

DRAIN AT VAITOLOA WASTE DUMP - SAMPLE LOCATION

APPENDIX F



TAFU'IGATA WASTE DEPOT INVESTIGATION RESULTS

CLIENT: JICA JOB NO: XP0014
 PROJECT TITLE: Samoa Waste Management
 ITEM: Investigation of Tafa'igata Waste Depot SHEET NO 1
 DESIGNER: SAD DATE: 19/1/98

LOCATION : Tafa'igata Waste Depot
 DATE : 19/1/98 3.30pm
 WEATHER : Heavy rain overnight

LEACHATE QUALITY TESTING : Sample SL1 - stagnant water (see sketch for location)

Temp (°C):	<u>40.1</u>	Ammonia (mg/L):	<u><5</u>
DO (mg/L):	<u>2.8</u>	Nitrite (mg/L):	<u>0.8</u>
pH :	<u>7.52</u>	Nitrate (mg/L):	<u>5</u>
Conductivity (ms/sec):	<u>1.7</u>	Phosphate (mg/L):	<u>20</u>
Salinity (%):	<u>0.06</u>		
Turbidity (NTU):	<u>390 - disturbed / aerated during sampling</u>		

COMMENTS : Heavy rain overnight but site still quite dry :
- not much runoff ??
- very permeable strata - likely very high infiltration

JICA SAMOA WASTE MANAGEMENT PROJECT

TAFAGA WASTE DEPOT

SOIL LOGS

TEST PIT 1

Location: Tafaigata waste depot, NW Upolu, just S of Research Station at Nu'u, NW Upolu, Samoa. Map reference 13°50'10"S, 171°50'W. In depression 5 m on N side of access road, approximately 500 m from depot entrance.

Topography: Site in depression on generally N facing slope, with runoff coming from E, S and W slopes surrounding site. Profile dug on 1° W facing very gently undulating slope.

Altitude: ± 100 m above m.s.l.

Vegetation: Originally in secondary forest with low canopy of grass (including *Imperata cylindrica*, *Paspalum conjugatum*) low shrubs and creepers (including *Michania micrantha*) sedges and low ferns, cleared in 1993 for establishment of depot.

Drainage: Site moderately well drained and profile well drained.

Parent Material: Colluvium derived from weathered basalt flow rock.

Climate: Average rainfall estimated 3500 mm annually with a very weak dry season June-September. Average temperature 26°C.

Comment: Site cleared for establishment of depot; 5-15 cm of topsoil disturbed/removed during site preparation; rubbish piled up on N side of depression has reduced runoff in that direction leading to some ponding adjacent to location of pit. Water ponded up to 10 cm deep at time of inspection.

Classification: Andic Humitropept, clayey, oxidic, isohyperthermic
(USDA Tentative)

Soil Description

Ap	0-10 (variable)	dry; dark brown (7.5 YR 3/2) slightly gritty and stony silty clay loam; weakly developed weakly developed fine subangular blocky and granular structure; friable to loose; not sticky, not plastic; subrounded stones and gravel common (about 5%); many fine and common medium roots; diffuse wavy boundary,
Bw	10-170 (variable)	moist; dark brown (7.5 YR 3/4) to dark reddish brown (5 YR 3/4) slightly stony silty clay; slightly massive breaking to weakly developed fine granular and crumb structure; firm to friable; slightly sticky, slightly smeary but not plastic; fewer roots than above; pieces (up to 10 cm maximum diameter) of weakly to moderately weathered basalt occur below 1 m, becoming more common with depth; few roots below 50 cm; diffuse straight bouldary,
BC	170-250	moist; dark brown (7.5 YR 4/4) stony silt loam to silty clay loam with a few boulders; weakly developed medium and fine granular and crumb structure; very friable to loose; few roots; diffuse straight boundary,
CR	250+	moist; mainly weakly weathered vesicular basalt rocks and boulders, with dark reddish brown (5 YR 3/4) stony and gravelly silty clay loam in the interstices.

TEST PIT 2

Location: Tafalgata waste depot, NW Upolu, just S of Research Station at Nu'u, NW Upolu, Samoa. Map reference 13°50'10"S, 171°50'W. Site located on N boundary of property, approximately 120 m WNW of Test pit No.1.

Topography: E facing 5-6° slope, 25 m S of significant drop off to the N; site on slightly concave slope, which has been slightly disturbed by depot management activities (waste has been deposited to a depth of 1.5 m within 5 m of pit).

Altitude: ± 100 m above m.s.l.

Vegetation: Originally in secondary forest with low canopy of grass (including *Imperata cylindrica*, *Paspalum conjugatum*) low shrubs and creepers (including *Michania micrantha*) sedges and low ferns, cleared in 1993 for establishment of depot. Pit dug on edge of small taro patch.

Drainage: Site and profile well drained.

Parent Material: Weathered basalt flow rock and associated colluvium.

Climate: Average rainfall estimated 3500 mm annually with a very weak dry season June-September. Average temperature 26°C.

Comment: Site cleared for establishment of depot; a small amount of topsoil disturbed/removed during site preparation; rubbish piled up on S and W sides of site, to a depth of 1.5 m. Associated vehicle movements may have caused disturbance to the site.

Classification: Andic Humitropept, clayey, oxidic, isohyperthermic
(USDA Tentative)

Soil description

A	0-15	moist; dark brown (7.5 YR 3/2) stony and bouldary silty clay, with boulders up to 60 cm longest diameter occurring right to the soil surface; weakly developed coarse subangular blocky breaking to weakly developed fine subangular blocky and granular structure; friable to loose; not sticky or plastic, but slightly smeary; many fine and common medium roots, with a few large tree roots; common subrounded stones up to 2.5 cm maximum diameter; indistinct wavy boundary,
Bw	15-150 (variable)	moist; dark reddish brown (5 YR 3/3) stony and bouldary silty clay with common subrounded stones and occasional boulders; massive breaking to weakly developed medium and fine subangular blocky and granular; firm to friable; slightly sticky, slightly smeary but not plastic; fewer roots than above but tree roots extend to about 70 cm; straight boundary (on the W side of the pit this boundary was sharp at a depth of 150 cm, while on the E side it was less distinct and occurred at 210 cm),
CB	150-260	moist; mainly weakly weathered vesicular basalt rocks and boulders, with dark reddish brown (5 YR 3/4) stony and gravelly silty clay loam in the interstices.

TEST PIT 3

Location: Tafaigata waste depot, NW Upolu, just S of Research Station at Nu'u, NW Upolu, Samoa. Map reference 13°50'10"S, 171°50'W. Site located in SW section of property adjacent to composting section.

Topography: Site located on NW facing 2-3° slope; pit dug in middle of slightly convex slope.

Altitude: ± 110 m above m.s.l.

Vegetation: Originally in secondary forest with low canopy of grass (including *Imperata cylindrica*, *Paspalum conjugatum*) low shrubs and creepers (including *Michania micrantha*) sedges and low ferns, cleared in 1993 for establishment of depot. A few of the original trees located about 20 m from pit on S and E.

Drainage: Site and profile well drained.

Parent Material: Weathered basalt flow rock and associated colluvium.

Climate: Average rainfall estimated 3500 mm annually with a very weak dry season June-September. Average temperature 26°C.

Classification: Andic Humitropept, clayey, oxidic, isohyperthermic
(USDA Tentative)

Comments: Site cleared of all low vegetation for use as a composting area; the large trees were left in place. Vegetation clearance and vehicle movement associated with dumping of compostibles will have disturbed the soil surface, but no major disturbance was obvious.

Soil description

A	0-45	moist; dark brown (7.5 YR 3/2) slightly gravelly and stony silty clay; weakly developed medium and fine subangular blocky and granular structure, but with some massive pieces up to 20 cm diameter in the top 30 cm of the profile (probably the result of vehicular compaction); friable to loose; slightly sticky, not plastic but slightly smeary; many fine and common medium roots; stones are sub-rounded with maximum diameter of 1.5 cm; diffuse slightly wavy boundary,
Bw	45-115 (variable)	moist; dark reddish brown (5 YR 3/3) stony silty clay; weakly developed medium and fine subangular blocky and granular structure; firm to friable; slightly sticky, slightly smeary but not plastic; fewer roots than above, but roots still common to about 70 cm; common rounded and sub-rounded stones up to 2.5 cm maximum diameter; indistinct straight boundary, on N side of pit
CB	115-260	moist; dark grey to black slightly weathered basalt gravels, stones and boulders with dark reddish brown (5 YR 3/3-3/4) silt loam to silty clay loam in the interstices; weakly developed medium and fine granular and crumb structure; very friable to loose; few roots, on S side of pit
CB	115-210	as above
C	210-260	yellow-grey weathered basalt flow rock in place

GENERAL COMMENTS

According to the soil maps produced by Wright (1963), the Tafaigata soils are part of an area mapped as the Tafatafa series. These are described by Wright as being latosolic soils derived from the A'ana volcanics consisting of mixed aa and pahoe-hoe basalt. The Tafatafa soils occur in an area with a very weak dry season, and are weakly to moderately leached. Wright describes the main profile characteristics as being dark reddish brown stony and bouldery shallow (25-50 cm) clays and loams, very well drained and slightly to moderately acid. The observations made at Tafaigata are entirely consistent with Wright's description, with the Tafaigata soils representing deeper variants of the Tafatafa series.

Information from adjacent sites at Nu'u (Morrison et al, 1986; Asghar et al, 1988) shows that the soils at Tafaigata are similar to those at Nu'u varying mainly in depth to stone and boulder dominance and with slight colour variations which would be expected in such terrain. Soils at Laloanea (Morrison et al, 1986), located about 400 m higher elevation from Tafaigata, but in a similar landscape, show some similarities in the profiles to those observed at Tafaigata, but are shallower and yellower, possibly the result of forming from a different basalt parent material.

REFERENCES

Asghar, M., Davidson, T.J., Jr., Morrison, R.J. (Editors), 1988. Soil Taxonomy and Fertility in the South Pacific. Proc. XVth International Forum on Soil Taxonomy and Agrotechnology Transfer, Apia, July 1986. University of the South Pacific, 547 p.

Morrison, R.J., Prasad, R.A. and Asghar, M., 1986. Classification of some benchmark soils from Western Samoa. Environmental Studies Report No.28, Institute of Natural Resources, University of the South Pacific, Suva, 65 p.

Soil Survey Staff, 1975. Soil Taxonomy : a basic system of soil classification for making and interpreting soil surveys. USDA Agriculture Handbook No. 436. Washington, D.C. 754 p.

Soil Survey Staff, 1996. Keys to Soil Taxonomy, Seventh Edition, USDA Natural Resources Conservation Service, Washington D.C., xxxp.

Wright, A.C.S., 1963. Soils and Land Use of Western Samoa. New Zealand Soil Bureau Bull. 22. Wellington, 191 p.

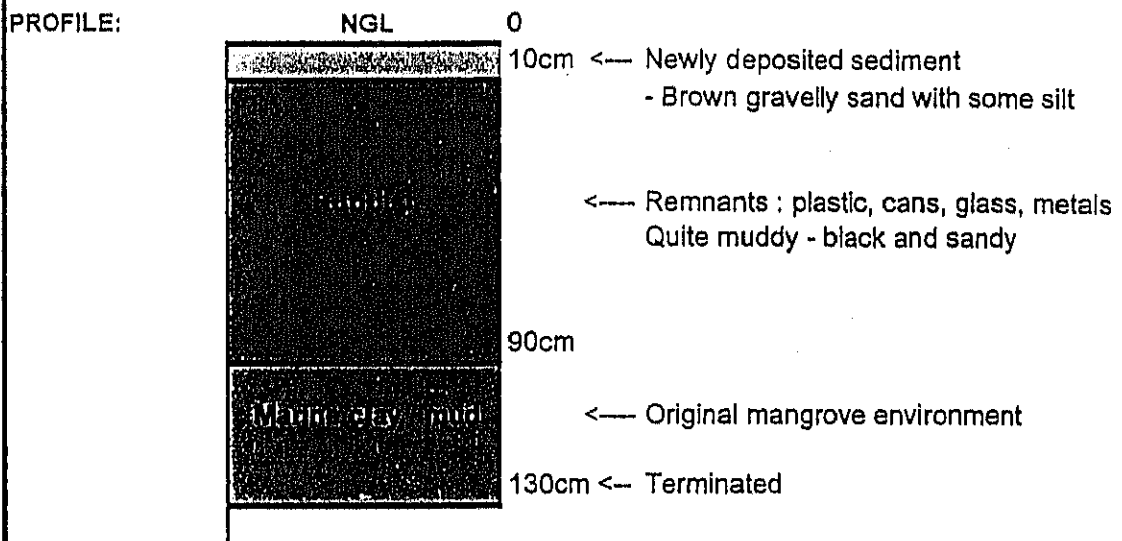
APPENDIX G



VAITOLOA WASTE DEPOT INVESTIGATION RESULTS

CLIENT: JICA JOB NO: XP0014
 PROJECT TITLE: Samoa Waste Management
 ITEM: Investigation of Vaitaloa Waste Depot SHEET NO 1
 DESIGNER: SAD DATE: 20/1/98

TEST PIT NO: 1



COMMENTS : Not a lot of odour from waste - except from marine clay
Although some smell when top 10cm layer is broken

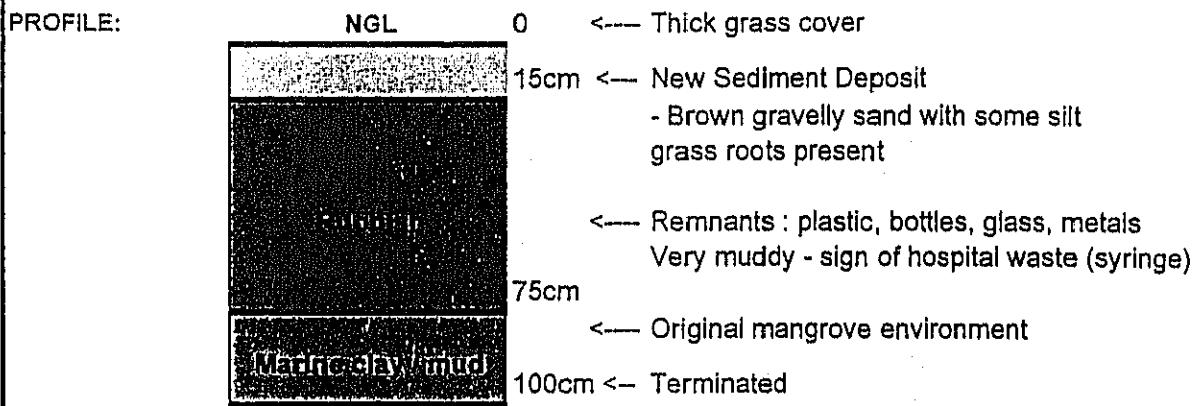
WATER QUALITY TESTING :

Temp (°C):	<u>28.9</u>	Ammonia (mg/L):	<u>5.1</u>
DO (mg/L):	<u>3.5</u>	Nitrite (mg/L):	<u>2.5</u>
pH :	<u>8.01</u>	Nitrate (mg/L):	<u>20</u>
Conductivity (ms/sec):	<u>6.8</u>	Phosphate (mg/L):	<u>13</u>
Salinity (%) :	<u>0.36</u>		
Turbidity (NTU):	<u>350</u>		

OTHER COMMENTS : Very dark in colour - very odorous
High level of suspended solids - suspected impact shown
nitrate and nitrite readings.

