SOPAC Trip Report 245

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WATER AND SANITATION PROJECT

WESTERN SAMOA FIELD TRIP REPORT

8-14 APRIL 1997

by

Ed Burke
Project Manager

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INTRODUCTION

At the request of the Apia Observatory, the Water and Sanitation Project (WASP) was invited to Western Samoa to inspect the existing stream gauging stations and to instruct Observatory staff on the use of stream measuring equipment. The opportunity was also taken to visit other water sector organisations based in Western Samoa.

The following documents this trip.

Monday 7 April

Arrived at Faleolo International Airport, Western Samoa, and went to Le Godinet Hotel.

Tuesday 8 April - Apia Observatory

Met with Faatoia Malele, Acting Director, and discussed in general the various activities of the Observatory that includes meteorology, seismology, magnetism, hydrology and hydrogeology.

The Hydrological Section of the Observatory look after 6 recording water level gauging stations, three on the Fuluasou River and three on the Vaisiango River and a number of rainfall stations. The Tiapapata stations (Vaisiango River) were destroyed in a recent flood with damage also to gauging stations located at the western and middle branches of the Fuluasou River.

The Hydrological Section also provide service to the Western Samoa Water Authority in locating test pumping and reporting on groundwater wells drilled by the Water Authority.

The Hydrological Section require assistance with the upgrading of the existing gauging stations including station controls, equipment, rating curves, data collection and analyses plus staff training. At the moment there is no trained personnel to oversee the Hydrological Section.

The Australian Bureau of Meteorology sent the Observatory 16 used Stevens type A 71 water level recorders. However to be useful, they all require an attachment to drive the recorder using a float and counterweight system.

The Observatory does not have any working equipment to carry out river-flow measurements. Thus, the SOPAC universal current meter was taken to Western Samoa to train staff and to measure various stream flows.

Western Samoa Water Authority (WSWA)

A brief meeting was held with Latu Kupa, WSWA General Manager, and Perelini Perelini, American Samoa Power Authority (ASPA) Deputy Executive Officer. ASPA and WSWA have a "buddy system" in place where they exchange information and staff visits to assist one another. Both ASPA and WSWA are strong supporters of the Pacific Water Association that promotes the sparing of information and resources within the region.

UNESCO and UNDP

Both Trevor Sankey (UNESCO Science Officer) and Tony Patten (UNDP Resident Representative) were unavailable. Trevor's Assistant provided me with information regarding potential participants of the IHP Working Group that is scheduled to meet in a Water Resources Workshop in conjunction with the VIII Pacific Science Inter-Congress to be held in Suva, Fiji, in July. His Assistant also advised that the Commonwealth Science Council approved funds to continue the UNESCO/SOPAC groundwater pollution study in Tonga.

Apia Observatory

Met with Amataga Penaia, Section Head of the Hydrological Section, and agreed on a programme for the rest of the visit.

The balance of the day was spent training the Hydrological Section staff in the theory and use of flow measurement and recording equipment. The following staff participated in the training session:

- Amataga Penaia
- Losefatu Eti
- Mafutang Sela
- George Wright
- Malaefutu Leavaaga

Wednesday 9 April

WSWA

Met with Latu Kupa who advised that the WSWA candidates for the Solar Pumping Workshop are Denis Faamau and Tita Faaiuaso. However, I advised that we could only fund one person unless another country candidate cancels. The workshop is scheduled to be held in Suva on 19-21 May 1997.

WSWA leak detection programme has finished Stages 1 & 2 that were funded by WHO. They are now seeking EU funding for Stage 3. The present water use in Apia is over 600 l/c/d and it is believed that over half of water usage is due to reticulation leaks. Thus, the leak detection programme should assist in reducing Apia's high water usage.

EU have approved $35M tala for the construction of two major rural water supply schemes, one on Upolu and one on Savai'i with construction expected to start in February/March 1998. I again stressed that any construction contracts should have provision for a maintenance period of at least 12 months with retention money held from the contractor until the end of the maintenance period in the order of 10 + percent of the contract price so if there are problems there is an incentive for the contractor to complete the schemes as designed.

The National Water Resources Master Plan Study (Stage 1) funded by EU, has been completed making recommendations for further stages involving stream flow measurements and groundwater studies. The synopsis of the recommendations follows:

"There is an urgent need to re-establish the hydrometric network and investigate and monitor the groundwater resources of the islands. We therefore recommend the implementation of a programme of investigations and monitoring under Stage 2 of the Water Resource Master Plan."

