59,317.83	2,281.46	30.42

Note: 1) Each grade is divided by 5 steps except for grade 1. These figures as step 3 are typified in each grade.
2) F/N means that fortnight, two weeks.
Source: SIWA

Their salary and wages are increased by some 10% yearly, reflecting the annual inflation rate in the Solomon Islands. Employment costs accounted for some 35% of recurrent expenses, which increased by some SI$3.0 million in FY2005. Basic salary and wages accounted for some 70% of employee costs and another 30% went on allowances and NPF contributions.

(4) Administration Costs

Administration costs accounted for some 35% of total recurrent expenses. SI$2.6 million in FY2004 is to be increased by SI$5.9 million in FY2005, almost double the figure of the previous year.

The most expensive item is accommodation and housing rental charge because SIWA is providing rental homes for their staff in accordance with the "Employment Terms and Conditions of Services".

In FY2005, computer and office equipment costs also made up a significant proportion of administration costs, because these costs mostly comprised computer consumables, computer hardware & upgrades, software upgrades and computer company's site visit support (catering for computer company's experts' on site visits) and catering for a new billing server, etc.

The audit fees for the period FY1997 to FY2004 (SI$25,000/year) are budgeted in FY2005. Therefore, this item is remarkable compared with the previous year. SIWA's Financial Statements for FY1996 were drawn up by PricewaterhouseCoopers and then approved by the Government in June of 2005.

Education and training costs are included in the form of staff awareness programs, long term financial and environmental staff training, database management, water & wastewater management, and an electrical license for short term training. However, this item accounts for just a modest proportion of total expenses.

(5) Operation Costs

Operation costs are the costs incurred in operating water supply and sewerage systems, which account for some 46% of total expenses. The largest portion of the operation costs is electricity charges, amounting to SI$3.1 million in FY2004 and SI$5.6 million in FY2005 respectively. According to the "2005 Approved Annual Budget", the estimated SIWA electricity cost was SI$3.5 million.

(a) Electricity

Electricity charges in FY2005 can be calculated by the following formula:

Total Electricity Charge /month =

Total consumption (Total 248,869 kWh)/month x

[Unit tariff (SI$0.825/kWh) + Fuel per annum (SI$0.84/kWh)] +

Service charge/meter (SI$20) x No. of installed meters (total 17 in 2005)

SIWA owed SIEA SI$17.885 million in arrears for electricity charges as of December 2004.

SIWA has reviewed the electricity bills received from SIEA for the period FY1999 to FY2004 and prepared "Financial Proposals for the Electricity Arrears" on 29 April 2005. According to this proposal, SIWA has concluded that it actually owed SIEA about SI$10.2 million at the end of December 2004 for arrears in electricity charges. In financing the arrears in the form of electricity bills for about SI$10.2 million, SIWA has three proposals for SIEA to consider, which are covered under options A, B and C. SIWA also requests that SIEA puts the total debt aside in a special account, so that any over payments on current bills can be credited against the same and not used to settle part of the arrears.

Option A: SIWA to finance the debt with SIG water arrears and interest and by installments. In this proposal, SIWA shall pay SIEA SI$0.2 million per month to settle the balance of SI$2.5 million (SI$10.2 M – SI$7.7 M (SIG owed SIWA SI$5.2 million in arrears on water bills and accumulating interest of SI$2.5 million)) over the period.

Option B: SIWA to finance the debt with SIG water arrears and by installments. In this proposal, SIWA to pay SIEA SI$0.2 million per month to settle the balance of SI$5 million (SI$10.2 M – SI$5.2 M (SIG owed SIWA in arrears on water bills)) over the period.

Option C: SIWA to finance the debt by installments. In this proposal, SIWA will finance 100% of the total debt owed and shall pay SIEA SI$0.2 million per month to settle the total debt over a period (a 4-year financing period is required).

The most preferable proposal for SIWA is outlined in Option C for SIEA to consider. SIWA also requests whether SIEA could consider granting some electricity concessions to SIWA to assist during the four-year debt-financing period.

SIWA has not yet received any answer to its proposals from SIEA. PricewaterhouseCoopers, under the contract with WB for the financial restructuring plan for SIEA, assessed SIWA's arrears at about SI$17million, which accounts for 30% of total electricity receivables from SIG and various public consumer bodies as of December 2004, based on the SIEA billing database.

This gap between SIWA and SIEA will be arbitrated by their supervisory organizations.

(b) Land rental and compensation

The Department of Lands has the responsibility to pay land rent for the sites of water sources, pipelines and water reservoirs, etc. However, SIWA has also responsibility to pay land rent for the

lease of the Skyline tank, borehole for the White River, and the pipeline for Tasahe and the provinces.

(c) Chemicals

Chemical costs are mostly incurred by the procurement of chlorine to ensure safety of the water supply, but also include small portions incurred on laboratory chemical analysis/reagents.

(6) Capital Costs

Capital costs mean investment costs for the rehabilitation of the water supply and sewerage system.

In the Department of Water Supply in FY2005, there are plans to implement rehabilitation of the Tuvaruhu new pump works, replacement of the lower west Kola tank, and of the Lengakiki tank roof, Konglai pump motor, submersible pump spares, Tuvaruhu fencing replacement, Rove source rehabilitation, and water tanker, etc.

Capital costs also include the costs of Tools and Equipments, of which procurement costs include bulk meters, correlators, ultrasonic flow measurement instruments, leak detection instruments, and pressure recorders, etc.

D3 Financial Forecast

D3.1 Preconditions

The assumption of an Income and Expenses statement should take account of annual inflation

(1) Inflation

The average annual rate of inflation (as measured by the 12 months moving average of the Honiara Retail Price Index) was 6.9% in FY2004, lower than the 10.1% recorded in FY2003, and 9.4% in FY2002 respectively. The downward movement was mainly due to a 6.2% decline in the imported component of the Honiara Retail Price Index (HRPI), compared to 19.8% in FY2003. The relative stability in the Solomon Islands dollar (SI$) against the US dollar, together with the declining inflation in major trading partner countries, resulted in a decline in inflation during the year.

The domestic inflation rates considered for the financial projections are provided in the table below in this financial plan. All values (SI$) are indicated in terms of nominal values, rather than constant price.

Table D3.1-1 Domestic Annual Inflation Rates

Year	Annual % Change	Notes
1998	12.4	(*1)
1999	8.0	
2000	6.9	
2001	7.6	
2002	9.4	
2003	10.1	
2004	6.9	
2005	6.6	
2006	9%	(*2)
2007	8%	
2008	6%	
2009	6%	
2010	6%	

Source: (*1)Table 1-18 HRPI, Annual Report 2004, Central Bank of Solomon Islands
(*2) "SIEA Financial Restructuring Plan" prepared by the World Bank.

D3.2 Income Forecast

(1) Preconditions

Income forecast is assumed by the following preconditions:

- Annual income will be estimated based on the projection for FY 2006, as estimated by SIWA
- Water sales unit will be according to the facility improvement.
- Households in the low pressure area in Honiara are expected to consume a considerable amount of water after implementation of the Project.
- Households in Kombito are expected to become new customers after implementation of the Project.
- The current customer proportions (sales by charge type) will be maintained in the same way.

It should be noted that the income from Auki is relatively minor at present. However, after rehabilitation works are completed through the assistance of ADB, income will be generated based on the number of customers.

(2) Revenue Water

Revenue water for January to December 2005 is recorded as shown in Tables D1.2-4 and D1.2-5 respectively.

The monthly average revenue water amounts were 410,000m^3, including the provinces, and 375.000m^3 in Honiara, which accounted for 90% of the total revenue water of SIWA.

(a) Tariff collection ratio

The current tariff collection performance in FY 2005 is shown in Table D2.2-3.

The tariff collection ratio for financial planning is to be determined by SIWA senior management staff through the action plan workshop, to be held in November 2005.

The present collection efficiency is 88%. Thus, a case study is made, not only concerning the present collection efficiency, but also collection efficiency tentatively improved to 95% up to FY 2010.

(b) Accounts receivables

SIWA's total water debtors owed about SI$17.87 million at the end of FY2005. SIWA is striving to reduce the total water debtors mentioned below.

Table D3.2-1 Debtors and Accounts Receivables Forecast by SIWA

	Value per Month (SI$1000)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
A. Active (Commercial)							6,316	6,316	7,141	8,156	7,745	6,814
A. Active (Domestic)										5,430	5,645	5,566
A. Active (Total)	11,282	12,136	11,041	11,546	11,793		12,135	12,183	13,359	13,586	13,390	12,380
B. Suspense	3,556	3,719	3,747	3,765	3,715		3,724	3,836	3,308	3,347	3,406	3,454
C. Disconnected	1,840	1,804	1,850	1,747	1,719		1,664	1,663	1,524	1,489	1,446	1,406
D. Vacated	542	552	1,132	660	893		652	649	630	633	633	630
E.. Total	17,220	18,211	17,770	17,718	18,120	18,836	18,175	18,331	18,821	19,055	18,875	17,870

Source: DSCS Monthly Report 2005, SIWA

D3.3 Expenses Forecast

SIWA's expenses consist of recurrent expenses, including routine budget and capital costs, in the form of an infrastructure development budget.

i) Annual expenditure is estimated, based on the FY2006 Approval Annual Budget of SIWA.

ii) Annual estimation shows the nominal price, including annual inflation

(1) Costs

Costs consists of direct and indirect costs respectively, including the electricity debt payment to SIEA and depreciation cost.

(a) Employee Costs

Employee costs consist of salaries and wages, allowances, NPF contributions and others. They are to be estimated by the following assumptions:

1) Salaries & Wages

Salaries & Wages are estimated based on the number of staff and their employment level, based in turn on the FY2006 Approval Annual Budget. The number of staff includes new employees.

SIWA had a total of 76 staff, including 4 senior management staff, in mid-FY 2005 and is planning to newly recruit 12 staff to strengthen its implementation capability, meaning that in FY 2006, the total number of staff will be 88. However, their salaries and wages, including allowances and NPF contributions, are already budgeted in the FY 2006 Approved Annual Budget. Thus, employment costs in the estimate for FY 2006 –FY 2010 only includes the annual inflation rate.

2) Allowances

SIWA's staff allowances consist mainly of i) Overtime Allowance, ii) Acting Allowance, iii) Industrial Allowance, and account for some 30% of basic salaries and wages over the past two years (FY2003-FY2004), therefore the annual allowance budget takes this ratio into account.

3) NPF contributions

NPF contributions are calculated by 7.5% of the salary and wage.

4) Others

Others, in the form of employment costs for water concession and housing allowance, are assumed to be 10% of salary and wages in the FY 2006 budget.

(b) Direct Costs

Direct costs for water supply and sewerage system services consist of employee costs, electricity costs (including debt payment to SIEA), depreciation costs and other recurrent costs for providing services. The direct costs are estimated based on the 2006 Annual Budged for the Office of the Divisional Manager of Engineering Services, Department of Planning & Design, Department of Water Supply, Department of Waste Water, Department of Environment, Department of Provincial Operations – Auki, Department of Provincial Operations – Tulagi, Department of Provincial Operations – Noro and Technical Services.

1) Electricity

The electricity cost is budgeted based on annual consumption plus debt repayment (SI$10.2 million) to SIEA for the period FY 2006 to FY2010. It assumes that the electricity charge includes annual inflation as shown in the following table. A debt repayment plan is employed with "Option C", whereby SIWA shall finance the debt by installment. SIWA shall finance 100% of the total debt owing and SIWA shall pay SIEA SI$0.2 million per month to settle the total debt over a period (a financing period is required for FY2006-FY2010). Debt repayment will be terminated at the beginning of FY2010.

Table D3.3-1 Estimated Electricity Cost (SI$1,000)

	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010
Electricity Bills *1	5,649.5	6,214.5	6,711.6	7,114.3	7,541.2	7,993.6
(Debt payment) *2		2,400.0	2,400.0	2,400.0	2,400.0	600.0
Annual SIWA Paid SIEA	5,649.5	8,614.5	9,111.6	9,514.3	9,941.2	8,593.6

Note: 1. Electricity bills in FY2005-2006 are based on SIWA estimate and for FY2007-2010 are estimated by the Study Team.
2. Debt payment schedule is based on the arrear installment proposal for SIEA prepared by SIWA.
Source: JICA Study Team

2) Depreciation

The SIWA accounting system does not consider depreciation cost, although this latter is essential for the survival of SIWA in terms of the future renovation or replacement of invested capital. Therefore, the following annual depreciation cost must consider recurrent costs, according to the capital investment plan and based on Non-Current Assets of some SI$42.4 million at the end of 2003.

The depreciation period is divided into two categories, considering the lifespan as follows:

Table D3.3-2 Depreciation Period

Category	Capital Goods	Service Life	Average Life
System	Building, System, Plants, Equipments, Meters, etc.	15 – 30 years	25 years
Other	Computer, Motor Vehicles, Motors, etc.	5 – 10years	6 years

Note: estimated by the Study Team
Source: JICA Study Team.

Table D3.3-3 Depreciation Cost

(Unit : SI$ 1,000)

	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010
Non-Current Assets	44,929.8	50,381.3	54,725.6	70,789.7	85,877.6	100,886.7
Depreciation	2,353.7	2,541.3	3,143.0	3,346.9	4,277.0	5,105.9

Note: Values in Non-Current Assets are estimated based on SIWA data of SI$42,397,123 in FY2003
Source: JICA Study Team

3) Other

Other costs consist of operation costs, such as fuels & lubricants, motor vehicle repair & service, and maintenance costs, based on the FY2006 Annual Budget.

(c) Indirect Costs

Indirect costs are estimated on the basis of the FY2006 Annual Budge, considering annual inflation.

Indirect costs consist of recurrent costs for a) the sales division, such as the Office of the Divisional Manager for Finance & Sales, Department of Sales and Customer Services, Department of Financial Management, Department of Internal Audit, and b) the administration division such as the Board of Directors, Office of General Manager, Office of Divisional Manager Support Services, Department of Human Resources Development, Department of Administration and Department of Management Information Systems.

Indirect costs also consist of employee costs for the abovementioned departments and other recurrent costs. Other costs of Indirect Costs include the following miscellaneous costs:

Miscellaneous costs consist of bank fees, insurance fees, custom fees, medical benefits, property insurance, funeral expenses, safety wear & uniforms, SIWA & world days and survey & land registration in major items. Except for survey & land registration fees, other costs are needed every year.

(2) Capital Costs

Capital costs mainly consist of system maintenance, project works and the tools & equipments cost. It also includes vehicles and computers as other items.

Capital costs for the Project are estimated in Section G2.5 and annual capital cost is shown in the following table, according to the investment plan.

Table D3.3-4 Capital Costs

(Unit : SI$ 1,000)

		FY2005	FY2006	FY2007	FY2008	FY2009	FY2010
Capital Costs	System	1,056.7	4,480.0	4,581.4	16,338.8	16,572.0	16,423.6
	Other	1,077.7	1,159.0	704.0	854.0	384.0	344.0
	Total	2,134.4	5,639.0	5,285.4	17,192.8	16,956.0	16,767.6

Note: Estimated by the Study Team.
Source : JICA Study Team

D3.4 Financial Forecasts and Counter Measures

D3.4.1 Financial Forecasts

According to the above assumptions, a trial calculation for a profit and loss statement is made. The Estimated Profit & Loss Statement -A (refer to Table D3.3-5, Revenue assumption based on the FY2006 Annual Budget) shows deficits (negative profits) having arisen from FY2007. Thus, SIWA is required to either increase revenue or reduce costs. If SIWA could not reduce its cost, revenue should be increased from FY2007.

If revenue is assumed to increase by 20% of the FY2006 level from FY2007 onwards, SIWA will be sustainable up to FY2008. In FY2009, costs will be nearly equal to income, as shown in the Estimated Profit & Loss Statement –B (refer to Table D3.3-6, Revenue assumption in FY2007 increased by 20% over FY2006), However, in FY2010, it will be difficult for SIWA to cover all costs, including depreciation.

Therefore, the water tariff to be applied for the period FY2007 to FY2009 must be increased for full cost recovery. If SIWA revenue changed to the tune of a 20% increase of that for the FY2007 to FY2009 period, SIWA would be financially viable according to the Estimated Profit & Loss Statement -C (refer to Table D3.3-7, Revenue assumptions in FY2007 and FY2010 increased by 20% over FY2006 and FY2009 respectively). Accordingly, the water tariff rate must be changed by FY2010.

Table D3.3-5 Estimated Profit & Loss Statement -A

(Unit : SI$ 1,000)

		FY2005	FY2006	FY2007	FY2008	FY2009	FY2010
A	Income						
	Water fees & Charges	18,635.7	21,950.0	21,950.0	21,950.0	21,950.0	21,950.0
	Wastewater fees & Charges	1,802.2	2,020.0	2,020.0	2,020.0	2,020.0	2,020.0
	Other Income	682.5	685.0	685.0	685.0	685.0	685.0
	Total	21,120.4	24,655.0	24,655.0	24,655.0	24,655.0	24,655.0
B	Direct Costs						
	Employee Costs	1,694.7	1,872.2	2,022.0	2,143.3	2,271.9	2,408.2
	Electricity (Billed)	5,649.5	6,214.5	6,711.6	7,114.3	7,541.2	7,993.6
	Electricity Debts	0.0	2,400.0	2,400.0	2,400.0	2,400.0	600.0
	Depreciation	2,353.7	2,541.3	3,143.0	3,346.9	4,277.0	5,105.9
	Other	2,896.1	3,368.7	3,638.2	3,856.5	4,087.9	4,333.1
	Total Direct Costs	12,594.0	16,396.6	17,914.7	18,860.9	20,577.9	20,440.8
C	Balance (A-B)	8,526.4	8,258.4	6,740.3	5,794.1	4,077.1	4,214.2
D	Indirect Costs						
	Employee Costs	695.4	916.4	989.8	1,049.1	1,112.1	1,178.8
	Other	764.2	1,490.1	1,609.3	1,705.9	1,808.2	1,916.7
	Sub Total (Sales)	1,459.6	2,406.5	2,599.1	2,755.0	2,920.3	3,095.5
	Employee Costs	634.0	1,241.8	1,341.2	1,421.6	1,506.9	1,597.3
	Other	2,084.1	4,536.2	4,899.1	5,193.0	5,504.6	5,834.9
	Sub Total (Administration)	2,718.1	5,778.0	6,240.2	6,614.7	7,011.5	7,432.2
	Total Indirect Costs	4,177.7	8,184.6	8,839.3	9,369.7	9,931.9	10,527.8
E	Total Costs (B+D)	16,771.7	24,581.1	26,754.0	28,230.6	30,509.7	30,968.6
F	Net Profits/Deficits (A-E)	4,348.7	73.9	-2,099.0	-3,575.6	-5,854.7	-6,313.6

Note: 1. It is assumed that revenues and cost based on the 2006 Annual Budget.
2. Values in FY2006 are based on the 2006 Annual Budget and Values in FY2007-2010 are estimated by the Study Team.

Source : JICA Study Team

Table D3.3-6 Estimated Profit & Loss Statement -B

(Unit : SI$ 1,000)

Item		FY2005	FY2006	FY2007	FY2008	FY2009	FY2010
A	Income						
	Water fees & Charges	18,635.7	21,950.0	26,340.0	26,340.0	26,340.0	26,340.0
	Wastewater fees & Charges	1,802.2	2,020.0	2,424.0	2,424.0	2,424.0	2,424.0
	Other Income	682.5	685.0	822.0	822.0	822.0	822.0
	Total	21,120.4	24,655.0	29,586.0	29,586.0	29,586.0	29,586.0
B	Costs (Direct and Indirect)						
	Employee Costs	3,024.1	4,030.4	4,352.9	4,614.0	4,890.9	5,184.3
	Electricity	5,649.5	8,614.5	9,111.6	9,514.3	9,941.2	8,593.6
	Depreciation	2,353.7	2,541.3	3,143.0	3,346.9	4,277.0	5,105.9
	Other	5,744.4	9,395.0	10,146.6	10,755.4	11,400.7	12,084.8
	Total	16,771.7	24,581.1	26,754.0	28,230.6	30,509.7	30,968.6
C	Net Profits/Deficits (A-B)	4,348.7	73.9	2,832.0	1,355.4	-923.7	-1,382.6

Note: 1. It is assumed that revenues from FY 2007 to 2010 are increased by 20% of 2006 revenue.
2.Values in FY2006 are based on the 2006 Annual Budget and Values in FY2007-2010 are estimated by the Study Team..

Source : JICA Study Team

Table D 3.3-7 Estimated Profit & Loss Statement -C

(Unit : SI$ 1,000)

	Item	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010
A	Income						
	Water fees & Charges	18,635.7	21,950.0	26,340.0	26,340.0	26,340.0	31,608.0
	Wastewater fees & Charges	1,802.2	2,020.0	2,424.0	2,424.0	2,424.0	2,908.8
	Other Income	682.5	685.0	822.0	822.0	822.0	986.4
	Total	21,120.4	24,655.0	29,586.0	29,586.0	29,586.0	35,503.2
B	Costs (Direct and Indirect)						
	Employee Costs	3,024.1	4,030.4	4,352.9	4,614.0	4,890.9	5,184.3
	Electricity	5,649.5	8,614.5	9,111.6	9,514.3	9,941.2	8,593.6
	Depreciation	2,353.7	2,541.3	3,143.0	3,346.9	4,277.0	5,105.9
	Other	5,744.4	9,395.0	10,146.6	10,755.4	11,400.7	12,084.8
	Total	16,771.7	24,581.1	26,754.0	28,230.6	30,509.7	30,968.6
C	Net Profits/Deficits (A-B)	4,348.7	73.9	2,832.0	1,355.4	-923.7	4,534.6

Note: 1. It is assumed that revenues from FY 2007 to 2009 are increased by 20% of 2006 revenue and revenue of FY 2010 is increased by 20% of 2009 revenue.
2. Values in FY2006 are based on the 2006 Annual Budget and Values in FY2007-2010 are estimated by the Study Team.

Source : JICA Study Team

D3.4.2 Consideration for Water Rate Revision

Based on the above forecasts, SIWA is required to revise water rates to increase income. Before the introduction of a new tariff structure, the following items should be carefully reviewed by SIWA:

1) To review the possibility of a reduction in recurrent expenses, from FY2007 in particular, and to avoid financial burden on the users.
2) To consider the ability to pay by low-income group for tariff revision, based on socio-economic survey results, such as the Ability to Pay and Willingness to Pay of low-income groups.
3) It is preferable to introduce a block-based commodity charge method for types of water consumption restraint. To study counter measures for different metering devices to achieve a new tariff calculation.
4) To study the change in tariff structure at 2 year intervals when significant changes take place at 3 year intervals.
5) To study special water rates to be applicable for foreign or high income residents, if they can be identified.
6) To consider water rates for large demand users in addition to social-economic survey results, because they are important customers for SIWA. Relatively high rates are already adopted for commercial and government institutions from the viewpoint of an income ratio of some 70%, despite a water distribution ratio of some 40% in terms of total water supply.
7) To review options as case studies for new rates to cover the expenditure forecast in FY2009. These options are made for Honiara, which accounted for 90% of total income based on the FY2005 performance record (refer to Part G2.2 for Action plan).

D4 SIWA Organizational Structure and Business Strategy

The SIWA Mandate, Departmental Purpose & Description and Strategic Directions are drafted as follows:

D4.1 SIWA Organizational Structure and Workforce

(1) SIWA Mandate

SIWA is mandated to deliver and levy charges for urban water industry services & products within its declared area of operations in a sustainable and environmentally responsible manner, consistent with government policies on good governance, transparency and accountability, while observing the cultural and social values of the Solomon Islands.

(2) Members of the Board of Directors

The board of directors consists of the following 7 members and board meetings are held regularly on a quarterly basis.

-Chairman: Member of Parliament

-Members: Permanent Secretary of the Department of Mines and Energy (Responsible for regulation/administration of water utility)

-Members: Finance representative

-Members: Public Health representative

-Members: Legal Affairs representative

-Members: Lands and Women representative

-Members: Private Sector representative/Chinese Association

(3) SIWA Organisational Structure

SIWA's current structure is illustrated in Table D4.1-1. SIWA is divided into 4 departments, namely i) Executive Management, ii) Engineering Services, iii) Support Services and iv) Financial and Sales under the board of directors.

The name of each department is as follows;

-Office of General Manager

-Office of Divisional Manager Engineering Services

-Department of Planning & Design

-Department of Water Supply

-Department of Waste Water

-Department of Environment

-Department of Provincial Operations – Auki

-Department of Provincial Operations - Tulagi

-Department of Provincial Operations - Noro

Technical Services

-Office of Divisional Manager Support Services

-Department of Human Resources Development

-Department of Administration

-Department of Management Information Systems

-Office of Divisional Manager Finance & Sales

-Department of Sales and Customer Services

-Department of Financial Management

-Department of Internal Audit

(a) Executive Management

Purpose:

The purpose of Executive Management is to set a strategic direction for the Solomon Islands Water Authority and monitor organizational performance.

Description:

This subprogram will ensure that SIWA functions in a sustainable and environmentally responsible manner consistent with Government policies and good governance, transparency and accountability, meeting international best practice standards.

(b) Engineering Services Division

Purpose:

The purpose of the Engineering Services Division is to provide reliable and quality water services and products in designated urban centers, while meeting statutory and regulatory requirements, and to plan and manage the future development of water industry services and products in line with government policies & urban water industry strategic directions.

Description:

This Division will be responsible for ensuring there is control over operational works and control of the quality of services delivered, effective and efficient maintenance on all installations and equipment and the planning and design of future infrastructure developments, management of projects and assets, and monitoring and updating of relevant information and that data and environmental protection is promoted in all aspects of its operations.

(c) Finance & Sales Division

Purpose:

The purpose of the Finance and Sales Division is to manage the financial affairs of SIWA in a transparent and accountable manner, so that it meets the needs of the urban water industry.