CLIENT: JICA JOB NO: XP0014
 PROJECT TITLE: Samoa Waste Management
 ITEM: Investigation of Vaitalao Waste Depot SHEET NO 2
 DESIGNER: SAD DATE: 20/1/98

TEST PIT NO: 2 - 50m from shoreline



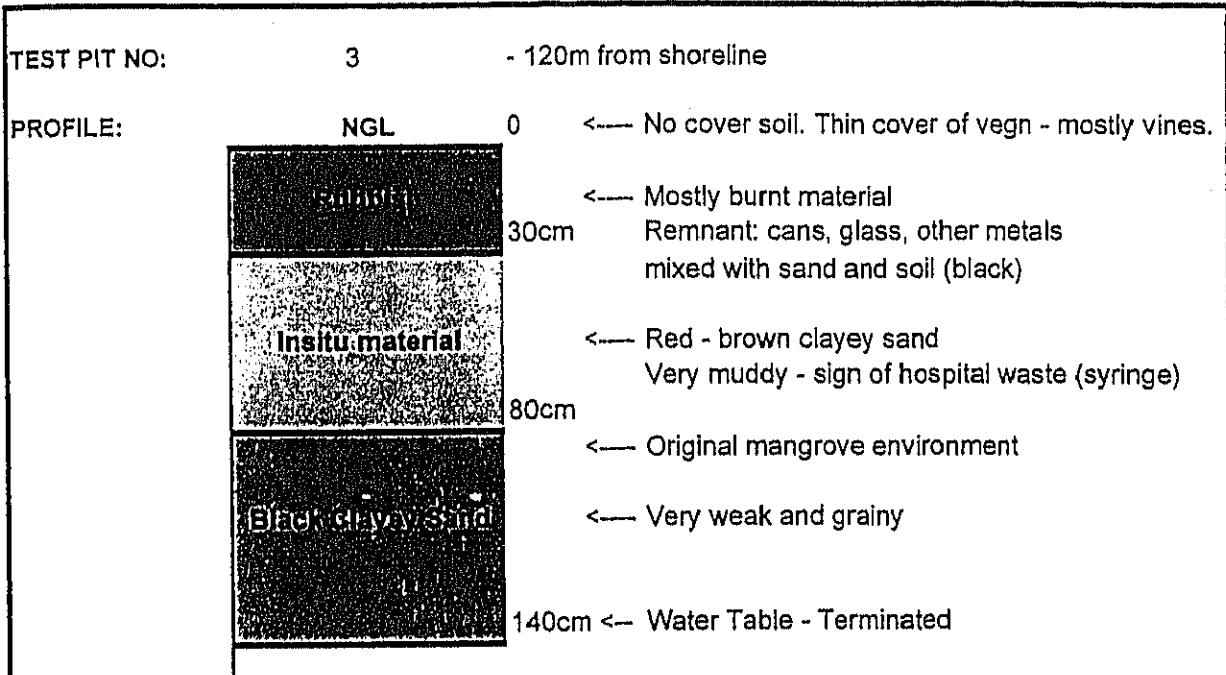
COMMENTS : Strong bitumen odour from waste and natural odour from marine clay
Water has oily sheen on surface

WATER QUALITY TESTING :

Temp (°C):	<u>29.3</u>	Ammonia (mg/L):	<u><5</u>
DO (mg/L):	<u>0.7</u>	Nitrite (mg/L):	<u>0.9</u>
pH :	<u>7.8</u>	Nitrate (mg/L):	<u>1</u> -<3 ?
Conductivity (ms/sec):	<u>10.1</u>	Phosphate (mg/L):	<u>7</u>
Salinity (%):	<u>0.54</u>		
Turbidity (NTU):	<u>176</u>		

OTHER COMMENTS : Very oily
Medium suspended solids, but suprisingly clear

CLIENT: JICA JOB NO: XP0014
 PROJECT TITLE: Samoa Waste Management
 ITEM: Investigation of Vaitaloa Waste Depot SHEET NO 3
 DESIGNER: SAD DATE: 20/1/98



COMMENTS : No water samples taken - no point as would simply be sea water.
-Waste layer too thin

WATER QUALITY TESTING :

Temp (°C):	<u>nt</u>	Ammonia (mg/L):	<u>nt</u>
DO (mg/L):	<u>nt</u>	Nitrite (mg/L):	<u>nt</u>
pH :	<u>nt</u>	Nitrate (mg/L):	<u>nt</u>
Conductivity (ms/sec):	<u>nt</u>	Phosphate (mg/L):	<u>nt</u>
Salinity (%) :	<u>nt</u>		
Turbidity (NTU):	<u>nt</u>		

OTHER COMMENTS : _____

CLIENT: JICA JOB NO: XP0014
 PROJECT TITLE: Samoa Waste Management
 ITEM: Investigation of Vaitaloa Waste Depot SHEET NO 4
 DESIGNER: SAD DATE: 20/1/98

LOCATION: Vaitaloa W SW1

DATE: 20/1/98

SURFACE WATER TESTING: SW1

Temp (°C):	<u>30.5</u>	Ammonia (mg/L):	<u><5</u>
DO (mg/L):	<u>2.4</u>	Nitrite (mg/L):	<u><3</u>
pH :	<u>7.36</u>	Nitrate (mg/L):	<u><0.5</u>
Conductivity (ms/sec):	<u>4.8</u>	Phosphate (mg/L):	<u>19</u>
Salinity (%):	<u>0.25</u>		
Turbidity (NTU):	<u>82</u>		

COMMENTS : Oily sheen on surface - from bucket and TP No. 2
- murky brown colour, but not much suspended solids
- slight organic odour

APPENDIX H



TERMS OF REFERENCE FOR PUBLIC AWARENESS SURVEY

WESTERN SAMOA WASTE MANAGEMENT PUBLIC AWARENESS SURVEY 1998

TERMS OF REFERENCE (for Maria Kerslake)

General Requirements

As part of the CMPS&F Waste Management Project Identification Mission being carried out on behalf of JICA, Mrs. Kerslake will carry out a public awareness survey in the Apia area.

Mrs. Kerslake, in consultation with the CMPS&F team, will develop a questionnaire in English and Samoan. Using the agreed questionnaire, she will meet with/interview 50 residents of the Apia region to assess their knowledge of waste management and related issues in the area. The responses will be collated and analysed.

Mrs. Kerslake will provide copies of the original notes/data/completed questionnaires to CMPS&F and to the Division of Environment and Conservation of the Ministry of Lands, Survey and Environment (DEC). She will keep the original data sheets for a period of 6 months from the end of the survey in case CMPS&F require any additional copies.

Mrs Kerslake will prepare a report for CMPS&F summarising the findings, data and conclusions of the survey, and including any recommendations for follow-up work.

Coverage

The survey should involve interviewing a minimum of 50 people living in the Apia area. The respondents should include both males and females, live in different suburbs/villages, should cover a reasonable span of age groups, education backgrounds and socioeconomic groups.

The project should involve, where possible, staff of the Division of Environment and Conservation (probably Easter Galuvau). DEC staff should be kept up to date with the status of the project, be given an explanation of the rationale for the survey plan, should be able to gain knowledge of how to carry out such surveys and, if possible involved in survey activities and assessment.

The questionnaire will include questions covering the following:

- Age, sex, education background and residential suburb of the interviewee
- Household -
 - no. of people living there
 - how many residents in paid employment
 - toilet facilities (flush, septic, pit)
 - if the house has a septic system, when was last cleaning?
 - what was the cost?

are the any problems?
waste collection service - does it cover the house?
if yes, how often?
any problems?
composting - do they do it in the household?
what is composted?
where is the composting done?
what is the compost used for?

- Knowledge of wastes

What happens to wastes (short-term and long-term)?

What problems to wastes cause?

Which wastes are hazardous?

How does respondent dispose of different types of waste,
e.g., plastics bags and bottles, glass bottles, tins, aerosol
cans, car batteries, pesticide containers

Where do wastes come from?

Can anything be done to reduce the amount of waste?

Collection Service

Who does it?

Who pays for it?

Where do the collected wastes go?

Who looks after the collected waste (and the dump)?

Would you pay a small fee for an improved collection service?

Reuse/Recycling

Do they reuse anything? If yes, what?

Do you separate wastes at home?

Do you know about recycling - explain?

Would you be prepared to separate wastes at home/work?

- Have you seen/heard any information about wastes and waste management and any associated problems?

If yes, when, where and from whom?

- Is waste a serious problem?

Is it more or less serious in Samoa than, e.g., poor water quality, deforestation, damage to coral reefs, taro blight, AIDS?

- How would you reduce waste problems in Samoa?

Timeframe

23 January 1998: submit draft questionnaire to John Morrison on fax number (61 2) 4221 4665

27 January 1998: John Morrison will provide written comments

29 January 1998: Start survey

15 February 1998: Submit draft report of survey to John Morrison

22 February 1998: John Morrison will respond to draft report with any comments/questions.

28 February 1998: Submit final report and copies of data sheets to John Morrison

Payment Schedule

The payment for the project will be a flat fee of US\$2,000. This will be paid as follows:

- A first payment of \$500 immediately after receipt of draft survey questionnaire;
- A second payment of \$500 immediately after receipt of the draft report;
- A final payment of \$1000 upon receipt of the final report and data sheets.

APPENDIX I

**REPORT ON
PUBLIC AWARENESS SURVEY**

Report on the Public Awareness
Survey on Waste Management
in the Apia Town Area

Submitted by :

Mrs Marla Kerslake
Head of Sociology/Geography Dept.
National University Of Samoa

25 February 1998

Report of the Public Awareness Survey on Waste Management

Introduction:

The CMPS & F Waste Management Project Identification Mission being carried out on behalf of Japan International Cooperation Agency (JICA) commissioned Mrs Maria Kerslake, in consultation with Dr John Morrison and the Department of Environment and Conservation to develop a questionnaire and interview fifty (50) residents of the Apia region. The main aim of the survey is to collect information which can be used to assess the knowledge and level of Waste Management Awareness of the residents of the Apia regional area. The Survey involved Consultation with the Director of Lands, Survey and Environment and the staff of the Division of Environment and Conservation. It was expected that Mrs Kerslake would provide copies of the original notes and completed questionnaires to CMPS & F and to the Division of Environment and Conservation, and keep the originals for a period of 6 months after the completion of the Survey.

Background:

Waste Management in Samoa has in the past followed traditional Samoan methods of disposal. Food and its associated remains or materials used for food preparation have either been buried, burnt or composted. Most of the food items and the material culture of Samoans, consisted of biodegradable products which did not present a problem. Modern Living and its associated changes have introduced products which are not biodegradable, for example, plastics, foam, aluminium cans and glass. These products have accumulated over the past twenty years and have presented a disposal problem. Most people treat non-biodegradable wastes as biodegradable and throw them just as they have behaved in the past. The levels of littering are such that there is widespread concern regarding a new approach to disposal of these materials. The Government established a rubbish depot at Vaitoloa to alleviate the problem. There was no Environmental Impact Assessment made in this project and later the depot was closed to facilitate a more organised and regulated Waste Management Plan. The Government is now operating a waste disposal depot at Tafaigata (Nu'u).

Methodology

The questionnaire was designed assess public awareness on Waste Management issues as well as pertinent information about the respondents. These included gender, village, educational background and family income level.

The sample was randomly selected according to the garbage collection routes used

in Urban Apia by the Division Of Environment and Conservation. The route includes three (3) areas: Area A is where the collection is daily. Area B is where the collection is three times a week and Area C is where the collection is twice a week. The respondents locations were as follows:

Area A	=	25 respondents
Area B	=	15 respondents
Area C	=	10 respondents
Industrial zone in Area C	=	4 respondents
Total number of respondents	=	54

The villages (suburbs) chosen were randomly selected from a list drawn to represent the three different areas. Once the villages were drawn, the street names were then decided on the basis of density of population. Every second household in the chosen streets was interviewed until the number of required households was reached.

Data was collected by interviewing the respondents (in Samoan) and filling the questionnaire provided (in English).

Staff of the Division of Environment and Conservation involved in the process were briefed on the questionnaire instrument for clarity and a reliable presentation of information. A letter of introduction was written to accompany the interviewers to facilitate their accessibility to respondents. This process of data collection took two and a half weeks to complete.

Analysis of Results

Personal Data of Respondents:

1. (a)	<u>Gender:</u>	Males	(45%)	(24)
		Females	(55%)	(30)

(b)	<u>Education level:</u>	<u>No. of Respondents</u>		<u>Percentage</u>
		Tertiary	18	33
		Secondary	25	46
		Primary	11	20

2. Ages:

<20	=	2	4%	51 - 55	=	2	4%
21 - 25	=	3	6%	56 - 60	=	2	4%
26 - 30	=	7	13%	61 - 65	=	4	8%
31 - 35	=	8	15%	66>	=	2	4%
36 - 40	=	11	20%	Total	=	54	100%
41 - 45	=	6	12%	Youngest age	=	19	
46 - 50	=	7	13%	Oldest age	=	75	

N.B. Children were not interviewed because it is culturally inappropriate in Samoa to interview them while older members of the family are present. The oldest family member present at the time of the survey was the person who was interviewed.

3. (a) Number of people in respondent's household:

	<u>No. of Respondents</u>	<u>Percentage</u>
3-5	15	28
6-8	13	24
9-11	9	17
12-14	2	4
15-17	4	7
18-22	3	5
23-25	1	2
26-30	3	5

(b) No. of Employees in Factory in Industrial Zone (4)

4 factories with 2015, 139, 115 and 50 employees

(c) Respondents reply to their Household Income - Fortnightly amounts in Samoan Tala (The majority of respondents income fall between \$200 and \$500 WST fortnightly)

<50 WST	=	0	
150 - 120	=	2	4%
200 - 300	=	11	20%
300 - 400	=	10	19%
400 - 500	=	6	11%
500 - 600	=	3	6%

600 - 700	=	2	4%
700 - 800	=	5	10%
800 - 900	=	1	2%
900 - 1000	=	2	4%
1100- 1300	=	2	4%

4. Respondents reply to Type of Waste & Disposal Method

<u>Type of Waste</u>	<u>Disposal Method</u>	<u>No. of Respondents</u>	<u>Percentage</u>
Food scraps	Govt. Rubbish Truck	20	37
	Feed for pigs	19	35
	Feed for Dogs	11	20
	Bury	3	6
	Burn	1	2
Food preparation			
Refuse	Govt. rubbish truck	25	46
	Feed for pigs	10	19
	Feed for Dogs	3	6
	Dump in hole	1	2
	Left in backyard	1	2
	Thrown away-ditch	2	4
	Bury	4	8
	Not applicable	4	8
Garden	Rubbish truck	24	44
	Burn	12	22
	Compost - veg garden	11	20
	Bury	4	8
	Fill material	2	4
	Left at backyard	1	2
Empty cans	Govt. rubbish truck	42	78
	Bury	3	5
	Recycling	5	10
	Not applicable	4	7
Glass bottles	Govt. rubbish truck	24	44
	Recycle to Vailima	18	33
	Sell to shops, people	5	9
	Refuse in the house	2	4
	Storage (kerosene)	2	4

	Broken bottles to govt truck	3	6
Plastic bags	Govt rubbish truck	32	59
	Reuse	8	15
	Burn	6	11
	Not applicable	8	15
Plastic bottles	Govt rubbish truck	37	68
	Recycle Pepsi bottles	7	13
	Stacked and burn	2	4
	Shredded	2	4
	Reuse for ice water	4	7
	Not applicable	2	4
Rags	Govt. rubbish truck	26	48
	Reuse for housework and floor mats	10	18
	Burn when soiled	9	17
	Use as cleaning material	3	6
	Give-away	6	11
Tyres	Govt Rubbish Truck	20	37
	Roofing material	2	4
	Use for garden design	10	19
	Kill of trees and farm	2	4
	Pot plants	4	8
	Traded-in	4	8
Batteries	Left in the backyard	4	8
	Kept in the workshop	2	4
	Taken in Commercial Co.	1	2
	In the ditch (waterway)	2	4
	Left in garage	1	2
	Used as fence for garden	2	4

Aerosol cans/

pesticide containers	Govt rubbish truck	39	72
	Bury	3	6
	Soak pit	3	5
	Not applicable	9	17
Scrap metal	Govt rubbish truck	22	41
	Bury	2	4
	Waste Man. Co.	2	4
	Left in garage	2	4
	Not applicable	26	48
Other: Paper	Govt. rubbish truck	16	30
	Taken to shop for refuse	5	10
	Burn	5	10
	Dumped in the backyard	2	4
	Scrapwire	Export to New Zealand	1
	Not applicable	25	46

5. Respondents Description of what they think hazardous waste is:

	<u>No of Respondents</u>	<u>Percentage:</u>
- Aerosol Containers, cleaning detergents & deodorants, paint, inflammable materials, insecticides	11	20
- Weed killers & toxic waste	3	6
- Waste which can cause damage to the health of people & other living creatures	5	10
- Empty & broken bottles, empty cans	9	17
- Waste which cannot be composted e.g. plastic	6	11

-	Cement truck	1	2
-	No response	22	41

6. Respondents knowledge of local industries which produce waste

<u>Response</u>	<u>Number of Respondents</u>	<u>Percentage</u>
Yes	34	63
No	10	19
No response	10	19

7. Respondents who answered positively to local industries producing waste and identified the types of waste as follows:

<u>Waste</u>	<u>Number of Respondents</u>	<u>Percentage</u>
Gases/ fumes	4	8
Chemicals	5	10
Paper	6	11
Wires, scrap metal, iron & steel	5	10
Noise	1	2
Smelly liquid from Processing Company (Vailima & Hellaby)	1	2
Packaging materials e.g. plastics	2	4
Food scraps & solids	4	8
Empty cans & glass	4	8
Total	=	<u>32</u>

8. Respondents responses to how they know what waste local industries produce

<u>Source</u>	<u>No. of Respondents</u>	<u>Percentage</u>
General knowledge	20	37

Industrial site	10	19
Radio	4	8
Personal observation & Media	4	8
Trade	3	6
They hear about	5	10
Working in these industries	5	10
Knowledge of industries	3	6
Total	54	

9. Respondents reply to who collects their rubbish and how often

It is evident that most respondents know that the Government is mainly responsible for the collection of waste.