SOPAC may be able to assist WSWA in drafting proposals based on the Master Plan recommendations to seek funding.

WSWA is being restructured in an attempt to operate more efficiently. Several young national engineers and scientists have been hired by WSWA to implement the restructuring. See Appendix 1 showing the new Technical Service Division structure chart.

Mr Kupa requested that SOPAC carry out a water resource survey on Manono Island with recommendations regarding upgrading its water supply. This could be carried out this year by WASP.

Apia Observatory

Existing equipment, instruments and files were inspected at the Observatory.

Parts of 3 pygmy current meters exist (2 Ott and 1 HS). However we could not make one working meter from the parts. Four propellers exist but the flow ratings for them could not be found. The three small diameter wading rods and one revolution counter are in working order with minor repairs needed for the connection cable. A new current meter is required.

One new Hydrological Services Sherlock Pressure Sensing unit complete with pressure bulb and tubing is stored at the Observatory. This unit is used to drive a water level recorder.

A quick inspection of the files and existing data showed useful information but much work is required to sort out the existing data. (i.e. flow measurements, daily flow rates, rating curves and tables, etc.). Also many Hydrological reports on Western Samoa are missing. Cyclone Ofa destroyed the building that housed the Hydrological Section, its files and reports. However, resources and guidance to re-organise the information is also lacking.

Water level data is currently being collected from the existing gauging stations. However, the raw data is just being stored and not processed. Also, the new gauging stations cannot be rated without a current meter.

Our planned field trip to the Vaisiango catchment had to be postponed due to lack of transportation.

Thursday 10 April

Four of the five existing gauging stations were visited with a flow measurement made at each station by the Hydrological staff and myself.

Alaoa East Gauging Station (Plate 1)

The gauging station is located on the Eastern branch of the Vaisiango River, an existing water supply intake and has been operating since the mid 1970s. The existing station consists of a large stilling well with a recorder housing built on top. The intake weir is very

broad (approximately 15 m) and thus is not too sensitive to flow changes. The recorder is a Stevens type A71 driven by a Sherlock pressure Unit using the bulb senser system (Plate 2). I do not believe that the pressure drive is required for this installation. All that is required is the Steven recorder to be driven by a float and counterweight system.

Pressure units are most appropriate where a stilling well cannot be easily constructed and the recorder located away from rivers subject to severe flooding.

The Observatory hydrological staff were instructed on the use of the universal current meter brought from Fiji (Plate 3). At a staff gauge reading of 0.198 m the flow was measured at 0.722 m^3/s. There is an existing rating curve for this station. The measurement made was 35% lower than the theoretical flow taken from the rating curve.

Alaoa Middle Gauging Station (Plate *5)*.
Middle branch of the Vaisiango River discharges into a small hydropower storage pond. The station is located about 200 m upstream of a ford crossing a plantation access road. A concrete structure is used as the "control" but it was not currently acting as a control due to flood damage. The control must be re-established if the gauging station is to be useful.

The recorder housing sits on top of a stilling well. Again a pressure sensing device is used to drive a Stevens A71 recorder. The recorder was not working because there was no spare battery to operate the clock recorders.

At a staff gauge reading of 0.29 m the flow was measured at 0.414 m^3/s. The measurement was made at about 10 m upstream of the ford.

Fuluasou Western Gauging Station (Plate *6)*
A new gauging station was constructed about nine months ago on the Western Branch of the Fuluasou River. The station consists of a broad central weir 3.8 m in length that is suitable for measuring only small flows due to its construction. Also water was flowing around its left side due to flood damage.

The instrumentation consists of a pressure sensing device driving a Steven A71 recorder. However, the recorder could not be inspected for it was not available at the time.

A flow measurement was taken just upstream of the weir. At a staff gauge reading of 0.102 m the measurement flow was 0.149 m^3/s. There is no rating curve for this station for there is no current metre to measure flows at various water levels. The Observatory requires a flow metre so measurements can be made by staff at various water levels and thus develop a rating curve for the station.

Fuluasou Middle Gauging Station (Plate 7)

The station on the Middle branch of the Fuluasou River at a location called Silver Stream was inspected. A steel pipe stilling well with a recorder housing on top has been installed. However the control that consisted of larger boulders has been moved due to flooding thus the station has little value in its present state. This station must be re-established to be useful.

A flow measurement was made about 40 m upstream of a ford and about 100 m upstream of the gauging station. The flow was measured at 0.315 m^3/s.

