Collection of Extracts on Wastewater (Theme 4 – Technology) from the Pacific regional consultation meeting on sustainable water management, Sigatoka, 2002

Contents

AMERICAN SAMOA COUNTRY BRIEFING PAPER

AMERICAN SAMOA'S WATER SUPPLY SYSTEM

Service Area

The ASPA primary water system is located on the Island of Tutuila. The system extends along the southern coast of Tutuila from the village of Onenoa on the eastern most tip of the island via the downtown Pago Pago Harbor area and to the village of Poloa on the northwestern tip of the island. The primary system has been extended over the years to serve villages on the north shore via an overland transmission main and series of booster stations to the villages of Masefau, Masausi, and Sailele. Satellite systems have also been constructed in the villages of Fagasa, Vatia, Aoa, the islands of Aunuu, Tau, Ofu and Olosega. ASPA operates water systems in 68 of the 72 villages in Tutuila Island, Aunu'u and Manu'a Group of Islands. There are a total of 7,300 residential, commercial and government metered water connections. The remaining villages still not served by ASPA are Afono (pop. 533), Fagalii (pop. 253), Maloata (pop. 16) and Fagamalo (pop. 113). Therefore, a total of 56,376 residents have access to clean, safe and potable drinking water that meets US EPAregulations and comply to the US Federal Safe Drinking Water Act or about 98.4% of the total population as of the year 2000. Plans for the extension of the primary water system and/or construction of satellite water systems to the remaining are villages are underway.

In addition to the population, ASPA provides a significant amount of water that supports industrial tuna cannery operations in the Pago Pago Bay area, namely Starkist and COS Samoa Packing. Total daily water production averages about 9.5 MGD (million gallons per day). Starkist and COS Samoa Packing consume a combined total of 2.0 MGD. The ASPA-WS evolved from the old Navy system originally designed to provide water needs for government-owned facilities. Today, appropriations for the ASPA water supply improvement projects come from U.S. Federal aid programs. Most of the funding has come from the Department of the Interior, the Department of Housing and Urban Development, and more recently from Rural Utilities Services, of the Department of Agriculture, and the US Environmental Protection Agency. The ASPA-WS is different from the village water systems in that it is operated and maintained by the ASPA-Water Division and recognized by the residents as ASPA-owned. Generally, customers receiving water from the ASPA-WS are charged a fee, by metered consumption. In contrast, it is understood that village systems are owned and operated by the villages and generally there are no charges for water service. However, in the next several years, the primary water system and/or satellite water systems will be available to all of American Samoa.

AMERICAN SAMOA'S WASTEWATER SYSTEM

Service Area

The treatment of wastewater in American Samoa is accomplished in one of two ways:

- Community wastewater collection, treatment and disposal systems owned and operated by the American Samoa Power Authority (ASPA);

- Individual onsite systems owned and operated by private businesses and individuals. The ASPA systems collect and treat the wastewater (via primary treatment), and subsequently discharge the effluent to the ocean through submarine outfalls. The individual onsite systems are, with few exceptions, soil based treatment systems that rely on the percolation of the wastewater through the soil to remove pathogens.

The ASPA wastewater system provides service to approximately 3,500 households and businesses on the Islands of Tutuila and Aunu'u in American Samoa. Nearly all remaining households and businesses in the Territory rely on onsite soil-based disposal systems. The ASPA Wastewater system has two wastewater treatment plants, namely the Utulei Wastewater Treatment Plant and Fogagogo Wastewater Treatment. The 2.0 MGD Utulei Wastewater Treatment Plant collect and treat wastewater from villages around the downtown area from the village of Atu'u, the tuna canneries, Upper and lower Pago Pago, Fagatogo, Utulei and Fagaalu In this system, the wastewater division operate and maintain gravity sewer mains and force mains. Lift stations in Atu'u, Satala, Korea House, Malaloa, Utulei and several in Faga'alu collect and pump raw sewage via the force mains into the Utulei Wastewater treatment Plant. Treated sewage is discharged to the Pago Pago Harbor via a 24" HDPE pipe sewer outfall.