	<u>No. of respondents</u>	<u>Percentage</u>
Government trucks	40	74
Private arrangement	14	26

	<u>No. of respondents</u>	<u>Percentage</u>
<u>Government</u>		
Daily	20	37
Twice a week	10	19
Once a week	10	19
<u>Private</u>		
Daily	10	19
Twice a week	2	4
Once a week	2	4

10. Respondents who also use other methods of disposal other than the ones above and identified them as follows:

<u>Methods</u>	<u>No. of respondents</u>	<u>Percentage</u>
Burning	5	10
Burying	2	4
Composting	1	2
Dumping	3	6

11. Respondents reply to who pays for the collection of waste

	<u>No. of respondents</u>	<u>Percentage</u>
Government	40	74
Tax Payer	1	2
Company	4	8
No response	7	13
Don't know	2	4

12. Respondents reply to whether they were satisfied with the Collection System

	<u>No. of respondents</u>	<u>Percentage</u>
Yes	45	83
No	6	12
Don't know	3	6
	1	2

13. The Respondents that were Dissatisfied with the Collection System, suggested the following measures to improve the System:

<u>Measures</u>	<u>No of respondents</u>	<u>Percentage</u>
Daily collection service	10	19
Improve the current service	30	56
To put in practice policies & legislation against littering	14	26

14. Respondents reply to whether they are prepared to pay a small fee for an improved Collection System:

	<u>No. of respondents</u>	<u>Percentage</u>
Yes	26	48
No	8	15
Government to subsidise	2	4
No response	18	33

15. Respondents reply to where the depot for Waste Disposal is situated.

stated the following:

	<u>No. of respondents</u>	<u>Percentage</u>
Tafaigata	25	46
Nuu	3	6
Vaitoloa	11	20
No response	15	28

16. Respondents comments about the Rubbish Depot ranges within the following Categories:

<u>Comments</u>	<u>No. of respondents</u>	<u>Percentage</u>
Unhealthy area for residents	8	15
Unsanitary & unsafe for workers	4	8
Access roads are poor	2	4
No dumping plan, and people dump indiscriminately	4	8
No separation of waste	2	4
Never seen the depot	2	4
No response	32	59

17. Respondents reply to who looks after the Rubbish tip, are stated below:

<u>Response</u>	<u>No. of respondents</u>	<u>Percentage</u>
- Government	14	26
- Department of Environment and Conservation	3	6
- O Le Siosiomaga Society	3	6
- Public Works Department	5	10
- Health Department	2	4
- Poor people	1	2
- No knowledge	15	28
- No response	11	20

18. Respondents reply to undertaking composting in their homes are as follows:

<u>No. of respondents</u>	<u>Percentage</u>
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No	30	56
Yes	24	44

19. Respondents knowledge of the type of Waste material that can be composted:

<u>Responses</u>	<u>No. of respondents</u>	<u>Percentage</u>
Glass & leaves	24	44
Organic material	20	37
Empty cans & sawdust	2	4
No responses	8	15

20. The Respondents reply to where the composting is done is stated as follows:

<u>Responses</u>	<u>No. of respondents</u>	<u>Percentage</u>
Backyard & around the house	9	17
No response	15	28

21. The respondents reply to what the compost is used for, range as follows:

<u>Responses</u>	<u>No. of respondents</u>	<u>Percentage</u>
- For new soil & fertiliser	11	20
- For fill material	3	6
- To feed pigs	1	2
- Don't know	2	4
- No response	37	69

22. Respondents replies to whether they reuse anything are as follows:

<u>Response</u>	<u>No. of respondents</u>	<u>Percentage</u>	<u>Examples</u>
Yes	14	26	Plastic bottles for storage & cooling water Plastic bags for rubbish

Cardboard for lining material
Boxes are resold

No	26	48
No response	14	26

23. Respondents reply to whether they separate their waste at home:

<u>Responses</u>	<u>No. of respondents</u>	<u>Percentage</u>
Yes	32	59
No	19	35
No response	3	6

24. Respondents who are prepared to separate their waste in the future responded as follows: (only respondents who responded no to Question 23 were asked this question)

<u>Responses</u>	<u>No. of respondents</u>	<u>Percentage</u>
Yes	13	24
No	6	11

25. Respondents who are prepared to separate their waste in the future responded as follows:

<u>Responses</u>	<u>No. of respondents</u>	<u>Percentage</u>	<u>Reasons</u>
Yes	9	17	If it needs to be done & that waster will be put into categories
No	10	19	-Too busy -No one to do it -They will miss it at the collection so why bother

26. Respondents reply to what they know about recycling:

	<u>No. of respondents</u>	<u>Percentage</u>
Know nothing	26	48
Understands a little	3	6
Fully understands the concept	6	11
No response	19	35

27. Type of toilet facilities in Respondents home:

<u>Type of toilet</u>	<u>No. of respondents</u>	<u>Percentage</u>
Flush septic	48	89
Peace Corps	6	11

28. Respondents answers to the question of when their septic tank was last cleaned varied as follows:

	<u>No. of respondents</u>	<u>Percentage</u>
Never been cleaned	10	19
Last year	10	19
Two years ago	10	19
Over 10 years	5	10
When it needs it	15	28
Not sure	4	8

29. Respondents reply to how often their septic tank is cleaned varied as follows:

<u>Responses</u>	<u>No. of respondents</u>	<u>Percentage</u>
Never been cleaned	14	26
Yearly	10	19
Every two years	10	19
Every 10 or more years	5	10
When it needs to be	10	19
Not sure	5	10

30. Respondents reply to who cleaned their septic and method used is as follows:

	<u>No. of respts</u>	<u>Percentage</u>	<u>Method</u>	<u>Percentage</u>
Private Company	14	26	Vacuums - 11	20
Government	20	37	Service truck - 16	30
No response	20	37	Don't know - 3	6
			No response - 24	44

31. The cost of the cleaning service range from:

-	10 - 100	=	8
-	101 - 200	=	10
-	500	=	1
-	3000	=	1
-	No response	=	33

32. Problems encountered by respondents on management of their septic tank are as follows:

	<u>No. of respondents</u>	<u>Percentage</u>
Smell	4	8
Drainage	4	8
Service truck access	2	4
Health problems	5	10
Pollution	2	4
Workers/no protective clothes, gloves, masks	2	4
No response	41	76

33. Respondents answers to where laundry activities take place:

	<u>No. of respondents</u>	<u>Percentage</u>
At home using taps	31	57
Laundromat	10	19
No response	13	24

34. Respondents answers to how the laundry water is disposed of:

	<u>No. of respondents</u>	<u>Percentage</u>
Ground & drains to sea	25	46
Soap pit	9	17
Septic tank	6	11
Don't know	4	8
No response	10	19

35. Awareness Information:

The respondents were asked whether they have heard or seen any information about Waste Management or any associated problems, for example - recycling, waste collection, waste disposal, littering or septic system.

The responses were as follows:

	<u>No. of respondents</u>	<u>Percentage</u>
Yes	30	55
No	21	39
No response	3	6

36. Respondents who answered yes (30) identified the type of information and its source as follows:

<u>Responses</u>	<u>Source</u>	<u>No.of respondents</u>	<u>Percentage</u>
Rubbish Collection	Television	5	10
Clean up campaign	Television/Radio	7	13
Recycling	Radio NZ	2	4
Anti litter Campaign	Govt. Newspaper	2	4
Waste separation	Pagopago Television	4	8
Anti litter-sea	Pagopago Television	2	4
No response		37	69

37. Respondents answers to when they saw or heard this information - range from:

	<u>Respondents</u>	<u>Percentage</u>
Yearly	4	8
3 years ago	3	6
Last year	3	6
No response	34	63

38. Respondents answers to where and from whom are as follows:

<u>Responses</u>	<u>Respondent</u>	<u>Percentage</u>
Siosiomaga Society	5	10
Overseas	7	13
Parents and Friends	3	6
SPREP & Health Department	2	4
Lands & Survey	2	4
Media - Radio & Newspaper	2	4
No response	31	59
Water Authority	2	4

39. Respondents answer to what the message given was as follows:

<u>Message</u>	<u>Respondents</u>	<u>Percentage</u>
Cleaning the Environment	10	19
Keep Samoa clean	4	8
Clean up the world	4	8
Look after ozone layer	5	10
Do not litter	4	8
Protect the Environment	4	8
Protect the Ozone layer	5	10
No response	18	34

40. Respondents answers to whether they receive training or information on how to maintain septic systems are as follows:

<u>Type of Information/Training</u>	<u>No. of respondents</u>	<u>Percentage</u>
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Hygiene training	2	4
Health talk by Women's Committee	3	6
Discussions with Public Works	4	8
SPC - New Caledonia	2	4
No	31	58
No response	12	23

41. Respondents answers to why they think waste is or is not a problem:

<u>(a) Waste is a problem</u>	<u>No. of Respondents</u>	<u>Percentage</u>
- If it is not managed properly	5	10
- It can breed flies & mosquitos	3	6
- If people do not keep the town clean	2	4
- Fugalei market needs a disposal system	4	8
- When it causes diseases	2	4
- When we run out of land for dumping	1	2
- When we leave rubbish overnight, it smells the next day	3	6
- When people throw litter everywhere	4	8
- If the rubbish is not collected regularly	3	6
- Especially the drainage system at Flea Market	2	4
- In the town area - it causes pollution	4	8
- If it pollutes the environment	2	4
- No responses	19	35

<u>(b) Waste is not a problem</u>	<u>No. of Respondents</u>	<u>Percentage</u>
- If family can be assisted to look after their rubbish	4	8
- If proper disposal facilities are provided	5	10
- If the rubbish truck collects rubbish daily	4	8
- Because it has improved in the last two years in Apia	6	11
- If we punish people who litter		

in Apia	6	11
- Because the truck takes the rubbish away	4	8
- If we dispose our rubbish properly	3	6
- No response	22	41

42. Respondents reply to whether they think rubbish and toilet waste disposal is affecting the local environment

<u>Responses</u>	<u>No. of Respondents</u>	<u>Percentage</u>
- Yes	30	56
- No	10	19
- Yes - especially sewage at Fugalei Market	3	6
- Yes - dogs spill rubbish and it looks ugly	3	6
- Yes - careless people who know it but still do it	4	8
- Yes - especially some families who's toilets drains into creeks	2	4
- No response	2	4

43. Respondents reply to the impacts of dumping and how these can be overcome:

<u>Impacts</u>	<u>How to overcome them</u>
- Smell	- Daily collections
- Plastic bags & paper lying around in an ugly site	- Proper containers & sealed bags for collection
- Pollution	- Awareness education needed
- Health Impact	- Reverse existing practices to overcome problems
-Contamination of Waterways, leachates affect ground water disease, dengue fever	- People to work together and to have a cleaning plan for their area

44. Respondents reply to seeing rubbish disposed in creeks and drains, as follows:

	<u>No. of respondents</u>	<u>Percentage</u>
- Yes	28	52
- No	6	11
- No response	19	35

45. Respondents who relied positively (28) stated the following reasons why people dump rubbish in creeks and/or drains:

<u>Responses</u>	<u>No. of respondents</u>	<u>Percentage</u>
- Ignorant & lazy	5	10
- Lack of education	3	6
- Easy to get rid of like it flows away to somewhere else	5	10
- Cultural attitudes & throw away life style	3	6
- Unaware people	6	11
- Lack of regular collection	4	8
- No response	28	52

46. Respondents reply to the best way to prevent dumping waste in creeks & drains

<u>Responses</u>	<u>No. of respondents</u>	<u>Percentage</u>
- Education for all	6	11
- Provide enough rubbish bins	4	8
- Public education on media	3	6
- Regular collection twice a day and enforce legislation against littering	5	10
- Government to work together with the people to reduce rubbish	5	10
- Education programme on Waste Management	4	8
- Public Education - using Media	3	6
- No response	14	26

47. Respondents reply to whether they have attended any workshop, seminar or training programme on Waste Management:

<u>Responses</u>	<u>No. of respondents</u>	<u>Percentage</u>
- Yes	9	17
- No	42	78
- No response	3	6

Eight of the nine respondents stated that the training Seminar they attended was useful.

48. Respondents reply to whether they think Samoa has a waste problem:

<u>Responses</u>	<u>No. of respondents</u>	<u>Percentage</u>
- Yes	43	80
- No	6	11
- No response	5	10

49. Respondents suggestions of ways in which waste can be reduced in Samoa:

- More Public Awareness Education on Waste Management on Radio, Television and Newspapers;
- Improve the Collection System and provide more rubbish containers;
- People to start using biodegradable products/packages;
- More support for Community groups especially the Women's Committee's in the village to teach Waste management programmes;
- Have more workshops on Litter Awareness;
- Provide improved facilities at the Rubbish Depot;
- Institute legislation on littering and enforce the law;
- Better and improved drainage system and sewage disposal especially restaurants and public places in Apia;
- Hire enough workers to collect rubbish;
- Initiate recycling activities.

Findings:

The survey has revealed and highlighted the important information required to assess the knowledge and waste management awareness of the respondents. It has also revealed some interesting factors which will be useful in planning projects to address the waste management problems facing the people living on the Apia area. The following is a brief summary of the findings from the data:

1. The majority of the respondents use the Government Waste Collection System as their main disposal method;
2. Only 9% of respondents understood what Hazardous Waste is, the rest quoted a wide range of examples;
3. 63% of the respondents stated that local industries produce waste But when they were asked to identify them - most did not know the specific details. 37% of them stated that they know from general knowledge, while 18% of these respondents stated they can tell from looking at the industrial site;
4. 83% of the respondents were satisfied with the Government Collection System. Those who were dissatisfied suggested measures to improve this. 48% of all respondents are prepared to pay a small fee to improve to collection system;
5. The majority of the respondents (52%) know where the rubbish depot is situated. However the rest of the respondents did not offer any comments regarding the rubbish depot. Most respondents are unaware of which Government Department looks after the Depot;
6. Most respondents knew what material should be composted (81%) but 72% of them did not answer or knew what compost is used for. Most respondents have no knowledge of how to keep a compost heap. They have lost a lot of their traditional knowledge on composting;
7. Almost all of the respondents do not have any knowledge on recycling. 26% of them reuse plastic and other nonbiodegradeable material as part of their housekeeping;
8. Some 59% of respondents are already separating their waste at home and the rest are prepared to separate waste in the future;

9. 89% of respondents have flush septic toilet facilities. Most of these respondents do not know how to care for their septic tank and how often they should be cleaned.
The data showed that cost of the cleaning varied depending on who does the cleaning;
10. Problems encountered by the respondents on management of their septic tank are very much visual problems. 76% of the respondents did not reply;
11. 80% of the respondents stated that Samoa has a waste problem and have suggested several ways in which these can be reduced.
12. The respondents have had very little information on waste management. 56% have seen or heard information on waste management, but 15% of these respondents have seen or heard the information overseas. Thus only 41% of the respondents had seen or heard anything locally.
13. 13% of the respondents have identified the source of information as overseas and 59% did not respond, i.e., 71% have no information and those that were exposed to these programmes accessed them overseas.
14. 65% of respondents stated that waste is a problem and 77% of respondents think that rubbish and toilet waste disposal does affect the environment.
15. 83% of respondents have not attended any workshop, seminar or training programme on waste management - this is a significant number.
16. 80% of respondents stated that they think Samoa has a waste problem.
17. People have an awareness of the overall problem that can be assessed visually, but awareness levels on specific waste management issues is quite low. A dependence on Government to manage their waste is demonstrated in the data, and some intervention methods are required to address this dependence, and develop a more self responsible attitude.

Conclusion:

The findings has fulfilled the aims and objectives of the survey, and has also highlighted other areas which can be pertinent to decisions regarding Waste management programmes.

Staff and time constraint have been a weakness to the Survey, but these can be addressed with more time and collaboration between the Staff of the Department of Conservation and Environment, and those commissioned on this project.

In summary, the level of awareness on Waste Management issues of the respondents is evident in the data. The behaviour of the respondents towards Waste Management issues can be generalised to reflect the behaviour and level of awareness of residents within the Apia area.