Description:

This Division will be responsible for levying charges in respect of the products and services provided by SIWA and collecting revenue to ensure the Authority continues to function in a financially and economically feasible manner, while maintaining the support of its customers.

(d) Support Services Division

Purpose:

The purpose of the Support Services Division is to provide professional support to SIWA's core business, so that the Authority can meet the obligations under its mandate.

Description:

This Division will ensure SIWA meets its strategic directions by providing efficient and effective administrative services, focusing on the development of its workforce and making use of the latest in information technology to provide an appropriate and efficient management information system.

(4) Members of the Board of Directors

The board of directors consists of the following 7 members and board meetings are held regularly on a quarterly basis.

-Chairman: Member of Parliament

-Members: Permanent Secretary of the Department of Mines and Energy (Responsible for regulation/administration of water utility)

-Members: Finance representative

-Members: Public Health representative

-Members: Legal Affairs representative

-Members: Lands and Women representative

-Members: Private Sector representative/Chinese Association

(5) Number of Staff

SIWA is planning to increase the number of staff to 88 from the current workforce of 76.

Table D4.1-1 SIWA's Current Workforce (at the end of April 2005)

		Level																	Total	New	Vacant	Total
		Exe.	8.1	7	6.3	6.1	5.4	5.3	5.2	5.1	4.3	4.2	4.1	3.5	3.3	3.1	2.5	2.3	2.1				
Department	Executive Managers	4	N																	4	1		5
	Sales and Customer Services		1						1		1	2	5		4	3				17			17
	Financial Management		1			V		2	V			1			1					5		2	7
	Administration		1					1	N			V	1					2	1	6	1	1	8
	Management Information System		1			1														2			2
	Human Resources Development		1																	1			1
	Environment		1							1								1		3			3
	Water Supply		1				1	5			2	N			4			6		19	1		20
	Wastewater		1						1											2			2
	Planning and Design		1		V	N		2			2				1			1		7	1	1	9
	Provincial Operations		1	N2	3							N2			2			1		7	4		11
Security Officers													1	1			1	1		3			3
Total		4	10		3	1	1	10	2	1	5	3	7	1	12	3	1	11	1	76	8	4	88

N: New V: Vacant
Source : SIWA

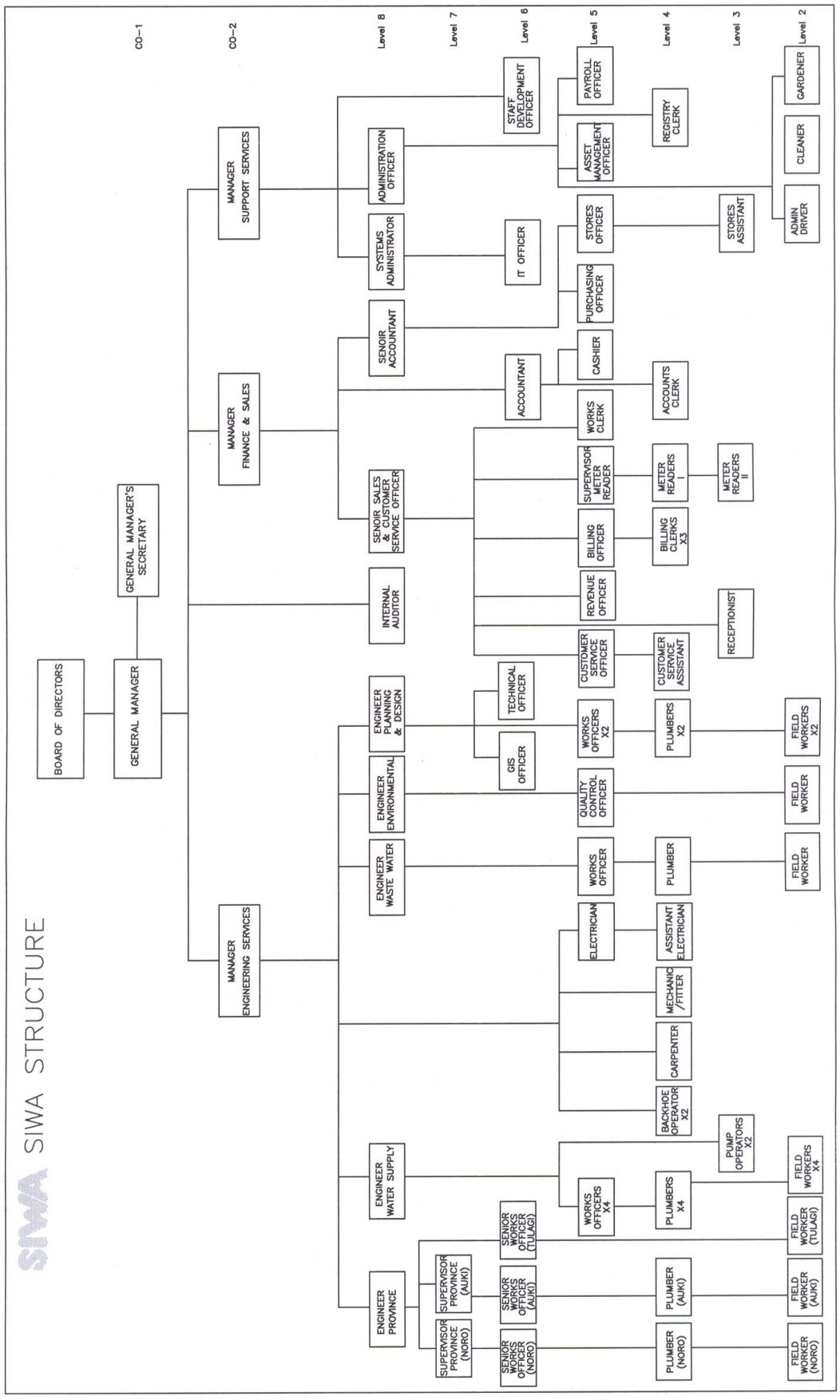


Figure D4.1-1 Organization of SIWA

Source : SIWA

D4.2 Programme Descriptions

The following programs by department are described in the "2005 Approved Annual Budget" of SIWA.

D4.3 Strategic Directions

The business strategy of SIWA is as follows:

(1) Strategic Direction 1

Develop a competitive advantage by attracting, developing and maintaining a competent workforce.

3-Year Strategies

- Introduce a strong sustainable corporate Human Resource Management culture
- Adopt working conditions that enhance SIWA's capacity to deliver its mandate

Planned 3-Year Outcomes

- A confident and focused workforce implementing SIWA's strategic directions
- An organisation attracting and keeping innovative and responsible workers

Performance Measures

- Reduction in absenteeism
- Percentage of experienced and qualified applicants responding to job advertisements
- Job satisfaction measured through a workforce survey

Priority Actions for 2003 - 2005

- Develop and implement industry best practice Human Resource Management policies and procedures
- Build upon SIWA's existing learning organisation focus
- Put in place working conditions that comply with International Labour Organisation, Occupational Health and Safety and industrial relations requirements

(2) Strategic Direction 2

Achieve customer satisfaction by developing and managing Urban Water Industry infrastructure to International best practices standard throughout the Solomon Islands.

3-Year Strategies

- Identify and establish long term infrastructure requirements, acquire funding and commence implementation.
- Put in place a functional system to manage urban water industry operations

Planned 3-Year Outcomes

- Urban Water Industry progressively meeting domestic and industrial demand for the supply of water products and services
- Drinking water quality progressively reaching WHO microbiologically acceptable levels
- The rights and responsibilities of customers well accepted as part of urban life

Performance Measures

- Reduction in complaints relating to the quality of drinking water
- Reduction in complaints relating to the duration and frequency of wastewater interruptions

- Reduction in unaccounted for water
- Reduction in water main breakages
- Reduction in wastewater blockages
- Increase in population connected to the water supply system
- Increase in population connected to the wastewater system

Priority Actions for 2003 - 2005

- Undertake a feasibility study to assess the current infrastructure situation and address short, medium and long term infrastructure requirements.
- Obtain donor funding by establishing the water industry infrastructure as the critical number one national development priority.
- Commence the implementation of funded projects.
- Explore possible alternative power options
- Further develop and implement operational processes & procedures for managing key operational activities
- Develop SIWA's planning and development capacity

(3) Strategic Direction 3

A move to a highly efficient and effective regulated national Urban Water Industry.

3-Year Strategies

- Define the participatory partnership with Land/resource owners to establish their agreed role within the Urban Water cycle.
- Establish a regulatory framework with line agencies, which have a legitimate role within the Urban Water Cycle.

Planned 3-Year Outcomes

- Standard lease arrangements for guaranteed access to raw water in place
- Standard market price for raw water established
- Urban Water Industry progressively meeting compliance standards for water quality, environment protection and water conservation

Performance Measures

- Reduction in demands and compensation claims for access
- Reduction in demands and compensation claims for raw water
- Increased percentage of compliance with WHO Guidelines concerning the bacteriological quality of drinking water
- Reduction in percentage of unaccounted for water

Priority Actions for 2003 - 2005

- Develop formal contractual arrangements for guaranteed access to raw water.
- Develop formal contractual arrangements for guaranteed quality of raw water.
- Identify a timeframe for the introduction of a regulatory framework.
- Establish a strategy for the introduction of a regulatory framework for drinking water quality

(4) Strategic Direction 4

Adherence to strong corporate governance and sound commercial principles & practices

3-Year Strategies

- Develop and implement best practice corporate management policies and practices.
- Address Government State Owned Enterprises (SOE) through a divestiture policy to ensure the continuing growth of a strong and viable Urban Water Industry.
- Introduce best practice commercial principles and practices to ensure economic viability.

Planned 3-Year Outcomes

- SIWA regarded as a good corporate citizen
- Community confidence in urban water service and products
- Fulfillment of Directions set out in this plan

Performance Measures

- Reduction in the cost of urban water industry services per property
- Overall increase in revenue
- Increase in allocation to capital works improvement

Priority Actions for 2003 - 2005

- Formally adopt Strategic Management policies & Practices.
- Introduce a formal internal and external communication policy, procedures and practices
- Introduce best practice administrative systems into SIWA.
- Update Customer Services policies & practices.
- Develop and put into place a comprehensive incident/emergency action plan.
- Provide the Government with a balanced organizational framework to ensure a sustainable urban water industry for the Solomon Islands.
- Implement the government's preferred option
- Review the organizational structure to meet the emerging requirements of SIWA
- Address office space and associated building requirements of SIWA
- Strengthen strategic partnerships in the regional and international water industry
- Adopt and implement best practice economic and financial management policies & practices.

D5 Current Problems Facing SIWA

The following problems have been identified through the Study and the necessary activities to be taken by SIWA for management improvement are mentioned in the Action Plan "Part G".

D5.1 Tariff Collection

(1) Collection Efficiency

SIWA identified a lack of full tariff collection as a problem because some people pay for water they use while other people do not worry about payment for water, even though they use the water service from SIWA. However, tariff collection efficiency has been gradually improved up to 90% of total water sales amounts (billed amounts) in 2005.

SIWA will act to disconnect their meters and take legal action. SIWA will ensure they collect a deposit when applications are received to ensure that all arrears are paid.

(2) Bill Posting to Customers

It is noted that approximately 2,000 water bills were not delivered to customers, meaning considerable lost revenue to SIWA or payments being delayed. This is because customers without postal boxes always experience delay with their water bills. Further arrangements to address this problem will be

dealt with by the SIWA and Postal Office management respectively.

SIWA decided to increase the delivery of water bills by hand as far as possible.

Particular consideration will be given to communities or settlements that are looked after by church workers (pastors, priests, bishops). SIWA has the idea of giving them incentives to carry out the tasks and meet the responsibility for consumers' definitely paying their water bills.

(3) Change of Customer Names/Addresses

SIWA found that customers sometimes move to a new location without settling their water bills. When they move to a new location or residence, they either change their name/s or address/es, making it difficult for SIWA to deliver their water bills to their new locations, as they do not inform SIWA of their new names and addresses.

To solve this problem, SIWA decided to request that landowners take responsibility for payment of water charges of their occupants or tenants. To avoid being liable for their water bills, they will then assist SIWA in recovering the water bills arrears.

(4) Mix of Gallon Meters and Metric Meters

There are two types of meters used by SIWA. One is the imperial (gallon unit) meter and the other is the metric meter. Imperials show different readings from metric meters. Sometimes bill amounts are calculated inappropriately due to calculations involving incorrect conversion. On a monthly basis, the number of claims from customers amounted to about 500, including a number of telephone enquiries on bills.

SIWA is planning to change all the old meters (imperial) within 10 years to metric ones to achieve accuracy. SIWA is considering that all the meter readers should be trained properly on a periodical basis.

(5) Tariff Collection from Shared Standing Pipe User's

Some communities use a single water meter, since shared standing pipes and their bill payment are mostly not made properly. This is because most customers have no postal boxes and the bill payment can not be coordinated by group users. This is one of the causes of revenue losses.

SIWA has the idea of providing some incentives to community leaders, who will then act as SIWA's agents to collect tariffs from their community members.

D5.2 Income Sources

(1) Water Sales Arrears

For domestic consumers who always delay their payment, SIWA is currently reinforcing efforts to ensure tariff collection from them. The customers owed SIWA around SI$ 12.4 million (active debtors) at the end of 2005. Although government arrears are gradually being recovered and decreased, the problem of college's arrears remains to be solved.

SIWA will take legal means to ensure that creditors, including the government, make full payment.

(2) Water Tariff

All expenses, such as salary, electricity, fuel, etc. in SIWA's account increase day by day due to inflation, while the present water tariff rate has been fixed since December 2003. There are 3 categories of tariff rate. The first category is domestic consumers, who are charged a tariff within the

lifeline, which is 30 kiloliters (m^3), at a rate of $1.00. The second category is for commercial customers and the third for the influx population, which typically represents RAMSI. The current tariff rate does not reflect the cost of the tariff in terms of services and recovery of costs. SIWA is considering how to justify a reasonable tariff rate for these categories, in particular, the first and third categories.

A tariff should not be uniform as it depends on the size of the operation cost. Now, Honiara subsidizes water production cost, as in the provinces.

(3) Low pressure and unserved area

As described in B1.4 "Water Supply System", the existing water supply system of Honiara is inefficient due to many problems, such as an insufficient water distribution system, pipe diameters, the capacity of water reservoirs, etc. These are considered to be the main reasons for the existence of low pressure areas. It has been confirmed by the Study that about 25% of the served population in Honiara is suffering from low pressure.

In order to overcome the above mentioned problems, SIWA is planning to improve the existing system to consumer demand, based on the results of this Study. If the water supply system is rehabilitated, SIWA will supply water to meet consumers' demands and needs in the low pressure areas. SIWA is also planning to provide a water tanker to deliver water to non water accessible consumers, who are living in an unserved or low pressure area.

(4) Sludge Disposal Services

There are 3 commercial vacuum trucks owned by the Honiara City Council and a commercial company. However, these services are not considered free from pollution. Sludge collected from septic tanks is drained into the SIWA's sewer manholes along the seashore or dumped untreated at the final disposal site.

Since sewage treatment service is one of the SIWA mandates for environmental protection, SIWA intends to take responsibility for maintaining septic tanks, which represents one of the potential industries for SIWA.

D5.3 Operation and Maintenance (O/M) Cost

(1) Electricity

The remarkable item of operation costs is electricity and reducing electricity cost is a major issue for SIWA. SIWA owed SIEA some SI$17million in arrears on electricity bills since 1999 to the end of FY2004. SIWA submitted a reconciliation proposal to SIEA for electricity arrears of SI$10.2 million in April 2005. However, negotiations for reconciliation between the two parties had not yet been held by the end of 2005.

(2) Housing allowance

SIWA is spending considerable amounts by renting accommodation for its employees according to a housing free policy, which is the same policy as that adopted by Solomon Telecom. For example, the cohousing cost is increasing from $1,000 for 3 beds to $10,000/house. In addition, SIWA needs to repair rented houses and is considering alternate possibilities to solve this issue. SIWA has already acquired land for housing estate in Honiara and the province.

(3) New Revenue Water (NRW)

According to the leakage survey under this study, NRW (real loss plus administration loss) was found to be 43% and revenue water (or authorized consumption) was 57%. Water losses are mainly considered to be caused by leakage from water distribution facilities used throughout their service life and due to poor workmanship of construction.
SIWA usually executes repairs on damaged parts only when leakage has occurred.

(4) Land Lease

Land lease fee for sites of boreholes, pipelines, water tanks, etc. should be born by SIWA. In case of Mataniko, SIWA and owners have mutually agreed upon an annual fee since 1988. However land lease fees in Noro and Tulagi remain under negotiation.

D5.4 Organization and Human Resources

(1) Staffing

SIWA currently has 76 staff and is planning to employ more than 10 additional persons to strengthen the organizational functions, securing workers needed to repair the aged infrastructure. This is imposed to reduce overtime, due to financial conditions. SIWA is planning to renovate the existing headquarters to a two-story building in order to cater for space that will accommodate the new development within the organization, i.e., the laboratory, financial and administration department.

SIWA is also aware of insufficient staff in the provinces, e.g. only two staff members in Auki. Low tariff collection efficiency in the provinces is caused by lack of manpower.

(2) Asset Management and Inventory Control

The system maintenance cost in the form of repair of tanks, replacement of pipes, and procurement of materials, etc. is increasing year by year.

SIWA has a large number of materials and parts in its store for repairing the water supply system. However, an inventory control system from purchasing materials and parts to their delivery for repair following customer request, is not well established.

SIWA is planning to develop store experts under the technical guidance of foreign experts and the following countermeasures should be introduced:

a) Control of the store system is necessary to minimize material purchasing.
b) The procurement cost of material is still very high, even if the lowest bidder is accepted through tendering. Strict control is needed for this area

(3) Accounting System

SIWA's accounting system does not accord with the international accounting system. The present accounting staff are incapable of preparing a Balance Sheet (B/S) and Profit and Loss Statement (P/L). The B/S and P/L for 1996 were drafted by Pricewaterhouse Cooper (Solomon accounting office) and authorized by SIG in 2005. The B/S and P/L for the period 1997-2005 are not yet authorized.

SIWA is encouraging its accounting staff to upgrade their skills through various training courses, i.e. SICHE, UPS, NTU, etc. SIWA is also planning to recruit a highly educated accountant, who is able to produce B/S and P/L.

(4) Geographical Information System (GIS)

The existing data and information for the water supply system has not been updated properly in the

GIS system introduced in SIWA, due to a lack of manpower of design engineers. This sometimes causes trouble in repairing and maintenance work at site, because the existing on-site system differs from existing data and information.

SIWA is planning to use GIS (Geographical Information System) more effectively by engineers under technical guidance or send the engineers overseas for training.

(5) Efficient Operation System for Water Supply Facilities

The electricity cost is a burden to the operation cost of SIWA. In order to reduce electricity cost through an efficient operation system for water supply facilities, SIWA is planning to introduce a SCADA system to intensively control the whole of SIWA's facilities at the SIWA headquarters.

(6) Water Quality Analysis

SIWA is required to provide a quality analysis for safe drinking water, in accordance with WHO guidelines. However, SIWA is only capable of performing water analysis for typical items defined in WHO guidelines because of a lack of testing equipment and staff. SIWA will acquire laboratory equipment to enhance capacity building for water quality analysis and also staff to enhance its quality services.

(7) Information Technology (IT)

An IT system (Linux) is installed in the Honiara headquarters but not yet in the provinces. An IT system is introduced to help in the billing systems, the fault receiving system, payroll and management. However, SIWA is lacking in IT systems, meaning it must install the latest software for the headquarters and IT hardware for the provincial offices to achieve efficient service. Accordingly, training for these areas will be needed.

(8) Workshop for Maintenance

There is no workshop for the maintenance of vehicles and machinery in and around the premises of SIWA headquarters. Mechanical technicians must perform repair work outdoors, under the strong sunshine, very hot weather and strong heavy rains in the rainy season

Repair works are affected by these circumstances

At the request of SIWA, the Study Team prepared a plan of the workshop building for repair work and laboratory to be located besides the new main office building.

PART E

PLAN OF NEW SIWA BUILDINGS FOR INSTITUTIONAL STRENGTHENING

PART E BUILDING PLAN FOR INSTITUTIONAL STRENGTHENING OF SIWA

E1 Current Situation and Problems for Office Environment of SIWA

Head office of SIWA is located in Honiara and the premises of SIWA's head office comprise as shown in Table E1-1.

Table E1-1 Outline of Head Office of SIWA

Building	Floor Area (m^2)	Used for
Main Office Building	323 (222)	General Manager room, General Manager's Secretary room, Engineering Services Manager room, Finance & Sales Manager room, Support Services Manager room, Planning & Design and Provincial Operations Dept. room, Water Supply and Wastewater Dept. room, Environment Dept. room (Laboratory included), Customer Service counter, Conference room
Customer Service Building	134 (109)	Accountant room, Purchasing Officer room, Customer Service center, Reception, Cashier room
Conference Building	36	Internal meeting, Rest room
Store House	25	Storage of materials
Security Post	16	Security room

Note : Figures in ( ) mean the area excluding common spaces such as corridor, toilets, etc.
Source : SIWA

Current problems facing SIWA are described as follows.

- Existing main office building is full up to capacity and it is difficult to make a proper room allocation to the staff.
- SIWA is planning to recruit around 10 new staff in the near future. However, insufficient capacity of main office building is now an obstacle to the recruiting plan of SIWA.
- Staff rooms for accountant department and the related departments are allocated separately so that their work can not be done efficiently.
- Since water quality laboratory is located in the main office building, it should be relocated in a separate building because the dangerous chemicals are handled there.
- Main store house is located across the road along SIWA's head office premises. Therefore, it is difficult for SIWA to do its maintenance properly. SIWA has a small store house made of container within the head office premises. However, it does not have enough space to contain important items with frequent use. Repair of vehicles and equipment is executed outside, which is easily affected by the weather.
- The elevation of the premises is lower than that of the road nearby and therefore the main office building is likely to be flooded by a heavy rain.
- There are 36 technicians and field workers mainly working outside who have no indoor space to take a rest.

E2 Overall Plan for New Buildings

In order to solve the above-mentioned problems, SIWA is desirous of making a construction plan for new buildings. Therefore, in this study, the construction plan for new buildings has been proposed.

Following points shown in Table E2-1 are considered in the preparation of the construction plan.

Table E2-1 Points to be Considered in Construction Plan of New Buildings

Building	Points to be Considered
Main Office Building	・ Functions of existing customer service building and conference building shall be included in new main office building so that services to the customers can be improved. ・ Space for all the permanent staff shall be secured and each room shall be arranged in the new main office building so that the staff can work efficiently.
Workshop Building	・ Water quality laboratory shall be relocated from the current main office building to this building. ・ Space for a store of important items with frequent use and maintenance area of vehicles and equipment shall be secured. ・ Space for all the field workers shall be secured so that they can use is for their doing desk work and taking a rest.
Security Post	・ Security Post shall be located at the new entrance of SIWA's premises which will be at the west end of the premises.
Landscaping	・ Fences shall be installed along the boundary of the premises. ・ The elevation of the land of the current premises shall be raised by 40cm in average so that the rain water does not flow into the building. ・ Space for vehicles for SIWA staff, customers and maintenance work shall be secured.

Source : JICA Study Team

E3 Layout of New Buildings

Arrangement of new buildings (Main Office Building, Workshop Building and Security Post) proposed in Table E2-1 has been examined taking into account the following points. The layout plan for new buildings is shown in Figure E3-1.

E3.1 Main Office Building

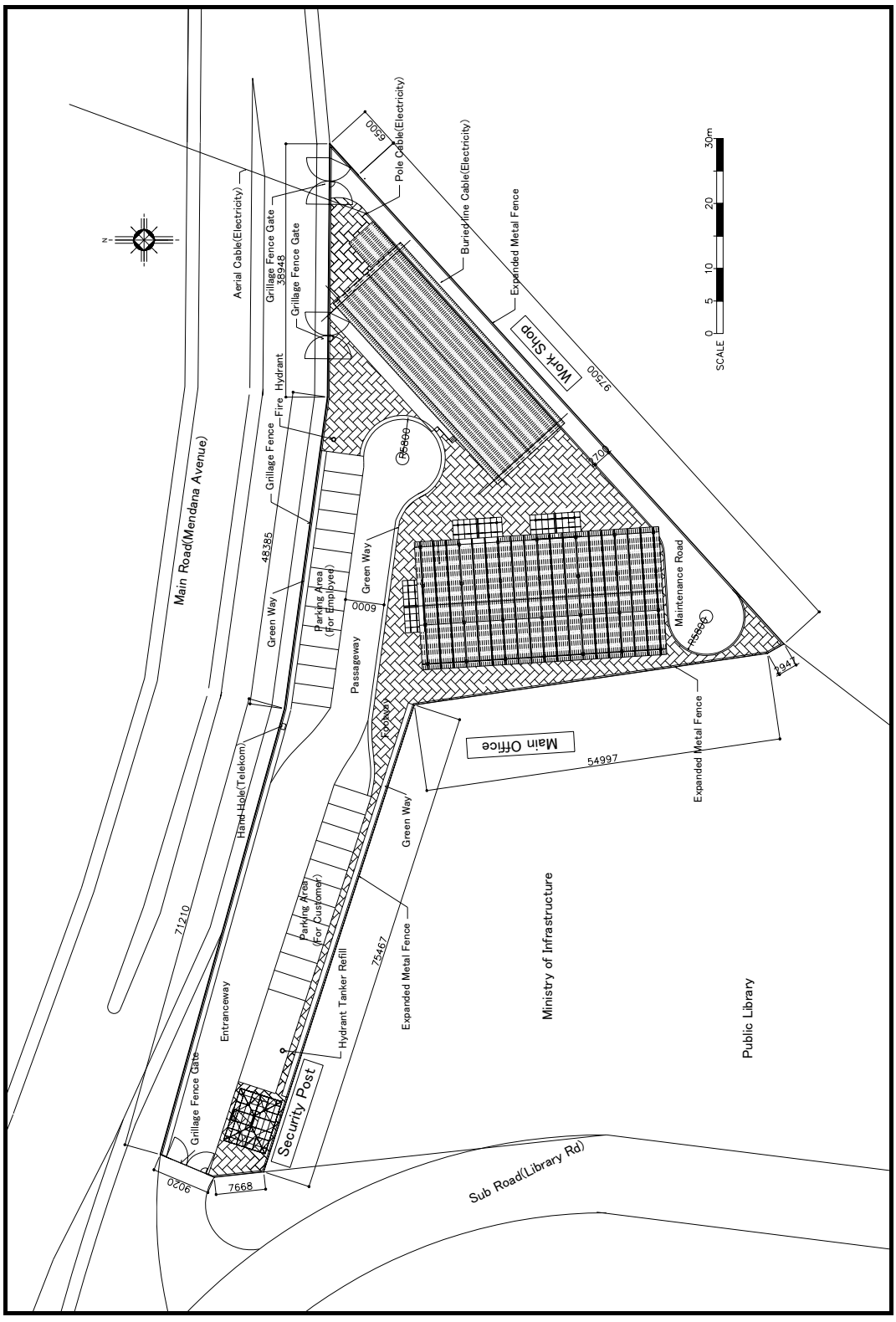
For the arrangement of new buildings, following three (3) options have been examined. As a result of examination, Option-1 is considered as the most viable solution.