The 2.0 MGD Fogagogo Wastewater Treatment Plant located on the western side of Tutuila collect and treat sewage from the village of Nuu'uli, the Pala Lagoon area, Tafunafou, Malaeimi up to the American Samoa Community College, Faleniu, lower Pavaiai, Ottoville and Fogagogo. Similarly, the ASPA Wastewater Division operates and maintains gravity sewer mains and lift stations. Lift Stations in Nuu'uli at Coconut Point (3), Andy, Sagamea, Papa Stream, Vaitele, Vo-Tech, Lavatai'I, and at the Pago Pago International Airport collect and pump raw sewage into the Fogagogo Wastewater Treatment Plant. Treated sewage is discharged to the Pacific Ocean via another 24" HDPE sewer outfall. In 1995, approximately 30% of American Samoa households were served by one of ASPA's centralized wastewater systems. The remaining homes that were not served by ASPA Wastewater Division in 1995 discharged sewage into a cesspool or a septic tank with a related drainfield system. It is suspected that most homes use cesspools, without an appropriate drainfield. Construction to add additional sewer mains in the highly populated interior of Tualauta County on the Western district is in progress.

Cook Islands Country Briefing Papers

Sanitation

Septic tank systems are widely used throughout Rarotonga, and typically comprise a septic tank and a soakaway. Soil soakage trenches or beds are rarely used. Septic tank sizes are governed by the regulations of the Ministry of Health. On Rarotonga, most septic tanks are pumped out only when they overflow and become a nuisance. The septage sludge is currently dumped on vacant land, or on fields at the request of planters. There is only one reticulated sewerage system on Rarotonga, which was install

in the early 50s and 70s. The sewer system collects sewage from the residents and fed into septic tanks for treatment. The old sewer system was however overloaded.

The septic tanks were replaced in 1994 with an Enviroflow proprietary sewage treatment plant. But the plant was neither maintained nor operated correctly, and fell into disuse, even today. For some years the plant has not been working, and the raw sewage currently bypasses the plant and flows via the airport perimeter drain into the sea. There is currently no method of de-sludging septic tanks in the other Southern Group islands. It is understood that this would pose future environmental concerns. In the Northern Group the use of flush toilets is becoming popular probably as a result of the improvement of living standards. The septic tanks and soak ways are used.

Water Treatment

The water supply in Rarotonga and outer islands are neither properly filtered nor disinfected. There are coarse filters at some intakes. During the wet season the water supply is often discolored and turbid and contains silt, sediment, leaves and twigs. Test of water quality from various intakes is undertaken regularly by the Department of Health. Test results have been returning positive with faecal coliforms. People are therefore advised to boil their water before drinking, and many people do this.

The age, lack of engineered designing and water quality of the existing water system in the Cook Islands restricts demand management. Even thou it is possible to apply demand management to the existing system this exercise will be extremely expensive. Therefore, it is far more economical to concentrate on developing the system to a stage whereby it is feasible to apply demand management. It is in the interest of the Ministry of Works to further develop sustainable development of the water sector therefore support the national vision.

Sanitation

The Public Health Regulation of 1987 (presently under review) administered by MOH require that all sanitary waste be connected to septic tanks or if available, a public sewerage system. The Public Health Department (PHD) of the Ministry issues a permit to erect, establish extend or alter any drain, septic, disposal system or any othersanitary appliance in compliance with the Building Code. Every septic tank should be constructed in accordance with a model plan provided by the PHD. No controls exist for the disposal of septage sludge except through the Rarotonga Environment Act. This provides for the development of a management plans for Rarotonga for the protection, conservation, management and the control of the environment including pollution and wastes.

East Timor Briefing Paper

Community Water Supply & Sanitation

93. The Community Water Supply & Sanitation Program provides support to the implementation of community managed water & sanitation facilities in the urban and rural areas outside Dili and the 12 other district capitals. In this program the role of SAS is to facilitate and provide management and technical support. Communities will be responsible for operation and management of community owned facilities.

94. Donors, particularly bilateral donors, are expected to provide capital funding and NGOs will support the implementation and capacity building require for sustainable facilities.

95. The Community Water Supply & Sanitation Program is just commencing with the appointment of Community Water Supply Project Officers for each of the districts. Works have been undertaken directly by NGOs since 1999. Substantial capacity building is required in order to equip SAS with the skills required to manage this program.