APPENDIX J

PROJECT TEAM - ASSESSMENT MATRIX

ASSESSMENT OF POTENTIAL WASTE MANAGEMENT PROJECTS

Potential Project	Criteria										Total Score	Rank	
	Cost Effectiveness	Financial Sustainability	Environmental Sustainability	Improvement in Local Environment	Reduction in Health Risks	Practicality & Feasibility	Public Acceptance	Likely Success	Political Support	JICA Compatibility			
SOLID WASTE PROJECTS													
<i>General</i>													
1 Preparation of a comprehensive solid waste management and management strategy for Apia	4	5	4	4	3	4	3	3	3	3	3	3	3
2 Development of a sustainable system for generating income to fund solid waste management activities	4	5	4	4	3	3	0	2	3	3	3	3	3
<i>Linting and Indiscriminate Dumping of Waste</i>													
3 Development and implementation of an education program to reduce the incidence of indiscriminate dumping of solid waste	3	2	3	3	4	3	4	4	4	3	4	3	3
<i>Solid Waste Generation</i>													
4 Undertake a detailed commercial and industrial waste (characterisation) study	2	2	3	1	1	3	3	4	3	3	4	3	3
<i>Solid Waste Storage, Collection and Disposal</i>													
5 Development and implementation of an education / incentive program to encourage the use of secure waste containers	2	2	3	3	3	3	2	2	4	3	4	3	3
6 Provision of household garbage bins in Apia to improve storage of solid waste	2	3	3	3	4	4	4	3	4	4	4	3	3
7 Preparation of a revised waste collection contract	4	4	3	3	3	4	4	4	3	4	3	3	3
8 Extension of waste collection service to fringe areas of Apia	1	2	3	4	3	3	5	3	4	3	4	3	3
9 Improvement of the Talagata Waste Depot	3	4	4	4	4	3	4	4	3	4	3	3	3
i) Preparation of landfill management plan	3	3	4	4	4	3	3	4	3	4	3	3	3
ii) Undertake a detailed hydrogeological investigation of the site	3	3	4	4	4	4	3	4	3	4	3	3	3
iii) Undertake upgrading works at the depot, including security fencing, road works and drainage works	3	3	3	4	4	4	3	4	3	4	3	3	3
iv) Provide landfilling equipment eg tracked loader	2	2	4	4	4	4	3	4	3	4	3	4	4
v) Provide landfill operational training to DEC site manager	4	3	4	4	4	4	3	4	3	4	3	3	3
10 Rehabilitation of the old Vaitoloa waste depot site	0	2	3	3	3	2	4	2	4	4	4	2	3

Potential Project	Criteria										Total Score	Rank	
	Cost Effectiveness	Financial Sustainability	Environmental Sustainability	Improvement in Local Environment	Reduction in Health Risks	Practicality & Feasibility	Public Acceptance	Likely Success	Political Support	JICA Compatibility			
Solid Waste Minimisation													
11 Investigate, develop and implement a commercial and industrial organic waste processing facility	3	3	5	4	3	3	3	3	3	3	3	3	
12 Investigate, develop and implement a domestic organic waste management program	1	2	5	4	3	2	2	2	3	3	3	3	
13 Develop formal aluminium and other high value metal recycling program	4	4	5	3	2	4	4	4	4	3	3	3	
14 Investigate, develop and implement a local waste minimisation program for glass, paper, wood, and plastic	2	1	5	3	2	2	4	4	4	3	3	3	
WASTEWATER PROJECTS													
1 Investigation, development and implementation of a program to improve septic tank design, construction, operation and maintenance	2	2	4	5	5	4	4	3	3	3	3	3	
2 Provision of surface water quality testing equipment to the DEC to allow insitu water quality testing	4	3	4	4	3	4	4	4	3	4	4	4	
SPECIAL WASTES													
Medical Waste													
1 Facilitation of an agreement for the medical waste to be disposed of at the Airport Quarantine waste incinerator	5	4	4	4	4	4	4	4	4	3	4	3	
2 Provision of a new incinerator to the Department of Health for disposal of hospital and other medical waste	3	2	4	4	4	4	4	4	4	3	4	3	
3 Provision of funding to allow the establishment of a waste separation program within the National Hospital	4	3	4	4	4	4	4	4	3	4	3	3	
Septage / Sludge Management													
1 Investigation, design and development of an appropriate septage / sludge handling facility in Apia	2	2	4	4	4	4	4	4	4	4	4	3	
Waste Oil													
1 Investigate and develop a program to facilitate waste oil recycling	2	2	4	4	3	3	4	3	4	3	4	3	

APPENDIX K



PROJECT PROFILES

PROJECT PROFILE No. 1

TITLE: Solid Waste Management Plan for Apia, Samoa

RATIONALE:

There is currently a lack of waste management planning in Samoa. A Draft National Waste Management Policy has been prepared by the Department of Lands, Survey and Environment, Division of Environment and Conservation (DEC), however, the policy has not yet been formally adopted by the Government of Samoa. The National Environment and Development Strategies document prepared in 1993, included several waste management projects (one to prepare to prepare a national waste management strategy), however, none of the projects have yet been fully implemented. This lack of waste management planning has lead to the following:

- inadequate and inefficient waste management services;
- reactionary approach to waste management issues;
- lack of landfill reserve;
- ineffective regulation of waste management activities;
- poor community awareness of the detrimental impacts of improper solid waste management;
- littering and indiscriminate dumping of solid waste, and consequent visual / aesthetic impacts resulting in decreased urban amenity;
- poor waste management practices and facilities, causing environmental impacts such as contamination of groundwater and surface waters and potential detrimental health impacts eg. contamination of drinking water supply, poor water quality, increased vermin and pest levels;
- excessive use of resources; and
- excessive consumption of scarce landfill space.

It is important that a comprehensive waste management plan / strategy be prepared for Apia. Preparation of such a strategy / plan should be the first step in improving waste management in Apia. The plan should give careful consideration to all the relevant issues and result in a strategy / plan appropriate for Apia, which sets out how waste will be managed over the next 20 years or so. A critical aspect of the Plan would be the identification and development of a sustainable means of funding solid waste management activities to ensure satisfactory performance in the long term. Proceeding to implement various waste management projects without such a plan in place may result in inappropriate developments.

DESCRIPTION OF THE PROPOSED PROJECT

Objective

The objective of the project is to prepare a comprehensive and sustainable waste management strategy for Apia, which sets out how waste will be managed over the next 20 years.

Outputs and Outcomes

The outputs and outcomes of the project will include:

1. A strategy document which sets out a plan for managing wastes generated in Apia for the next 20 years, including an implementation program for any new facilities / upgrading works or other programs; and
2. Improved waste management planning, leading to more effective waste management services and facilities, and improved waste management practices.

General Scope

This project will encompass collection all relevant data, a detailed review of existing waste management practices, a review of options for managing waste and development of a preferred waste management strategy. These activities are described in more detail in the following section.

Detailed Tasks

1. Detailed review of existing waste management practices

This has essentially been done as part of this project but would need to be repeated by the Consultant that undertakes the Waste Management Planning Project.

2. Data collection / baseline sub-studies

Data collection and baseline studies would need to include:

- i) waste stream characterisation (for all solid waste streams eg. municipal, commercial / industrial, construction and demolition) - to determine composition and generation;
- ii) Demographic and socio-economic analysis eg. population forecast, identification of significant cultural issues;
- iii) Community, NGO and Government consultation program to identify views, preferences and expectations;

3. Investigation, concept development and comparison of options for the following:

- i) Waste prevention
- ii) Waste re-use and recycling
- iii) Waste processing
- iv) Waste storage, collection, and disposal
- v) Funding
- vi) Public awareness and education
- vii) Legislation, regulation and institutional strengthening

4. *Development of preferred waste management strategy encompassing the following:*

- i) Waste prevention;
- ii) Waste re-use and recycling;
- iii) Waste processing;
- iv) Waste collection, transfer and disposal;
- v) A public education and awareness program;
- vi) A program for strengthening waste management legislation, regulation and institutional arrangements;
- vii) An implementation program, addressing actions, staging, responsibilities, resources, costs and financing;

Further details of the process to prepare a comprehensive Waste Management Strategy are provided in Attachment A.

Costs and Resources

The cost and resources required for the project are shown in the attached table.

Program

The suggested implementation sequence and task durations are shown in the attached table.

ISSUES

Technical Feasibility

The project may introduce new technologies and equipment to Samoa. This may include new waste collection and processing equipment. As a result, in evaluating the suitability of such processing options there will be a need to consider local skills and the ability to operate and maintain the equipment, and if selected ensure that appropriate training is provided.

Implementation

To ensure ownership of the resulting Waste Management Plan, the DEC should be extensively involved in the process of preparing the Plan. This may require the Consultant undertaking the project to undertake the project from Apia essentially in the role as Project Manager / Technical Adviser, with the DEC undertaking most of the work.

Risks and Likely Success

Risks to the success of the project include:

- that Samoan Government acknowledging the urgent need to improve waste management planning;

- the omission of avoided landfilling costs in the economic evaluation of waste minimisation initiatives;
- development of waste management strategies which are not financially sustainable and not acceptable to the community; and
- the inability of taxes and duties to be earmarked for funding waste management activities;

To overcome the above the following should be undertaken:

- prior to commencing the project the scope and possible outcomes of the project will be explained and full support of the Samoan government sought;
- avoided landfilling costs will be included in any economic evaluation of options;
- the economic viability of all options will be assessed as part of the project; and
- means of earmarking funds for funding waste minimisation initiatives will be investigated as part of the project.

Sustainability

The objective of the project is to prepare a sustainable waste management strategy for Apia, and thus sustainability of the project is not considered an issue. Although, unless a sustainable means of funding waste management activities is identified the final waste management strategy may not be able to be fully implemented.

POTENTIAL IMPACTS OF THE PROJECT

Environmental

Implementation of the project will improve the local environment by reducing the impacts of current poor waste management practices. This would include improved public health and urban amenity, improved air, surface and groundwater quality, and reduced nuisance to those premises adjacent to existing waste depots.

Potential negative environmental impacts may occur if waste processing options are not designed, constructed, and operated in an environmentally sound manner. This includes composting operations and incineration i.e. odour, dust, contaminated stormwater runoff. Any such processing proposals resulting from the waste minimisation plans would undergo an environmental assessment prior to implementation.

Other potential negative impacts of the development may include increased traffic and associated noise from re-use, recycling and processing activities. However, it is considered that the impact of a small increase in traffic would not be significant compared to the potential environmental gains.

Social

The social benefits of the project would encompass improved public health and urban amenity, due to reduced littering, reduced indiscriminate dumping of solid waste, improved waste storage and collection, and improved waste landfill disposal;

Financial and Economic

Potential financial and economic implications of outcomes of the project include:

- increased taxes / levies to fund re-use and recycling activities, possibly leading to increased product prices;
- increased waste collection and disposal costs;
- potentially reduced landfilling costs due to decreased waste quantities;

As a result of the project, it is likely that the community as whole will be required to pay more, either directly or indirectly, for waste management services. There will be a need to carefully investigate what are acceptable / sustainable increased costs for residential premises, particularly low income households. There will also be a need to develop strategies for those low income households which may not be able to cope with increased costs.

It is proposed that as part of the strategy plan that a sustainable financial plan be developed to fund the waste management services in the long term. This may include direct recovery of costs by implementing user charges for waste management services or indirect recovery of costs via increased taxes and duties. To successfully implement user charges waste management services will need to be improved to a level where people are willing to pay. Also extensive community education will be required. However, to be sustainable in the long term it is important that the services provided are financially viable.

It is anticipated that through the improved financial planning developed as part of the project that waste management services will be delivered in a more cost efficient manner, and the use of private contractors would be encouraged.

Trade and Commerce

Implementation of the project will result in increased waste management costs to commerce and industry. However, it is anticipated that the increased waste management costs will more truly reflect real costs and will be minor compared to other business operating costs. From information gathered during the Project, commerce and industry are generally paying very little for waste management.

Institutional

It is intended that relevant personnel from the DEC be actively involved in undertaking the project so as to learn and understand about waste management planning and how to implement waste management services. In this way DEC personnel will take ownership of the project, thus maximising the likelihood of successful implementation in the long term.

One aspect of the project is to review current institutional and legislative arrangements for waste management and make recommendation for changes if necessary.

DETAILED OUTLINE OF SHORTLISTED PROJECTS

Project	Intended Outcome	Project Tasks	Project Sub-Tasks	Resources JICA	Local	Estimated Cost (AU \$)	Likely Duration (mths)
1. Solid Waste Management Planning 1.1 Preparation of a comprehensive, sustainable solid waste minimisation and management strategy for Apia	A formal Plan which considers solid waste management in Apia and sets out a sustainable strategy for minimising and managing waste for the next 20 years. Includes development of a sustainable means of funding waste management activities	(i) Data collection, investigation of existing practices and detailed waste characterisation study, including identification of data required for strategy eg. population, demographics, development profile, employment profile, tourism (ii) Undertake public awareness survey to assess public awareness and understanding (UNDERTAKEN AS PART OF THIS STUDY) (iii) Investigate and assess options for managing waste, including funding, waste minimisation, collection, treatment and disposal options, and develop preferred strategy (iv) Submit to Government for adoption and implementation	(a) Detailed review of existing waste management practices	Waste management consultant (2 weeks)	DEC Counterpart (4 weeks)	\$7,500	2
			(b) Detailed waste characterisation study	Waste management consultant (2 weeks)	DEC Counterpart Labour (2x)	\$7,500	1
			(c) Other data collection and review	Waste management consultant (1 week) Travel And Accommodation Project vehicle (4 weeks) Other Expenses	Office support services	\$3,750	
						Travel And Accommodation Project vehicle (4 weeks) Other Expenses	Office support services Sub total
						\$0	
				Waste management consultant (8 weeks)	DEC Counterpart (12 weeks)	\$30,000	3
				Economist / Financial Expert (1 weeks) Institutional / legislative Specialist (2 weeks) Travel And Accommodation Project vehicle (12 weeks) Other Expenses		\$5,625 \$11,250 \$20,700 \$7,200 \$10,000	
					Office support services Sub total	\$84,775	
						\$0	6
					TOTAL	\$115,725	12

ATTACHMENT A

TYPICAL PROCESS FOR PREPARATION OF A COMPREHENSIVE WASTE MANAGEMENT STRATEGY

1. Detailed review of existing waste management practices, including review of Government waste management policy;
2. Data collection / baseline sub-studies:
 - 2.1. Waste stream characterisation (for all solid waste streams eg. municipal, commercial / industrial, construction and demolition) - to determine composition and generation;
 - 2.2. Demographic and socio-economic analysis eg. population forecast, identification of significant cultural issues;
 - 2.3. Community, NGO and Government consultation program to identify views, preferences and expectations;
3. Investigation, concept development and comparison of options for the following:
 - 3.1. Waste prevention eg.
 - education / training;
 - financial incentives;
 - 3.2. Waste re-use and recycling eg.
 - waste / material exchange;
 - local innovative re-use and recycling activities;
 - conventional recycling activities;
 - financial incentives and levies to encourage re-use and recycling
 - 3.3. Waste processing eg.
 - composting;
 - incineration / energy recovery;
 - digestion;
 - 3.4. Waste storage, collection, and disposal eg.
 - domestic and commercial / industrial waste collection services;
 - use of contract services and types of contracts which are appropriate;
 - landfill disposal;
 - 3.5. Funding eg.
 - capital and operating costs of the various options;
 - user pays charging for waste collection and disposal services;

- tariffs / duty on non locally recyclable materials;
- 3.6. Public awareness and education eg.
- multimedia advertising campaign;
 - schools program / curriculum changes;
 - support to NGO activities;
 - public training courses;
- 3.7. Legislation, regulation and institutional strengthening eg.
- legislative strengthening eg. new waste management act;
 - increased enforcement of legislation;
 - on the spot fines for breaches;
 - institutional strengthening eg. rationalisation, clear responsibilities, increased resources;
4. Development of preferred waste management strategy encompassing the following:
- 4.1. Waste prevention;
 - 4.2. Waste re-use and recycling;
 - 4.3. Waste processing;
 - 4.4. Waste collection, transfer and disposal;
 - 4.5. A public education and awareness program;
 - 4.6. A program for strengthening waste management legislation, regulation and institutional arrangements;

An implementation program, addressing actions, staging, responsibilities, resources, costs and financing;

PROJECT PROFILE No. 2

TITLE: Solid Waste Management Education in Samoa

RATIONALE:

During this Project, evidence of poor waste management practices and indiscriminate dumping of solid waste into creeks and on land was observed across urban Apia. These poor waste practices are causing pollution of creeks and rivers and reducing the visual aesthetics of Apia.

As part of this Project, a public awareness survey was carried out. The results of the survey showed that the level of awareness on waste management issues in Apia is generally low. Many people in Apia are aware of the fact that waste is a problem and can identify the visual (unsightly) impacts that poor waste management creates. Awareness about specific waste issues such as waste separation, composting, recycling, reuse, and hazardous wastes is low. This survey also showed that there was a need for improved dissemination of waste management information as:

- respondents had only very limited knowledge of the specific waste types produced by local industries;
- most respondents knew what materials should be composted but many did not know what compost is used for or had no knowledge of how to manage a compost heap;
- most people had little knowledge on recycling;
- most people do not understand how septic systems work;
- only a small proportion of respondents understood what is meant by hazardous waste.

The amount of information disseminated on waste management appears limited. Less than half of the people interviewed reported seeing or hearing information locally on waste management, and many could not clearly remember when they had encountered the waste information. The vast majority of people have not attended any workshop, seminar or training program on waste management. The impact of community awareness programs carried out to date on waste management appears relatively low, and there is probably a need to undertake some research into the best methods of getting such information effectively across to the general public in Samoa.

When the people interviewed were asked to suggest ways in which waste can be reduced in Samoa, and some of their answers included:

- More public awareness education on waste management on radio, television and in the newspapers;
- More support for community groups especially the Women's Committees in the village to teach waste management program;
- There should be more workshops on litter awareness.

Failure to undertake this project will result in continued indiscriminate dumping of waste and pollution of the local environment.

DESCRIPTION OF THE PROPOSED PROJECT

Objective

The objective of the project is to significantly improve waste management knowledge among Samoans, leading to reduced indiscriminate dumping of solid waste in creeks and to better storage and management of solids waste in households and other premises.

Outputs and Outcomes

The outputs and outcomes of the project will be:

1. A report assessing the waste management education needs in Samoa and recommending the best strategies for addressing these needs.
2. A set of waste management education materials for use in Samoa.
3. A community with a much greater appreciation of waste management issues
4. Reduced instances of indiscriminate waste disposal.
5. Reduced problems associated with poor storage of solids in home and industry in Samoa.

General Scope

This project will develop and implement an education program which aims to reduce the incidence of indiscriminate dumping of solid wastes, and encourages improved on-site storage of wastes, i.e., use stands and garbage bins.