Option-1 : After the existing Customer Service Building and Security Post are moved to the vacant space of the premises, new Main Office Building shall be constructed at the same location.

Option-2 : After the existing Main Office Building is demolished, new Main Office Building shall be constructed at the same location.

Option-3 : The existing Main Office Building is remodeled from one story building to two story building.

The following are the examination results of layout plan for the new Main Office Building.



Source : JICA Study Team

Figure E3-1 Layout Plan for New Buidings

Table E3-1 Examination Results of Layout Plan for New Main Office Buildings

Option	Examination Result	Evaluation
Option-1	Although the existing Customers Services Building should be relocated inside the premises, the existing Main Office Building can be used during the construction period. It is not needed to find a temporary office in other place and therefore this option is considered the most viable.	A
Option-2	In this option, SIWA has to rent a building somewhere as a temporary office. It is very difficult to find such building in Honiara.	B
Option-3	Remodeling of the existing building from one story to two stories is difficult from the technical point of view. Moreover, temporary office has to be kept during the remodeling work. Therefore, this is not practicable.	C

Note : A=Most viable, B=Less viable than A, C=Least viable among three options
Source : JICA Study Team

E3.2 Workshop Building

After the new Main Office Building is constructed, the existing Main Office Building will be demolished. Then, Workshop Building will be constructed at the same location.

E3.3 Security Post

Security Post will be constructed at the new entrance located at the west end of the premises.

E4 Room Arrangement of New Buildings

Room arrangement plan for each building shall be made taking into account the function of each department, number of permanent staff and field workers, etc.

E4.1 Main Office Building

E4.1.1 Room Arrangement for Permanent Staff

Room arrangement plan of the new Main Office Building shall be formulated in consideration of the function of each department, the number of permanent staff, etc. The number of staff for SIWA is 76 at present and will be increased up to 88 in the near future. Among 88 staff, permanent staff working in the new building will be 39 as shown in Table E4-1. Among the remaining 49 staff, 36 staff consists of technician, water quality laboratory staff and field workers, etc. and they will use Workshop Building. Other 10 staff will work in the provincial centers and 3 staff for the security.

Table E4-1 Permanent Staff in the New Main Office Building (2010)

Division & Department	Executive Manager	Dept. Manager	Staff	Total
Office of General Manager	1			1
Engineering Services Div.	1			1
Planning & Design Dept.		1	2	3
Water Supply Dept.		1		1
Wastewater Dept.		1		1
Environment Dept.		1	1	2
Provincial Operations Dept.		1		1
Support Services Div.	1			1
Human Resources Development Dept.		1		1
Administration Dept.		1	3	4
Management Information Systems Dept.		1	1	2
Finance & Sales Div.	1			1
Sales & Customer Services Dept.		1	11	12
Financial Management Dept.		1	6	7
Internal Audit Dept.		1		1
Total	4	11	24	39

Source : SIWA

E4.1.2 Common Space

In the new Main Office Building, the following common space shall be secured;

- Toilet
- Shower room
- Locker room
- Corridor
- Board room
- Conference room
- Staff lounge
- Rest room

E4.2 Workshop Building

Workshop Building consists of Water Quality Laboratory, Store Officer Room, Store and Maintenance Yard for Vehicles and Equipment. Space for technicians and field workers shall be secured beside the Maintenance Yard for their doing desk work and taking a rest. Furniture such as desks, chairs and book shelves shall also be installed.

E4.3 Security Post

In Security Post, 3 staff will work in three shifts. Space for reception, desk work and toilet shall be secured.

E5 Structural Plan for Buildings

E5.1 Main Office Building

Structure of the building shall be of structural steel which is commonly applied in Solomon. Finishing of the structural steel such as columns and beams shall be made by concrete because the anti-corrosion paint is not available in Solomon. Flooring material of the second floor shall be deck plate which is available in Solomon. The material for walls shall be concrete block.

E5.2 Workshop Building

Similar structure and materials shall be applied.

E5.3 Security Post

Since the scale of the building is small, wooden frame generally applied in Solomon for ordinary houses shall be applied.

E6 Cost Estimation

The construction cost for new buildings was estimated as shown in Table E6-1.

Table E6-1 Cost Estimation for New Buildings of SIWA

Building Name	Floor Area (m^2)	Unit Price (SI$/$m^2$)	Cost (SI$)	Remarks
Main Office Building	1,224	5,000	6,120,000	Structural Steel
Workshop Building	648	4,000	2,592,000	Structural Steel
Security Post	35	2,000	875,000	Wooden Frame
Related Works	Quantity	Unit Price (SI$)	Cost (SI$)	
External Work	3,100	1,000	3,100,000	
Generator	1	30,000	30,000	
Temporary Work	1	10,000	10,000	
Demolition Work	1	15,000	15,000	
Total			12,742,000	

Source : JICA Study Team

E7 Drawings

Drawings of new buildings for institutional strengthening of SIWA are included in S-9 of Supporting Report.

PART F

PILOT PROJECTS OF THE STUDY

PART F PILOT PROJECTS OF THE STUDY

F1 Contents of Pilot Projects

F1.1 Basic Policy for Selecting Pilot Projects

Pilot projects were selected in accordance with the following policy;

- Pilot project will lead to capacity development of management and financial aspect of SIWA.
- Pilot project will lead to strengthening the relation between SIWA and residents.
- Outcomes of the pilot project will be utilized for action plans.

F1.2 Analysis of Current Issues for SIWA

The current issues facing SIWA were sorted out through;

- Internal workshops by SIWA.
- Several discussions between SIWA and the Study Team about the current issues to be solved.

Major issues for SIWA and actions to solve are summarized in Table F1.2-1.

Table F1.2-1 Major Issues for SIWA and Actions to Solve

No.	Major Issues	No.	Action to Solve
1	Management system (financial, human resources, corporate structure, etc.)	1-1	Provision of adviser for introducing proper management systems
		1-2	Improvement of inventory control system
		1-3	Improvement of accounting system
2	Bill collection	2-1	Introduction of effective revenue collection system
		2-2	Establishment of GIS to link with the billing system
		2-3	Replacement of inaccurate or inactive meters
3	Land matters (land lease at water sources)	3-1	Shifting water sources from the customary land to the vacant land inside the town boundary owned by Commission of Land
4	Water conservation	4-1	Replacement of water supply equipment such as deteriorated washer of water tap, etc. and campaign for water conservation
5	Non revenue water	5-1	Introduction of method for leakage reduction and establishment of leakage reduction parameter
6	Protection of water sources	6-1	Improvement of existing sewerage system and/or septic tanks and campaign for protection of water sources
7	Water quality of drinking water	7-1	Provision of filter on water tap for securing drinking water quality
8	Expertise (technical standards, corporate structure, planning & management)	8-1	Provision of more training to staff
9	System Capacity	9-1	Upgrading of all systems to standard that will satisfy all consumers
10	Environmental pollution	10-1	Proper treatment of sewage by on-site or off-site treatment system
		10-2	Rehabilitation of sewerage outfalls in order to make a safe discharge and free from pollution
11	Office buildings	11-1	Construction of proper office building maintaining work practice at high level in order to achieve job satisfaction
12	Counter measures for unserved area	12-1	Provision of standing pipe

Source : SIWA

F1.3 Selection of Pilot Projects

Pilot projects were selected using four (4) criteria as follows;

- Criterion-1 : Impact on SIWA's capacity development
- Criterion-2 : Period for implementation
- Criterion-3 : Effect after implementation
- Criterion-4 : Utilization of outputs in action plans

Process for selection of pilot projects is shown in Table F1.3-1.

Table F1.3-1 Process for Selection of Pilot Projects

No.	Action to Solve	Impact on SIWA's Capacity Building A : Large B : Medium C : Small	Period for Implementation A : Short B : Medium C : Long	Effect after Implementation A : Quick B : Medium C : Slow	Utilization of outputs in Action Plan A : Large B : Medium C : Small	Appropriate as Pilot Project
1-1	Provision of adviser for Introduction of proper management systems	**A**	C	C	B	
1-2	Improvement of inventory control system	**A**	C	C	B	
1-3	Improvement of accounting system	**A**	C	C	B	
2-1	Introduction of effective revenue collection system	**A**	**A**	**A**	**A**	○
2-2	Establishment of GIS to link with the billing system	B	C	C	C	
2-3	Replacement of inaccurate or inactive meters	B	B	B	B	
3-1	Shifting water sources from the customary land to the vacant land inside the town boundary owned by Commission of Land	**A**	C	C	**A**	
4-1	Replacement of water supply equipment such as deteriorated washer of water tap, etc. and campaign for water conservation	**A**	**A**	**A**	**A**	○
5-1	Introduction of method for leakage reduction and establishment of leakage reduction parameter	**A**	**A**	**A**	**A**	○
6-1	Improvement of existing septic tanks and campaign for protection of water sources	**A**	**C**	**A**	**A**	
7-1	Provision of filter on water tap for securing drinking water quality	C	**A**	**A**	**A**	
8-1	Provision of more training on staff	B	C	C	C	
9-1	Upgrading of all systems to standard that will satisfy all consumers	**A**	C	C	C	
10-1	Proper treatment of sewage by on-site or off-site treatment system	B	C	**A**	**A**	
10-2	Rehabilitation of sewerage outfalls in order to make a safe discharge and free from pollution	B	C	C	**A**	
11-1	Construction of proper office building maintaining work practice at high level in order to achieve job satisfaction	B	C	C	C	
12-1	Provision of standing pipe	**A**	**A**	**A**	**A**	○

Source : JICA Study Team

F1.4 PDM for Each Pilot Project

Project design matrix (PDM) for the selected pilot projects are shown in Table F1.4-1 to Table F1.4-4.

Table F1.4-1 Project Design Matrix (PDM) - 1

Project name: Formulation of tariff collection improvement method **Duration: Nov. 15 to Jan. 31**

Project area: SIWA service area **Target groups: SIWA staff**

Design Summary	Performance Indicators and Targets	Monitoring Mechanisms	Assumption and Risks
Goal Financial situation of SIWA is improved	Increased tariff collection ratio from SI$1.4 mil/month (89%) to SI$1.7mil/month (100%)	JICA Report	
Purpose Improvement plan for tariff collection ratio by SIWA is formulated.	Improvement target	SIWA Annual performance records	Present organization of SIWA is unchanged.
Outputs 1. Practical method for collection efficiency is formulated. 2. Tariff collection improvement method is acquired by SIWA's staff.	1. Number of holding workshop 2. Workshop participants	1. Discussion Record 2. Participants List	Staff is to be continuously worked in SIWA.
Activities Hold workshops for tariff collection improvement - Analyze current problem including SIWA collection system - Find out counter measures for tariff collection efficiency including staff training, billing and collection system, etc.	**Inputs** [Japan] (1) JICA team members • Financial analysis 2.0 MM (2) Expenditure • Workshops (facilitators, materials, venue, etc.): 3 times	[Solomon Islands] Personnel: • SIWA General manager: 1 • SIWA Department managers:3 • SIWA Custom Service Dept: 3 • Outside organizations: 6	**Preconditions** Present tariff system is unchanged.

Table F1.4-2 Project Design Matrix (PDM) - 2

Project name: Establishment of leakage reduction indicator **Duration: Nov. 15 to Jan. 31**

Project area: Honiara **Target groups: SIWA staff**

Design Summary	Performance Indicators and Targets	Monitoring Mechanisms	Assumption and Risks
Goal Effective leakage reduction plan can be formulated by SIWA.	Number of the sections in water distribution line to be replaced in leakage reduction plan by SIWA	Annual budgetary plan in 2006	
Purpose Indicators related to leakage reduction through the replacement of deteriorated pipelines are established.	Reduction indicators	Leakage survey report of JICA study team	
Outputs 1. Leakage volume for each material type and diameter per km is obtained. 2. Leakage survey technique is transferred to SIWA staff.	1. Leakage volume per km for each diameter for main water distribution pipe. 2. Record of leakage survey by SIWA staff	1. Production and distribution record of SIWA 2. Operation record of SIWA	• Water supply area operated by SIWA in Honiara is not substantially changed. • SIWA staff trained in this pilot project continues to work for SIWA.
Activities 1-1 Execute leakage survey before replacement of distribution pipelines. 1-2 Conduct replacement of pipes for the section with much leakage. 2-1 Execute leakage survey after replacement of distribution pipelines. 2-2 Calculate the parameters related to leakage reduction for each pipe diameter and piping material.	**Inputs** [Japan] (1) JICA team members • Leakage survey expert 2.0 MM (2) Expenditure • PVC pipes • Technical fee of installing pipes	[Solomon Islands] Personnel: • SIWA supervisor: 1 • SIWA assistant supervisor: 1	Residents do not object to replacing pipes. **Preconditions** SIWA do not change their policy for leakage reduction.

Table F1.4-3 Project Design Matrix (PDM) - 3

Project name: Water conservation campaign **Duration: Nov. 15 to Jan. 31**

Project area: Honiara **Target groups: SIWA customers**

Design Summary	Performance Indicators and Targets	Monitoring Mechanisms	Assumption and Risks
Goal Water supply volume to be developed by SIWA can be reduced.	Water supply volume	Record of water supply	
Purpose Water conservation is enhanced in the sample users.	Change of water consumption volume	Record of billing	Aware users continue to conserve water.
Outputs 1. Public awareness of water conservation in the sample area is raised. 2. Leakage from the sample users' taps, toilet and showers is decreased.	1. No. of users participating in community workshops 2. Difference of sample users' consumption volume between before and after replacement of gaskets	1. Attendance list of workshops 2. Meter reading	Purposes of using water are not changed in the sample users.
Activities 1-1 Carry out awareness survey 1-2 Prepare and issue PR materials 1-3 Hold community workshops on water conservation 1-4 Carry out awareness survey on water conservation at the end of pilot project 2-1 Check leakage from sample users' taps, toilets and showers 2-2 Procure equipment 2-3 Read meters of sample users before replacement of equipment 2-4 Replace equipment 2-5 Read sample users' metres after replacement of equipment	**Inputs** [Japan] (1) JICA team members: • Public participation: 0.4 MM (2) Equipment • Gaskets of taps • Bungs of flush toilet reservoir (3) Expenditure • Leaflets for raising awareness • PR by media • Workshops (Venue, materials, etc.) • Technical fee for replacement of equipment	[Solomon Islands] (1) Personnel: • Metre reading (SIWA): 2 • Community education (SIWA): 1 • Workshop facilitators (NGO): 2 • Interviewers for awareness survey (NGO): 6 (2) Expenditure • Communication with sample users	• Leakage of the existing pipe is not change between meter and sample users' tap. • Meter is properly read. **Preconditions** • SIWA doesn't change the policy of water conservation and community education. • Users cooperate on this project.

Table F1.4-4 Project Design Matrix (PDM) - 4

Project name: Installation of shared standing pipe **Duration: Nov. 15 to Jan.31**

Project area: Model Communities in Honiara **Target groups: Low income households** Ver. 2

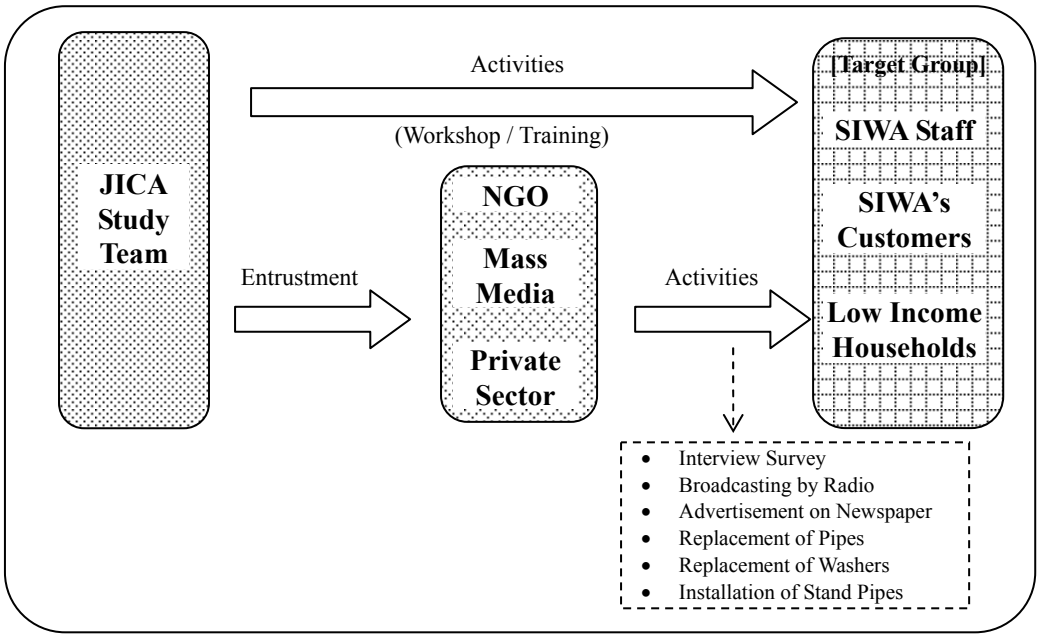
Design Summary	Performance Indicators and Targets	Monitoring Mechanisms	Assumption and Risks
Goal Living condition of model communities is improved.	Satisfaction ratio of water supply services	Questionnaire survey	
Purpose Water supply of model communities is improved.	Water volume available to the households in model communities	Record of billing	Sample households
Outputs 1. Shared standing pipe is installed in each model community. 2. Operation and maintenance of the shared standing pipe is done by the community members. 3. Cost sharing system for construction of shared standing pipe is examined.	1. Water consumption volume 2. Amount paid to SIWA 3. Analysis of investment cost per household	1. Meter reading 2-1 Record of fee collection 2-2 Users' records of management (distribution of initial fee and billing) 3. Cost breakdown for shared standing pipe	• Illegal connection to the standing pipe does not increase. • Standing pipe is properly managed by users.
Activities 1-1 Select installation site 1-2 Procure equipment 1-3 Install the equipment 2-1 Appoint the leader of standing pipe management in the area 2-2 Establish management system of shared standing pipe (fee collection, facility management, recording, etc,) 2-3 Train users for metre reading 2-4 Conduct questionnaire survey on living condition and household expenses before and after the project	**Inputs** [Japan] (1) JICA team members: • Public participation: 0.4 MM (2) Equipment • Standing pipe • Shower room • Connection pipe (3) Expenditure • Technical fee for installation of standing pipe	[Solomon Islands] (1) Personnel: • Metre reading (SIWA): 2 • Community education (SIWA): 1 • SIWA Engineers: 2 (2) Equipment • Metres (3) Expenditure • Communication with standing pipe users	**Preconditions** Model communities cooperate on the project.

F1.5 Implementation Framework of Pilot Project

Pilot projects have been implemented for getting data for formulation of the action plan on capacity development of SIWA by means of;

- Training SIWA staff for the improvement method for water tariff collection
- Training SIWA staff for leakage detection and reduction technique
- Training SIWA staff for enhancing awareness of water conservation to the residents and,
- Training SIWA staff for developing a method for expansion of water supply to the unserved population mainly in the low income area

The pilot projects were implemented by JICA Study Team in cooperation with SIWA counterpart staff and by the assistance of NGOs, mass media and private sectors. Implementation frame of the pilot projects are as shown in Figure F1.5-1.



Source : JICA Study Team

Figure F1.5-1 Implementation Framework of Pilot Projects

F2 Results of Pilot Projects (PP)

F2.1 PP-1 : Formulation of Tariff Collection Improvement Method

F2.1.1 Activity Implemented

In order to strengthen SIWA management system, the following workshops with SIWA staff were held for examining a method for revenue improvement of SIWA by means of project cycle management (PCM) method.

(1) 1st Workshop

- Date : 16th of November 2005 (14:00 – 17:00)
- Target : Increasing water sales income (tariff collection ratio).
- Subject: To discuss current problems (direct causes) on tariff collection system by means of problem analysis

(2) 2nd Workshop

- Date : 23rd of November 2005 (14:00 – 17:00)
- Target: Financial situation of SIWA is improved.
- Subject: To find out solution of each problem by means of objective analysis taking account of their realization in terms of expectation.

(3) Attendants

Following staff from SIWA participated in the workshops.

- General Manger, SIWA: Mr. John Waki
- Manger of Engineering Services: Mr. Ray Andersen
- Manger of Finance and Sales: Mr. Roger Townshend
- Administration Officer, Act DMSS: Mr. Leonard Meleibla
- Senior SCS Officer: Mrs. Freda Unusi
- Senior Accountant: Mrs. Hazel Hamutagi
- Customer Service Officer: Mrs. Lovelyn Dalavera
- Engineer Province: Mr. Silas Talosui
- Revenue Officer: Mr. Enoch Munah
- Billing Officer: Mr. Doni Manning
- Supervisor Meter Reader: Mr. Jack Sam
- Meter Reader, Assisting Revenue Officer: Mr. Robert Panakera
- Engineer Planning & Design: Mr. Allan Lilia

F2.1.2 Results of the Activities

(1) Discussion Area of Workshop

Discussion area is shown in the following figures. It was discussed to focus problem analysis on "water sales income is not enough" in 1st Workshop and objective analysis on "Financial situation is improved" in 2nd Workshop.

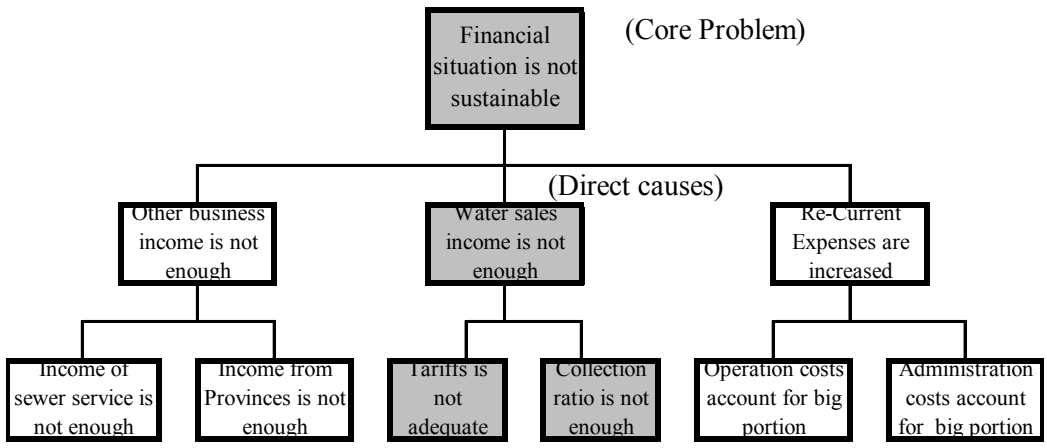


Figure F 2.1-1 Workshop Discussion （Problems Analysis）

2. Objectives Analysis（2nd Workshop）

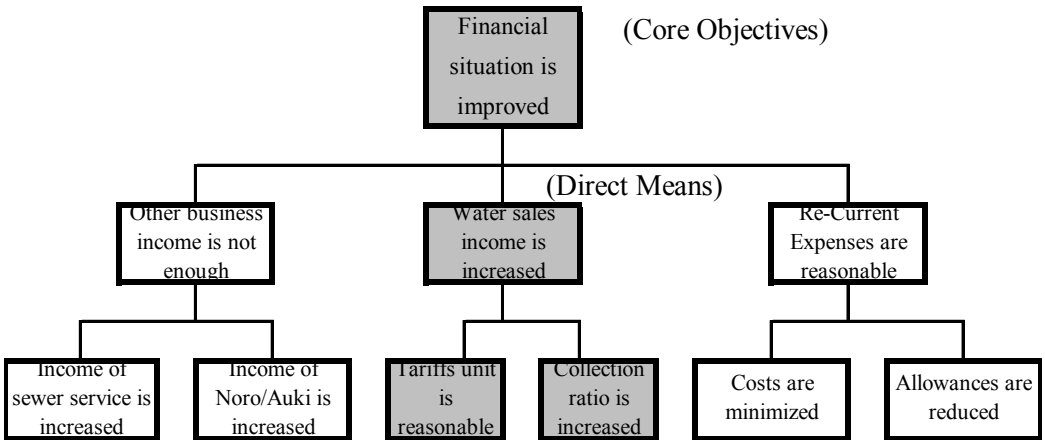


Figure F2.1-2 Workshop Discussion (Objectives Analysis)

(2) Output of Workshop

Participants identified the following problems and solutions as the output of management improvement of SIWA. Lessons through workshops were reflected to the action plan for capacity development of SIWA.