96. Substantial funding is being provided by AusAID, GTZ, CIDA, UNICEF and others towards both implementation and capacity building. This includes capacity building for SAS and implementing partners, as well as for the communities and community groups which will be responsible for managing completed systems. Current activities focus on the following districts:

a) TFET: Covalima, Bobonaro, Liquica, Manatuto, Los Palos, Manufahi, Ermera, Dili
b) AusAID: Covalima, Bobonaro, Viqueque;
c) GTZ & KfW: Viqueque, Baucau;
d) CIDA: Lautem, Aileu, Ainaro
e) UNICEF: Dili, Manatuto, Ermera

97. There is a lack of information in relation to the coverage and quality of existing water supply and sanitation in rural areas and small towns. However based on all the evidence available from current activities, the needs in this sub-sector are substantial. Based on the National Consultations and other data, including CEP proposals, the demand also appears to be high. Quantification of the long-term needs is a high priority but this data needs to be determined from detailed analysis of data from recent country wide surveys

and current sector activities in a number of districts, rather than from new comprehensive countrywide surveys.

98. The community water supply & sanitation program requires long term involvement of donors and their implementing partners to establish relationships with communities and to mobilise community resources and build capacity for implementation and sustainable long term operation. Current donor commitments are substantial and will continue for 1-3 years but there is a need for additional funding in year 3-5 of the planning period.

99. In the case of the community water supply & sanitation sub-sector the identified projects are essentially the outsourcing of program implementation through donor programs, which are integrated with capacity building and community development activities. However there are a number of discrete projects which need to be specifically addressed including:
a) Agreement on the policy and introduction of legislation covering community water supply & sanitation;

b) Development of best practice methodologies and upgrading of guidelines for planning and implementation of community water supply & sanitation programs for application by all donors/implementers;

c) Providing for an emergency response facility in addition to the on-going donor programs to respond to issues such as water related disease outbreaks and natural disasters such as landslides, floods etc. which impact on water supply systems.

100. The Community Water Supply & Sanitation Program provides support to the implementation of community managed water & sanitation facilities in the urban and rural areas outside Dili and the 12 other district capitals. In this program the role of SAS is to facilitate and provide management and technical. Communities will be responsible for operation and management of community facilities. Donors will provide capital funding and NGOs will support the implementation and capacity building require for sustainable facilities.

Urban Sanitation

101. The Urban Sanitation Program provides services for solid waste management, wastewater management and drainage in Dili and District towns. At present urban sanitation services are operating to a limited extent primarily in Dili and further work is required to deliver effective services in the three sub-sectors. This will involve a number of key steps to establish the strategies and detailed implementation plans for sub-sector development including:

a) Clarification of the institutional framework and roles and responsibilities of key stakeholders;
b) Preparation of strategies and action plans for program implementation;
c) Rehabilitation and augmentation as well as implementation of new infrastructure; and
d) Improved levels of service delivery.

102. Key issues to be addressed in this process is the role of district administration and communities in the provision of urban sanitation services, the role of the private sector in the provision of services, and approaches for user charges to recover some cost from customers.

103. The projects listed below provide for the achievement of the above through a structured and staged series of activities.

Sector Capacity Building

104. While the above core programs and projects will include capacity building activities, there is a need for specific capacity building programs to strengthen the sector generally. Accordingly a separate capacity building program is proposed. This will address a range of sector needs and stakeholders including: SAS organisation and staff; Communities (both urban and rural); NGOs; and Private sector contractors and service providers.

FSM Briefing Paper

In the **sanitation** sector there is not much improvement. Only limited areas in the nerve centers of the states are provided with sewerage system so far and large numbers of household still have pit latrines or other unhygienic excreta disposal system. Considerable attention is required for planned drainage in the developed areas to protect the road pavement and foothill areas from land erosion and flooding.