Detailed Tasks

1. *Supplementary public awareness survey*

A supplementary public awareness survey is recommended to confirm the findings of the survey undertaken as part of this Project as the survey only involved 50 respondents and none of these was under 19 years of age. As a full waste management education program would be aimed at all sections of the community, additional information on community reactions, information, and attitudes will be required.

2. *Identification of key issues and approaches*

Based on the results of community surveys and other information on the effectiveness of other community education programs, the key issues will be identified and the best approaches to conveying the messages to the identified audience. Issues specifically addressing improved solid waste management in the home and industry will be given priority.

3. *Develop education program*

Following from the above, an appropriate and comprehensive waste management education program would be developed. The program would include the messages to be conveyed, the best approaches to an integrated presentation involving all media available, and detail the recommended implementation program. It is envisaged that the education program would be staged, with the initial stages focusing on raising the awareness of the general community

about waste management as a serious environmental issue and educating the public about basic "common sense" things that can be done to improve waste management practices ie. do not throw rubbish on creek, do not dump oil in creeks, use a secure container (garbage bin) to store household garbage or use a garbage stand. Later stages would focus on more advanced activities such as recycling and home composting and other waste minimisation practices.

4. *Implement education program*

The education program would be implemented by the DEC over a period of time (2 - 3 years), with initial support from the consultant who prepared the education program and a local consultant / NGO. The program would be staged and include common sense type lessons and materials appropriate to Samoan culture.

5. *Assessment of effectiveness of program*

It is essential that the effectiveness of the program be assessed from the beginning of the presentation. This will involve assessing increases in the knowledge of local residents, and of the effect in terms of improved management of solid waste in Samoa.

Costs and Resources

The inputs and estimated costs of the project are shown in the attached Table.

Program

The suggested implementation sequence and task duration are shown in the attached Table.

ISSUES

General

It is very important that this activity be fully integrated with other environmental education programs in Samoa, particularly those which have waste management as a focus. These include the current NZODA programs and the upcoming EU project being undertaken through SPREP. Given the limited funds available for environmental education in Samoa, avoiding overlap and duplication is vital.

Technical Feasibility

This project is a logical extension of current environmental education activities in Samoa. The techniques proposed have been used already, and are readily available in Samoa or in neighbouring countries. There is a certain amount of local expertise available to be involved in the project.

Implementation

Effective implementation of this project will depend on the quality of the personnel working on it. It is therefore essential that experienced and enthusiastic people who have previously worked in Pacific Island situations be involved. This is likely to be achieved by using local consultants working in association with DEC and, if necessary, a JICA appointed external adviser.

Likely Success

Since a number of environmental education activities have been successfully implemented in Samoa and other countries in the Pacific region with similar cultures, there is a high likelihood of success provided there is good overall project planning and appropriate educational materials are developed.

Risks

The risks associated with this project are:

- The methods adopted will not be appropriate in Samoa;
- The local residents will not react positively to the message;
- Government and industry will not fully support the proposed program;
- The effectiveness component is not completed in line with implementation, thus minimising the opportunities for modifications to be made if problems are identified.

Sustainability

The following actions should be taken to mitigate the risks identified above:

- Ensuring that the current public awareness database is accurate;
- Employing well qualified and experienced personnel to develop the materials;
- Maintaining close contact with community groups during all phases of the project;
- Keeping Government and industry updated on the project;
- Seeking continual feedback from media operators and selected recipients on the operation and effectiveness of the project.

It is unlikely that sustainable funding will be made available for this sort of activity in Samoa in the near future, but a successful program of this sort will help to convince Government of the benefits of supporting environmental education activities.

POTENTIAL IMPACTS OF THE PROJECT

Environmental

This project is specifically aimed at improving public awareness and knowledge of environmental issues associated with waste management; and consequently improve the environmental situation in Samoa. Implementation of the Project would essentially involve running awareness and education programs which would not cause any detrimental impacts on the environment, but would lead to improved solid waste management and consequently improved local environment eg. less litter and pollution of local waterways.

Social

If successful this project will have a significant social impact as it will lead to Samoans adopting different and improved solid waste management practices. The adoption of appropriate waste

separation, composting, recycling and related activities will lead to changes in both household and business operations.

Financial and Economic

Improved management of solid wastes will have a significant economic impact in Samoa. If solid waste can be better managed, involved better handling of solid materials, waste separation, recycling, reduced amounts of materials going to landfill, this will lead to increased waste management costs, but these may be offset by reduced imports, new employment opportunities and improved tourism opportunities.

Trade and Commerce

It is difficult to estimate the likely trade and commerce impacts, but if the education program leads to improved waste management and a cleaner environment this will have beneficial effects for tourism. The introduction of new solid waste containers may lead to increased costs for home owners and business, but it may be possible to have some subsidy on these, resulting from reduced waste management costs.

Institutional

It is intended that relevant personnel from Government organisations will be actively involved in undertaking the project so as to learn and understand about waste management education and expand their skills in implementing environmental education activities. To ensure input from a broad cross section of the community it is also intended that community organisations be consulted at the commencement of the planning process and their assistance sought throughout the program.

DETAILED OUTLINE OF SHORTLISTED PROJECTS

Project	Intended Outcome	Project Tasks	Project Sub-Tasks	Resources JICA	Local	Estimated Cost (AU \$)	Likely Duration (mths)				
2. <i>Solid Waste Management Education</i> 2.1 Develop and implement an education program which aims to reduce the incidence of indiscriminate dumping of solid waste and encourage improved on site storage of wastes i.e. use stands and / garbage bins	A reduction in indiscriminate dumping of solid waste in creeks and improved storage of solid waste at households and other premises.	(i) Undertake detailed public awareness survey to assess public awareness and understanding		Environmental Education Consultant (2 weeks over 4 week period)	DEC Counterpart	\$7,500	1				
				Local Community Consultant (4 Weeks)		\$4,000					
				Travel And Accommodation Project vehicle (4 weeks)		\$4,900					
					Office support services	\$1,200					
					Subtotal	\$17,600					
				(ii) Identification of key issues and approaches							0.25
				Environmental Education Consultant (1 weeks)	DEC Counterpart	\$3,750					
				Local Community Consultant / NGO Officer (1 Weeks)		\$1,000					
				Travel And Accommodation Project vehicle (1 weeks)		\$1,200					
					Office support services	\$600					
					Subtotal	\$6,550					
				(iii) Develop education program							1
				Environmental Education Consultant (4 weeks)	DEC Counterpart	\$15,000					
				Local Community Consultant / NGO Officer (2 weeks)		\$2,000					
				Travel and Accommodation Project Vehicle (2 weeks)		\$4,900					
					Office support services	\$1,200					
					Subtotal	\$23,100					
				(iv) Implement education program							24 - 36
				Environmental Education Consultant (8 weeks over 12 months)	DEC Counterpart	\$30,000					
				Local Community Consultant (12 weeks)		\$12,000					
Travel and Accommodation Project Vehicle (12 weeks)		\$19,600									
Program costs eg. advertising etc		\$4,800									
	Office support services	\$150,000									
	Subtotal	\$216,400									
(v) Assessment of Effectiveness of the program						1					
Environmental Education Consultant (4 weeks equivalent)	DEC Counterpart	\$15,000									
Travel and Accommodation Local Community Consultant / NGO Officer)		\$3,700									
Project vehicle		\$2,000									
	Office support services	\$1,200									
	Subtotal	\$21,900									
						Total	\$285,550	27 - 39			

PROJECT PROFILE No. 3

TITLE: Improving Solid Waste Minimisation in Samoa

RATIONALE:

Land suitable for landfill operations in Samoa is scarce. This problem is primarily due to the existing traditional land ownership system, which results in government owning little land and having little control over land, thus providing few opportunities for establishing waste depots. In Samoa, a landfill site has been established at Tafa'igata which, under present conditions, should be able to cater for the needs of the Apia region for about 20 years. However, once this site has been filled, finding a new site may be a major problem.

Currently only limited waste minimisation (waste prevention, re-use, recycling, and reprocessing of waste) is occurring in Samoa. Activities currently being undertaken include reuse of glass bottles, reuse of waste plastic containers by householders, some recycling of aluminium and other high value metals, and some home composting.

Continuation of current waste generation and management practices will result in excessive resource consumption, rapid filling of the Tafa'igata waste depot and present the problem of finding a new waste depot site.

Consequently, there is a need to minimise the quantity of waste going to landfill, thus conserving the landfill site for waste which cannot be avoided, and thus reducing the detrimental impacts of the landfilling operations.

DESCRIPTION OF THE PROPOSED PROJECT

Objective

The objective of the project is to develop and provide assistance with the implementation of sustainable waste minimisation activities in Samoa. The project will focus on the Apia urban area, where waste management problems are most severe, and address all potential waste streams eg. commercial and industrial organic waste, domestic organic waste and other waste materials such as glass, paper, plastic and metals.

Outputs and Outcomes

The outputs and outcomes of the project will include:

1. Detailed feasibility studies on waste minimisation opportunities for aluminium and other valuable metals, commercial and industrial organic waste, domestic organic waste and glass, paper and plastic;
2. Various facilities / schemes / programs to reduce the quantity of waste being disposed of to landfill;
3. A reduction in the quantity of waste going to landfill, local businesses and community groups involved in recycling, composting technologies and field application techniques developed for improved crop production.

General Scope

This project will involve the development and implementation of several waste minimisation activities focusing on the Apia area. The project would be separated into 4 programs addressing:

1. aluminium and other high value metals;
2. commercial and industrial organic waste;
3. domestic organic waste; and
4. glass, plastic and paper.

It is envisaged that the following schemes would be investigated, developed, trialed and possibly implemented as part of the above 4 programs:

1. A system for the collection and recycling of aluminium and other valuable metals. It is envisaged that a system of local drop off (collection) centres could be established in Apia and nearby villages, involving local community groups and NGOs (who undertake the activity as a means of raising funds). Collected material would then be sold to a local recycling merchant for export to overseas recycling markets.
2. A commercial and industrial organic waste processing facility located at the Tafa'igata waste depot. Waste materials would be transported to the depot by the waste generators where it is processed into compost or other organic products eg. mulch, potting mix, etc, for sale to local Apia residents and local farmers;
3. Schemes for the local collection, reuse, recycling and local reprocessing of glass, paper and plastic waste materials. Options that should be investigated include:
 - export recycling markets;
 - local reprocessing of paper in fuel bricks;
 - local processing of glass into drainage, concrete, or road making aggregate;
 - use of waste paper and plastics in handicrafts;
 - reuse of plastic shopping bags;
4. A domestic organic waste processing facility located at the Tafa'igata waste depot, incorporated with the facility processing commercial and industrial organic waste. Options for waste collection should be examined as well as options for processing. It is envisaged that initially garden waste only would be processed, before expanding the operation to cater for kitchen food wastes.

Detailed Tasks

For each of the 4 recommended waste minimisation programs, the following would be undertaken:

1. A feasibility study to investigate and assess the waste source, assess potential markets for products, assess public reaction and support for any possible schemes, assess likely support from industry, assess collection and processing options, and assess economics and sustainability. The outcome of the study would be a preferred scheme(s) for minimising the target waste stream / type.
2. Trial of the recommended scheme(s) - where necessary;
3. Implementation of the preferred scheme(s);

The feasibility study for each target waste stream should encompass the following

1. A detailed review of existing waste minimisation activities in the Apia region;
2. Data collection and baseline sub-studies including a detailed waste characterisation study and community/government consultation;
3. An assessment of potential markets for resulting waste materials / products
4. Investigation, concept development and comparison of options for:
 - i) waste prevention;
 - ii) waste collection;
 - iii) waste re-use, recycling; and
 - iv) waste processing, e.g., composting, digestion, incineration.

This will encompass identifying potential re-use, recycling and reprocessing opportunities, (local and export); estimating costs and economic viability; identifying potential use of tariffs, import duties and container deposit legislation to encourage waste minimisation and re-useable/recyclable packaging. Assessment of the economic viability will consider the cost savings by avoiding landfilling. Consideration should also be given to innovative local collection and waste minimisation measures, e.g., craft making, using crushed glass and shredded plastic as drainage aggregate, as well as conventional re-use and recycling activities.

5. A review of existing activities and options for improving community awareness and education in regard to waste minimisation activities;
6. A review of waste management policy, legislation and institutional arrangements, with the aim of rationalising existing arrangements to achieve maximum effectiveness and efficiency of any waste minimisation activities;
7. Development of a preferred waste minimisation strategy for the target waste materials encompassing the following:
 - i) waste prevention activities;

- ii) waste collection;
- iii) waste re-use and recycling activities;
- iv) waste processing activities;
- v) a community awareness and education program; and
- vi) a program for institutional and legislative strengthening.
- vii) an implementation program which defines actions, staging, responsibilities, resources, costs and financing.

More details of what is typically included in the preparation of a detailed waste minimisation plan is contained in Attachment A.

It is proposed that technical assistance and funding be provided to assist with implementation of the preferred waste minimisation schemes. The type of assistance provided will be dependent on the outcomes of the plan but may encompass the following:

- funding for equipment, e.g., can crushers, shredders;
- conducting trial processing operations, e.g., organic waste collection and centralised mulching and composting operation;
- funding a community education/awareness program;
- assisting to establish legislative and institutional arrangements for implementing financial incentives for waste prevention, re-use and recycling;
- assisting in negotiations with export recycling activities; and
- developing local re-use and recycling initiatives.

While the final outcome of the waste minimisation plan study cannot be predicted with certainty, there would appear to be a serious need to investigate, develop and operate a composting program that will collect much of the biodegradable waste from the Apia area, convert it into compost and use it on farms in the surrounding countryside. This work should involve collaboration between the DEC, the Department of Agriculture, the USP School of Agriculture, the industries generating large quantities of organic wastes (e.g., Vaillima Brewery and Hellaby), the Ministry for Women's Affairs and the O le Siosiomaga Society. Issues that need investigation are the scale of composting, identification of sites for composting operations, preparation of trial loads of compost and field experiments to validate the utility of the product. It is recommended that a sum of money be set aside for labour and procurement/equipment to assist with implementation of the plan.

Costs and Resources

The estimated costs and resourcing for the project are outlined in the attached table. Given that the planning outcomes are not known in detail, the funding for the implementation phase can only be a rough estimate.

Program

The suggested implementation sequence and task durations for each waste minimisation program is shown in the attached Table.

ISSUES

Technical Feasibility

The project may introduce new technologies and equipment to Samoa. This may include centralised composting. As a result, in evaluating the suitability of such processing options there will be a need to consider local skills and the ability to operate the equipment, and if selected ensure that appropriate training is provided for any selected technologies.

Implementation

Focus should be initially placed on those waste streams where waste minimisation opportunities are greatest ie. easier to develop and implement and more likely to be sustainable. Considering such the recommended order of priority is high value metals; commercial and industrial organic waste; domestic organic waste; and glass, paper and plastic

There should be extensive involvement of relevant DEC staff in the project, to ensure the DEC takes ownership of the waste minimisation projects and drive their implementation.

There should be careful assessment of the available markets and options for waste materials (export and local).

Consideration should be given to avoided landfill waste disposal costs in any economic analysis.

There should be careful selection of projects for trialing, considering economic sustainability and market stability.

Community education, co-operation and support will be critical to the success of any waste minimisation project, as it will be necessary for the public to segregate their wastes for re-use, recycling and reprocessing.

Likely Success

Given the success of some small scale waste minimisation activities currently in place, and the expressions of interest by some key players, the project has a good chance of success provided the planning is good and all the requisite agencies play their parts when needed.

Risks and Sustainability

Risks to the success of the project include:

- the Samoan Government and people who do not acknowledge the urgent need to reduce the quantities of waste going to landfill;

- the omission of avoided landfilling costs in the economic evaluation of recycling opportunities;
- uncertainties in the market for recyclable materials, e.g., in New Zealand;
- development of waste minimisation initiatives which are not financially sustainable nor acceptable to the community; and
- the inability of taxes and duties to be earmarked for funding waste minimisation initiatives.

To overcome the above the following will be undertaken:

- prior to commencing the project, the scope and possible outcomes of the project will be explained, and full support of the government sought;
- avoided landfilling costs will be included in any economic evaluation of options;
- the economic viability of all options will be assessed as part of the project; and
- means of earmarking funds for funding waste minimisation initiatives will be investigated as part of the project.

POTENTIAL IMPACTS OF THE PROJECT

Environmental

Implementation of the project would reduce the potential health impacts of landfilling operations, improve urban amenity through reduced littering, improve surface and groundwater quality by reducing landfilling impacts, and help reduce nuisance to those premises adjacent to the existing waste depot. Also, minimising waste quantities will help to conserve resources.

Potential negative environmental impacts may occur if waste processing options are not designed, constructed, and operated in an environmentally sound manner. This includes composting operations and incineration, i.e., odour, dust, contaminated stormwater runoff. Any such processing proposals resulting from the waste minimisation plan would undergo an environmental assessment prior to implementation.

Other potential negative impacts of the development may include increased traffic and associated noise from re-use, recycling and processing activities. However, it is considered that the impact of a small increase in traffic would not be significant compared to the potential environmental gains.

Social

A reduction in the quantity of waste going to landfill would help to reduce the impacts of the landfilling operation, thus reducing potential health risks and improving urban amenity. There will also be less future demand for landfill space and therefore the need to develop new landfill sites will be pressed further into the future, resulting in less impact on the community.