(a) Low tariff for domestic customers

Problem: SIWA staff identified a lack of full tariff collection as a problem because some people pay for water they use while other people do not care about paying water charge even though they enjoy water services by SIWA. Domestic users' rate is hold down as low as \$1.00 as a lifeline, while rate for commercial users is \$2.42 per 1 m^3.

Solution: SIWA should strengthen water tariff collection from every customer using water service and only accept full payment for water bills, not accepting half payment or installment payment. There are 3 categories for water tariff. The first category is for domestic consumers who are charged \$1.00 for the consumption up to 30 m^3. The second category is for commercial customers and the third category is for mobile population. The current rate does not reflect the cost of services and recovering of cost. SIWA has an idea to justify reasonable tariff for these categories, especially, the first and third categories.

(b) Affordability of low income class

Problem: It is known that about 25% of the domestic customers can not afford to pay fully for their water bills. The reasons are 1) their minimum wage (\$12.00/day) is below the average cost of living, 2) they were laid off during the ethnic tension and they have not yet been paid for employment or full time jobs to help sustain them.

Solution: SIWA has a concern that customers surely pay their water charge. Therefore, by the policy and legislation in regard to their bill payments, SIWA will disconnect their meters and take legal action.

(c) Water Sales Arrears:

Problem: SIWA currently strengthens tariff collection from domestic customers in general and for selected customers to be charged for overdue accounts, particularly those who always delay their payments. Government institutions like hospitals, schools (SICHE) and others owed SIWA around \$7 million, but nowadays they have gradually been paying their dues.

Solution: (a) SIWA will strengthen to collect deposit when application is received in order to

ensure that all arrears are paid.
(b) SIWA will take legal means to ensure that creditors including government make full payments.

(d) Change of names/addresses of customers

Problem: SIWA found that, when customers move to new location, some of them do not settle their water bills. While they moved to new location or residence, they also either change names or address. Therefore, it is difficult for SIWA to recover their arrears or their water bills from their new locations as they changed names and addresses.

Solution: To solve this problem, SIWA decided to ask landlord to take responsibility for payment of water bill and to include water charge in their rental. This will avoid house occupants or tenants leaving their residence without paying for their water bills. Cost of the meter is the responsibility of the landlords therefore they will assist SIWA to recover the water bills arrears.

(e) Bill posting method

Problem: Lot of water customers do not have postal boxes and they are living at outskirt of the city. Therefore, SIWA can not deliver their bills through this mean.

Solution:
(a) SIWA decided to increase deliver of water bills to each house by hand as much as possible.
(b) Particular consideration will be given to communities or settlements that is looked after by church workers (pastors, priests, bishops) and give them incentives for carrying out the task/responsibility of the consumers' paying surely their water bills.
(c) For some communities using one water meter, SIWA will give some incentives to the communities leaders who will act as SIWA's agents to collect tariff from their community's members.

(f) Consumers' negligence

Problem: Consumer attitudes affect SIWA management, SIWA decided to disconnect water supply when customers do not pay their water bills.

Solution:
(a) This is where a lot of education awareness will be needed on a regular basis particularly through community participation, e.g. schools/communities
(b) If customers continue to neglect paying their water bills then SIWA will resolve to legal actions.

(g) Customers' satisfaction

Problem: Customers complain about water quality, water quantity and accessibility of water services, since water service provided is less than the customers' demand and customers living in suburbs have no access to public water supply.

Solution:
- SIWA will ensure that quality of water is free from water contamination by continuing water test.
- SIWA will upgrade the existing water sources so that enough water can be supplied to meet consumers' demands/needs.
- SIWA will provide water tanker to deliver water to consumers in unserved areas or insufficient water pressure areas.

(h) Mix of metric meters and gallon meters

Problem: There are two types of meters used by SIWA. One is the imperial (gallon unit) meter and the other is the metric meter. Imperial meter will show different readings from metric meters. Bill amounts are sometimes calculated inappropriately by calculation with wrong conversion.

Solution: SIWA will change all old meters (imperial) to metric meters to achieve consistency. SIWA is planning to change all the meters within 10 years.

(i) Lak of logistic support

Problem: SIWA staff experienced that logistic support hindered tariff collection efficiency. Logistic support includes both human and equipment.

Solution:
(a) SIWA needs to recruit extra staff to maintain job demand.
(b) SIWA needs to be supported by his legal advisor.
(c) SIWA needs water tankers to deliver water to the consumers in unserved areas.
(d) SIWA needs transport for field mobilizations.
(e) Computers/Information technology (IT) personnel will carry out back up services.

F2.1.3 Lessons Learnt from Pilot Project

In order to improve revenue for SIWA, two workshops were held in November 2005. Through these workshops, top management and senior staff of SIWA had discussions on the current problems on tariff collection system and solution of the problems. Lesson learnt form the workshop is described as follows;

Purpose of workshop was to find out the current problem on tariff collection system and how to increase collection efficiency from the present tariff collection achievement. However, it is very difficult for them to fix future collection ratio because they are familiar with water sales value (Billed Amount) by monthly basis. There would be two major reasons mentioned below;

1. One of the absolute measures is to disconnect meters of the customers who do not pay water bills. On the other hand, this countermeasure is against SIWA's slogan of "Water is life" and he will reduce number of customers. Therefore, SIWA is in a dilemma whether to implement disconnection of meters or to allow payment arrear which causes huge amount of customer's debts for SIWA.
2. Although they understand collection efficiency is one of the most important factors in view of SIWA management, it is difficult for them to assume future collection ratio because there is no achievement records due to the ethnic tension.

F2.2 PP-2 : Establishment of Leakage Reduction Indicator

F2.2.1 Activities Implemented

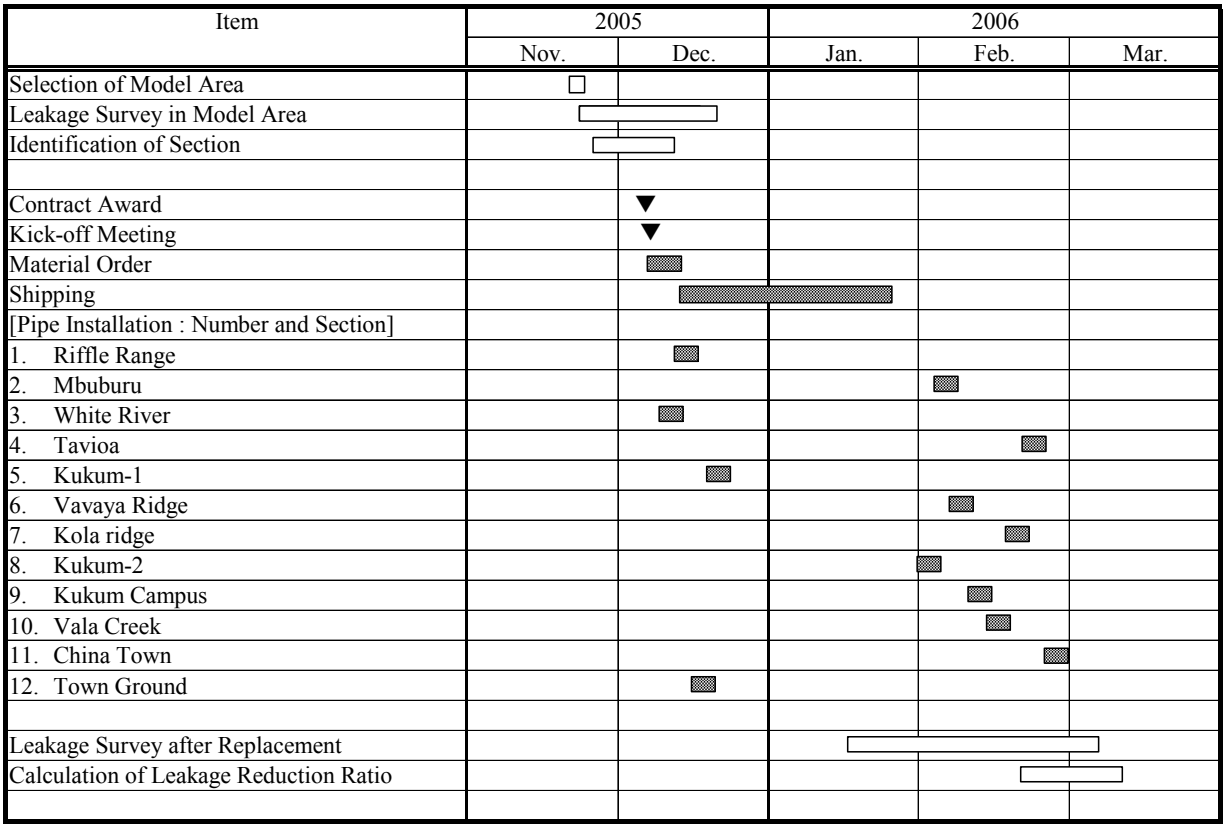
According to the leakage survey conducted in Phase-1 of the Study, the leakage (or real loss) ratio of Honiara was found as 40% and non revenue water consisting of leakage, apparent loss and unbilled authorized loss was 43%. This means that SIWA is distributing water without revenue so that revenue water ratio is as low as 57% in 2005. Therefore, reduction of leakage is one of the biggest issues for the management of SIWA.

Purpose of this pilot project is to establish leakage reduction indicator which will be utilized for implementation of the efficient leakage reduction program by SIWA. It is also stressed that, through the implementation of this pilot project, SIWA staff has mastered the leakage reduction skills and a leakage reduction team will be established after the Study.

The pilot project was mainly divided into two activities as follows;

- Minimum night flow (or leakage) survey by JICA Study Team and SIWA counterpart.
- Pipe replacement work done by the private sector entrusted by the Study Team.

Implementation work schedule of PP-2 (Establishment of Leakage Reduction Indicator) is as shown in Figure F2.2-1. Process and activities of PP-2 is as explained in Figure F2.2-2.



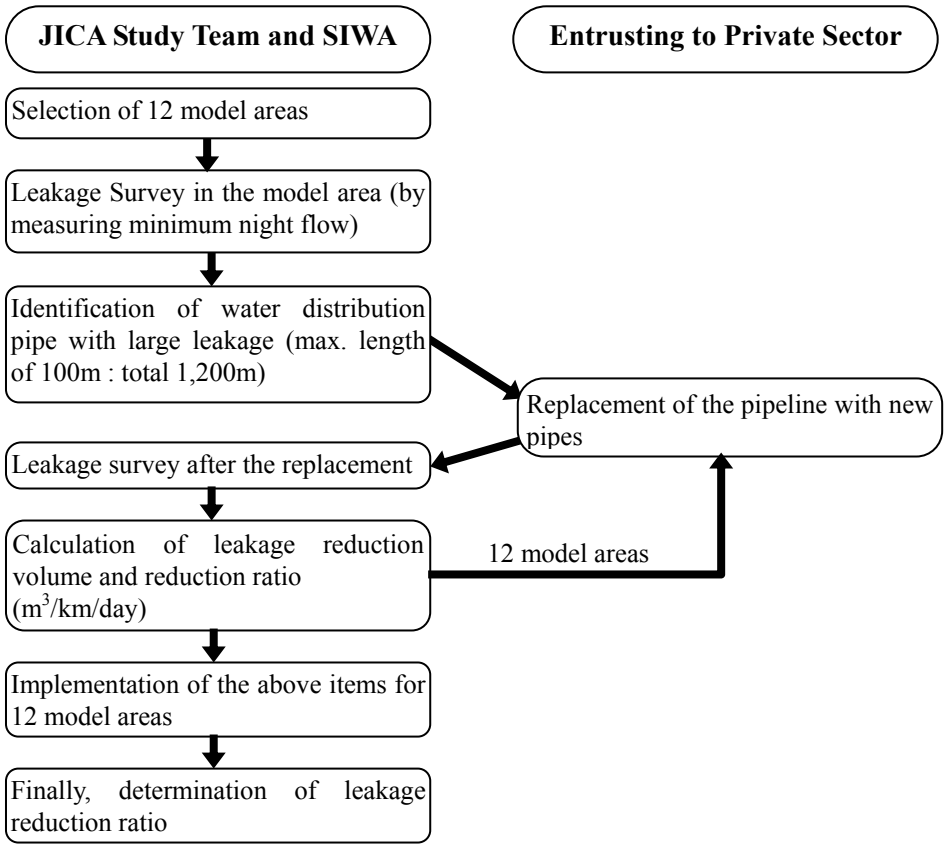
Source : JICA Study Team

Figure F2.2-1 Implementation Work Schedule of PP-2

The pilot project was done by entrusting pipe replacement work to the private company under the supervision of the Study Team and SIWA. Figure F2.2-2 shows the process of the activities in the pilot project.

Locations of 12 model areas have been selected in such a manner that the selected areas represent the whole Honiara city. lected in the following manner.

1) Area where large leakage occurs The model areas were se.
2) Aged pipes which were installed between the years from 1966 to 1975.
3) Pipe diameters from 50mm to 150mm.
4) More than one area from one type of pipe material.

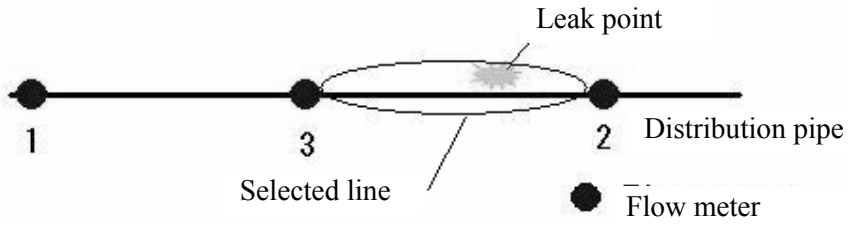


Source : JICA Study Team

Figure F2.2-2 Process of the Activities for PP-2

The water distribution pipeline with large leakage was selected as follows;

1) In order to define the pipeline with large leakage shorter in length, several measurement points were installed and flows were measured.
2) After the pipeline was identified, then leakage point was detected by the listening survey and the point detection survey was executed as shown in Figure F2.2-3.



Source : JICA Study Team

Figure F2.2-3 Leak Detection Method

The equipments applied in this pilot project were as follows;

1) Digital sound detector
2) Leak noise detector
3) Pipe and cable locator
4) Ultrasonic flow meter

Features for the equipments are shown in Figure F2.2-4.

Equipment	Feature	Photo
Digital sound detector	Detecting leakage sound directly by contacting rod with meters and valves.	
Leak noise detector	Detecting peak position of leakage by amplifying electrically the leakage sound propagated to the road surface from the leak point.	
Pipe and cable locator	Measuring location and depth of metal pipe.	
Ultrasonic flow meter	Measuring velocity by change of reflective speed by discharging an ultrasonic wave into the pipe from the outside.	

Source: JICA Study Team

Figure F2.2-4 Equipments for Leakage Detection Survey

F2.2.2 Results of the Activities

In order to grasp the leakage reduction volume, the minimum night flow before pipe replacement was measured. Then, the pipeline with large leakage was replaced with new pipes. After that, the minimum night flow was measured again.

From the results of leakage survey, it was found that there was larger leakage in diameters of 50 and 75mm than in diameters of 100 and 150mm and it was difficult to identify the difference of leakage amount for pipe materials. The leakage reduction indicator is indicated by m^3 per km per day. From the survey in this pilot project, 367m^3/km/day was obtained as the leakage reduction indicator as shown in Table F2.2-1. However, taking into account the unexpected flow from the outside of the model area, moderate leakage reduction indicator has been set as 300m^3/km/day.

Table F2.2-1 Leakage Reduction Indicator

	[General Data in 2005]	Unit	Data
	Water distributed in Honiara	m^3/day	**25,719**
	Leakage ratio	%	**40**
	Total leakage	m^3/day	**10,288**
Code	**[Results of Pilot Project]**	Unit	Data
A	Leakage before replacement for 1.2km length	m^3/day	**678**
B	Leakage after replacement for 1.2km length	m^3/day	**238**
C	Reduction after replacement for 1.2km length [C=A－B]	m^3/day	**440**
	Total leakage after replacement	m^3/day	**9,848**
	Leakage ratio at present	%	**38.3**
D	**Leakage reduction indicator** [D=C/1.2]	m^3/km/day	**367**

Source : JICA Study Team

F2.2.3 Lessen Learnt from Pilot Project

The Solomon Islands has a dry season and rainy season. Implementation period of this pilot project fell in the rainy season. Therefore, the progress of pipe replacement work and minimum flow measurement were much affected by the weather.

During the detection work of the existing pipelines with large leakage to be replaced, it was found that the existing GIS drawings of SIWA did not show the pipe location exactly and some of the pipelines were buried just under the ordinary houses or opposite side of the indicated route. This means that the maintenance of the pipelines is difficult for SIWA.

In this pilot project, the existing pipelines with the diameters of 50, 75, 100 and 150mm and service life of more than 30 years were selected. Among these diameters, leakage amount of 50 and 75mm pipeline, the length of which accounts for one-third of the existing pipelines, was judged relatively bigger than 100 and 150mm.

By the implementation of this pilot project, following lessons have been learnt;

- Pipe replacement for leakage reduction should be executed intensively during dry season.
- SIWA has to update the GIS data for the location of water supply facilities such as pipelines, valves, etc. so that the pipe replacement work can be executed smoothly and effectively.
- Leakage reduction work should be concentrated on the pipelines of 50mm and 75mm at the stage when large leakage is found in the area to gain much leakage reduction.

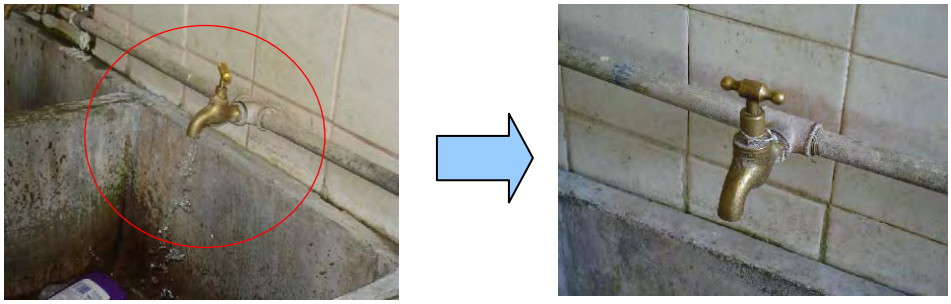
F2.3 PP-3 : Water Conservation Campaign

F2.3.1 Activities Implemented

(1) Replacement of Washers and Cisterns at Home, School and Hospital

In order to raise awareness of water conservation, replacement of washers and cisterns was carried out at the selected households, KG VI School and Honiara Hospital. Prior to implementation, SIWA carried out questionnaire survey to select the candidate households for the PP-3. SIWA also selected the candidate large water users from public sector. As a result, 50 households, KG VI School and Honiara Hospital were selected as the targets for PP-3.

<Before> <After>



a. Leakage of Wash Basin (at KG VI School)

<Before> <After>

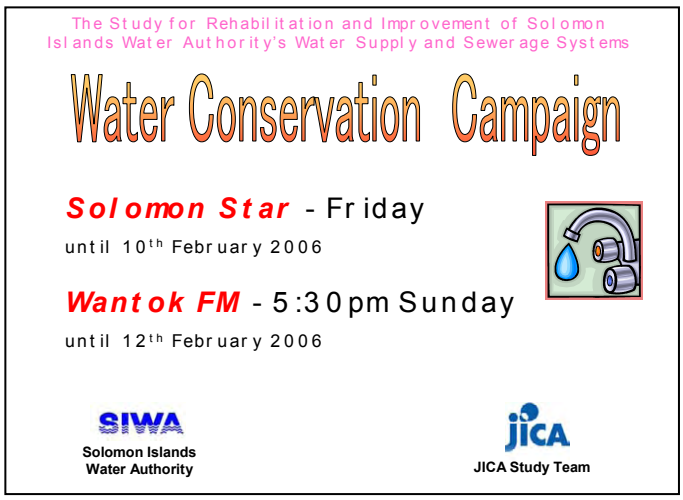
b. Leakage of Shower (at Honiara Hospital)

Source : JICA Study Team

Figure F2.3-1 Repair of leaking Taps

(2) Medium Programme

Newspaper advertisement and radio programme were carried out for eight weeks in order to raise public awareness of water conservation. As for radio programme, necessity of water conservation and tips to save water was disseminated to the public once a week. In the newspaper advertisement, current water tariff and consumption volume were also disseminated as well as necessity and tips of water conservation.



Source : JICA Study Team

Figure F2.3-2 Advertisement of Medium Programme at Super Market

(3) Community Workshop

Community workshops were carried out at Kaibia, Fulisango and Burns Creek. Target communities were selected based on SIWA's information that there are many leakage taps. Burs Creek was selected in order to disseminate basic information of SIWA's water supply and water conservation, and make it sustainable to manage the shared standing pipe which is installed under the PP-4.

a. Workshop at Kaibia

b. Workshop at Fulisango

c. Workshop at Burns Creek (1)

d. Workshop at Burns Creek (2)

Source : JICA Study Team

Figure F2.3-3 Repair of leaking Taps

(4) Distribution of Leaflets

Leaflets explaining tips for water conservation were prepared and distributed in order to raise public awareness of water conservation.

Source : JICA Study Team

Figure F2.3-4 Leaflet of Water Conservation Campaign

F2.3.2 Results of the Activities

(1) Change of Water Use and Attitude toward Water Conservation

Table F2.3-1 shows the monitoring result of water consumption of large water users and domestic users after repair of water service equipment. Water consumption of the large water users tends to decrease after repair of leaking taps, showers and toilets. On the other hand, water consumption of the domestic users is decreasing for some households, while others are increasing or no change. Monitoring period is only one month after repair, so that there is not enough data to evaluate effects of repair of water service equipment on water conservation. It is necessary to continue to monitor water consumption of the large water users and domestic users.

Table F2.3-1 Water Consumption after Repair of Water Service Equipment

Item	Name	Meter ID	Water Consumption (kL)					Repair Date
			Oct-05	Nov-05	Dec-05	Jan-06	Feb-06	
Large Water Users								
1	National Referral Hospital	08088	7314	4751	7809	2390	4934	
2	National Referral Hospital	08087	3033	4815	2930	1860	3500	
3	King George VI School	16299	2731	3190	3002	1643	3242	
4	King George VI School	16300	8818	8788	6642	2990	7237	
Domestic Users								
1	Adrian Alamu	16219	19	68	32	105	29	3-Jan-06
2	Rachel Garoi	16220	33	68	32	105	29	3-Jan-06
3	Ian Rakafia	16221	35	68	32	105	29	3-Jan-06
4	Isaac Seko	16222	35	68	32	105	29	3-Jan-06
5	Janet Tuhaika	01279-1	43	2	32	22	32	3-Jan-06
6	John Kingsley	19116	50	1	40	15	29	8-Jan-06
7	Errol Koebule	16337	217	177	222	143	207	
8	Vincent Shangafu	03068	N/A					11-Jan-06
9	Rauta Rabaua	06087	72	59	10	130	60	6-Jan-06
10	Rosta Tinarai	19420-2	21	24	18	19	19	8-Jan-06
11	Lyzarus Maneari	06253	8	40	30	15	25	
12	Comince Pinoru	09224	95	32	20	30	114	5-Jan-06
13	Leonard Logna	07040	15	0	17	6	10	8-Jan-06
14	Carol Pitisopa	19060	51	14	37	23	41	7-Jan-06
15	Alice Maeti	05028	46	14	14	14	32	5-Jan-06
16	Anna Kama	07035	82	32	82	32	46	6-Jan-06
17	Joyline Evo	05063	60	32	32	32	32	
18	Jackson Olea	01491	82	4	37	41	46	3-Jan-06
19	John Manau	03137	30	0	-37	0	0	4-Jan-06
20	Solbrew Ltd	15215	55	478	101	71	52	
21	Isacc Sonia	04219	51	8	4	28	52	7-Jan-06
22	Alfred Liatta	11197	N/A					
23	Michael Haomae	04102	85	32	-117	10	7	9-Jan-06
24	Enoch Naomane	19063	99	129	61	36	59	7-Jan-06
25	Hudson Mala	02275	119	69	103	72	32	4-Jan-06
26	Hazel Hamutagi	05266	47	37	41	37	37	5-Jan-06
27	Manning Doni	07061	41	48	36	32	37	8-Jan-06
28	Martin Tura	06767	69	-19	51	32	41	9-Jan-06
29	Sale Noli	07026-1	32	32	32	32	20	6-Jan-06
30	James Apanai	02185	26	484	123	33	102	4-Jan-06
31	T. Taasi	04136	10	902	20	7	7	4-Jan-06
32	Robert Manekaea	19076	15	0	-3	5	55	8-Jan-06
33	Fujiyama Naoyuki	02166	8	133	52	32	41	13-Jan-06
34	Charles Stennet	05265	196	0	96	105	91	
35	Alick Koburu	19407	69	0	32	32	32	
36	YWCA	18007	32	672	669	501	164	
37	Albert Tani	11285	18	17	125	32	7	
38	Hopkin Ulioha	03128	67	32	45	38	57	
39	Severino Horesi	01546	40	41	35	40	46	
40	Kauli	03122	557	39	23	0	0	
41	John Diamana	01532	123	163	138	139	247	
42	Gordon Bila	03116	59	29	62	50	79	
43	Tafia	03144	94	83	20	109	49	
44	D. Apuali	03145					54	
45	Ote Tura	15038	37	5	23	3	32	

Source : SIWA

Questionnaire survey was also carried out in order to grasp the change of attitude toward water conservation before and after replacement of equipment.