There are now five **sewerage systems**, which serve Kolonia town in Pohnpei, Weno Island in Chuuk, Colonia town in Yap, Lelu town in Kosrae and the Tofol administrative area in Kosrae. The largest of these sewerage systems is the Kolonia Central Sewerage System in Pohnpei, which consists of about 12 miles of sewers, a total of 7 lift stations and a package sewage treatment plant with a capacity of about a 0.8 million gallons a day. The system has about 1,200 connections. The treated sewage is discharged into the Sokehs harbor through a 12-inch diameter pipeline. The sewerage system in Weno Island, Chuuk State, comprises 11.3 miles of sewer mains, 12 lift stations, 9 grinder stations and a package treatment plant with a capacity of 0.75 million gallons a day. However, the sewage treatment plant is nonfunctional and raw sewage is discharged into the Weno lagoon, through a 2,000-foot long marine outfall. The system has about 475 connections. The Colonia sewerage system in Yap provides primary treatment utilizing an Imroff tank with a capacity of 340,000 gallons per day. The treated effluent is discharged to a sewage outfall, which extends about 560 feet into the ocean. There are about 700 connections to the system. The Lelu sewerage system in Kosrae provides small bore sewers, which receive the effluent from household septic tanks. The sewage thus collected is delivered to pumping station from where it is pumped through a 6-inch diameter marine outfall extending about 1,082 feet offshore. The Tofol sewerage system collects sewage from the Government buildings in the Tofol and provides treatment in oxidation ponds, which have a capacity of 15,000 gallons a day.

The FSM is yet to establish an organized system for the collection and disposal of **solid waste**. There are several dumpsites throughout the FSM, but none of them have been properly constructed and maintenance is minimal or nonexistent. With the exception of

the Yap main islands, there is no public service for the collection of solid waste, and households and commercial establishments have to transport their own waste to the public dumpsites. This encourages a considerable amount of illegal dumping in areas, which are not designated as dumpsites. Another problem is that most of the public dumpsites are either inappropriately located (as in Pohnpei and Chuuk), or are very close to full capacity as in Yap. The critical deficiencies in the area of solid waste collection and disposal constitute one of the major environmental problems in the FSM. The disposal of solid and liquid waste (particularly of human excreta, household garbage and disposal from pigpens in urban areas) has been identified as perhaps the foremost environmental health problem. There are many pigpens located besides the lagoon, continuously contaminating the surrounding waters. In addition, septic systems, in most of the cases, are poor in design and construction. The pour-flush toilets and overland benjoes frequently overflow during heavy rains. Some toilets are located nearby or over water sources. The extent of this problem varies from settlement to settlement and found more pronounced in densely populated areas. This has resulted in public health problems including recent cholera outbreaks and a continued high mortality rate from diarrhoeal disease. Over population coupled with their increased production of wastes including human waste makes the urban centers particularly vulnerable to disease and conditions associated with waste disposal and waste

FSM COUNTRY OVERVIEW ON WASTEWATER MANAGEMENT:

States	**Public sewer system**					**Residential sewer system (population served)**	
	Treatment process	**Design capacity (MGD)**	**LPS/GPS /ES**	**Length of sewer/ size (Miles)**	**Population served**	**Septic tank /cesspool**	**Pit latrine and others**
Pohnpei State						8,500 (20%)	20,500 (57%)
PUC wastewater system	Extended aeration activated sludge	0.8 –av. 1.6-max	5-lps 2-es	11.6	7,000 (18%)		
PFC	Extended	.0066	1	0.5	12-tonnes of		

	aeration				tuna, one hotel & staff		
Palikir	Septic tank w/ leaching field				700 employees		
Chuuk State							
Weno Island	Primary treatment	0.75 – av 1.5-max	21 (old) 15 (new)	11.3 6.0 (new)	5,000 (8.6%)	8, 300 (14.4%)	45,000 (77%)
Yap State						1,000 (9%)	6,400 (56%)
Yap Central	Imhoff tank	0.35	11		4,000 (36%)		
Kosrae State						4,500 (57.7%)	1,500 (19.3%)
Tofol	Oxidation pond	0.015			1,800 (23%)		
Lelu	Small bore sewer and marine outfall						

Lps-Lift Pump Station, es-Ejector Station, av- average, max-maximum

Fiji Country Briefing Paper

4 TECHNOLOGY

Reticulated water supply in Fiji has full treatment with pH correction, flocculation, sedimentation, filtration and chlorine is added for disinfecting. Where possible and economically viable gravity supply system as opposed to pumping is preferred. Water from all urban water supply systems is routinely analyzed for quality (pH, residual chlorine, and colliform) every month. Wastewater and sewerage (urban) is treated before being discharged. Low energy waste treatment lagoons are preferred to high-energy mechanically driven aeration treatment where possible. Availability of economically suitable land for this type of waste treatment facilities in urban centers is restrictive. Treated waste discharge is routinely analyzed for quality by the national water quality laboratory to monitor satisfactory standards in accordance with accepted international guidelines.