Friday 77 April

WSWA

I met with Holger Maier Senior Civil Engineer of the WSWA. We discussed the Western Samoa Master Water Resources Plan (Stage I) of which he gave me a copy for copying in Suva. He also gave me a copy of a tender document for a consultant to undertake an investigation of the Alaoa Water Treatment Plant to upgrade the plant so that it can produce sufficient treated water to supply the central Apia business area. I was asked to review the document and comment on it on Monday 14 April.

UNDP

Met with Tony Patten, UNDP Resident Representative in Apia. He was not aware of any actions by the UNDP Suva Office to provide funding for the water sector. Note that the UNDP Suva Office is responsible for regional programming and decided not to provide continued funding for the Pacific Water and Sanitation Program.

We generally discussed water sector activities within the Apia office area of responsibility which includes Western Samoa, Cook Islands, Niue and Tokelau. I gave him a copy of a proposal to implement a surface water resource monitoring programme for Rarotonga that included the installation of three catchment stream gauging and rainfall stations at an

estimated cost of F$76,000. He indicated that the Cooks must make a request for this proposal to be considered.

Apia Observatory

A further training session was held with the Hydrological staff on the calculation of flow measurements using the data collected the previous day (Plate **4).** We calculated the flow for the Alaoa East station as an example. Everyone calculated the total flow by summing the flows from each measured section. The discharged measurement form used is shown in Appendix 2.

Fuluasou East Gauging Station (Plate 8)

This gauging station is located at an abandoned intake structure utilising the intake chamber as a stilling area. This site has been a gauging station since the early 1970s and is located a few 100 m downstream of a water supply intake that in part supplies Apia and part of the West Coast of Upolu. The recorder housing is fitted on a steel stilling pipe. The recorder is an Australian recorder similar to the Stevens type A71 with a float and counterweight system and battery powered clock. The staff gauge reading and chart reading were the same at 0.265 m. The flow was measured at 0.899 m^3/s. The measured flow was 20% higher than the theoretical flow based on the existing rating curve for the same water level.

This catchment is a very good producer of water and has a high base flow fed by groundwater that I believe comes in part from connections to Lake Lonoto'o. Also in the past the Fuluasou River was used to generate hydropower electricity. However, the system was damaged by flooding and was not recommissioned.

Monday 14 April

WSWA

I met again with Holger Maier and I gave him my comments on his tender document seeking a consultant to assist in the upgrading of the Alaoa water treatment plan. I also told him that WASP can review any report resulting from the Alaoa upgrading project if WSWA wish us to do so.

While at WSWA I also met with a group from ASPA that was visiting WSWA. They were Michael Dworsky and Tom Author from ASPA and John Emmerson from the US Corps of Engineers, Pacific Division. They were at WSWA as part of a "buddy system" between ASPA

and WSWA where staff are exchanged as a training exercise to share and learn from each other.

We took this opportunity to discuss the development of the Pacific Water Association. The PWA is suffering from a lack of funds to appoint a full-time Director to drive the Association forward. SOPAC through WASP tries to assist on a part-time basis but has other member countries' commitments as well. WASP are currently preparing a PWA newsletter to circulate to members and potential members. Regarding the next venue for the PWA meeting, Fiji appeared to be favoured due to its central location and better resources to hold a meeting (i.e. SOPAC, PPA and the Fiji water sector).

Apia Observatory

My trip concluded with a visit to the Observatory to thank the Observatory staff for their assistance.

Note that while instructing Observatory staff I was interviewed by the Apia Observer Newspaper and a copy of the article is in Appendix 3.

Conclusions resulting from this trip

- The Hydrological Section of the Apia Observatory require additional resources in the form of adequately trained personnel and the necessary equipment plus spare parts if it is to provide a useful service in the assessment and development of Western Samoa's water resources. This supports the main recommendation of the National Water Resources Master Plan Study (Stage 1) that states "There is an urgent need to re-establish the hydrometric network and investigate and monitor the groundwater resources of the islands ……."

- The WSWA requires water resources information to enable the sustainable management of the national water resources to convey adequate and safe water to the people of Samoa.

Possible action by SOPAC

If requested the SOPAC Water and Sanitation Program may be able to assist as follows:

- Using the recommendations made in the National Master Plan, assist in drafting proposals seeking donor funding for upgrading the hydrological network and for groundwater studies.

- Carry out a water resources survey of Manono Island for WSWA.

- Provide technical backup services for the Observatory and WSWA.