(a) Households

Out of the households that participated in PP-3, twenty one households answered the questionnaire. 57 % of the respondents live in the rented dwelling. Average family size is 7.9. 67% of the respondents have kitchen in side the dwelling and half of them share the kitchen with other households. 76% of the respondents have shower/bathroom in side the dwelling and half of them share the shower/bathroom with other households. All the respondents use flush toilet. 43% of the respondents have not repaired the leaking taps even though they identified the leakage. Out of them, 67% live in the rented dwelling. All the respondents feel that leaking taps make water bills high, but 15 of the respondents do not want to repair if they find another leaking taps. The reasons that they have not repaired the leaking taps are "not affordable" and "landlord's responsibility".

(b) Honiara Hospital

39 respondents answered the questionnaire at Honiara Hospital. 41% of the respondents knew that there were leaking taps in the hospital. 50% of the respondents knew that the leaking taps had been repaired. For their behavior, 41% of the respondents wash dishes/clothes under running tap. 23% of the respondents brush teeth with tap on. 18% of the respondents do not think unattended running taps wasting water/money. 21% of the respondents answered that they do nothing if they find unattended running taps.

(2) Raising Public Awareness

(a) Medium Programme

In the questionnaire survey abovementioned, half of the households knew the newspaper advertisement and radio programme, and most of them though those were informative. At the hospital, perception of medium programme is 60% of the respondents and all of them feel those are informative or not bad. 60% of the respondents gave a positive answer to the question "Do you think you can help to conserve water?"

(b) Community Workshop

Participants of the workshops had no knowledge of water conservation. They did not understand the importance as to why water has to be conserved. Some people knew the radio programme of water conservation. Therefore, the necessity of water conservation was explained by facilitator.

<Necessity of water conservation>

- Residents in Kaibia have been facing water problems due to the fact that the flow of water at the source has changed its direction. This has resulted with water shortage. Therefore, it is important that the residents save water as it is getting more difficult to obtain water from their source.
- Fulisango residents have been facing same water problems as Kaibia. If they did not wave water by monitoring and saving their daily usage they are at risk of drying up their water source faster.
- Residents have to use their water sustainable as SIWA has to practice sustainable pumping or the water in the bore hole will mix up with sea water.

<Benefit of water conservation>

- If they monitor the amount of water, they will be able to save a lot of money.
- In addition to saving money, the environment will improve as there is less water that is used. It

means that the supply does not deplete at a fast rate.

Participants did not know how to calculate daily water consumption and bills, so that they split into two groups to calculate water consumption and bills based on the amount of water used in a typical household. In case of calculation for only one person, they feel the water bill is not so high. However, when they calculate water consumption and bills for their family, those become very high because of the extended family and their behavior. Thus some participants raised comments that it is hard to save water because of the extended family.

F2.3.3 Lessen Learnt from Pilot Project

(1) Low Perception of Current Water Tariff and Behavior

The followings are identified as low perception of current water tariff and behavior through the community workshops and questionnaire survey.

- Most of community members did not know the current water tariff and water consumption per day before the workshop.
- In Kaibia and Fulisango, they use the piped water as they do in their home village, i.e. washing clothes under running tap, etc. In Burns Creek, they use different water sources by purpose because they do not have private water taps and the number of standing pipe is very limited.
- Most of community members did not understand the term "water conservation" before the workshop.
- In addition to their behavior on water consumption, the extended family also makes the water bills high. Therefore, it is thought that water conservation is difficult.
- Some people do not care about washing dishes/clothes under running tap and unattended running taps.
- Landlords are responsible for repair of leaking taps in the rented dwelling, so that tenants' awareness of leaking taps is relatively lower than dwelling owners.

(2) Limited Resources and Opportunities for Public Relations

SIWA had activities for raising public awareness of water such as talks at schools, issuing newsletters, etc. before changing job description of community education and consultation officer in 1999. After that, nobody is in charge of public relations and a few activities have been carried out in the national event or the anniversary of establishment of SIWA. It is difficult to disseminate basic information on water supply, i.e. water tariff and enhance practice of proper water use or water conservation because the activities are not carried out continuously. Metre readers are most visible and have opportunities for public relations, but reliability from the customers on metre reading is very low.

F2.4 PP-4 : Installation of Shared Standing Pipe

F2.4.1 Activities Implemented

(1) Selection of Target Communities

Selected communities as targets for the PP-4 are as shown in Table F2.4-1.

Table F2.4-1 Selected Target Communities for PP-4

No.	Name in the Study	Location	Number of Households
1	Burns Creek 1	Burns Creek, Honiara	40 households
2	Burns Creek 2	Burns Creek, Honiara	8 households
3	Matariu	Matariu, Honiara	3 households

Source : JICA Study Team

(2) Selection Process of Target Communities

1) Matariu

Matariu was hit in the Socio-economic Survey as a community, which had wanted a shared standing pipe. The Team interviewed its residents with SIWA and confirmed their intension to have a shared standing pipe. The Team also confirmed that the community is far at approx. 300m from the existing water distribution pipeline and individual service pipe conduction by customer is difficult in cost. Then the Team judged that sharing water service facility is effective in cost and the community is a good example as a small scale community.

2) Burns Creek

Several communities of Burns Creek have already had shared standing pipes and SIWA recognizes that communities of Burns Creek have potentials to manage shared standing pipes since there are good example in the area. Intension to have shared standing pipes for both communities of Burns Creek 1 and 2 was confirmed through interview to the community members. As the numbers of households of the communities are 40 for Burns Creek 1 and 8 for Burns Creek 2, the Team judged that both communities are good examples as medium and large scale communities.

(3) Survey on Current Living Conditions of Residents before the Project

(a) Burs Creek 1

Only one household is living in the rented dwelling. The others own their dwelling. Average family size is 5.9 per household. It is lower than the average of Honiara (8.6). Average income is SI$928 per household and SI$447 per worker. It is less than half of the average income in low income area of Honiara. 26 households keep savings. Sources of water supply are shared piped water (standing pipe) and well. Only one household uses a rain tank for drinking water. Main source of drinking water of the other households is the shared piped water which is constructed in the other settlement area. They pay SI$20 per month to use the shared standing pipe. Average daily water consumption is 33 liters per day per household. 93% of the households think water volume is not sufficient. First priority for improvement of life conditions is "food", followed by water and clothes.

(b) Burns Creek 2

Eight (8) households share the standing pipe in the settlement. Chief of the settlement is working for Solomon Brewer. Only one household is living in the rented dwelling. The others own their dwelling. Average family size is 6.6 per household. It is lower than the average of Honiara (8.6). Average income is SI$1,038 per household and SI$692 per worker. It is almost as half as in low income area of Honiara. 7 households keep savings. Sources of water supply are shared piped water. Only one household uses a rain tank for drinking water. Average daily water consumption is 43.25 liters per day per household. Water bill is fixed rate, SI$20 a month for each household. All the households think water volume is not sufficient. First priority for improvement of life conditions is "food", followed by clothes and water.

(c) Matariu

All the households own their dwelling. Average family size is 11.3 per household. It is higher than the average of Honiara (8.6). Average monthly income is SI$3,413 per household. However average monthly income per worker SI$853 is lower than the average in low income area of Honiara. It is higher than the average monthly income in low income area of Honiara. All the households keep savings. Source of water supply is bore hole/spring. Average daily water consumption is 70 liters per day per household. They don't pay water bill because of no access to piped water. All the households think water volume is not sufficient. First priority for improvement of life conditions is

"food", followed by water and clothes.

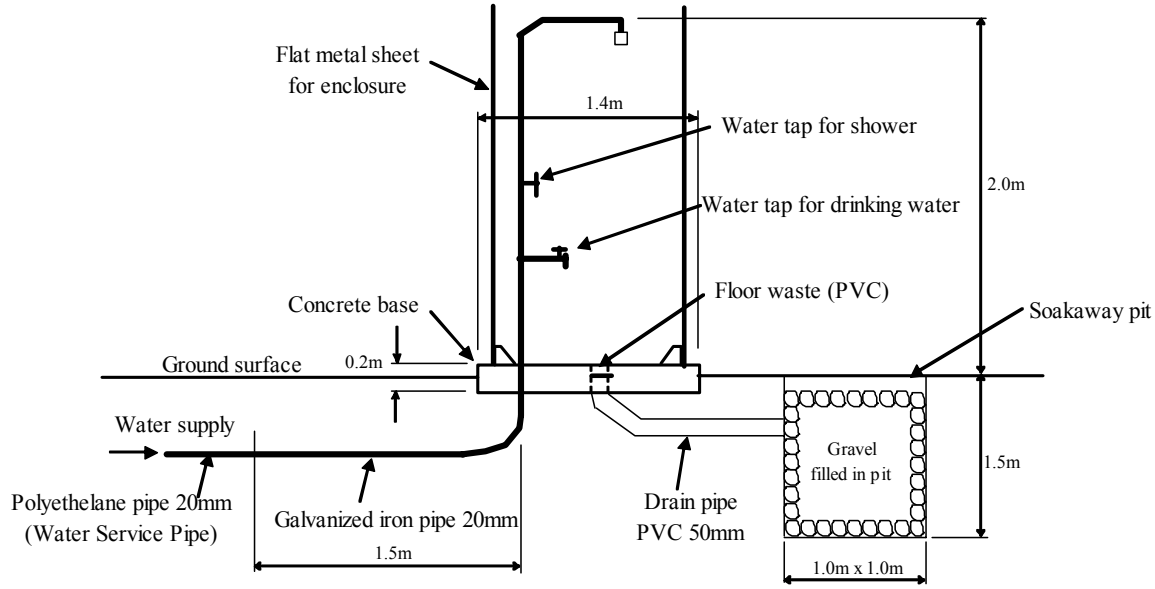
(4) Organizing Maintenance Structure

Based on the SIWA's regulation for new connection, an applicant should inform SIWA of postal address to send the water bills. However, the households in the target areas did not have postal address. Therefore, one representative was appointed to control usage of the shared standing pipe and collect charge from the households. The representative consulted with the community members on usage of the shared standing pipe and charge collection. As a result, the representative and the community of each target area decided that the standing pipe should be used for drinking and cooking only because it is very difficult to control water consumption if it can be used for all proposes. For Burns Creek 1 and2, SI$20 per month is collected from each household as the water charge. On the other hand, the households in Matariu did not pay the water charge because they did not have access to the piped water, so that they decided to collect SI$10 per month from each household.

(5) Construction of Facility

After the "survey on current living conditions of residents before the project", the construction works have been conducted by the Team for two months since December 6, 2005 to February 9, 2006. A local company was selected by the Team as a contractor of the construction through competitive quotations.

One standing pipe was constructed in each target community. Standard figure of the constructed facility is shown in Figure F2.4-1.



Source : JICA Study Team

Figure F2.4-1 Standard Drawing of Standing Pipe for PP-4

(6) Cost Breakdown for Standing Pipe Construction

Total cost for the construction is SI$49,500.00- (US$7,071.43-) and average cost of one standing pipe construction is SI$16,500.00- (US$2,357.14-).

As a result of PP-4, it was cleared that 70% of the construction cost is for the water service pipe laying and the remaining 30% is for the water tap facilities including enclosure and soak away pit. The length of water service pipe impacts the cost directly. Cost breakdown of the standing pipe are shown in Table F2.4-2.

Table F2.4-2 Cost for Shared Standing Pipe

No.	Site	Water Service Pipe Cost		Tap Facility Cost		Total
		Length (m)	Cost (SI$)	Quantity	Cost (SI$)	Cost (SI$)
1	Burns Creek 1	100	5,775.00	1	4,950.00	10,725.00
2	Burns Creek 2	100	5,775.00	1	4,950.00	10,725.00
3	Matariu	400	23,100.00	1	4,950.00	28,050.00
	Total	600	34,650.00	3	14,850.00	49,500.00
	Average	200	11,550.00	1	4,950.00	16,500.00

Source : JICA Study Team

F2.4.2 Results of the Activities

(1) Cost Analysis

As a general scope of SIWA is to lay 10m of water service pipe from water distribution pipe, most of required water service pipe laying should be borne by customer. Bearing the water service cost is supposed to be one of the reasons that low income households can not conduct the water individually. Therefore cost per household should be affordable for the households of the target community if the standing pipe water supply were extended by SIWA. Result of PP-4 on the construction cost per household is shown in Table F2.4-3.

Table F2.4-3 Investment Cost per Household for Shared Standing Pipe Construction

No.	Site	Number of Households	Water Service Pipe Cost		Tap Facility Cost		Total	
			Cost (SI$)	Cost (SI$)/H	Cost (SI$)	Cost (SI$)/H	Cost (SI$)	Cost (SI$)/H
1	Burns Creek 1	40	5,775.00	144.38	4,950.00	123.75	10,725.00	268.13
2	Burns Creek 2	8	5,775.00	721.88	4,950.00	618.75	10,725.00	1,340.63
3	Matariu	3	23,100.00	7,700.00	4,950.00	1,650.00	28,050.00	9,350.00
	Total	51	34,650.00	679.41	14,850.00	291.18	49,500.00	970.59
	Average	17	11,550.00	2,855.42	4,950.00	797.50	16,500.00	3,652.92

Remark: Cost (SI$)/H is Cost (SI$) / Household
Source : JICA Study Team

The cost per household is supposed to be high compared with average income in the target communities, especially for Burns Creek 2 and Matariu. However the cost should be evaluated taking depreciation into consideration as the facility is considered as a fixed assets. The standard life of construction can be assumed by Japanese guideline for water supply facility maintenance as follows;

- Water service pipeline: 25 years
- Tap facility: 15 years

Applying the above figures as depreciation years, monthly cost for each household is calculated as shown in Table F2.4-4. The cost for Matariu, whose number of member household is less, is relatively high, however the others are supposed to reach a capable level to be borne by household.

Table F2.4-4 Monthly Cost per Household for Shared Standing Pipe Construction

No.	Site	Water Service Pipe Cost			Tap Facility Cost			Total
		Cost (SI$)/H	Depreciation (years)	Cost (SI$)/H/M	Cost (SI$)/H	Depreciation (years)	Cost (SI$)/H/M	Cost (SI$)/H/M
1	Burns Creek 1	144.38	25	0.48	123.75	15	0.69	1.17
2	Burns Creek 2	721.88	25	2.41	618.75	15	3.44	5.85
3	Matariu	7,700.00	25	25.67	1,650.00	15	9.17	34.84
	Total/Average	679.41	25	2.26	291.18	15	1.62	3.88
Remark: Cost (SI$)/H/M is Cost (SI$) / Household / Month								

Source : JICA Study Team

(2) Survey on Water Supply after the Project

(a) Burns Creek 1

After installation of the shared standing pipe, 50 percent of the households feel that access to the piped water is improved. 50% of the households answered that water volume they can use was improved and was sufficient. WTP is SI$20 per month.

(b) Burns Creek 2

After installation of the shared standing pipe, 58 percent of the households feel that access to the piped water is improved. However, 95% of the households answered that water volume they can use unchanged and was not sufficient. Before installation of the shared standing pipe under the Project, only a few shared standing pipes were available for the households in Burs Creek. Therefore, an additional standing pipe makes access to the piped water improved, but the shared standing pipe is used only for drinking and cooking in this area so that most of the households feel that there is no change in terms of "volume of the piped water available to them". WTP is SI$20.38 per month.

(c) Matariu

All the households feel that water supply is improved in terms of access to the piped water, water volume they can use after installation of the shared standing pipe. WTP is SI$30 per month.

(3) Customer Increase

After the facility construction, the representative person of each target community applied water supply service to SIWA and SIWA put meters and started managing the standing pipes as customer. Since one standing pipe is counted as one customer under the current SIWA's customer registration system, the number of registered customer increased only three. However there are 51 households behind the three registered customers. As a result, SIWA got 51 real customers and 51 households became to be capable to obtain the piped water.

(4) Tariff Payment and Maintenance of the Facility

Each target community plans to pay the water tariff through the representative person, who signed on water supply service application form to SIWA. The representative person is required to collect certain amount of money from member households and finish the monthly payment to SIWA. As the meter was put and SIWA's water supply was started in the middle of February 2006, stability on the payment system has not been proved yet.

Furthermore, each target community should maintain the constructed facility. As the facility has been just constructed, less repair requirement is expected for several months. Therefore repair cost

sharing system also has not been proved yet.

Those cost sharing system should be confirmed before construction if SIWA extended shared standing pipe system to other areas. The recommended confirmation items are described in Article F2.6.4.

As for the construction cost of the facility, each target community and/or SIWA does not plan to collect the cost from the households since the JICA invested as a Pilot Project.

Source : JICA Study Team

Figure F2.4-2 Shared Standing Pipe installed at Burns Creek 2

F2.4.3 Lessen Learnt from Pilot Project

(1) Advantage of Shared Standing Pipe

Through PP-4, the followings are found as advantage of shared standing pipe.

1) Shared standing pipe increases real customers at low investment cost when the length of water service pipe can be kept shorter and consisting household number can be secured enough.
2) Shared standing pipe decreases unserved population of the piped water at low investment cost.
3) Shared standing pipe is effective for low income households, who can not afford to connect the piped water individually.

(2) Disadvantage of Shared Standing Pipe

Through PP-4, the followings are found as disadvantage of shared standing pipe.

1) Shared standing pipe requires investment to be charged to customers for construction. The construction cost is high, especially for communities far from the existing water distribution pipe.
2) Shared standing pipe requires stable revenue form member households. In case that some households did not pay their share, all remaining households should be influenced for water supply maintenance.

(3) Recommended Ways to Overcome Disadvantages

1) Investment Sharing and Payment

In order to keep fairness between shared standing pipe customers and other individual customers, the construction cost should be borne by customers. Therefore candidate communities, which need shared standing pipe, are responsible for construction in principle.

However many of communities are supposed to be unable to finish full payment at construction time. In this case, it is recommended that SIWA constructs the facility and claim the payment in installments. Reasonable payment period is as same as life of construction i.e. 25 years for water service pipe and

15 years for tap facility. When the payment in installments is introduced, SIWA claim the construction cost monthly as an additional claim to water tariff.

2) Securing Stable Revenue

The following two cases are forecasted as obstacles for stable revenue;

- Some households are put in serious situation for paying water tariff or refuse the payment. Consequently enough amounts can not be collected to complete the payment to SIWA.
- Representative person, who collect the tariff in the community, does not complete the payment to SIWA.

In order to solve the above problem, SIWA should conduct a series of workshops in the community before the construction and obtain residents' consent on rule of shared standing pipe management. It is recommended to have a written consent of member households as an attachment of water supply application.

3) Residents' Consensus

The written consent, above described, is recommended to cover the followings:

- Ways to select/dismiss the representative person and his service term
- Rights and obligations of the representative person
- Name of the selected first representative person
- Ways to share the construction cost and payment period
- Ways to share the maintenance cost, reserve fund for repair and manage the fund
- Ways to determine the sharing water tariff such as fixed rate per household or number of family
- Location of tap facility
- Rules for usage of the tap facility
- Ways to withdraw from community of shared standing pipe
- Countermeasures in case that non payable household is found

(4) Role of SIWA

SIWA should play roles of not only water supplier but also facilitator to conduct the residents' consensus. The recommended activities of SIWA are as follows for the shared standing pipe;

- Survey for candidate community on number of households, topography, households' spreading condition, distance from the existing distribution pipeline, capable water quantity to be supplied from the existing distribution network
- Cost estimation for construction of shared standing pipe and make a example price to be shared
- Holding workshop to confirm the residents' intension to have a shared standing pipe and presenting the example price to be shared
- Facilitating the residents' consensus through several workshops until completion of written consent
- Inspection and maintenance with charge of the facility on behalf of the community if the community desires

(5) Finding Candidate Community

Principally, SIWA starts facilitating activities based on community's application. However SIWA can utilize the shared standing pipe as one way to increase the number of customer and develop the income. It is therefore recommended positive customer development through shared standing pipe.

SIWA can list up candidate communities utilizing the existing list of customer and contact the listed community for needs and market survey through hearing from sampled households. After

confirmation of potential to have a shared standing pipe, SIWA should organize the first workshop to confirm the intention of the community.

(6) Standard Number of Household of Candidate Community

Water consumption rate of shared standing pipe is supposed to be approx. 50 LCD. According to the Socio-economic Survey, average family number is about 8 per household in Honiara. Therefore the water consumption per household is supposed to be 12 m^3 per month. This is converted into SI$12.00 using the current water tariff rate.

The other hand, from the result of "Survey on Water Supply after the Project" done in PP-4, resident s are willing to pay SI$20.00 - 30.00/household/month. In this case, SI$8.00 - 18.00/household/month can be affordable for construction and maintenance cost of the shared standing pipe because the standing pipe is used only for drinking and cooking, so that the water charge will not become so high.

Assuming that standard length of water service pipe is 100m, the construction cost is calculated at SI$10,725.00 as shown in Table F2.4-5

Table F2.4-5 Construction Cost of Standard Facility

No.	Item	Quantity	Unit	Unit Cost (SI$)	Construction Cost (SI$)
1	Water Service Pipe	100	m	57.75	5,775.00
2	Tap Facility	1	lot	4,950.00	4,950.00
3	Total				10,725.00

Source : JICA Study Team

Considering depreciation years and maintenance cost (1% of construction cost per year), total cost per year is supposed to be SI$668.25/year. When construction cost is shared by 50 households, the cost per household will be decreased. However, risk that some households cannot afford to pay will be increased. Although the risk will be decreased if 30 households share the standing pipe, the cost per household will be increased. From the viewpoints of WTP and efficiency of fee collection and management, construction cost of the shared standing pipe should to be covered by 40 households as shown in Table F2.4-6. Therefore 40 is set as standard number of household to share one standing pipe.

Table F2.4-6 Standard Cost per Household

No.	Item	Construction Cost (SI$)	Depreciation (years)	Construction Cost/year (SI$)	Maintenance Cost/year (SI$)	Total Cost/year (SI$)	Member Household	Cost (SI$)/H/M
1	Water Service Pipe	5,775.00	25	231.00	57.75	288.75		
2	Tap Facility	4,950.00	15	330.00	49.50	379.50		
3	Total	10,725.00		561.00	107.25	668.25	40	16.71

Remark: Cost (SI$)/H/M is Cost (SI$) / Household / Month
Source : JICA Study Team

(7) Attention to be paid in the extending Shared Standing Pipe

Although the extending shared standing pipe will conduct the customer development, it has a risk of unstable revenue. Therefore SIWA should pay attentions on the residents' consensus and confirm through the written consent. The followings are conditions to be examined.

- Residents' consensus is confirmed.
- Residents understand the tariff and ways for payment.
- SIWA has enough capacity of water supply for the area.

F2.5 Evaluation of Pilot Projects

F2.5.1 Evaluation Criteria

Evaluation of the pilot projects has been conducted according to the criteria as shown in Table F2.5-1.

Table F2.5-1 Evaluation Criteria of Pilot Projects

Evaluation Criteria	Main Considerations
Efficiency	➢ How can the amounts of "inputs" be cut back to produce the same "outputs"? ➢ Are the inputs being utilized properly to produce "outputs"?
Effectiveness	➢ To what extent has the "proper purpose" been achieved? ➢ Is the "project purpose" expected to be achieved by the end of cooperation period? ➢ Are there any "outputs" that need boosting to achieve the "project purpose"? Conversely, can any "outputs" be cut back without jeopardizing the achievement of the "project purpose".
Impact	➢ Is the project producing any negative effects? If so, how can they be minimized?
Relevance	➢ Are "project purpose" and "overall goal" still compatible with the needs of the beneficiaries, priorities of the recipient country and the local social environment? If there are discrepancies, can any changes to rectify them?
Sustainability	➢ Are the implementation organization, key implementation personnel and others on the recipient-country side developing technical expertise, operation/management skills and financial capability to carry on the project activities independently after the expiry of the of the cooperation period? ➢ To ensure self-reliance after the withdrawal of cooperation, what aspects and to what extent?

Source : Project Cycle Management, Monitoring and Evaluation Based on the PCM Methods, Foundation for Advanced Studies on International Development (FACID), March 2000

The relative importance of the above five evaluation criteria changes with the structure of PDM as shown in Table F2.5-2. For example, efficiency is mainly evaluated focusing on outputs and inputs, while effectiveness focuses on project purpose and outputs. Sustainability is evaluated from overall goal to inputs.

Table F2.5-2 Basic Ideas of Five Evaluation Criteria of Pilot Projects

Evaluation Criteria	Efficiency	Effectiveness	Impact	Relevance	Sustainability
Overall Goal			What positive and negative effects, either direct or indirect, has the implementation of the pilot project had?	Are the "project purpose" and "overall goal" still meaningful as objectives at the time of evaluation?	To what extent will the recipient country's organizations be able to retain the positive effects of the pilot project after the withdrawal of cooperation?
Project Purpose		Whether the "project purpose" has been achieved, and how much contribution did "outputs" make?			
Outputs	To what extent have "inputs" been converted to "outputs"?				
Inputs					

Source : Project Cycle Management, Monitoring and Evaluation Based on the PCM Methods,

Foundation for Advanced Studies on International Development (FACID), March 2000

Evaluation mainly focuses on what effects a pilot project has had, rather than how it was implemented. Namely, it aims to ascertain its impacts and achievements, make recommendations on the future course of the activities and draw lessons for other activities.

F2.5.2 Results of Evaluation of Pilot Projects

Based on the results and achievements of the pilot projects executed in Phase-2 of the Study, a final evaluation was conducted for the activities of the pilot projects from the view point of five criteria, i.e., relevance, effectiveness, efficiency, impact and sustainability. The results of evaluation are summarized in Table F2.5-3 on each pilot project.