Although Fiji has advanced access to technology they are not necessarily applicable, as supplies and support is invariably from abroad and in many cases it can be economically restrictive. Simple technology that balance modernity, economy, robustness and

suitability for Pacific Island environment is needed, to this end home grown as opposed to imported high tech equipment is desirable. For irrigation and hydropower runoff the river systems are preferred however because of seasonal deficiencies in many cases capital-intensive storage reservoirs are the only option.

Kiribati Briefing Paper

The common type of sanitation system in the country ranges from a simple pit latrine commonly used in the outer islands and peri-urban areas of South Tarawa to sewerage system on the three major centers of South Tarawa; i.e. Betio, Bairiki and Bikenibeu. The raw sewage from the sewerage system is discharged at the edge of the reef without any form of treatment. The compost toilet was introduced in the country very recently, but it is not very popular. At present the compost toilet is not culturally acceptable - only 6% of the South Tarawa population prefer to use compost toilet (SAPHE Consumer Survey, 2001).

Apart from the pit latrines, the septic tanks are quite common on areas on South Tarawa where the sewerage system does not serve. A modern on-site wastewater treatment tank was used at the new House of Parliament complex and at one of the Junior Secondary schools on South Tarawa. These plants are operated by the owners with assistance provided by the PUB as and when required. Demand management is important for water resources management on small islands. In urban areas such as South Tarawa, demand management measures should include an appropriate pricing policy plus consumer education on the reduction of waste. Other measures may include reduction in water supply pressure to minimum levels and the use of water conserving devices. As many water supply systems often have substantial leaks, an active leak detection and repair program is essential for both delivery systems and individual household systems. The savings in water can often have positive benefits in delaying the need for development of new sources. The problem of low water pressure in the water supply system is closely associated with limited water resources. To increase the water pressure one has to run the water supply system 24 hours a day so that the water reaches all consumers on the reticulation system. This will obviously lead to excessive water usage and wastage.

A promising alternative is to have a constant flow system with flow restricting devices on each connection. A similar system has been successfully implemented in Kiritimati Island under an Australian aid program. The system ensures that each household receives a constant but low flow of water that is fed into small tanks and stored until required. Different sized flow restrictors can be provided according to household water needs and monthly charges can be set accordingly. The constant flow method of water distribution is an answer to the present low water pressure problem in the South Tarawa Water Supply System and an unequitable water distribution to PUB water consumers. The method has been successfully tested in one area on South Tarawa and was found to work well. The water can reach all water consumers at a slow flow rate. Even though the available water does not meet all water requirements (i.e. washing, cooking, drinking and bathing) it should be a good test case for people to conserve water and to live with limited water resources. This can also be applied on small island countries in the Pacific with limited water sources.

Maldives Country Briefing Paper

Water Supply

A reticulated water supply network exists only in two islands. Therefore in the rest of the islands, groundwater is the main source of water for daily needs and this water is extracted using shallow wells located in individual house premises. There are no legislative measures in place to limit/control groundwater extraction. Even in the islands where there is a water supply network, groundwater is still the main source. Rainwater is used universally in all islands but mainly for drinking and cooking. Space limits the storage that can be accommodated in a house premise.

Sanitation

i. Urban Sanitation

A comprehensive, sewerage network was laid for 2 islands one in Male' in 1988, and in Villingili in 1998. Every household in Male' and Villingili islands is now connected to the sewerage network. The national target of 100 percent sanitation coverage now is in place for Male' and Villingili. With the completion of the Male's sewerage network in 1988, no major outbreak of water-borne diseases has occurred within the country. To improve and ensure continuity of service, and as part of the Government's policy to privatise these services, the sewerage system has been handed over to a private company, Male' Water and Sewerage Company (MWSC). MWSC also operates the services in Villingili.

ii. Rural Sanitation

Access to safe sanitation during the current plan period has reached 40 percent from a baseline level of 22 percent in 1990. Progress in this sector is slow due to geographical, financial and other logistical constraints. With increased awareness, better medical services and increased sewerage facilities, water-borne diseases in the rural islands have also been brought under control.