The community would also benefit from the education program through increased awareness of environmentally friendly waste management practices, possibly leading to less littering and indiscriminate dumping of waste materials.

There will be a good opportunity to involve women in all aspects of the project. The interactions with the many effective women's groups would be beneficial, both in the planning stage through a community consultation process, and also in the implementation phase.

Financial and Economic

Potential financial and economic implications of outcomes of the project include:

- increased taxes/levies to fund re-use and recycling activities, possibly leading to increased product prices;
- increased waste collection and disposal costs to fund processing operations;
- reduced landfilling costs due to decreased waste quantities;

As a result of the project, it is likely that the community as whole will be required to pay more, either directly or indirectly, for waste minimisation activities. There will be a need to carefully investigate what are acceptable/ sustainable increased costs for residential premises, particularly low income households. There will also be a need to develop strategies for those low income households which may not be able to cope with increased costs.

Trade and Commerce

The potential outcomes of the project may have implications in regard to trade and commerce. These may include the following:

- increased prices for some products due to deposit/refund scheme, increased taxes, special levies, i.e., for non-locally recyclable products or products with excessive/non recyclable packaging;
- banning of certain products.

Further, outcomes of the project are likely result in increased waste management costs, as a means of funding waste minimisation initiatives. However, it is anticipated that the increased waste management costs will more truly reflect real costs and will be minor compared to other business operating costs. From information gathered during the mission, commerce and industry are generally paying very little for waste management.

Institutional

It is intended that relevant Government personnel be actively involved in undertaking the project so as to learn and understand what waste minimisation is and how to implement such activities. In this way the Government personnel will take ownership of the project, thus maximising the likelihood of successful implementation in the long term.

To ensure input from a broad cross section of the community it is also intended that community organisations be consulted at the commencement of the planning process and their assistance sought in the community consultation program.

DETAILED OUTLINE OF SHORTLISTED PROJECTS

Project	Intended Outcome	Project Tasks	Project Sub-Tasks	Resources JICA	Local	Estimated Cost (AU \$)	Likely Duration (mths)
J. Solid Waste Minimisation 3.1 Investigate, develop and implement a commercial and industrial organic waste processing facility	To reduce commercial and industrial waste disposal whilst producing a useful product for local use.	(i) Undertake feasibility study to investigate and assess potential waste sources, potential markets for product, collection and processing options, and viability of such a scheme. Includes detailed waste characterisation study. (ii) Implement preferred scheme, including establishing agreements with waste generators, collection services and establishing a processing facility. Also, includes reaching agreements with markets, prior to establishing facility, if able.	(a) Project kickoff, data collection and review (b) Waste characterisation study (c) Market study (d) Review of options (e) Feasibility analysis (f) Develop preferred schemes	Waste management consultant (12 weeks over 6 months)	DEC Counterpart	\$45,000	6
				Labourer (2) (2 weeks) Travel and Accommodation Project Vehicle (12 weeks) Other expenses		\$19,400 \$7,200 \$3,400 Office support services sub total \$75,000	
3.2 Investigate and develop a domestic organic waste management program	A reduction in the disposal of domestic organic waste (which comprises >60% of the waste stream) at the waste depot, whilst producing a useful product for local use.	(i) Undertake feasibility study to investigate and assess the waste source, potential markets for products, collection and processing options, and viability of such a scheme. Should include detailed waste characterisation study and public survey.	(a) Project kickoff, data collection and review (b) Waste characterisation study (c) Market study (d) Review of options (e) Feasibility analysis (f) Develop preferred schemes	Project Manager (12 weeks over 12 months)	DEC Counterpart	\$45,000	6
				Technical input (waste management engineer, economist/ financial expert..etc) Equipment / Trials Programs Travel and Accommodation Project Vehicle		\$15,000 \$400,000 \$29,200 \$9,600 Office support services sub total \$498,800	
Total						\$573,800	12
3.2 Investigate and develop a domestic organic waste management program	A reduction in the disposal of domestic organic waste (which comprises >60% of the waste stream) at the waste depot, whilst producing a useful product for local use.	(i) Undertake feasibility study to investigate and assess the waste source, potential markets for products, collection and processing options, and viability of such a scheme. Should include detailed waste characterisation study and public survey.	(a) Project kickoff, data collection and review (b) Waste characterisation study (c) Market study (d) Review of options (e) Feasibility analysis (f) Develop preferred schemes	Waste management consultant (12 weeks over 6 months)	DEC Counterpart	\$45,000	6
				Labourer (2) (2 weeks) Travel and Accommodation Project Vehicle (12 weeks) Other expenses		\$19,400 \$7,200 \$4,500 Office support services sub total \$76,100	

DETAILED OUTLINE OF SHORTLISTED PROJECTS

Project	Intended Outcome	Project Tasks	Project Sub-Tasks	Resources JICA	Local	Estimated Cost (AU \$)	Likely Duration (mths)		
3.3 Develop formal aluminium and other high value metal recycling program	To reduce the quantity of metal being disposed of at the waste depot.	(ii) Implement preferred scheme. Likely to be at source management. However, may include establishing a collection service and processing facility, and establishing agreements with markets.		Project Manager (12 weeks over 12 months)	DEC Counterpart	\$45,000	6		
				Technical input (waste management engineer, economist/ financial expert..etc)		\$15,000			
				Equipment / Trials Programs		\$150,000			
				Travel and Accommodation		\$29,200			
				Project Vehicle		\$9,600			
				Office support services					
				sub total		\$248,800			
				Total		\$324,900	12		
				(i) Undertake feasibility study to investigate and assess the waste source, potential markets for products, collection and processing options, and viability of potential schemes. The study should include a waste characterisation study and extensive consultation with industry and community groups.	(a) Project kickoff, data collection and review	Waste management consultant (6 weeks over 3 months)	DEC Counterpart	\$22,500	3
					(b) Waste characterisation study		Labourer (2) (2 weeks)		
	(c) Market study	Travel and Accommodation		\$12,200					
	(d) Review of options	Project Vehicle (12 weeks)		\$3,600					
	(e) Feasibility analysis	Other expenses		\$5,000					
	(f) Develop preferred schemes	Office support services							
		sub total		\$43,300					
	(ii) Implement preferred scheme. Likely to be based around using community groups for collection of the materials.		Project Manager (4 weeks over 6 months)	DEC Counterpart	\$15,000	6			
			Technical input (waste management engineer, economist/ financial expert..etc)		\$11,250				
			Equipment / Trials Programs		\$60,000				
			Travel and Accommodation		\$15,900				
			Project Vehicle		\$4,200				
			Office support services						
			sub total		\$106,350				
			Total		\$149,650	12			

DETAILED OUTLINE OF SHORTLISTED PROJECTS

Project	Intended Outcome	Project Tasks	Project Sub-Tasks	Resources JICA	Local	Estimated Cost (AU \$)	Likely Duration (mths)
3.4 Investigate, develop and implement a local waste minimisation plan for glass, paper, plastic and wood	To reduce the quantity of glass, paper, plastic and wood waste being generated and disposed of to landfill.	(i) Undertake feasibility study to investigate and assess potential waste reduction, re-use, recycling and reprocessing options, potential markets for waste products, collection and processing options, and viability of potential schemes. The study should include a waste characterisation study, extensive consultation with local industry and community groups, and result in an action plan and implementation program for preferred schemes.	(a) Project kick-off, data collection and review	Waste Management Engineer / Planner (8 weeks)	DEC Counterpart	\$30,000	6
			(b) Waste characterisation study	Economist / Financial Expert (2 weeks)		\$11,250	
			(c) Market study	Institutional / legislative Specialist (2 weeks)		\$11,250	
			(d) Review of options	Community Education Specialist (2 wks)		\$7,500	
			(e) Feasibility analysis	Local Community Consultant / Advisor (2 weeks)		\$2,000	
			(f) Develop preferred schemes	Draftsperson (2 weeks)		\$5,000	
				Miscellaneous equipment		\$1,500	
				General labour (2 persons X 2 weeks)		\$1,000	
				Travel and accommodation		\$26,800	
				Project Vehicle (8 weeks)		\$4,000	
	Office support services Subtotal		\$100,300				
	(ii) Implement preferred waste minimisation schemes.		Project Manager (12 weeks over 12 months)	DEC Counterpart	\$45,000	12	
		Technical input (waste management engineer, economist/ financial expert..etc)		\$22,500			
		Equipment / Trials Programs		\$150,000			
		Project Vehicle		\$7,200			
		Office support services Subtotal		\$224,700			
			Total		\$325,000	18	
			Total		\$1,373,350		

ATTACHMENT A

TYPICAL PROCESS FOR PREPARATION OF A FEASIBILITY STUDY FOR A WASTE MINIMISATION PROGRAM

Preparation of a feasibility study for a waste minimisation program typically encompasses undertaking the following:

- 1 Detailed review of existing relevant waste minimisation activities, including a review of Government waste management policy;
- 2 Data collection / baseline sub-studies:
 - 2.1 Waste stream characterisation (for all solid waste streams eg. municipal, commercial / industrial, construction and demolition) - to determine composition and quantities;
 - 2.2 Community, NGO and government consultation program to identify views, preferences and expectations;
- 3 Investigation, concept development and comparison of options for the following:
 - 3.1 waste prevention eg.
 - 3.1.1 community education / training;
 - 3.1.2 financial incentives eg. increased import duties on certain "wasteful" products eg. disposable nappies;
 - 3.1.3 encouraging clean technologies;
 - 3.2 waste re-use and recycling eg.
 - 3.2.1 waste / material exchange;
 - 3.2.2 requiring re-useable bottles for local beer and softdrink;
 - 3.2.3 conventional recycling activities;
 - 3.2.4 drop off centres run by community groups and NGOs
 - 3.2.5 financial incentives eg. import duty on products with non-locally reusable / recyclable packaging; special levies to fund export / recycling; container deposit / refund schemes;
 - 3.2.6 innovative local re-use and recycling eg. craft making, crushed glass and shredded plastic used as drainage aggregate;
 - 3.3 waste processing eg.
 - 3.3.1 mulching and composting eg. home composting and centralised mulching and composting;

- 3.3.2 organic waste digestion and beneficial re-use of the resulting sludge via agricultural applications;
- 3.3.3 glass crushing to produce aggregate for drainage, concrete, and road making;
- 3.4 public education and awareness eg.
 - 3.4.1 funding NGO activities;
 - 3.4.2 multi-media advertising campaigns;
- 4 Development of a detailed waste minimisation strategy for the target waste stream encompassing the following:
 - 4.1 waste prevention activities;
 - 4.2 waste re-use and recycling;
 - 4.3 waste processing;
 - 4.4 a program for public education and awareness;
 - 4.5 an implementation program defining actions, staging, responsibilities, resources, costs and financing;

PROJECT PROFILE No. 4

TITLE: Improving Domestic Solid Waste Storage in Apia, Samoa

RATIONALE:

Currently, domestic solid waste is typically stored at households on a stand, which is typically located on the road side (ready for collection). The stands are typically 1.5 m high and made of timber. The purpose of the stands is to prevent disturbance of the stored garbage by animals e.g. dogs, and thus create litter.

Many of the existing garbage stands are in a state of disrepair and many households do not have a stand. The result is that household garbage is left at the roadside at natural ground level and is therefore prone to disturbance by animals, often resulting in scattering of the garbage into drains and nearby waterways.

To address this problem it is proposed to undertake a project to repair or replace existing household garbage stands and provide new stands to those households that do not currently have a stand.

DESCRIPTION OF THE PROPOSED PROJECT

Objective

The objective of the project is to improve the storage of garbage at households by upgrading current garbage stands and thus minimise the litter resulting from poor garbage storage.

Outputs

The outputs of the project would be:

1. A report on the current status of household garbage stands which identifies the number of stands that need to be repaired and the number of new stands required. The report would also assess the options for improving household waste storage considering performance and costs.
2. Appropriate tender documentation to allow the project to go out to tender e.g. design drawings, if necessary, specification and contract; and
3. Repaired and new household garbage stands.

General Scope

To improve domestic household garbage storage following scope of work is proposed:

1. Undertake a survey of existing household garbage stands and review and assess options for improving household waste storage;
2. Preparation of appropriate tender documentation, for provision of repairs to existing household garbage stands and provision and installation of new household garbage stands e.g. fabrication drawings, specification and contract documentation;

3. Undertake tendering process to select contractor to undertake the upgrading works; and
4. Undertake works to upgrade household garbage storage e.g. fabrication of new household garbage stands and repair work on existing garbage stands;

These tasks are described in more detail in the following Section.

Detailed Tasks

1. Survey of Existing Household Garbage Storage

To determine the scope and extent of work necessary for upgrading household waste storage it is proposed that the project commence with a survey of all households in Apia to determine how many existing garbage stands need repair work and identify how many new stands are required. This survey would involve visiting all households currently being serviced by the waste collection service and recording the status of the existing garbage stand (this could possibly be done by the waste collection contractor during their normal collection round).

Once the survey has been completed it is proposed that a number of options for improving household waste storage be reviewed and assessed to ensure the most appropriate and cost effective option is implemented. This would include repairing and/or replacing existing garbage stands, providing bags for garbage storage, providing garbage bins to all households.

2. Preparation of Tender Documentation for Upgrading Household Waste Storage

Once the preferred option for upgrading household waste storage has been selected, it would be necessary to prepare the necessary documentation to allow the project to be implemented. Depending on the option selected, necessary documentation may fabrication drawings for new garbage stands, a specification for the works to be undertaken and accompanying contract documentation.

3. Tender Upgrading Works

Once the Tender Documentation has been prepared the Tender should be let. This would involve calling for Tenders, reviewing and assessing tenders, and selecting the preferred contractor to undertake the upgrading works.

4. Undertake Household Garbage Storage Upgrading Works

The scope of work for upgrading household garbage storage will be dependent on the option selected. However, assuming the project does involve repairing and / or providing new household garbage stands, the following activities would be undertaken:

- i) Repair work to those existing garbage stands which require repairs;
- ii) Fabrication of the new household garbage stands (there are currently about 6,000 households receiving the waste collection service, however, not all will require a new garbage stand); and
- iii) Installation of the new garbage stands.

Costs and Resources

The estimated costs and resourcing of the project are shown in the attached Table.

Program

The suggested implementation sequence and task durations are shown in the attached Table.

ISSUES

Technical Feasibility

No issues. All proposed tasks are technically feasible within Samoa.

Implementation

No issues. The project is simple and should be able to be completed successfully.

Likely Success

It is considered that the project would be simple to implement and therefore has a good chance of being completed successfully. However, there is some concern that providing new garbage stands or repairing existing garbage stands will not result in a significant improvement in waste management practices. The new / repaired stands will help to prevent disturbance of the garbage by animals, but will not prevent windblown litter, nor reduce nuisances such as odours and insects / vermin. A secure garbage container is required to overcome these problems.

Risks

The project may not achieve a significant improvement in waste management practices.

Sustainability

The project would involve a once off provision of equipment (garbage stands) in Apia, which should last many years. However, the project does not address how funds will be obtained when the stands need to be replaced next time.

POTENTIAL IMPACTS OF THE PROJECT

Environmental

The objective of the project is to improve the storage of household garbage, thus helping to minimise the disturbance of the garbage by animals and consequent scattering of waste. The new / upgraded stands will achieve this, however, the stands do not prevent windblown litter, nor reduce nuisances such as odours and insects / vermin. A secure garbage container is required to overcome these problems.

Social

No negative social impacts are anticipated as a result of the project.

Financial and Economic

No negative financial or economic impacts on local residents or the Government of Samoa are anticipated.

Trade and Commerce

The project may involve the importation of selected materials for fabricating the new garbage stands. If it is decided to provide secure garbage containers, it is likely that these would need to be imported also.

A contractor (local?) will be required to fabricate and install the new garbage stands and undertake repairs on existing garbage stands.

Institutional

DEC staff will be required to assist with implementation of the project, however, no long term impacts on institutional arrangement are anticipated.

DETAILED OUTLINE OF SHORTLISTED PROJECTS

Project	Intended Outcome	Project Tasks	Project Sub-Tasks	Resources JICA	Local	Estimated Cost (AU \$)	Likely Duration (mths)
4. Solid Waste Storage 4.1 Develop and implement a program for improving garbage stands (storage) in Apia	To improve on site waste storage and consequently reduce disturbance of waste by animals	(i) Undertake a survey to identify the extent / need for repairs to existing garbage stands and for new garbage stands. (ii) Assess results of survey, develop documentation and program for undertaking required works, including preparation of cost estimate and tender documentation. (iii) Conduct tender process (iv) Undertake repair works / organise fabrication and distribute new stands	(a) Management	Consultant - 2weeks	DEC Officer - 1 week (part time)	\$1,500	1
			(b) Survey (c) Analysis and reporting	Consultant - 2weeks Consultant - 2weeks	DEC Staff (2) - 1 week DEC Officer - 1 week(part time)	\$2,000 \$1,000	
				Consultant - 6 weeks	DEC Officer - 6 weeks (part time)	\$15,000	1.5
				Consultant - 4 weeks Contractor - 26 weeks	DEC Officer - 26 weeks (part time)	\$5,000 \$450,000	1.5 9
					Total	\$474,500	13

PROJECT PROFILE No. 5

TITLE: Improving Solid Waste Disposal in Apia

RATIONALE:

Currently, all solid waste generated in Apia is disposed of at the Tafa'igata waste depot, which is located approximately 10 km south west of the Apia town centre. The waste depot can be described as a semi-controlled "dumping" operation with minimal compaction and covering of the deposited waste (leading to "unsanitary" conditions at the site). One of the reason for the lack of compaction and covering is the lack of funds and equipment to regularly undertake such. Few measures are implemented at the site to control or prevent environmental impacts e.g. there limited compaction and covering of the deposited waste, no leachate (contaminated water) controls, no stormwater runoff controls, no landfill gas controls, and there is no plan of management for the operation. The site is located in an area where the soils/rock underlying the site are of high permeability, and as a consequence the risk of groundwater contamination (and nearby springs) due to the landfilling operation is high, particularly considering the current operating practices. Another issue with the current waste disposal activities is the limited expertise and experience of the Division of Environment staff in planning, managing, supervising and day to day operation of a modern sanitary landfill waste depot. In particular, there is a lack of appropriate supervision of the waste depot operation - an experience supervisor should be on site at all times.