Table F2.5-3 Summarized Evaluation of Pilot Projects

Pilot Project	Relevance	Effectiveness	Efficiency	Impact	Sustainability
PP-1 : **Formulation of Tariff Collection Improvement Method**	Since the improvement of tariff collection ratio is one of the vital issues for SIWA's management, it can be said that the pilot project has met the keen needs of the Solomon side on management strengthening.	The project purpose of the pilot project has been successfully achieved because solutions have been obtained from the pilot project and incorporated in the action plan.	The inputs from both sides were appropriate for achievement of outputs. Three workshops were held and 13 staff including general manager participated in the workshops, which were more than planned.	Almost all the staff for administration and financial departments participated in the workshop. They discussed the issues and found solutions for tariff collection system. Almost all the staff of SIWA is now aware of the problems and solutions. Therefore, it can be said that this pilot project had positive impact.	Sorting out problems and finding out solutions through workshops is now familiarized among SIWA staff.
PP-2 : **Establishment of Leakage Reduction Indicator**	Since the leakage reduction is one of the key issues for improving management capacity of SIWA, it can be said that the pilot project has met the keen needs of the Solomon side on technical knowledge.	The project purpose of the pilot project has been successfully achieved because the leakage reduction indicator was obtained and technical transfer was made effectively.	Most of the necessary inputs have been made as planned from the Japanese side and Solomon side.	By the implementation of this pilot project, about 380m^3 of leaked water was reduced. It accounts for 1.6% of total leakage in Honiara. Therefore, it can be said that this pilot project had positive impact.	During this pilot project, three (3) staff of SIWA mastered the leakage detection and reduction method. Therefore, SIWA will be able to establish a leakage reduction unit.
PP-3 : **Water Conservation Campaign**	In order to reduce the water consumption, it is necessary for the customers to save water. Repair of leakage and saving water help SIWA reduce water distribution volume and cost of water supply.	For the participants of PP-3, awareness of water conservation was raised. However, it takes time to root practice of water conservation, so that it is necessary for SIWA to continue to monitor change of water consumption.	The inputs from both sides were appropriate for achievement of outputs. However, monitoring period should be longer and life style of Solomon Islanders should be taken into consideration.	According to the monitoring data by SIWA, water consumption of large water users such as school and hospital is decreasing after repair of leaking taps. However, it is necessary to continue to monitor water consumption.	It is necessary for SIWA to assign the officer in charge of public relations. Current conditions and public perception of water supply also should be improved to obtain cooperation of the customers.
PP-4 : **Installation of Shared Standing Pipe**	It is necessary for the low income households in the unserved area to improve access to the piped water. SIWA should provide the options which enable the low income households to connect the piped water.	Water supply conditions of 3 model communities were improved by access to piped water through the installation of shared standing pipe.	The inputs from both sides were appropriate for achievement of outputs. It is necessary to examine share of the expenditure for installation between communities and SIWA.	Improvement of access to the piped water reduced time and released labor force to get water in 3 model communities.	It is necessary for the candidate communities to understand the tariff and ways for payment and consent installation of shared standing pipe. SIWA should confirm to have enough capacity of water supply in the areas.

Source : JICA Study Team

PART G

ACTION PLAN

PART G ACTION PLAN

G1 Future Frame for Action Plan

G1.1 Socio-economic Frame (Population Projection)

In Solomon, the official document which can be an aid in forecasting future socio-economic conditions at a national level is the National Economic Recovery, Reform and Development Plan (NERRDP) 2003 - 2006. NERRDP is a medium-term development strategy policy document of the Solomon Islands Government. Its purpose is to set out the government strategies, polices and actions to be taken for economic recovery, social restoration, reform and development during the Plan period.

The overall national development goal of NERRDP is to enhance and improve the quality of life and the living standards of all the people in the Solomon Islands.

The immediate objectives of the Plan are to:

- Improve the security environment in restoring law and order and fostering peace.
- Strengthen and improve governance institutions and good governance.
- Bring about macroeconomic stability and income growth.
- Restore basic social services in health and education.
- Re-establish the foundations for sustained economic growth and human development.

In the context of its overall goal and its immediate objectives, NERRDP 2003 – 2006 focuses on five key strategic areas. These are:

- Normalizing law and order and the security situation
- Strengthening democracy, human rights and good governance.
- Restoring fiscal and financial stability and reforming the public sector.
- Revitalizing the productive sector and rebuilding supporting infrastructure.
- Restoring basic social services and fostering social development.

NERRDP made reference to the 1999 population census and described as follows:

- The population of the whole Solomon Islands is 409,042 people.
- The average population growth rate between 1986 and 1999 was 2.8%.
- The majority of the people, namely 84%, live in rural areas, in small and widely dispersed settlements, mostly along the coasts.
- The main urban area is Honiara, the capital of Solomon, where 12% of the population lives.
- The Solomon Islands as a whole is sparsely populated, with a population density of 13 people per square kilometer.

In the Study, the population projection for 2005 and 2010 was executed based on the national census conducted by the Department of Statistics in 1986 and 1999, which is referred to in NERRDP. As mentioned above, the annual population growth rate for the whole nation was an average of 2.8%. For the population projection of Honiara, the growth rate was examined taking into consideration migration into the capital city and determined as 3.5% based on the study result in the AusAID report. For the provincial centers of Noro, Auki and Tulagi, an average national growth rate of 2.8% applied.

An action plan was formulated for the following three (3) stages:

- Short term plan : Period from 2006 to 2007
- Mid term plan : Period from 2008 to 2010
- Long term plan : Period from 2011 to 2016

Thus, the population projection for the action plan (2007, 2010 and 2016) for the study areas has been determined as shown in Table G1-1.

The population of Honiara shows the population of the service area in Honiara, including that of the

urban developed areas adjacent to and still outside the city boundary, which is estimated as 10% of the population inside the city boundary.

Table G1-1 Population Projection for Study Areas in 2007, 2010 and 2016

Study Area	1999 Census Population Inside City Boundary	Annual Population Growth (%) (2006～2016)	Population Projection		
			2007 (Short-term)	2010 (Mid-term)	2016 (Long-term)
Honiara City	49,107	3.5	64,664 (71,131)	71,695 (78,865)	88,131 (96,945)
Noro	3,482	2.8	4,342	4,718	5,568
Auki	4,022	2.8	5,017	5,450	6,432
Tulagi	1,333	2.8	1,662	1,806	2,131

Note : Figures in ( ) shows the population of service area by SIWA.
Source : Calculated by the Study Team using data from SIWA data from Department of Statistics

G1.2 Future Indicators and Targets for Managerial and Institutional Strengthening

In general, important indicators for the management of the water supply utility are recognized as follows:

1. Revenue water ratio
2. Water tariff collection ratio
3. Leakage (or Real loss) ratio
4. Effective water ratio
5. Served ratio

The meaning of the above indicators is explained in Table G1-2.

Table G1-2 Important Indicators for Water Supply Utilities

No.	Indicator	Formula
1	Revenue water ratio (%)	Water Production Billed / Water Produced
2	Water tariff collection ratio (%)	Tariff Revenue Collected / Tariff Revenue Billed
3	Leakage ratio (%)	Water Leakage Amount / Water Produced
4	Effective water ratio (%)	100%－Leakage Ratio
5	Served ratio (%)	Current Served Population / Population of Service Area

Future targets for the above indicators are as shown in Table G1-3. The targets have been determined based on actual figures in 2005, which were obtained in the field survey, as well as analysis of the collected data, and the Water Supply Capital Works Plan of SIWA.

Table G1-3 Performance Indicators and Targets for SIWA's Management

(Unit : %)

No.	Indicator	Area	Targets		
			2007 (Short-term)	2010 (Mid-term)	2016 (Long-term)
1	Revenue water ratio	Honiara	57	57	70
		Noro	53	53	60
		Auki	50	50	60
		Tulagi	39	39	55
2	Water charge collection ratio	Honiara	90	95	98
		Noro	-	-	-
		Auki	-	-	-
		Tulagi	-	-	-
3	Leakage ratio	Honiara	40	40	27
		Noro	40	40	35
		Auki	40	40	35
		Tulagi	50	50	40
4	Effective water ratio	Honiara	60	60	73
		Noro	60	60	65
		Auki	60	60	65
		Tulagi	50	50	60
5	Served ratio	Honiara	70	78	90
		Noro	63	67	75
		Auki	60	67	75
		Tulagi	70	74	80

Source : SIWA and field survey by JICA Study Team

G1.3 Approach to Formulation of Action Plan for Capacity Development of SIWA

SIWA is currently facing the management problems mentioned in section D5 of PART D. These problems are caused by issues such as a lack of human resources, financial constraints and obsolete infrastructure. Thus, the management problems were classified by objective analysis. Linkage among the management problems facing SIWA and the necessary activities to be taken by SIWA for management improvement is shown in Figure G1-1.

After this analysis, each activity is evaluated in terms of several requirements for management improvement, which are divided into two categories mentioned below:

Primary evaluation is made by the first category that consists of the following factors:

a) Urgency : Problems must be solved urgently.
b) Scale of influence for management : Scale of influence is the degree to improve management efficiency.

Secondary evaluation is made by the second category that consists of the following factors:

c) The necessity for support from donors : Since it is difficult for SIWA to solve all the problems by itself, cooperation from other donor countries and international organizations is required.
d) Necessity for facility improvement : Facility improvement is necessary to solve the problems.
e) Contribution to improvement of services : It is necessary to upgrade the services of SIWA to ensure customers' satisfaction.

The evaluation results mentioned above are summarized as shown in Table G1-4.

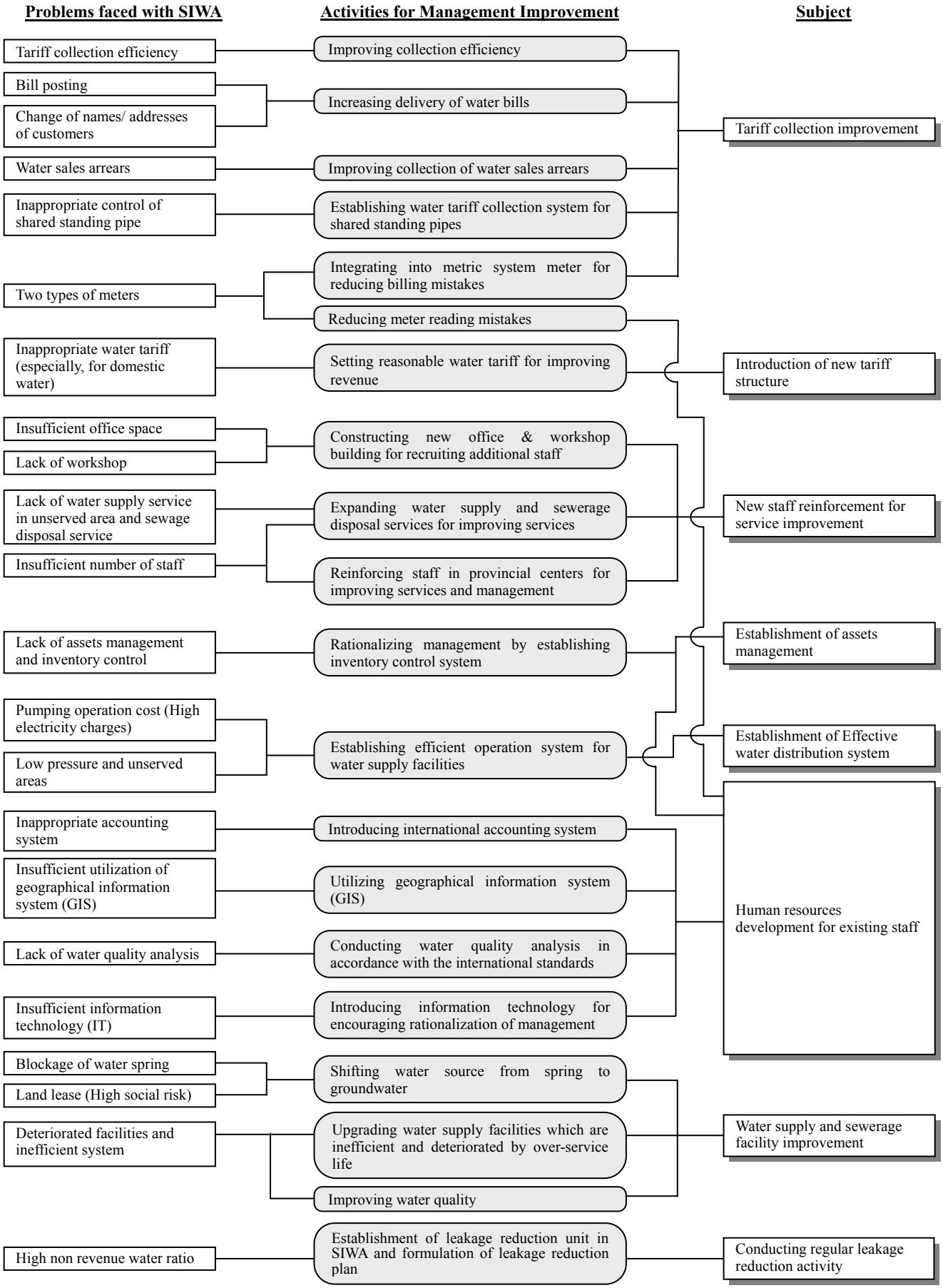


Figure G 1-1 Linkage among Management Problems and Improvement

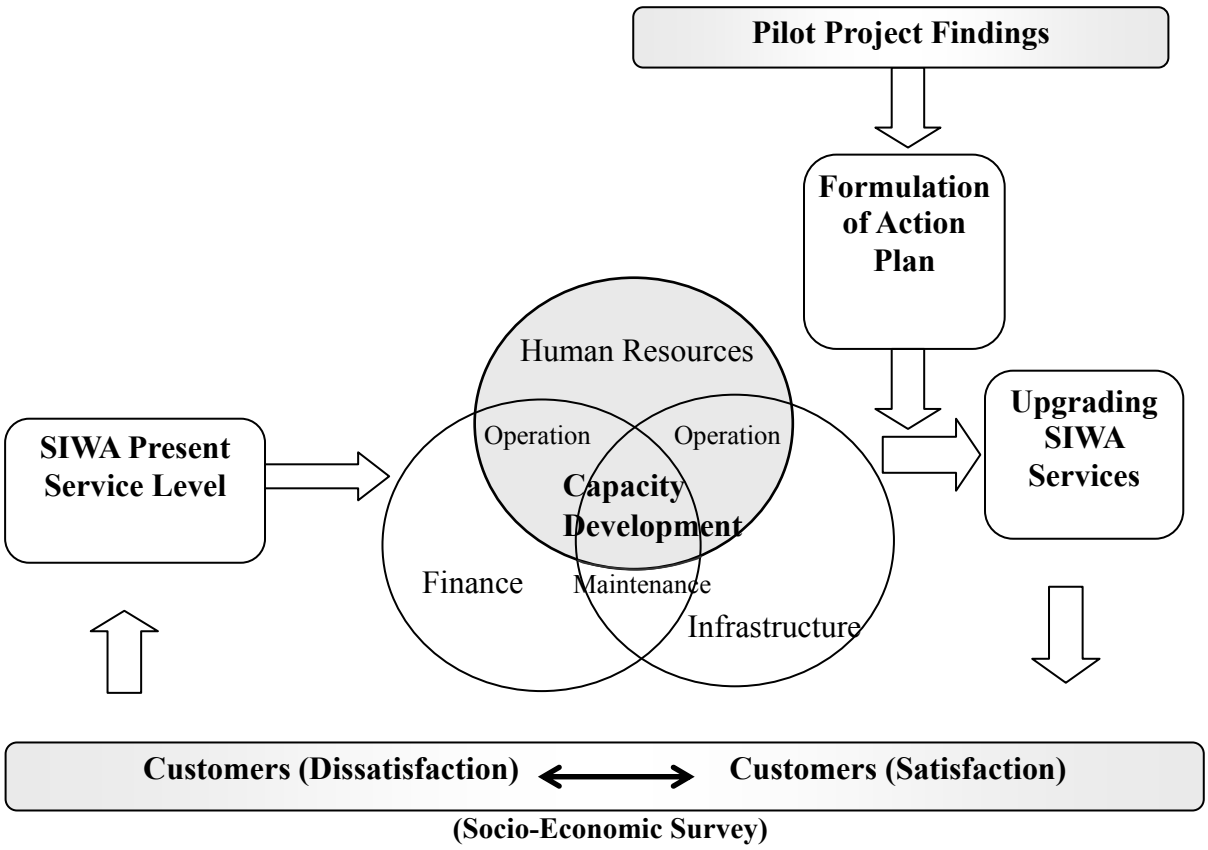
Table G1-4 Evaluation of Management Improvement for SIWA

Subject	Related Section for Action Plan	Activities	Primary Evaluation		Secondary Evaluation		
			Urgency	Scale of Influence for Management	Necessity for Support from Donors	Necessity for Facility Improvement	Contribution to Service Improvement
Tariff Collection Improvement	G2.1	1) Improving collection efficiency	A	A			
		2) Increasing delivery of water bills	A	B			
		3) Improving collection of water sales arrears	A	B			
		4) Integrating into metric system meter to reduce billing mistakes	B	B		Y	Y
		5) Establishing water tariff collection system for shared standing pipe	C	C		Y	Y
Introduction of New Tariff Structure	G2.2	Setting reasonable water tariff for improving revenue	A	A			
New Staff Reinforcement for Service Improvement	G2.3	1) Constructing new office building for recruiting additional staff	A	A		Y	Y
		2) Constructing workshop building for maintenance of equipment for improving services	C	C		Y	
		3) Reinforcing staff in provincial centers for improving services and management	B	C		Y	Y
Establishment of Assets Management	G2.4	Rationalizing management by establishing inventory control system	A	A	Y	Y	
Establishment of Effective Water Distribution System	G2.5	Establishing efficient operation system for water supply facilities	B	B	Y	Y	
Human Resources Development for Existing Staff	G2.6	1) Reducing meter reading mistakes	A	A			Y
		2) Introducing international accounting system	A	A	Y		
		3) Rationalizing inventory control and assets management	A	A	Y	Y	
		4) Improving capability for planning and maintenance of water supply system	B	B	Y		
		5) Utilizing geographical information system (GIS)	B	B	Y		
		6) Conducting water quality analysis in accordance with the international standards	B	B		Y	
		7) Upgrading Information Technology for encouraging rationalization of management	B	A		Y	
Water Supply and Sewerage Facility Improvement	G3	1) Shifting water source from spring to groundwater	A	A	Y	Y	Y
		2) Upgrading water supply facilities which are inefficient and deteriorated by over-service life	A	A	Y	Y	Y
		3) Improving water quality	A	A	Y	Y	Y
Leakage Reduction	G4	Conducting regular leakage reduction activity	A	A		Y	Y

Notes: A - high (large), B - normal, C - low (small), Y – "Yes" (necessary)
Source : JICA Study Team

The action plans to solve the above subjects for capacity development are proposed in consideration of

maximizing SIWA management resources (human, financial and infrastructure resources) and customer requirements, which are derived from the results of the socio-economic survey and lessons from pilot projects conducted under this study. The idea of this concept is illustrated as follows:



Source : JICA Study Team

Figure G1-2 Relation of Capacity Development and Action Plan

G2 Action Plan for Capacity Development of SIWA

The action plan for the SIWA capacity development is formulated as follows. The implementation schedule of the Action Plan is shown in Table G2-2.

G2.1 Tariff Collection Improvement

One of the most important issues for SIWA management is tariff collection improvement. However, several problems represent obstacles to tariff collection for SIWA activities. Of these, major problems include false meter readings caused by meter readers and a huge number of undelivered bills. For improvement from meter readings to tariff collection, SIWA should consider the following activities, with management improvement in mind:

(1) Improving Collection Efficiency

It is recommended that a monitoring committee be established for the tariff collection rate and that the committee monitor the collection efficiency regularly. When targeted efficiency rates are not reached, the committee shall examine and propose solutions to problems. A review of performance records should be performed at least every quarter (3 months). The head of committee will be the General Manager and he should report the monitoring results to the SIWA Board.

(2) Increasing the Delivery of Water Bills

The current total undelivered bills, numbering about 2,000, should be delivered by meter readers to customers when they visit households for monthly inspection. Undelivered bills are classified by district or circles according to the meter readers visiting schedule and handed over to the meter readers in advance. For confirmation of delivered bills, meter readers will get a receipt from the customers. The monitoring committee should observe this activity strictly.

(3) Improving Collection of Water Sales Arrears

Total water debs was more than SI$17 million, including active debts of SI$12 million at the end of FY2005. SIWA must improve the collection efficiency of water sales arrears via negotiation with debtors and an awareness campaign for debtors to settle accounts with SIWA.

(4) Integrating into Metric System Meters to Reduce Billing Mistakes

SIWA is planning to replace the old gallon meters, of which some are out of order, with metric meters. The above monitoring committee is required to prepare a meter replacement plan, as mentioned below, and observe the practice sequentially.

- To prepare an annual implementation plan to replace all gallon meters within 5 years. In order to reduce incorrect meter readings, meter replacement will be completed by circle units (water supply district).
- To draft the plan in parallel with annual budget preparation for the procurement of meters in the next fiscal year, so that meter replacement will be conducted according to the plan.
- To procure the approved number of metric meters according to the plan.
- To transfer the latest information on meter type to meter readers after a renewable system directory, whenever meter exchange is completed.

(5) Establishing a Water Tariff Collection System for Shared Standing Pipes

SIWA has not positively promoted the installation of shared standing pipe up to now because they have faced some difficulties in tariff collection. A socio-economic survey, conducted as part of this study, confirmed that there were some demands for shared standing pipes. Therefore, it is proposed to install shared standing pipes and increase the tariff collection efficiency in the following manner:

- To input data, stating whether it is a shared standing pipe or one solely for individual customer use, into the mobile meter devices (terminals) which meter readers bring with them at the time of inspection.
- To check the tariff collection situation for all shared standing pipes after preparation of the database.
- To reach an amicable solution through negotiation with group users in case there are shared standing pipe customers whose payment is delayed.
- Based on the lessons of the socio-economic survey and the pilot project, new shared standing pipes are to be actively installed (Refer to the result of the pilot project in F 2.4 and F 2.6.4 of Part F).

The action plan for the tariff collection improvement is shown in Table G2-2.

G2.2 Introduction of New Tariff Structure

It is recommended that the water tariff rate be revised to consider inflation over the past 3 years since the current water tariff rate was introduced in October, 2003. It is proposed to revise the following procedures. Considering the gap in "Willingness to Pay" between Honiara and provinces according to socio-economic survey conducted under this study and that the income of Honiara accounts for 90% of total incomes of SIWA, thus it is suggested that the new tariff structure in Honiara be established firstly.

(1) Setting Reasonable Water Tariff for Improving Revenue

(a) Establishment of New Tariff Committee

It is preferable to establish the tariff revision committee headed by the General Manager to examine a new tariff structure. According to the findings of the socio-economic survey being carried out under this Study, a reasonable water rate will be established for both sides of SIWA management and customers as users.

(b) Study of New Tariff

The examination should proceed based on the following preconditions:

- It is required that the rate be set at a reasonable level compared with the cost of water under efficient management, because of the monopoly by SIWA as the public authority.
- Full cost recovery cannot be achieved within the current tariff structure because depreciation and amortization are not considered current expense items.
- 70% of the people (of those who responded to the questionnaire) are complaining of the billed amount for water against SIWA's service level.
- It is estimated that the "Willingness to Pay" of a high-income group household is more than twice that of a low-income group household.
- The average water consumption of 164 liters per person in Honiara is high in comparison with other developing countries, thus, the consumption restraint type of charging method is preferable to reduce water consumption.
- Considering the current inflation rates in the Solomon, it seems that a revision is desirable at 2-3 year intervals.

For reference, case studies for a new tariff structure are made based on the following points. The results of the study are shown in Table D2-1.

a) Taking into consideration the socio-economic survey results such as WTP (Willingness to Pay) and ATP (Ability to Pay)
b) Introduction of a new tariff structure of a differentiated unit price for every $10m^3$ block up to $30m^3$ from the constant price of SI$1.00 for $30m^3$ should be considered for public utility charges of the water consumption restraint type.

A number of case studies for the new tariff structure are prepared based on the means by which SIWA can secure its revenues to cover the estimated expenditure in FY2009. For the case studies, the following 3 preconditions are selected from the socio-economic survey results;

Case-1: Domestic water rates are set for an ATP of SI$80.28 as the upper limit for the low-income group. The domestic rate would be increased by a range of between 0% and 40% for the first, second and third $10m^3$ blocks and 50% of the current tariff rate beyond $30m^3$ respectively. The average domestic rate will increase by SI$2.13/$m^3$ from SI$1.58/$m^3$. In addition to the domestic tariff rate, commercial and government tariff rates shall also be increased by 75% for recovery of the expenditure forecast in FY2009.

Case-2: Domestic water rates are set for an ATP of SI$142.80 as the upper limit for an average in the low- and high-income groups, while the domestic tariff rate would be increased by a range of between 0% and 140% for the first, second and third $10m^3$ blocks and 200% of the current tariff rate beyond $30m^3$. The average domestic rate will increase by SI$3.74/$m^3$ from SI$1.58/$m^3$. In addition to the domestic tariff rate, commercial and government tariff rates shall also be increased by 50% for recovery of the expenditure forecast in FY2009.

Case-3: Domestic water rates are set for WTP of SI$142.80 as the upper limit that is a precondition to improve the water supply service for low income groups, domestic tariff rate would be increased by a range of between 0% and 210% for the first, second and third $10m^3$ blocks and 250% of the current tariff rate beyond $30m^3$. The average domestic rate will increase by SI$4.37/$m^3$ from SI$1.58/$m^3$.In addition to the domestic tariff rate, commercial and government tariff rates shall also be increased by 30% for recovery of the expenditure forecast in FY2009.

Among 3 cases, in Case-1 and Case-2, the current tariff is raised with a comparatively high rate for commercial and government users. Since customers with significant demand might oppose such planned increases, Case-3 is recommended.