Country Briefing Paper for Papua New Guinea

THEME 4: TECHNOLOGY

(i) Appropriate Technology for Water Supply and Wastewater Treatment

The use of the phrase" **Appropriate Technology"** can mean many things. For instance, in the travel industry the most appropriate technology for travel from PNG to Fiji or Sydney to Los Angeles is by jet aircraft. In the water industry however, **appropriate technology** has been taken to mean the use of basic infrastructure for extraction, treatment and distribution of water and collection, treatment and disposal of wastewater.
In PNG the design philosophy for urban water supply is to make use of conventional water technology for extraction, treatment and distribution. The use of automation and high technology control systems is to be avoided or kept to very minimum. In urban sewerage systems, the conventional collection method is used and treatment is either by large septic tank of sewage stabilisation ponds. There is very extensive use of onsite septic tank treatment and disposal in PNG. The level of technology adopted is in line with the skills and knowledge of the operational staff. In the rural areas basic technology on the use of hand pumps, gravity systems and rainwater harvesting are popular for water supply and basic pits or over-water latrines are used for sanitation. The ventilated improved pit latrine has been introduced to a number of communities but its acceptance and popularity is yet to be seen.

(ii) Demand Management and Conservation

Since water is plentiful in PNG, the concept of water conservation has yet to be understood and accepted by users in the urban centres. Despite the fact that tariffs are designed to favour small water users, it is not unusual to see low wage earners having high monthly water bills. PNG Waterboard by its own experience has proven that management of water demand can be easily achieved by metering all the consumers. The most effective demand management tool is a tariff structured to discourage excessive use of water.

(iii) Human Resources

The human resources required in PNG for various aspects of water resources management are few and far between. Various Government agencies are responsible for recruitment, training and maintaining the required knowledge and skills within their organisation. The knowledge and skills required to plan, construct, manage, operate and charge for water and sanitation services is varied. Most professional training is given overseas while technician and tradesman are trained in the country.

Samoa Briefing Paper

Technology:

Water Treatment

Samoa, like many of the Pacific Islands, is fortunate to be blessed with adequate annual rainfall reasonably distributed throughout the year giving rise to reliable raw water, river resources in several areas along with good sources of groundwater in many parts of the country. The catchment condition for the major rivers is reasonably good, although changing at present. As a result – coupled with favourable hydro geologic impacts on quality the raw water quality is good (relatively) and leads itself to basic treatment technologies to achieve WHO drinking water standards. After many studies over the years associated with various schemes the water treatment processes for surface water which are working well and 'appropriate' to the Samoan situation are:

- Turbidity - Sedimentation (horizontal flow)
  Roughing Filters (up flow)
  Slow Sand Filters
- Bacteria & Parasites - Slow Sand Filters
- Bacteria & Viruses - Chlorination (Calcium Hypo chlorite)
- Taste & Ordour - Slow Sand Filter
- Hardness - Not Applicable
- Organic - Not Applicable

This treatment train works well although it is labour intensive but requires only basic water treatment plant operation skills.

Picture 3: Slow Sand Filter, Treatment for Rural Water
Samoa Country Paper for Sigatoka Forum on WATER

In the case of the Groundwater the basic water quality is generally very good and meets WHO standards. However the aquifers are generally unconfined and coliform and E Coli have been detected in some bores. Our most recently constructed scheme involving 23 bores has adopted chlorination at the well head as precautionary measure against bacteria and viruses.