DESCRIPTION OF THE PROPOSED PROJECT

Objective

The objective of the project is to improve the operation of the Tafa'igata waste depot and thus minimise its impact on the local environment.

Outputs

The outputs of the project will be:

1. A detailed report on the geology and hydrogeology of the site, which assesses the risks and likely consequences of groundwater contamination, and provides information on the underlying strata to allow the plan of management to be prepared;
2. A plan of management for the waste depot, which sets out a plan for landfilling the site, describes how the site will be operated, what environmental management and monitoring measures will be employed, and how the site will be rehabilitated once the landfilling is completed. A critical aspect of the Plan will be an implementation program for the necessary upgrading works and scheme for funding the works;
3. Upgrading works at the waste depot possibly encompassing surface water (leachate) drainage works, fencing and road works.
4. Equipment to allow efficient and effective landfilling of the site; and
5. Training for Division of Environment staff, on how to effectively plan and manage a sanitary landfilling operation, from an operational and environmental perspective;

6. Data to assess the quality of surface water runoff discharging from the site and water quality downstream of the site.

General Scope

To improve the operation of the Tafa'igata waste depot the following scope of work is proposed:

1. Undertake a detailed geological / hydrogeological and geotechnical investigation of the site;
2. Preparation of plan of management for the waste depot;
3. Undertaking upgrading works at the waste depot, possibly encompassing surface water (leachate) drainage works, fencing and road works.
4. Provision of equipment to allow effective and efficient landfilling at the site;
5. Provision of training of appropriate Division of Environment staff, to allow effective planning, management, supervision and operation of the waste depot;
6. Monitoring of the quality of surface water discharged from the waste depot site and downstream of the site.

These tasks are described in more detail in the following Section.

Detailed Tasks

1. *Detailed Geological / Hydrogeological and Geotechnical Investigation*

The preliminary investigation of the site identified that the strata underlying the site a shallow layer of gravely, silty clay overlying a highly vesicular and fractured basalt. This formation is suspected to be highly permeable. No measures have been implemented at the site to prevent leachate percolation into the underlying strata and nothing is known about the location and quality of the underlying groundwater (or the impact of the landfilling operation on groundwater quality). There is some concern regarding the impact of the landfilling operation (septage disposal operations at the site) on the underlying groundwater, as the groundwater downhill of the site is used for drinking water supply (springs at Vaitele). The Water Authority has a groundwater bore in the vicinity of the waste depot, however, due to concerns over the possible effects of the waste depot on groundwater quality, decommissioned the bore.

To determine the effect of the waste depot operation on the underlying groundwater as well as provide necessary information for the preparation of the Plan of Management, an investigation and assessment of the site which encompasses the following is proposed:

- i) a review of existing available geological / hydrogeological and geotechnical information on the site / local area;
- ii) installation of groundwater monitoring wells at the site, and wells up gradient and down gradient of the site;
- iii) determination of the location, direction and rate of groundwater flow;

- iv) sampling of local groundwater to determine whether contamination has occurred, and the extent of contamination;
- v) assessment of the risks of any contamination on downhill groundwater springs (used for drinking water supply);
- vi) identification and assessment of options to remediate any contaminated groundwater, if practical;
- vii) investigation and determination of the depth of soils over the site and the extent of clayey soils on site;
- viii) assessment of on site soils for use in the landfilling operation e.g. for lining, cover material, and capping;
- ix) preparation of a detailed report presenting the findings of the investigation.

2. *Preparation of a Plan of Management for the Waste Depot*

Preparation of a Plan of Management for the waste depot would encompass the following:

- i) undertake detailed site investigation and data collection including site topographical survey;
- ii) investigate and develop concepts for the waste depot / landfilling operation, including plan of landfilling, necessary upgrading works, landfilling details, waste minimisation activities, environmental management measures, and proposed site rehabilitation works;
- iii) preparation of the Plan.

Further details on preparation of the Plan of Management are contained in Attachment A.

It is recommended that upgrading of the waste depot operation occur in a staged manner, as funds become available. A suggested 3 stage approach to upgrading the landfilling operation is provided in Attachment B.

3. *Upgrading works at the Waste Depot*

The necessary upgrading works required at the waste depot to reduce environmental impact and public health risks will be determined during preparation of the landfill management plan. However, likely upgrading works that were identified during this project include:

- provision of surface water (leachate) drainage works to prevent discharge of contaminated water off site and consequent contamination of local creeks and rivers;
- fencing of the hospital waste disposal area and the septage disposal area to reduce possible risks to users of the waste depot ie. by preventing unauthorised access; and
- road works, including road drainage, to improve access to the waste depot during wet weather.

4. *Provision of Equipment for the Landfilling Operation*

The most appropriate equipment to achieve effective landfilling of the site would be identified as part of preparation of the Plan of Management. It is considered critical that as part of the project that a storage / maintenance shed be provided with the equipment (to maximise the life of the equipment and allow maintenance) and that training in the operation and maintenance of the equipment be provided. As such, the proposed steps for obtaining the selected equipment would encompass the following:

- i) Preparation of tender documentation for the supply of the equipment, construction of the storage / maintenance shed and training program;
- ii) Conduct tendering process, including tender preparation, calling of tenders, assessment and selection of the preferred tenderer;
- iii) Construction of the storage / maintenance shed;
- iv) Receive equipment; and
- v) Training of appropriate staff in the operation and maintenance of the equipment.

5. *Training of Division of Environment Staff*

To overcome the limited expertise and experience of Division of Environment (DEC) staff, it is proposed that a training program be developed and implemented. The training program should encompass the following:

- i) Training of appropriate DEC staff in the supervision of the waste depot on a day to day basis, including how to effectively operate equipment for the purposes of landfilling waste. The target person(s) for such training is the waste depot site supervisor i.e. the person who is on site full time, supervising the depot operation;
- ii) Training of appropriate DEC staff in the planning and management of landfill waste depot operations, including implementation of the Plan of Management. The target person(s) for such training is the DEC office staff / person charged with managing the waste depot;

The Project Team knows of no training courses specifically addressing the above training needs. The following actions are suggested as a way of achieving the above training needs:

- i) Temporary secondment of appropriate DEC staff to appropriate landfill facilities overseas, e.g. in Australia or New Zealand, for a period of up to 3 months, to learn / experience day to day supervision and operation of a modern sanitary landfill;
- ii) Engagement of a consultant team which includes a trainer (educational expert) and technical expert to conduct a training course for DEC staff in the planning and management of landfill waste depots. This necessary training could be achieved by a 1 - 2 week training course. A possible less specific alternative to this is to fund the appropriate DEC staff to attend a short course in waste management at the University of NSW. This course is a 1 week long short course which covers a broad range of waste management topics including sanitary landfill planning, design, construction and operation.

6. *Monitoring of the Quality of Surface Water Discharging from the Waste Depot Site*

To assess the quality of surface water being discharged from the waste depot site and downstream of the site, it is proposed that the Tafa'igata waste depot be incorporated as a testing location in Project No. 6 - Surface Water Quality Testing Equipment and Monitoring Program. Testing should be undertaken by Division of Environment & Conservation staff using the equipment provided in Project No. 6, before, during and after undertaking the upgrading works described above in Task 3. This would allow existing surface water quality to be determined and allow the effect (improvement) of the upgrading works, in particular the effect of the surface water drainage works, to be determined.

Costs and Resources

The estimated costs and resourcing of the project are shown in the attached Table.

Program

The suggested implementation sequence and task durations are shown on the attached Table.

ISSUES

Technical Feasibility

No issues. All proposed tasks are technically feasible in Samoa.

Implementation

Availability of suitable drilling rig and operators in Samoa. If such equipment is not available the cost of the investigation will increase significantly.

To maximise the chances of successful project completion and implementation of the Plan of Management, it is important that the DEC develop ownership of the Plan of management. To achieve this, the DEC should be closely involved throughout the project, but particularly in the preparation of the Plan of Management. That is why two workshops with DEC staff have been proposed.

Likely Success

It is considered that the project has a good chance for success, particularly given the interest shown by the DEC.

Risks

Cost of geological / hydrogeological investigation could increase.

Lack of on going funding for regular operation of the selected landfilling equipment, thus resulting in no improvement in the compaction and covering of the deposited waste.

Sustainability

There is concern regarding ongoing funding for the operation and maintenance of the landfilling equipment. There is also concern for funding for implementation of the Plan of Management. A

critical aspect of the project is identification of a appropriate scheme for long term funding (or supplementing current Government funding) of the waste depot operation e.g. charging for entry to the waste depot.

The proposed training components of the project (for DEC staff) i.e. in equipment operation and maintenance, landfill supervision and operation, and landfill planning and management, contribute to improving the sustainability of the project, by improving self sufficiency.

POTENTIAL IMPACTS OF THE PROJECT

Environmental

The objective of the project is to improve the operation of the Tafa'igata waste depot, and consequently reduce the current impacts of the waste depot on the local environment. This will include reducing impacts on local surface waters, groundwater, as well as reducing nuisance eg. vermin, flies, odour, and windblown litter.

However, need to consider the potential impacts if charging fees for disposing of waste at the waste depot is introduced e.g. illegal dumping of wastes elsewhere.

Social

Need to consider the impacts of any tax increases or introduction of additional charges for waste management services on residents of Apia, particularly the poorer families.

Financial and Economic

As a means of raising funding to maintain the upgraded operation of the waste depot it may be necessary to charge to dispose of waste at the Tafa'igata waste depot.

Trade and Commerce

The project will involve the importation of selected landfilling equipment and possibly materials for the equipment maintenance shed.

Institutional

DEC staff will receive additional training, specifically focused on improving waste management knowledge and consequently services.

DETAILED OUTLINE OF SHORTLISTED PROJECTS

Project	Intended Outcome	Project Tasks	Project Sub-Tasks	Resources JICA	Local	Estimated Cost (AU \$)	Likely Duration (mths)
5. <i>Solid Waste Disposal</i>							
5.1 Undertake a detailed geological / hydrogeological / geotechnical investigation of the site	To determine if groundwater contamination is occurring due to landfilling on the site and provide information necessary for the upgrading of the operation.	(i) Undertake necessary site investigations, analyse data, prepare report.	(a) Mobilisation (b) Data collection and review (c) Install g/w wells, g/w sampling and analysis (d) assessment of risks, including g/w modelling (e) identification and assessment of remediation options (f) site soils investigation and assessment (g) reporting	Consultant - 16 weeks	DEC Officer - 16 weeks (part time)	\$10,000 \$15,000 \$70,000 \$20,000 \$10,000 \$10,000 \$7,500	4
					Total	\$142,500	4
5.2 Preparation of landfill management plan	A formal plan for filling of the site which addresses both operational and environmental issues	(i) Undertake detailed site investigation and data collection, including site topographical survey (ii) Investigate, develop and design the necessary upgrading works, including plan of filling, leachate and stormwater works. (iii) Prepare landfill management plan	(a) Site topographical survey (b) Site investigation, data collection and review (a) Undertake investigation and design work (b) Workshop with DEC staff (a) Prepare Draft Management Plan (b) Workshop with DEC staff (c) Finalise Management plan	Local surveyor - 2 weeks Consultant - 4 weeks Consultant - 8 weeks Consultant - 1 week Consultant - 4 weeks Consultant - 1 week Consultant - 2 weeks	DEC Officer - 2 weeks (part time) DEC Officer - 4 weeks (part time) DEC staff - 2 days DEC staff - 2 days	\$10,000 \$10,000 \$25,000 \$8,000 \$7,500 \$8,000 \$2,500	2 3 3
					Total	\$71,000	8
5.3 Undertake upgrading works at the depot, including surface water (leachate) drainage, security fencing, and road works	To improve control over access to the site, thus reducing potential health risks, improve access, and improve surface water management.	(i) Investigate, develop and design the necessary upgrading works (ii) Prepare and call tenders for undertaking the works (iii) Construct the upgrading works - Drainage works - Fencing - Roadworks - Other		Consultant Consultant Consultant and Contractor	DEC Counterpart DEC Counterpart DEC Counterpart	\$75,000 \$25,000 \$300,000 \$50,000 \$400,000 \$250,000	4 2 6
		Sub total			Total	\$1,100,000	12
5.4 Provide landfilling equipment e.g. tracked loader	To allow regular compaction and covering of waste deposited at the landfill, thus reducing nuisance and leachate generation	(i) Prepare tender documentation for supply of equipment, construction of shed and training program (ii) Prepare and call tenders for the equipment and construction of the storage shed, including tender assessment	(a) Specification for equipment (b) Design and documentation of shed (c) Specification for training program	Consultant - 1 week Consultant - 4 weeks Consultant - 1 week Consultant - 4 weeks	DEC Officer - 1 week (part time) DEC Officer - 1 week (part time) DEC Officer - 4 weeks (part time)	\$2,500 \$10,000 \$2,500 \$15,000	3 3

DETAILED OUTLINE OF SHORTLISTED PROJECTS

Project	Intended Outcome	Project Tasks	Project Sub-Tasks	Resources JICA	Local	Estimated Cost (AU \$)	Likely Duration (mths)
5 5 Provide landfill operational training to appropriate DEC staff	To improve the capability of DEC staff in regard to planning and operating the landfill site	(iii) Construct storage shed		Contractor - 12 weeks Consultant - 12 weeks (part time) Consultant - 4 weeks	DEC Officer - 12 weeks (part time) DEC Officer - 4 weeks (part time)	\$100,000	3
		(iv) Purchase equipment and undertake training program - operation and maintenance	(a) Equipment			\$500,000	3
			(b) Training	Equipment supplier - 2 weeks	DEC Staff - 2 weeks	\$10,000	
					Total	\$640,000	12
		(i) Identify / develop appropriate training course, select and send appropriate DEC staff.	(a) Site supervisor training		DEC Site Supervisors (2) - 12 weeks	\$35,000	3
	(b) Site manager training		DEC Site Managers (2) 2 weeks	\$13,600			
			Total	\$48,600	3		
5 6 Undertake monitoring of quality of surface water discharged from waste depot site, before, during and after upgrading works (to be undertaken as part of Project No. 6)	Data to assess the quality of surface water discharging from the waste depot site, which will then allow potential environmental impacts to be identified.	See Project No. 6		See Project No. 6	DEC staff - see Project No. 6	See Project No. 6	Ongoing
					Total	\$2,002,100	27

ATTACHMENT A

SUGGESTED PROCESS FOR PREPARATION OF A LANDFILL MANAGEMENT PLAN

1. Data collection / baseline sub-studies
 - 1.1. Waste stream characterisation - composition and generation, for all waste streams coming into waste depot;
 - 1.2. Site investigations:
 - geological / hydrogeological investigations, including groundwater monitoring bore installation and water quality testing;
 - hydrology, including surface water quality testing;
 - 1.3. Collection of other relevant data:
 - topography;
 - climate;
 - land use / land planning;
 - flora and fauna;
 - site soil data;
2. Concept development of the landfilling operation:
 - 2.1. Remedial works
 - rationalising and consolidating current filling activities;
 - upgrading access road;
 - constructing surface water drainage system;
 - 2.2. Ongoing landfilling operation
 - site layout;
 - plan of landfilling and final landform;
 - waste disposal cell preparation;
 - waste receipt;
 - waste deposition;
 - waste covering;
 - site supervision and control;
 - staffing;
 - hours of operation;
 - permitted and excluded wastes;
 - waste control and inspection;
 - equipment;
 - wet weather operation;

2.3. Waste re-use, recycling and reprocessing activities

- waste exchange centre;
- recycling centre;
- composting operation;

2.4. Environmental management measures

- surface water management;
- leachate;
- landfill gas;
- odour;
- litter;
- vermin;
- dust;
- noise;
- visual aesthetics;

2.5. Environmental monitoring

- surface waters;
- ground water;
- leachate;
- landfill gas;
- dust and noise;

• 2.6. Site rehabilitation and post closure management

2.7. Funding / revenue options

3. Plan preparation

3.1. Documentation

3.2. Cost estimate and funding

3.3. Implementation program, including resourcing / responsibilities

ATTACHMENT B

TYPICAL 3 STAGE APPROACH TO UPGRADING A LANDFILLING OPERATION

1. Uncontrolled Tipping to Controlled Tipping

- 1.1. Upgrade access road to allow all weather access to the tipping area;
- 1.2. Introduce staffing to supervise tipping / dumping of waste, including appropriate staff training;
- 1.3. Install gatehouse and lockable front gate on access road and necessary fencing to prevent access to the site when not staffed. If sufficient funds are available the whole site should preferably be fenced to prevent unauthorised access; and
- 1.4. Introduce restricted tipping hours to coincide with site supervision hours. Substantial public education and awareness activities may initially be required.