Table G2-1 Case Study for New Tariff Structure

Classification	Current Water Tariff		Case 1 ATP(SI$80.28) for Low Income Group		Case 2 Average ATP (SI$142.12)		Case 3 WTP(SI$167.14) for Low Income Group	
Domestic	Unit	a) Current Rates	b) Changed ratio	New Rates (=a x b)	c) Changed ratio	New Rate (=a x c)	d) Changed ratio	New Rate (=a x d)
Fees and Charges (0 to 10m^3)	SI$/m^3	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fees and Charges (10 to 20m^3)	SI$/m^3	1.00	1.20	1.20	1.80	1.80	2.00	2.00
Fees and Charges (20 to 30m^3)	SI$/m^3	1.00	1.40	1.40	2.40	2.40	3.10	3.10
Fees and Charges (over 30m^3)	SI$/m^3	2.42	1.50	3.63	3.00	7.26	3.50	8.47

Classification	Record of Water Supply Services for FY2005			Case 1 ATP(SI$80.28) for Low Income Group		Case 2 Average ATP (SI$142.12)		Case 3 WTP(SI$167.14) for Low Income Group	
Domestic	Unit	a) Current Rates	Record	b) Changed ratio	New Rates (=a x b)	c) Changed ratio	New Rate (=a x c)	d) Changed ratio	New Rate (=a x d)
Average Charges/household	SI$/Month		60.31		81.47		142.94		167.10
Average Water Value/m^3	SI$/m^3		1.58	1.35	2.13	2.37	3.74	2.77	4.37
No. of Households [*1]	Household		5,778						
Water Consumption (Honiara)	m^3/year		2,653,000						
Water Sales Value (Honiara)	SI$/year		4,182,000	1.35	5,648,976	2.37	9,911,232	2.77	11,586,216
Water Consumption/capita/day	LCD		180						
Commercial/Government									
Commercial Fees and Charges	SI$/m^3	5.60		1.75	9.80	1.50	8.40	1.30	7.28
No. of Commercial Customers [*1]	No.		639						
Government Fees and Charges	SI$/m^3	6.16		1.75	10.78	1.50	9.24	1.30	8.01
No. of Government Customers [*1]	No.		318						
Water Consumption (Commercial/Government)	m^3/year		1,845,000						
Water Sales Value (Commercial/Government)	SI$/year		13,167,000	1.75	23,042,250	1.50	19,750,500	1.30	17,117,100
Average Value	SI$/m^3		7.14		12.49		10.70		9.28
Other Income [*2]	SI$/year		2,018,400		685,000		685,000		685,000
1. Total Sales Value (Honiara)	SI$/year		19,367,400	1.52	29,376,226	1.57	30,346,732	1.52	29,588,206
2. Sales Value (Province) [*2]	SI$/year		1,753,000		1,280,000		1,280,000		1,280,000
A. Income Forecast (1 + 2)	SI$/year		21,120,400		30,656,226		31,626,732		30,668,316
B. Expenditure Forecast (FY2009)	SI$/year				30,509,700		30,509,700		30,509,700
C. Balance (A - B)	SI$/year				146,526		1,117,072		158,616
D. Expenditure Forecast (FY2008)	SI$/year				28,230,600		28,230,600		28,230,600
E.. Balance (A - D)	SI$/year				2,425,626		3,396,132		2,437,716

Note :1: Actual data as of April 2005 were given by SIWA.
2: Actual data in FY 2005 and value for case-1 to case-3 is based on SIWA 2006 Approved Annual Budget.
Source : JICA Study Team

Before the introduction of a new tariff structure, the following items should be reviewed by SIWA:

1) To review the possibility of a current expenditure reduction of SIWA,
2) To study change in the tariff structure at 2 year intervals when overly significant changes are called for every 3 years,
3) To study a special tariff rate for foreign or high income residents, if they are identifiable,
4) To consider a tariff rate for users with high water demand, in addition to social-economic survey results, because they are important customers for SIWA.

(c) Getting Approvals from the Board and SIG

If a new rate revision plan is settled by the Committee, SIWA board members should study in particular whether the revision plan is acceptable for households of low income group or not. A rate revision is enforced only after obtaining approval for the rate revision plan from the SIG parliament.

(d) Implementation of Awareness Campaign

The enforcement of the new rate should be introduced by an explanation and publicity campaign. SIWA should announce the revision rate, effectively using media, such as radio and newspapers. Though acting to explain to residents, SIWA must get their overall consensus, especially from those in the low-income group. In addition, it is necessary for SIWA to explain to residents based on the fact that electricity cost is the most significant item of expenses in SIWA management and gradually increasing yearly due to inflation. In addition, an explanation of full cost recovery of the system operation, including depreciation and amortization, is important to manage a water service business from the perspective of a long-term operation.

(2) Rate Revision of Province

A new tariff structure for the provinces is to be introduced by a similar step while observing the domestic customer payment situation after introduction of a new tariff structure in Honiara City and based on the socio-economic findings in the provinces.

The action plan for the introduction of a new tariff structure is shown in Table G2-2.

G2.3 New Staff Reinforcement for Service Improvement

It is physically impossible to reinforce staff numbers because the SIWA office building is not capable of housing additional staff. Therefore, it is necessary for SIWA to prepare an organizational reinforcement plan by examining both an office expansion plan and staff recruitment plan.

(1) Constructing a New Office and Workshop Building for Recruiting Additional Staff

A new plan for an office building is already underway as part of this study, and construction is ready to start once funding can be secured. In addition, it is desirable that a workshop for machinery repair, including a laboratory, be constructed at the same time. The procedure for this subject is as follows:

(a) Finding out Fund

Construction costs of the office are estimated at about SI $ 12.7 million, including external construction works. It is necessary to consider a fund based on the terms of payment to a construction company. If funding is promising, concrete implementation will be studied based on the selection of the contractor, consisting of the authorization for the acquisition of construction works to the completion of construction.

(b) Preparation of Tender Documents and Tendering

SIWA is familiar with construction works relating to the water supply business, but a tender document must be prepared by the project team with DMES as the person in charge. According to SIWA Procurement Guidelines, SIWA should select the most suitable construction company with enforcement ability through negotiation for various contractual terms with the candidate company after a public bid announcement.

(c) Construction supervision

After selection of the contractor, the required construction period is around 3 years. Construction supervision during this period is to be carried out by DMES as the person in charge.

(2) Expanding Water Supply and Sewerage Disposal Services for Improving Services

SIWA needs to examine the following for staff reinforcement in parallel with construction of the office

buildings:

(a) Study of Cost and Service Comparision with Outsourcing

A "Corporate Plan 2005-2007" is drafted, based on the mandate given to SIWA. A staff reinforcement plan, including a position description of each department, and the ability of the current staff, etc should be reviewed based on the cost comparison analysis between direct management and outsourcing for provision of the same service, according to the SIWA management strategy. It is assumed that the General Manager shall be the enforcement person in charge for this purpose.

(b) Review of Corporate Plan

In 2007, the "Corporate Plan 2008-2010" will be drafted after the review of "Corporate Plan 2005-2007" and based on the results of performance records. In particular, it is advisable that realization of new services, such as a water supply service and sewage treatment service, should be studied as mentioned in the action plan. In addition, a new plan should be considered to meet the requests of several provincial centers for water supply services.

(a) Providing Services with Water Tankers and Vacuum Trucks

Staff reinforcement is required for the new duties of SIWA's business expansion. New business is expected as follows:

- Water supply service : Employment of the new staff to provide a water supply service by water tanker to unserved areas will be necessary (a cost comparison study with outsourcing should be performed).
- Sewage treatment service : There are plans to purchase vacuum trucks for a sewage sludge disposal service. To realize this service, it is necessary to hire new staff (a cost comparison study with outsourcing should be performed).
- Water quality analysis : One of the SIWA mandates is to supply safe water as drinking water. For this purpose, water quality analysis is essential. It is necessary for SIWA to carry it out for the main items stipulated in WHO guideline regularly. In order to do so, SIWA needs to reinforce the staff and supply necessary chemical reagents and equipment for water analysis appropriately.

(6) Reinforcing Staff in Provincial Centers for Improving Services and Management

SIWA is responsible for water service in provincial centers. Noro, Auki and Tulagi are already administered by SIWA, but SIWA also has the intention to administer other provincial centers. When these are realized, reinforcement of the personnel is required. The water supply service in several provincial centers is planned as follows:

In accordance with "SIWA Water Supply Capital Works Plan: 1996 to 2016, May 2004 (Revision 2)", SIWA's area of responsibility includes provincial centers. The water supply systems in Tulagi, Noro and Auki are already operated by SIWA. The remaining Munda (Population in 1996: 1,745) in Western Province, Kira Kira (Population in 1996: 3,482) in Makira Province, Lata (Population in 1996: 2,039) in Timoutu Province and Gizo (Population in 1996: 4,996) in Western Province had not yet been handed over as of the end of 2005, but at present SIWA is negotiating the takeover of a number of these centers. It is estimated that Buala (Population in 1996: 256) in Isabel Province and Taro (Population in 1996: 292) in Choiseul Province will be handed over to SIWA within the twenty year horizon. Due to a lack of available information, no discussion is provided for in some centers. SIWA should consider both the political and physical conditions of those centers.

The action plan for new staff reinforcement for service improvement is shown in Table G2-2.

G2.4 Establishment of Assets Management

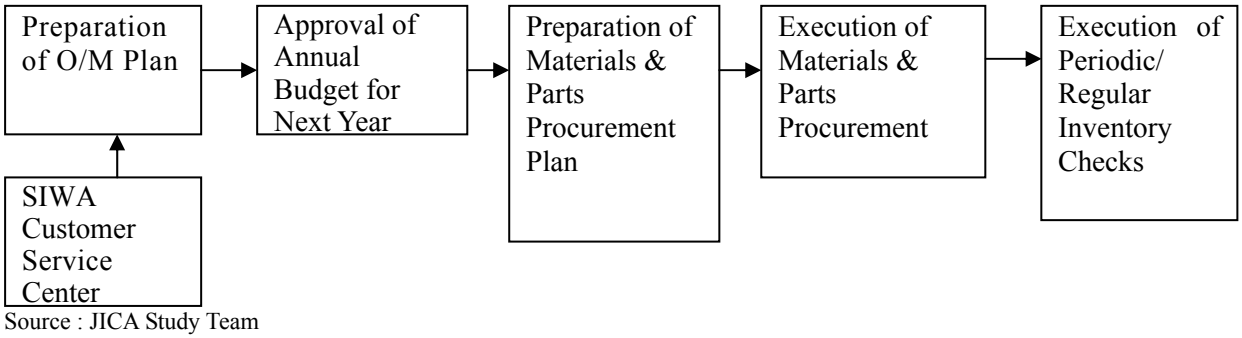
SIWA is expecting to establish a reasonable management system for materials and parts control. SIWA is required to stock and deliver materials and parts to the site on a timely basis from their procurement, through management of a series of duties. In the case of SIWA, the majority of materials and parts for

the maintenance of a water supply and sewerage system are usually imported from a foreign country. This may lead to a problem of a delay in supply for several months caused by supplier's conditions. On the other hand, it is necessary to maintain stock for materials to cope quickly when they are needed.

There are the following demerits for stock possession, meaning it is necessary to manage stock adequately:

1) Increase of inventory control expense
2) Increase of stock fund
3) Obsolescence of stock articles, and deterioration of quality;
4) Increase of stock space

SIWA is required to establish the following inventory control flow from the preparation of an operation and maintenance (O/M) plan to periodic and regular inventory checks.



Source : JICA Study Team

Figure G2-1 Inventory Control Flow

(1) Preparation of Operation and Maintenance (O/M) Plan

SIWA prepares the annual budget of the next fiscal year by the end of the current fiscal year. In parallel with this activity, Divisional Manager Engineering Services (DMES) is required to prepare a materials and parts list for maintenance for the following year. The O/M plan should specify the repair time, and materials and parts in order to reflect the materials and parts procurement plan whenever needed. The plan should be considered to reflect the number of repairs, and kinds of materials, etc. to be requested by the customers for the Customer Service Center. The Department of Sales and Customer Services (DSCS) also considers the urgent repair materials list, which will be needed in the next year and prepares the O/M plan.

(2) Preparation of Materials and Parts Procurement Plan

If the budget is approved in the next fiscal year, the required amount is to be calculated based on the O/M plan and the materials and parts procurement plan. The contents of the materials and parts procurement plan includes purchasing items, the required amount, and the appointed date of delivery from suppliers, prices, terms and conditions, etc.

The plan should consider the following points:

(a) Cost reduction

It is necessary to calculate the quantity of indispensable materials, based on a stock directory, to reduce the stock cost of materials and parts at the initial stage. The quantity of the ordering amount will be finalized, taking consideration of the economic lot of a delivery by supplier and the potential for price fluctuation.

(b) Operation funds reduction

The supply period of materials and parts should be examined in order to reduce saving stock quantities of operation funds as much as possible. To target a reduction in operation funds, immobilized stock is to be reduced as much as possible.

(c) Prevention of lack of stock articles

Quick delivery of materials or parts to the repair spot from a warehouse is required upon request of their exchange. It is always necessary to keep materials and parts for system repair judging from existing data and experience.

(3) Materials and Parts Procurement

It is necessary to manage materials and parts procurement for suppliers to be implemented according to the contract.

It is necessary to terminate business with suppliers that are unfavorable in terms of the quality and price of a product and to locate appropriate suppliers. The latest information concerning materials for future uses can be regularly collected via the Internet, etc. In addition, participation in exhibition and trade fairs performed in neighboring countries represent one of the effective ways to get detailed information on products at a time.

(4) Periodic and Regular Inventory Check

It is necessary to conduct stock inventory control continuously every day in order to avoid various problems that may occur unless stock of an inventory control account book accords precisely with the stock articles. This can be done through adequate management of a daily suitable method called "a circulation inventory control", which provides for all items to be checked regularly within a fixed period. Even SIWA has to perform an inventory check every month at least. It is recommended that easy management be administered for sock articles, based on the importance and frequency of usage of an item.

The action plan for establishment of assets management is shown in Table G2-2.

G2.5 Establishment of Efficient Water Distribution System

SIWA is planning to take some countermeasures to reduce operation and maintenance costs by effective pump operation and make effective use of the limited water resources in the water distribution districts.

Therefore, SIWA wishes to introduce the SCADA system (Supervisory Control and Data Acquisition) for controlling, a) water distribution from water sources to the distribution reservoir, b) water level change at water sources and distribution reservoir and c) pressure change at main pumping stations, which will enable SIWA to distribute the limited water effectively within the water distribution district and to control the total waterworks system comprehensively for effective water distribution over a wide district area.

The SCADA system has already been introduced in many countries and has many advantages in particular for a complicated water supply system within an urban area.

The SCADA system consists of measuring instruments used to collect data at monitoring sites, a telemetry system to convey collected data to the central station, and data processing equipment at a monitoring center (SIWA Headquarters), used to process the collected data. Telemeter panels will be installed in each monitoring site and monitoring center to convey data.

However, since it seems difficult for SIWA to introduce such system within the short and mid-term plans, due to its financial and technical constraints, the introduction of the system shall be examined in the long term plan and implemented according to the following steps, under technical guidance from an overseas expert.

(a) Basic Design of the SCADA System

The functions and cost comparison of the system will be studied after collection of equipment specifications from the various overseas manufacturers. If possible, the basic design for SCADA system would be drafted in collaboration with a foreign expert in this field.

(b) Purchasing and Installation of the SCADA System

According to the SIWA Procurement Guidelines, the most suitable SCADA system would be purchased by SIWA and installed by the selected manufacturer.

(c) Operation Guidance for the SCADA System

The nominated water supply engineers of SIWA must receive operational guidance for the SCADA system from the manufacturer. It is recommended that SIWA receive technical guidance by a foreign expert during and after installation of the system for appropriate operation.

The action plan for the establishment of an effective water distribution system is shown in Table G2-2.

G2.6 Human Resources Development for Existing Staff

(1) Review of Staff Training Plan

In order to reinforce the SIWA organization, human resources development is an essential issue. Although SIWA has already made "Staff Development Plan 2004-2006" and is going to perform ability development of the staff positively, the following points will be considered for review of a personnel training plan:

(2) Necessary Training Field

SIWA should conduct capability development of the existing staff in the following fields:

(a) Reducing Meter Reading Mistakes

There are many false readings. It is necessary to train meter readers on how to deal with different kind of meters (gallon or metric systems). Many complaints on false readings have been made by customers.

To reduce meter reading errors caused by meter readers, remedial education of meter readers is necessary. Supervisors of meter readers should control and confirm with meter readers whether meters are of the metric or gallon type by households within each circles before they implement meter inspection. As one of the ways to reduce meter reading errors, the introduction of incentives as a bonus or disincentives as a penalty should apply to supervisors and meter readers. The monitoring committee will study further effective manners of meter reading and obtain its conclusions.

(b) Introducing an International Accounting System

There would be two issues in this matter. One is a lack of skilled staff to support daily routine work and the other is a lack of experts with knowledge of an international accounting system. With the former issue in mind, SIWA is encouraging the dispatch of accounting staff to a college or school (SICHE, UPS, NTU) in the country for upgrading their professional knowledge of the accounting system. The second issue concerns an accounting system which does not accord with international standards. For instance, SIWA staff cannot draw up profit and loss statements (P/L) and balance sheets (B/S) unaided. In addition, no asset account book has yet been drafted. For the latter issue, it is necessary to perform education based on technical guidance from an accounting expert from any donor country or international organization, because it seems difficult to source such an expert in Solomon.

(c) Rationalizing Inventory Control and Assets Management

SIWA holds considerable stock, such as parts for repair or plumbing that are necessary for system maintenance. However, the inventory control of materials is not performed properly due to a lack of trained persons with professional field. In addition, there is a lack of inventory control. It seems that training by OJT (On-the-Job Training) is conducted by an expert from any donor country or international organization because of a difficulty to finding experts in such fields in Solomon.

(d) Improving Capacity for Planning and Maintenance of the Water Supply System

SIWA is planning to upgrade the operation system in consideration of reducing maintenance costs, especially electricity charges, which account for the majority of costs. However, engineers should

upgrade their technical capability, including a SCADA system, for the planning and maintenance of the water supply system. SIWA is trying to train engineers of this field under technical guidance by experts from any donor country. It seems that training by OJT is the most effective method. It is also possible to acquire technical capability by training in foreign countries.

(e) Utilizing Geographical Information System (GIS)

It is important that existing data and information should be daily updated by GIS (Geographical Information System). In the case of SIWA, data is not updated. Thus, there is a problem of inconsistency between the site and system data. SIWA is expecting to improve the current staff capability and has to reinforce the staff. The current staff are able to provide technical guidance for new employees. Additionally, SIWA has to look for an opportunity to dispatch staff for overseas training.

(f) Conducting Water Quality Analysis in Accordance with International Standards

SIWA has an expert who has the ability to analyze water quality items in accordance with WHO guidelines. However, not all required items stipulated by the WHO are conducted, due to a lack of manpower. It seems, however, that the senior staff are able to provide other staff with technical guidance of water quality analysis by OJT according to WHO guidelines.

(g) Upgrading Information Technology for Encouraging Rationalization of Management

The practical use of a computer is indispensable to normal business routine work for SIWA, and there are two Information Technology (IT) Engineers. However one engineer is currently dispatched for long-term training abroad. It is expected that another person shall be dispatched for the long-term training abroad in turn.

(3) Training Method

There would be various kinds of methods for training, i.e. dispatching staff for participation in a seminar for the short term or a vocational school for the longer term. However, external resources for acquired technical knowledge in Solomon are considerably limited to capability development. Therefore, an effective method would be technical guidance by a special instructor from overseas or dispatching staff to overseas specialized agencies for a certain period of time. It seems that practice by OJT is the most effective method.

The action plan for human resources development for existing staff is shown in Table G2-2.

Table G2-2 Action Plan for Capacity Development of SIWA (1/3)

Subject		Activities	Performance Measure	Short-term		Mid-term			Long-term	Responsible
				2006	2007	2008	2009	2010	2011-2016	
Tariff Collection Improvement	1	Improving collection efficiency	Establishment of monitoring committee							GM
	2	Increasing delivery of water bills	Dispatching undelivered bills							DMFS
	3	Improving collection of water sales arrears	Implementation of awareness campaign & negotiation with debtors							DSCS
	4	Integrating into metric system meter for reducing billing mistakes	Preparation of meter replacement plan							DSCS
			Replacement of imperial meters to metric							DSCS
	5	Establishing water tariff collection system for shared standing pipes	Promotion of shared standing pipe installation							DSCS
			Negotiation with group users & Appointment of money collector							DSCS
Introduction of New Tariff Structure	1	Setting reasonable water tariff for improving revenue	Establishment of new tariff committee							GM
			Study of new tariff							DMFS
			Getting approvals from Board and SIG							GM
			Implementation of awareness campaign							DSCS

Notes:
- DMSS: Divisional Manager Support Services,
- DFM: Department of Financial Management,
- DA: Department of Administration ,
- DPD: Department of Planning & Design ,
- DMIS: Department of Management Information Systems,
- DMFS: Divisional Manager Finance & Sales ,
- DSCS: Department of Sales and Customer Services
- DIA: Department of Internal Audit
- DWS: Department of Water Supply
- DE: Department of Environment
- GM: General Manager
- DMES: Divisional Manager Engineering Services

Source : JICA Study Team

Table G2-2 Action Plan for Capacity Development of SIWA (2/3)

Subject		Activities	Performance Measure	Short-term		Mid-term			Long-term	Responsible
				2006	2007	2008	2009	2010	2011-2016	
New Staff Reinforcement for Service Improvement	1	Constructing new office & workshop building for recruiting additional staff	Finding out fund							GM
			Preparation of tender document and tendering							DMES
			Construction supervision							DMES
	2	Expanding water supply and sewerage disposal services for improving services	Study of cost & service comparison with outsourcing							DMSS/DMES
			Review of Corporate Plan							GM
			Providing services with water tankers & vacuum trucks							DMSS/DMES
	3	Reinforcing staff in provincial centers for improving services and management	Business expansion in provincial centers							DMSS
Establishment of Assets Management	1	Rationalizing management by establishing inventory control system	Preparation of O/M plan							DMES
			Preparation of materials and parts procurement plan							DMFS
			Materials and parts procurement							DMSS
			Periodic and regular inventory check							DA

Notes:
- DMSS: Divisional Manager Support Services,
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- DMFS: Divisional Manager Finance & Sales ,
- DSCS: Department of Sales and Customer Services
- DIA: Department of Internal Audit
- DWS: Department of Water Supply
- DE: Department of Environment
- GM: General Manager
- DMES: Divisional Manager Engineering Services

Source : JICA Study Team

Table G2-2 Action Plan for Capacity Development of SIWA (3/3)

Subject		Activities	Performance Measure	Short-term		Mid-term			Long-term	Responsible
				2006	2007	2008	2009	2010	2011-2016	
Establishment of Effective Water Distribution	1	Establishing efficient operation system for water supply facilities	Basic design of SCADA system							DPD
			Purchasing and installation of SCADA system							DMES
			Operation guidance for SCADA system							DPD
Human Resources Development for Existing Staff	0	(Common items)	Review of staff training plan							DMSS
	1	Reducing meter reading mistakes	On the Job Training							DSCS
	2	Introducing international accounting system	Training of accounting staff at schools							DFM
			Receiving technical guidance by foreign expert or overseas training							DIA
	3	Rationalizing inventory control and assets management	Receiving technical guidance by foreign expert or overseas training							DA
	4	Improving capability for planning and maintenance of water supply system	Receiving technical guidance by foreign expert or overseas training							DWS/DPD
	5	Utilizing geographical information system (GIS)	Receiving technical guidance by foreign expert or overseas training							DPD
	6	Conducting water quality analysis in accordance with the international	On the Job Training							DE
	7	Upgrading information technology for encouraging rationalization of management	Overseas training							DMIS

Notes:
- DMSS: Divisional Manager Support Services,
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- DMFS: Divisional Manager Finance & Sales ,
- DSCS: Department of Sales and Customer Services
- DIA: Department of Internal Audit
- DWS: Department of Water Supply
- DE: Department of Environment
- GM: General Manager
- DMES: Divisional Manager Engineering Services

Source : JICA Study Team

G3 Action Plan for Water Supply and Sewerage Facility Improvement

In 2004, SIWA prepared "Water Supply Capital Works Plan" for the years from 2006 to 2016. Therefore, the action plan for the water supply and sewerage facility improvement has been prepared taking into account the Capital Works Plan by SIWA.

The outline of the action plan for the water supply and sewerage facility improvement is as shown in Table G3-1 and the detail of the plan is shown in Table G3-2.