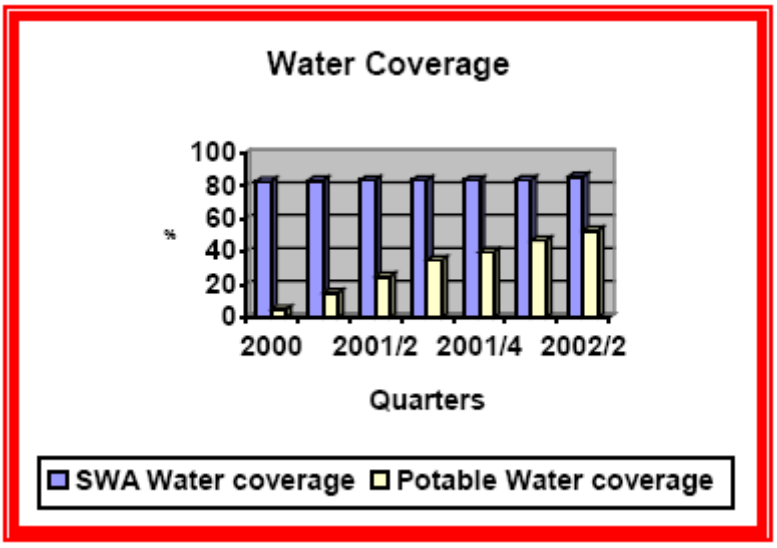
Wastewater Treatment

Samoa is currently going through the process of preparing a sanitation plan for Apia and investigating 'appropriate' technology for any wastewater treatment scheme or schemes that may be proposed for the Central Business District in Apia. Currently in Samoa, septic tank or cess pits are used - in greater Apia and the rural areas. The Central Business District, Hospitals and major industries have a range of treatment systems ranging from enlarged septic tanks to state of the art package plants.

We are currently investigating options for sanitation improvements in Apia. Although several conventional reticulation, treatment and outfall disposal schemes have been put forward it is likely a more rational and 'appropriate' solution will be eventually adopted for Apia. This will involve:

- . Upgrading septic tank standards (design construction)
- Preparation of spectage disposal plans
- Sewage reticulation of the Central Business District
- Selection of an 'appropriate' treatment process and disposal system for the Central Business District.

It should be noted Samoa is in the process of setting receiving water quality standards.



Demand Management

Demand Management is addressed in the "National Water Resources Policy" as one of the challenges that needs to be addressed in particular with regard to:

- Competing and conflicting demands for water resources nationwide

- . Excessive demand on water supply

The first challenge has not been addressed at present, and this will depend on the Institutional arrangements, which are also outlined in the Policy (as part of the Medium- to long- term strategy), which is to "Establish a regulatory framework for the sustainable management of water resources". This has been allocated as a responsibility of the Department of Lands, Survey and Environment (DLSE) and part of this strategy is to "establish pricing mechanisms for the extracting and allocating of water". The Samoa Water Authority however has addressed the latter challenge quite extensively in the last 5 years and some notable progress has been made. One of the key factors, which

placed emphasis on this issue of excessive demand, was the pre-requisite of the current EU/Samoa Rural Water Supply Scheme that the consumption had to be reduced before the project could commence. A study that was done as part of the design for this project had measured consumption at approximately 670l/c/d, which was considered excessive and unsustainable. This challenge has also been addressed by another project funded by KfW – the Apia Water Supply Consolidation Project (AWSCP 1999-2001) that was contracted to improve the water quality and supply in the urban Apia area. They discovered early in the project that this could only be achieved with a reduction in demand (amongst other factors). With the momentum and progress that these projects have initiated, the SWA has continued its programs for Demand Management to continually drive it down to a target of approximately 220 l/c/d within the next 5 - 10 years. The achievements of the Demand Management initiatives also impact on the service of the SWA in many areas but especially on the quality of water supply, which further impacts on reduction of consumption through metering. The reason is that there are areas currently being supplied by raw water and in order for these areas to be shifted onto treated water supply (and therefore can be metered), consumptions in these treated water areas have to be reduced.

The reduction in consumption (primarily domestic) is achieved through a combined effort of metering and public awareness, and this 'saved' water can be re-routed into these raw water supplied areas a portion at a time, continuously decreasing the raw water supply coverage area until it is completely supplied with treated water (and synonymously completely metered) SWA aims to achieve 100% treated water supply coverage to all its customers as a longterm objective primarily through an extensive Demand Management plan. Target date has not been established for this goal as yet until sufficient information becomes available (from meter readings etc) to enable this to be done meaningfully.

Solomon Island Briefing Paper

Theme 4: Technology

Appropriate technologies for water supply and waste water treatment RWSS has been employing sustainable and appropriate technologies in all engagements with provision of its services. Appropriate technology for each location is site specific. That which is appropriate at one location does not have to have to be applicable in another situation. Three main types of water sources extraction methods employed by RWSS are; using gravity feed systems, the use of rain and roof catchments and hand dug wells using hand pumps.