Table G3-1 Outline of Action Plan for Water Supply and Sewerage Facility Improvement

Area	Item to be Implemented	Short-term 2006～2007	Mid-term 2008～2010	Long-term 2011～2016
Honiara	［Water Supply］			
	Implementation of mid-term facility improvement plan		▨	
	Replacement of the existing equipment	▨		
	Expansion of water distribution network	▨	▨	▨
	Replacement of meters	▨	▨	▨
	［Sewerage］			
	Implementation of mid-term facility improvement plan		▨	
Noro	Expansion of water distribution network	▨	▨	▨
	Replacement of filters for water treatment facility	▨		
	Replacement of pumps	▨		
	Replacement of motors		▨	
	Replacement of meters	▨	▨	▨
Auki	Implementation of mid-term facility improvement plan		▨	
	Expansion of distribution reservoir	▨		
	Replacement of riser main	▨		
	Installation of booster pumps	▨		
	Expansion of water distribution network	▨	▨	▨
Tulagi	Installation of disinfection facility	▨		
	Replacement of pumps		▨	▨
	Expansion of distribution reservoir	▨		
	Expansion of water distribution network	▨	▨	▨
	Replacement of meters	▨	▨	▨
Expected Project Cost（x 1,000 SI$）		16,746	77,226	20,791

Source : SIWA and JICA Study Team

Table G3-2 Action Plan for Water Supply and Sewerage Facility Improvement (1/10)

(unit : SI$)

Urban Center	Item	Detail Description	Short Term		Mid-Term			Long Term					
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
A. HONIARA Water Supply System in the Mid-term Facility Improvement (MFI) Plan by JICA Study (Option J-1)	**A-1. Source Development**												
	1. Tasahe New Borefield 800m^3/day x 4 bores				1,711,346	1,711,346	1,711,346						
	2. Titinge New Borefield, 800m^3/day x 4 bores				1,729,000	1,729,000	1,729,000						
	3. Skyline New Borefiels 800m^3/day x 4 bores				1,554,000	1,554,000	1,554,000						
	4. Borderline New Borefield 800m^3/day x 4 bores				1,869,000	1,869,000	1,869,000						
	A-2. Water Treatment												
	1. Disinfection Plant for New Borefields	Tasahe New Borefield Titinge New Borefield Skyline New Borefield Borderline New Borefield			634,737	634,737	634,737						
	2. Disinfection Plant for Existing Borefield	Mataniko Borefield Kombito EU Borefield Panatina Borefield			454,300	454,300	454,300						
	3. Intermediate Water Treatment Facility	While River Gravity System Rove Spring Kombito Spring			2,811,494	2,811,494	2,811,494						
	A-3. Pumping station												
	1. Tasahe New Borefield	Tasahe to Tasahe Preservoir			344,155	344,155	344,155						
	2. Titinge New Borefield	Titinge To Titinge Reservoir			326,200	326,200	326,200						
	3. Skyline New Borefield	Skyline To Skyline Reservoir			326,200	326,200	326,200						
	4. Borderline New Borefield	Borderline To Borderline Reservoir			326,200	326,200	326,200						
	A-4. Distribution Storage												
	1. Upper Tasahe Reservoir (1,600m^3)				461,447	461,447	461,447						
	2. Titinge Reservoir (1,400m^3)	From Titinge New Borefield			387,800	387,800	387,800						
	3. Skyline SIWA Reservoir (1,550m^3)	From Skyline New Borefield			424,200	424,200	424,200						
	4. Lower West Kolaa Reservoir (455m^3)	From Mataniko Borefield			147,700	147,700	147,700						
	5. Panatina Reservoir (2,000m^3)	From Panatina Borefield			701,400	701,400	701,400						
	A-5. Distribution Mains												
	1. Tasahe New Borefield to Tasahe Reservo	PVC main, 250mm, 1.0km			169,806	169,806	169,806						
	2. Tasahe Distribution Main	PVC main, 50~100mm, 4.9km			331,151	331,151	331,151						
	3. Rove Spring Distribution Main	PVC main, 200mm, 1.5km			202,300	202,300	202,300						
	4. Titinge New Borefield to Titinge Reservoir Rising Main Skyline New Borefield to Skyline Reservoir Rising Main Titinge Distribution Main	PVC main, 100~250mm, 3.3km			388,500	388,500	388,500						
	5. Skyline Distribution Main	PVC main, 50~250mm, 4.8km			508,500	508,500	508,500						
	6. Borderline New Borefield to Borderline Reservoir Rising Main Borderline Distribution Main	PVC main, 50~300mm, 9.8km			811,900	811,900	811,900						
	7. Panatina Distribution Main	PVC main, 100~150mm, 3.2km			251,800	251,800	251,800						

Source : SIWA and JICA Study Team

Table G3-2 Action Plan for Water Supply and Sewerage Facility Improvement (2/10)

(unit : SI$)

Urban Center	Item	Detail Description	Short Term		Mid-Term			Long Term					
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
B. HONIARA	**B-1. Source**												
General	1. Develop New Source	**Refer to "A. HONIARA Water Supply System" (A-1)**											
	2. Telemetry System									500,000			
	B-2. Treatment												
	1. Water Testing Equipment	Chemical testing equipment											
	B-3. Existing System												
	1. Expected Network Replacement		500,000	300,000				130,560	130,560	168,249	168,249	168,249	168,249
	2. Identified Network Replacement					**Refer to A-5**							
	B-4. New Areas												
	1. Projected New Network		950,000	500,000		**Refer to A-5**		1,282,728	1,282,728	1,603,873	1,603,873	1,603,873	1,603,873
	B-5. Meters	Bulk flow meters	100,000	50,000	20,000								
		Residential meters	700,000	700,000	595,440	613,702	631,845	650,107	668,250	742,254	764,944	787,572	810,319
	B-6. Residential Housing	Tuvaruhu renovations Renovate 3 blocks 12 rooms											
		6 residential houses	300,000	300,000									
		2 executive houses	500,000										
		General managers residence	100,000										
		Henderson development (49 houses)											
		Kombivalu development (5 houses)	200,000	700,000									
	B-7. Offices and Stores	Renovate Tuvaruhu workshop											
		Renovate existing offices to stores and build new office	200,000	2,000,000									
	B-8. Plant	Replacement vehicles	600,000	1,000,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000
		Tip truck											
		Water tanker		500,000									
		Trailer mounted drilling rig							1,000,000				
	B-9. Other equipment	Replacement - computers	90,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000	49,000
		Information Systems Upgrade	500,000										

Source : SIWA and JICA Study Team

Table G3-2 Action Plan for Water Supply and Sewerage Facility Improvement (3/10)

(unit : SI$)

Urban Center	Item	Detail Description	Short Term		Mid-Term			Long Term						
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
C. HONIARA White River Gravity	**C-1. Source Development**													
	1. Catchment Management Plan	Develop draft												
		Obtain legal advice												
		Public education		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	
		Installation of signs												
	2. Investigation of White River Spring	2 week input by specialist												
	C-2. Treatment													
	1. Filtration	Install cartridge filtration system												
	2. Disinfection	Purchase back-up pump												
		Replacement of pump				10,000				10,000				
	C-3. Reservoirs Development													
	1. New Tanks	**Refer to "A. HONIARA Water Supply System" (A-4)**												
	C-4. Pumps													
	1. New White River Pump Station - Emergency supply to Tasahe Tank			200,000										
	2. Standby Generator													
	C-5. Pipeline Development													
	1. Realign Pipe Water Crossing (secure pipeline)													
	2. New Pipeline connecting White River Tank to Tasahe Tank			300,000										
	C-6. Houses													
	1. Caretaker houses			60,000										

Source : SIWA and JICA Study Team

Table G3-2 Action Plan for Water Supply and Sewerage Facility Improvement (4/10)

(unit : SI$)

Urban Center	Item	Detail Description	Short Term		Mid-Term			Long Term					
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
D. HONIARA	**D-1. Source Development**												
White River	1. Restore JICA Bores-Kombito												
High Level	2. Develop New Boreholes at Mataniko to increase capacity												
	3. Develop Mataniko Gallary Source			200,000									
	4. Investigate Kovi Sinkhole to reduce chances of blockage												
	D-2. Treatment												
	1. Filtration	Install cartridge filtration system											
	2. Disinfection	Puchase back-up pump											
		Replacement of pump				10,000				10,000			
	3. Integrate treatment plant for water purification		**Refer to "A. HONIARA Water Supply System" (A-2)**										
	D-3. Reservoirs Development												
	1. New Tanks	**Refer to "A. HONIARA Water Supply System" (A-4)**											
	D-4. Pumps												
	1. White River Pump Station	Motor - major service	50,000				10,000				30,000		
		Motor - replacement											
		Motor - major service	50,000				10,000				30,000		
		Motor - replacement											
		Motor - major service				10,000				10,000			
		Motor - replacement								30,000			
	2. JICA Mataniko Bores	Replacement - 0.43m^3/min x 100mH x 11kW			50,000								
		Replacement - 0.43m^3/min x 100mH x 11kW			50,000								
		Replacement - 0.43m^3/min x 100mH x 11kW			50,000								
		Replacement - 0.43m^3/min x 100mH x 11kW			50,000								
		Replacement - 0.43m^3/min x 100mH x 11kW			50,000								
		Motor - major service			10,000								
		Motor - replacement	100,000							15,000			
	3. Exploring Alternatives Power Sources - Solar, Water and Oil									50,000			
	4. Telemetry System			100,000									
	D-5. Pipeline Development	Link Kombito JICA bores to East Kolaa Tank											
		Replace West Kolaa to East Koaa pipeline	200,000										
		Investigate and assess Mataniko under water Crossing											
		Link Skyline to Rove Gravity System		100,000									

Source : SIWA and JICA Study Team

Table G3-2 Action Plan for Water Supply and Sewerage Facility Improvement (5/10)

(unit : SI$)

Urban Center	Item	Detail Description	Short Term		Mid-Term			Long Term					
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
E. HONIARA	**E-1. Source Development**												
Rove Spring	1. Catchment Management Plan												
	2. Rehabilitate Source	Revegetation											
		Construction of Dam Walls											
		Replace Fencing of perimeter of source											
	3. Develop New Boreholes												
	E-2. Treatment												
	1. Filtration	Install Cartridge Filtration System											
	2. Disinfection	Purchage back-up pump											
		Replacement of pump				10,000				10,000			
	3. New Treatment Plant	**Refer to "A. HONIARA Water Supply System" (A-2)**		200,000									
	E-3. Reservoir's Development												
	1. New Tanks	New 600m^3 Tank											
		Replacement - Lengakiki Tank roof	200,000										
	2. Pumps	Replacement - 0.6m^3/min x 80mH x 11kW			50,000								
		Replacement - 0.6m^3/min x 80mH x 11kW			50,000								
		Replacement - 0.6m^3/min x 80mH x 11kW			50,000								
		Replacement - 0.6m^3/min x 80mH x 11kW			50,000								
		Motor - major service			50,000								
		Motor - replacement								15,000			
	E-4. Standby Generator												
	E-5. Pipeline Development	Replace pipeline from Rove Source to											
		Lengakiki Tank		100,000									
		Realignment of Gravity line		100,000									

Source : SIWA and JICA Study Team

Table G3-2 Action Plan for Water Supply and Sewerage Facility Improvement (6/10)

(unit : SI$)

Urban Center	Item	Detail Description	Short Term		Mid-Term			Long Term					
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
F. HONIARA	**F-1. Source Development**												
Panatina	1. Development of New Bores	**Refer to "A. HONIARA Water Supply System" (A-1)**											
	2. Catchment Management Plan	Installation of signs											
		Revegetation		40,000									
	3. Secure Kombito Source Dam												
	4. Investigate Lunga River as a new source												
	5. Investigate Mboko as an alternative source			10,000									
	F-2. Treatment												
	Panatina-Kombito Source												
	1. Filtration	Install cartridge filtration system				10,000							
	2. Disinfection	Purchase back-up pump					10,000						
		Replacement of pump									10,000	10,000	
	F-3. Reservoirs Development												
	1. New Tanks	Replacement 900m^3 tank											
		New 900m^3 tank				150,000							
		New 600m^3 tank			100,000								
		Replacement - SICHE Kukum campus tank											
	F-4. Pumps												
	1. Panatina Pumping Station	Replacement - Grundfos bores pump (BH3)	50,000									50,000	
		Replacement - Grundfos bores pump (BH2)	50,000										50,000
		Replacement - Grundfos bores pump (BH1)									150,000		
	2. Kombito Bores	Replacement - Southern Cross bore pump				10,000							
		Motor - major service									10,000		
		Motor - replacement											
		Replacement - JICA 0.53m^3 x 80mH x 11kW											
		Replacement - JICA 0.53m^3 x 80mH x 11kW		300,000									
	3. Standby Generator												
	4. Telemetry System												
	5. Pipeline Development	Amplication of pipeline behind Hot Bread Kitchen	100,000										

Source : SIWA and JICA Study Team

Table G3-2 Action Plan for Water Supply and Sewerage Facility Improvement (7/10)

(unit : SI$)

Urban Center	Item	Detail Description	Short Term		Mid-Term			Long Term					
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
G. HONIARA	**G-1. Source Development**												
Mataniko	1. Development of New Bores	Hiring of drilling rig									150,000		
		Hiring of pump test equipment									10,000		
		100m x 6" bore easing									50,000		
		6" bore pump 30L/s at 100mH									100,000		
	2. Catchment Management Plan	Installation of signs											
		Protection of existing boreholes											
	3. Rehabilitation Infiltration Gallery												
	G-2. Treatment												
	1. New Water Treatment Plant												
	2. Disinfection	**Refer to "A. HONIARA Water Supply System" (A-2)**									10,000	10,000	
	G-3. Reservoirs Development												
	1. New Tanks	Lower West Kolaa Tank 1		200,000									
		Lower West Kolaa Tank 2											
		Replace fensing											
	G-4. Pumps												
	1. Mataniko Pumping Station and Bores	Replacement - BH1 bore pump		50,000								50,000	
		Replacement - BH2 bore pump		50,000									
		High lift pump (Kelly and Levis 65x40-200)			50,000		10,000						
		15kW motor - major service										15,000	
		15kW motor - replacement										100,000	
		High lift pump (Southern Cross 65x40-200)					10,000						
		15kW motor - major service										15,000	
		15kW motor - replacement											
		High lift pump (Southern Cross 100x65-200)						10,000					
		30kW motor - major service											
		30kW motor - replacement											15,000
	2. Standby Generator			750,000									
	3. Upgrade of Pump Station	Pipeworks											
		Switchboard											
		Fencing											
	G-5. Pipeline Development	Cross connection of Skyline to West Kolaa		200,000									

Source : SIWA and JICA Study Team

Table G3-2 Action Plan for Water Supply and Sewerage Facility Improvement (8/10)

(unit : SI$)

Urban Center	Item	Detail Description	Short Term		Mid-Term			Long Term					
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
H. HONIARA Sewerage System in the Mid-term Facility Improvement (MFI) Plan by JICA Study	**H-1. Sewage Outfall System**	Cyclone proof ocean pipeline & outfalls				7,000,000	5,418,000						
		Pumping station											
	H-2. Sludge Treatment Facility	Sludge drying bed					938,000						
		Septic tank											
	H-3. Procurement of Operation Equipment	Vacuum truck					6,300,000						
		Jet cleaning truck for sewer pipe											
		Wheel loader for sludge disposal											
I. NORO	**I-1. Source Development** 1. Catchment Management Plan	Repairing of signs											
	I-2. Treatment	Replacement of filler material ($20m^3$)	130,000	100,000									
		Disinfection - pump									10,000		
	I-3. Reservoirs	New $900m^3$ tank											
	I-4. Pumps	Standby - high lift pump							8,500				
		Replacement - motor											
		Major service - motor				10,000					10,000		
		Replacement - river pump											
		Replacement - river pump		60,000									
	I-5. Standby Generator			200,000									
	I-6. New Areas	Installation of new reticulation areas	50,000	50,000	96,255	95,969	96,255	95,969	96,255	114,535	114,535	114,535	114,535
	I-7 Miscellaneous	Domestic meters	45,000	50,000	64,937	66,560	68,302	69,925	71,667	77,329	79,334	81,339	83,344
		Bulk flow meters	35,000										
		New residential house											
		New stores/office	200,000										
		New vehicle	200,000										

Source : SIWA and JICA Study Team

Table G3-2 Action Plan for Water Supply and Sewerage Facility Improvement (9/10)

(unit : SI$)

Urban Center	Item	Detail Description	Short Term		Mid-Term			Long Term					
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
J. TULAGI	**J-1. Source Development**	Preliminary design - earthfill dam											
		Earth fill dam (5m high, 30m long)		50,000									
		Installation of signs											
	J-2. Treatment	Total unit - chrolination equipment and shed	50,000										
	J-3. Reservoirs	Replacement 600m^3 tank	50,000										
		Replacement 10m^3 tank											
	J-4. Pumps	Replacement of pump station											
		Replacement - motor									15,000		
		Major service - motor											
		New standgy high lift pump				10,000							
		Replacement - motor									15,000		
		Major service - motor				10,000							
		New float control system											
	J-5. Rising Mains	Amplification of rising main											
	J-6. Existing System	Replacement of existing network	20,000										
	J-7. New Areas	Installation of new reticulation areas		7,230	6,784	6,962	7,230	7,319	7,498	7,765	7,944	8,122	8,390
	J-8. Miscellaneous	Domestic meters	15,000	20,000	19,323	19,827	20,404	20,871	21,405	22,011	22,571	23,140	23,781
		Bulk flow meters	10,000										
		New stores/office	50,000										
		Rehabilitate residential housing											
		Canoe and outboard		60,000	50,000								
K. AUKI	**K-1. Source Development**												
MFI Plan by JICA Study	1. New Borefield, 600m^3/day x 2 bores	To be located at the transmissio pump station site (Low Level Tank)				1,162,000	1,162,000						

Source : SIWA and JICA Study Team

Table G3-2 Action Plan for Water Supply and Sewerage Facility Improvement (10/10)

(unit : SI$)

Urban Center	Item	Detail Description	Short Term		Mid-Term			Long Term					
			2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
L. AUKI	**L-1. Source Development**	**Refer to "K. AUKI MFI Plan by JICA Study"**											
	L-2. Reservoirs	New 900m^3 tank											
		New 450m^3 tank											
	L-3. Pumps	Renovate gallery source pump station											
		Renovate Kwaibala source pump station											
		Replacement - booster pump (Kwaibala)											
		Standby - booster pump (Kwaibala)											
		Replacement - booster pump (gallery)											
		Standby - booster pump (gallery)											
	L-4. Rising Mains	New transfer main (allow 3km of 150mm PVC)											
		New transfer main (allow 1km of 200mm PVC)											
	L-5. Existing System	Amplification of delivery main											
		Replacement of existing network		69,353	69,353	69,353							
	L-6. New Areas	Installation of new reticulation areas		20,000			57,660	57,491	57,491	72,075	72,075	72,245	72,075
	L-7. Miscellaneous	Domestic meters	80,000	50,000	54,496	56,191	57,949	59,586	61,281	68,321	70,446	72,633	74,701
		Bulk flow meters	20,000										
		New residential house											
		New stores/office	200,000										
		New vehicle	200,000										
Annual Projected Capital Works			8,485,000	8,260,583	18,753,724	26,497,700	31,974,781	2,678,556	3,699,635	3,820,412	3,797,971	3,475,708	3,318,267

Summary

Urban Centers	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
HONIARA	7,130,000	7,524,000	18,392,576	24,990,838	30,504,981	2,367,395	3,375,538	3,458,376	3,381,066	3,103,694	2,941,441
NORO	660,000	460,000	161,192	172,529	164,557	165,894	176,422	191,864	213,869	195,874	197,879
AUKI	500,000	139,353	123,849	1,287,544	1,277,609	117,077	118,772	140,396	142,521	144,878	146,776
TULAGI	195,000	137,230	76,107	46,789	27,634	28,190	28,903	29,776	60,515	31,262	32,171
Total	8,485,000	8,260,583	18,753,724	26,497,700	31,974,781	2,678,556	3,699,635	3,820,412	3,797,971	3,475,708	3,318,267

To be implemented by SIWA's budget and or donor's assistance
To be implemented by ADB project

Source : SIWA and JICA Study Team

G4 Leakage Reduction

Leakage (or real loss) in the water supply system is one of the most important factors which affects the management of water supply utility. Reduction of the leakage will lead to the following improvements:

- Reduction of the water distribution volume
- Reduction of the operating cost (electricity cost, disinfection cost, etc.)
- Elimination of the need for new water source development in future

Through the pilot project for the establishment of leakage reduction indicators, and the leakage reduction rate per unit length (m^3/km/day) has been obtained as explained in section F2.2 of PART F.

On condition that the mid-term facility implementation plan is implemented by 2010 and SIWA regularly executes the replacement of pipelines for leakage reduction, an action plan for leakage reduction was formulated as shown in Table G4-1.

Table G4-1 Action Plan for Leakage Reduction by Pipe Replacement

Item	Unit		Short Term		Mid Term			Long Term					
		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Water Demand (or Distributed)*[1]													
- Demand With Leakage Reduction	m^3/day	25,719	26,590	27,504	28,477	29,513	30,587	30,684	30,850	31,016	31,182	31,350	31,510
(Design production capacity)			25,719	25,719	25,719	25,719	30,957	30,957	30,957	30,957	30,957	30,957	30,957
- Demand Without Leakage Reduction	m^3/day	25,706	27,047	28,468	29,990	31,615	33,368	35,230	37,244	39,408	41,736	44,243	46,944
Leakage of the Year	m^3/day	10,288	10,545	10,517	10,489	10,468	12,416	12,169	11,632	11,091	10,471	9,800	9,085
Pipe Length to be Replaced	**km/year**		**0.95**	**0.95**	**0.95**	**0.95**	**0.95**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**
Leakage Reduction Rate	m^3/km/day		300	300	300	300	300	300	300	300	300	300	300
Leakage Reduction Volume	m^3/day		285	285	285	285	285	600	600	600	600	600	600
Leakage With Replacement	m^3/day	10,288	10,259	10,232	10,204	10,183	12,131	11,569	11,032	10,491	9,871	9,200	8,485
Leakage Without Replacement	m^3/day		11,089	11,957	12,896	13,911	15,015	16,206	17,505	18,916	20,451	22,122	23,942
Leakage Ratio													
- With Replacement	**%**	**40**	**40**	**40**	**40**	**40**	**40**	**38**	**36**	**34**	**32**	**29**	**27**
- Without Replacement*[2]	%	40	41	42	43	44	45	46	47	48	49	50	51
Effective Ratio (with replacement)	**%**	**60**	**60**	**60**	**60**	**60**	**60**	**62**	**64**	**66**	**68**	**71**	**73**
Population in Service Area*[3]		66,402	68,726	71,131	73,621	76,198	78,865	81,625	84,482	87,439	90,499	93,667	96,945
Served Ratio	%	70	71	73	75	76	78	80	82	84	85	87	90
Served Population*[4]		46,221	48,948	51,836	54,894	58,117	61,520	65,150	68,994	73,064	77,375	81,940	86,775
Per Capita Consumption													
- Domestic	LCD	164	164	164	164	164	164	164	164	164	164	164	164
Water Consumption													
- Domestic	m^3/day	7,596	8,045	8,519	9,022	9,551	10,118	10,707	11,339	12,008	12,717	13,467	14,261
- Commercial and Others	m^3/day	7,835	7,913	7,992	8,072	8,153	8,235	8,317	8,400	8,484	8,569	8,655	8,741
Total	m^3/day	15,431	15,958	16,512	17,094	17,705	18,352	19,024	19,739	20,492	21,286	22,122	23,003
Per Capita Consumption	LCD	334	326	319	311	305	298	292	286	280	275	270	265
Design Production Capacity*[5]	m^3/day	25,719	25,719	25,719	25,719	25,719	30,957	30,957	30,957	30,957	30,957	30,957	30,957

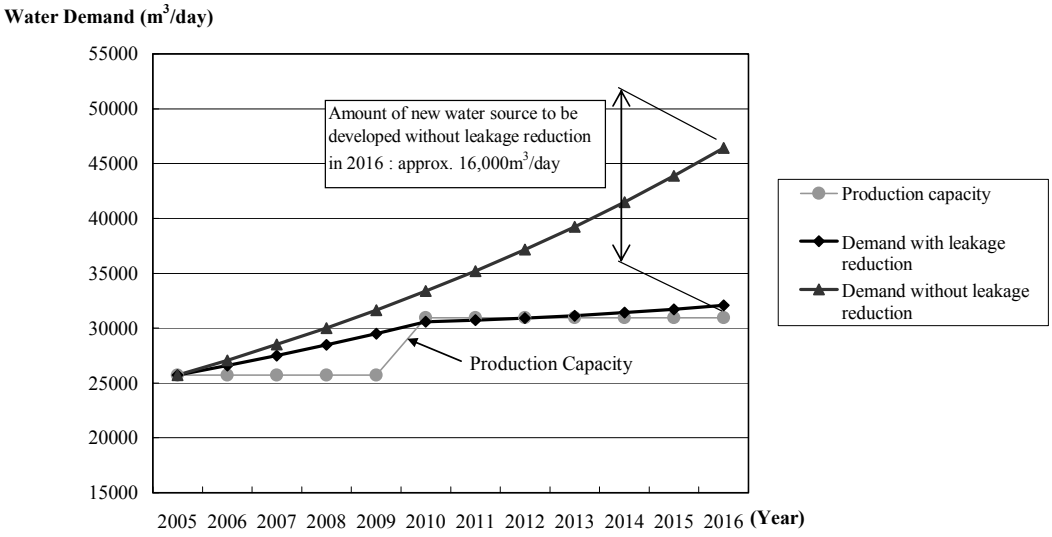
Notes : 1. Water Demand = Water Consumption/(1-Leakage Ratio/100)
2. Leakage ratio without taking leakage reduction measures is assumed to be increased annually by 1.0% .
3. Annual growth rate of population is 3.5% .
4. Served population is assumed to be increased annually by 5.9% based on the past records.
5. Design production capacity in and after 2010 is the capacity proposed in this study.

Source : JICA Study Team

A substantial length of transmission and distribution pipelines will be replaced in accordance with the mid-term facility improvement plan. Therefore, in order to avoid duplication of pipe replacement, it is recommended that SIWA start large scale leakage reduction work by replacing pipes after the implementation of the mid-term facility plan. Based on the above action plan, SIWA is required to conduct the replacement of pipes with significant leakage of about 1.0km per year to maintain the current leakage ratio of 40% until the implementation of the mid-term facility improvement plan. In order to achieve the target leakage ratio of 27% in 2016, SIWA has to perform pipe replacement of 2.0km every year after the year 2011.

In case SIWA has sufficient budget and starts large scale reduction work, they should follow the mid-term facility plan prepared in this study.

Figure G4-1 shows the water demand forecast, both with and without leakage reduction measures. In case these are not taken, new water source development of 16,000m^3/day will be required in 2016. On the other hand, assuming leakage reduction measures are taken properly, the new water source development will not be required.



Source : JICA Study Team

Figure G4-1 Water Demand Forecast up to 2016