2. Controlled Tipping to Basic Sanitary Landfill

- 2.1. Develop a basic plan / concept for filling and operating the site, and implement;
- 2.2. Organise / obtain equipment and undertake regular compaction and covering of the landfilled waste. The regularity of compaction and covering of the waste will be dependent on funds available. Ideally, compaction and covering should be undertaken at the end of each day the facility receives waste. If required, undertake training of machine operators in regard to effective compaction and covering of the waste;
- 2.3. Construct stormwater drainage to divert upstream stormwater runoff around the landfilled area. When budget permits, construct catch drains downstream of the landfill area to collect contaminated runoff from the landfill area. This contaminated runoff should be directed to a suitably sized detention pond for treatment prior to discharge off site;
- 2.4. Investigate options for obtaining funds / raising revenue to sustain the landfilling operation, and implement e.g. charge for entry to the waste depot;
- 2.5. Undertake vermin and insect control programs, as required;

3. Basic Sanitary Landfill to Modern Sanitary Landfill

- 3.1. Prepare and implement a comprehensive landfill management plan addressing both operational and environmental aspects, as well as site rehabilitation and post closure monitoring and maintenance. Train all relevant staff on implementation of the plan;
- 3.2. Install appropriate leachate containment, collection, storage, treatment and disposal system. Every effort should be made to separate uncontaminated runoff from contaminated waters (leachate) and leachate should preferably be managed on site;

- 3.3. Develop and implement other relevant environmental management measures e.g. for landfill gas, dust and noise;
- 3.4. Develop and implement a comprehensive environmental monitoring program for the waste depot i.e. for surface water, groundwater, leachate, landfill gas, dust and noise;
- 3.5. Develop and implement a waste inspection program, aimed at identifying and excluding hazardous wastes;
- 3.6. Develop and implement a data recording system to allow monitoring of the type and quantity of waste being landfilled at the site and consequently the rate of landfilling and remaining life of the site;
- 3.7. Develop and incorporate waste minimisation measures to maximise the life of the site e.g. through waste separation, re-use, recycling, and reprocessing of the waste, possibly at the waste depot;

PROJECT PROFILE No. 6

TITLE: Water Quality Monitoring Equipment and Testing Program

RATIONALE:

Work during the 1998 JICA Project and information from previous studies clearly indicated that very little data has been collected or is being collected on surface water quality in Samoa. Very limited surface water quality testing has been carried out in the past in Apia by the Public Works Department (physicochemical testing) and the Department of Health (microbiological testing), and the Water Authority tests drinking water supplies, most of which are groundwater or water collected in upstream catchment areas. Currently there is no program of testing streams, creeks, or nearshore coastal waters around Apia, partly because of a lack of suitable equipment / facilities and partly because of the lack of funding.

Given the likely impact of local industries and poorly managed septic systems, particularly in the Apia area, it is essential for good environmental management that some regular monitoring be carried out of surface waters in the area, to identify health risks to users of these water bodies, to identify environmental impacts, and to assess changes that occur as improved management of wastes occurs.

DESCRIPTION OF THE PROPOSED PROJECT

Objective

The objective is to provide the Department of Environment and Conservation (DEC) with the equipment and training necessary to carry out regular monitoring of surface water bodies in the Apia area, and to initiate such a monitoring program in 1999. This is part of an overall objective of monitoring and thus minimising the contamination of coastal, surface and ground waters from the waste depot, industry, septic tank effluent, including overflows, and related problems, as a contribution to health and sanitation improvements in Samoa.

Outputs and Outcomes

The outputs of the project will be:

1. DEC will have a set of equipment suitable for in situ testing of the quality of surface water under Samoan conditions.
2. Several DEC staff trained in the use of the water testing equipment, and in associated skills such as design of monitoring programs, sampling, quality control of data, and monitoring data analysis and interpretation.
3. Data from a program of surface water quality testing in the Apia region, indicating the quality of local surface waters (including surface water discharging from the Tafa'igata waste depot).

General Scope

This project will provide DEC with the capacity to undertake independent studies of surface water quality anywhere in Samoa, but particularly in the Apia area. This will lead to improved assessment of the impacts of local industry, waste water management systems, and provide DEC with a mechanism for early identification of potential problems associated with deteriorating water quality.

Detailed Tasks

The project would involve undertaking the following tasks:

1. Review the existing capability, programs, and facilities for water quality monitoring in Samoa (encompassing all relevant Government Departments eg. Water Authority, Department of Health), and identify and purchase suitable equipment for in situ testing of water quality for surface waters by DEC staff. It is anticipated that this would include:
 - a multiparameter water quality probe able to monitor dissolved oxygen, pH, turbidity, conductivity / salinity, and temperature; and
 - a portable water quality testing kit which is able to measure nitrogen compounds, phosphorus, and other relevant pollutants.
2. Undertake a training program involving at least 3 DEC staff in the use of the water quality testing equipment, design of monitoring programs and in data analysis and interpretation.
3. Investigate, develop, and initiate a program to monitor surface water quality in the Apia area (including surface water discharge from the waste depot and creeks downstream - see Project No. 5), and produce regular annual reports on the results of the monitoring program. Where required, it will be necessary to organise for other Government Departments to undertake laboratory analysis for pollutants not able to be measured in-situ eg. Health Department to undertake bacteriological testing.

To undertake a comprehensive surface water quality monitoring program will require the co-operation of several Government Departments eg. DEC, Water Authority, Health Department. The Water Authority and the Health Department both have laboratories which will be required for measuring certain pollutants unable to be confidently measured insitu eg. bacteriological and biological testing. Co-operation of the Government Departments should be sought to avoid the duplication of equipment and facilities.

Costs and Resources

The estimated costs and resources for the project are outlined in the attached table.

Program

The suggested sequence of activities and task duration are shown in the attached Table.

ISSUES

General

Equipment of this sort has been widely distributed in the Pacific Islands, but often has been ineffectively used. Reasons for this include lack of training in equipment use, no support services in terms of replacement consumables, lack of training in monitoring program design and data interpretation, turnover of staff in government agencies, and poor liaison between government departments, e.g., with Health Departments doing microbiological testing, and other units doing physio-chemical testing.

It is for these reasons that the training has been recommended for at least 3 DEC staff, and staff from other government departments could also be involved. During the development of the monitoring program, discussions would be held with the Department of Health and the Water Authority to see if an integrated program can be designed, making effective use of all the resources in Apia. DEC could proceed independently if necessary, but a coordinated approach would be better.

Technical Feasibility

The field-based water testing equipment systems now available are very robust and user friendly, being designed for a wide range of applications. Thus no problems are anticipated in the training and use of equipment. The design, implementation and data interpretation of monitoring programs requires some basic training, but the current DEC staff are sufficiently qualified and experienced to quickly develop the necessary skills within a short training program. Continued contact with the consultant should avoid any significant problems arising.

Implementation

The following issues are important for implementation:

- The water quality testing consultant should have wide experience of the needs and operating conditions in small island/isolated situations, as these are often quite different from those in larger communities.
- There is definite future need in Samoa to start evaluating the testing and monitoring needs of all government agencies, so that the resources available can be used in an integrated, prioritised and coordinated program to achieve the maximum benefit per unit cost. During this project, therefore, every effort should be made to initiate such collaboration by involving, wherever possible, other agencies likely to require testing and monitoring data.
- The development of a 'maintenance' culture (i.e., a built-in appreciation of the need to maintain equipment and order spares and refills of consumables) among DEC staff would be an excellent initial model that other agencies in Samoa could follow.
- Development, implementation and completion (with a final report) of a 12 month monitoring program is also important to illustrate the capacity of Samoan scientists to undertake such an operation - this will develop confidence in other agencies to embark on similar activities and illustrate the benefits of longer-term programs in environmental assessment and planning.

Likely Success

This project has a high probability of success

Risks

Elements of project which may create risks that could affect the outcome are:

- Poor selection of equipment
- Inappropriate staff trained
- Poor interaction with other testing agencies
- No funds earmarked for maintenance and replacement consumables
- DEC staff not having sufficient time to use the equipment regularly

Measures planned to reduce these risks include:

- Wide consultation with suppliers before final decision on equipment type
- Early discussion with DEC on staff to be involved
- Commitment by DEC to provide staff with time to use the equipment
- Ensuring that consultant is readily contactable by DEC staff if problems arise

Sustainability

Once the equipment has been provided and the initial training completed, DEC will have to ensure that newly recruited staff are trained in the proper use of the equipment, so that if any of the current staff leave, an adequate pool of trained users remains. In addition, all field-based water quality equipment needs some maintenance and replacement consumables. A small budgetary item must be included to allow for this - probably of the order of A\$500 per year. In addition, even with careful use, the equipment has a limited life (5-10 years depending on care); longer-term planning should ensure that provision is made for replacement at an appropriate time. If this is done then water monitoring should be sustainable for many years

POTENTIAL IMPACTS OF THE PROJECT

Environmental

The whole focus of the problem is aimed at minimising a recognised environmental issue, and providing information for significantly improved environmental management. The chemicals, etc., used in the testing are generally non-toxic and are used in very small quantities.

Social

The direct social benefits are not large, but improved knowledge about surface water quality will enable government to better advise the community about problem areas and reduce health and sanitation problems associated with people (especially children) using water which is of low quality.

Financial and Economic

The financial benefits identified for the project include reduced health problems associated with contaminated water, and a valuable information source for planning new industries.

Trade and Commerce

No significant trade/commercial benefits are immediately identifiable, except for the possible benefit to tourism, by informing visitors that regular testing of surface waters is occurring, and that government is in a position to take action to deal with major problems when they are identified.

Institutional

The project will strengthen the capacity and capability of DEC (and possibly) other government institutions by training of local staff, provision of equipment, program designs. Local level community organisations, both formal and non-formal, which can be drawn into the project include environmental NGOs, women groups, high schools.

DETAILED OUTLINE OF SHORTLISTED PROJECTS

Project	Intended Outcome	Project Tasks	Project Sub-Tasks	Resources JICA	Local	Estimated Cost (AU \$)	Likely Duration (mths)
6. Water Quality Monitoring Equipment and Program 6.1 Provision of surface water quality testing equipment to the DEC to allow insitu testing of drains, creeks and water courses in and around Apia (Including surface water at the Tafa'igata waste depot).	Equipment to allow DEC staff to monitor local surface water quality	(i) Review existing equipment / facilities and identify suitable equipment for the DEC, prepare specification, obtain quotes and purchase (ii) Prepare monitoring program and undertake relevant training of DEC staff. (iii) Implement monitoring program and report, under supervision of consultant	(a) Identify equipment and prepare specification, and obtain quotes (b) Water quality meter (c) Other potable test equipment	Consultant (1 week over 4 weeks)		\$3,750	1
						\$15,000	
						\$7,500	
				Consultant (2wks)	DEC: Staff time for training	\$7,500	0.5
				Consultant (2 wks over 12 months)	DEC staff to undertake monitoring	\$7,500	12
				Travel and Accommodation Vehicle Use		\$12,300 \$2,400	
	Office support services						
	Total	\$55,950	13.5				

PROJECT PROFILE No. 7

TITLE: Improving Medical Waste Management in Apia

RATIONALE:

Currently in Apia, medical waste is generated at the National Hospital and at 4 local private medical centres. Waste disposal practices at the National Hospital generally encompass the following:

- separation of the "contaminated" wastes eg. soiled bandages, and burning of the waste in the old incinerator at the hospital;
- separation of the sharps (needles) and disposal in a separate trench at the Tafa'igata waste depot;
- collection and disposal of general garbage from the hospital at the Tafa'igata waste depot.

It was reported during site inspections that the separation of the various waste materials at the hospital was not as good as it could be due to the lack of suitable containers for sharps and contaminated wastes, and a lack of training. As a result, it is possible for sharps and contaminated wastes to be mixed with general garbage and disposed of at the Tafa'igata waste depot taking no special precautions.

The contaminated wastes generated by the hospital are disposed of at the hospital in an old incinerator located at the rear of the hospital. The incinerator is some 30 years old and originally was diesel fired. Some years ago the diesel injection system ceased to operate and repairs were not able to be made. As a result the incinerator is now fired by stoking the incinerator with wood and paper. Firing the incinerator using paper and wood is not likely to reach the design operating temperatures and therefore achieve effective destruction of the contaminated wastes. This then raises several concerns about emissions from the incinerator eg. smoke and other pollutants, and their potential effects on hospital patients and nearby residents.

Separated sharps are disposed of in a specially prepared trench at the Tafa'igata waste depot due to a lack of capacity to burn the waste at the hospital incinerator (and due to the problems with the old incinerator, as described above). The trench for the hospital waste is sign posted and is located along the access road to the main active waste dumping area. There are, however, no controls over access to the sharps disposal trench. At the time of the inspection of the waste depot a load of sharps had recently been deposited in the hospital waste trench, however, although the waste is suppose to be immediately covered, it had not been covered. Considering the lack of control over access to the hospital waste disposal area (and the waste depot site in general), this type of practice presents a real public health risk and should be addressed.

The current waste management practices of the 4 private medical centres are not known. However, it is known that the wastes are not being disposed of at the hospital's incinerator, and thus may present significant risk to the public.

DESCRIPTION OF THE PROPOSED PROJECT

Objective

The objective of the project is to improve medical waste management in Apia, thus minimising existing public health risks associated with current practices. This will essentially involve developing and implementing a rigorous waste separation program at the hospital and the 4 medical centres, and establishing a system for incineration of the separated medical waste eg. via utilisation of the Department of Agriculture's airport quarantine waste incinerator or provision of a new medical waste incinerator.

Outputs

The outputs of the project will be:

1. A waste characterisation study which defines the types and quantities of medical waste being generated in Apia (to allow an appropriate incinerator to be selected);
2. An arrangement to use the Department of Agriculture's quarantine waste incinerator at the airport; or
3. An assessment of the environmental impacts of establishing a new medical waste incinerator. The assessment should give particular consideration to the location of the incinerator eg. at the hospital or elsewhere, and consequent impacts and practicality of operation;
4. A specification for an appropriate incinerator. This would consider the outcome of the environmental assessment and identify performance requirements such as air emission standards, fuel consumption, noise levels etc.;
5. Tender documentation for provision of an incinerator;
6. A new medical waste incinerator for Apia, including training for Department of Health staff in operation and maintenance of the incinerator;
7. A program for separation of medical waste implemented at the hospital and the 4 medical centres.

General Scope

To improve medical waste management in Apia the following scope of work is proposed:

1. Undertake a waste characterisation study which defines the types and quantities of medical waste being generated in Apia (to allow an appropriate incinerator to be selected);
2. Investigate the opportunity to utilise the Department of Agriculture's airport quarantine waste incinerator for disposal of the medical waste;
3. Undertake an assessment of the environmental impacts of establishing a new medical waste incinerator. The assessment would give particular consideration to the location of the incinerator eg. at the hospital or elsewhere, and consequent impacts and practicality of its operation;

4. A review of options for medical waste incineration and preparation of a specification for an appropriate incinerator. This would consider the outcome of the environmental assessment and identify performance requirements such as air emission standards, fuel consumption, noise levels etc.;
5. Preparation of tender documentation and calling of tenders for provision of a medical waste incinerator;
6. Installation of a new medical waste incinerator in Apia, including training of Department of Health staff in the operation and maintenance of the incinerator.
7. Development and implementation of a program for medical waste separation at the National Hospital and the 4 Medical centres, including the provision of suitable containers for the medical waste and training of all relevant staff.

These tasks are described in more detail in the following Section.

Detailed Tasks

1. *Waste Characterisation Study*

To allow an appropriate incinerator to be selected, a waste characterisation study would be undertaken. This would involve identifying all sources of medical waste in Apia and determining the types and quantities of waste being generated.

2. *Investigate the Opportunity to utilise the Airport Quarantine Waste Incinerator for disposal of Medical Waste*

To avoid unnecessary duplication of facilities, the opportunity to utilise the existing airport quarantine waste incinerator to dispose of medical waste should be explored. The Department of Agriculture advise that the airport incinerator has significant capacity for disposal of other waste. Activities that should be undertaken within this task include:

- i) Assessing the suitability of the airport incinerator to burn medical waste; and
- ii) Identifying whether a mutually agreeable arrangement between the Department of Agriculture and the Department of Health could be reached. This may best be done by organising a meeting between the Departments to discuss the matter.

3. *Environmental Assessment of Proposal to Establish a New Medical Waste Incinerator*

It is proposed that an assessment of the potential environmental impacts of establishing a new medical waste incinerator be undertaken. This assessment would consider a number of options for siting the incinerator and for each option investigate and assess potential public health risks, detrimental environmental impacts, practicality of operation, costs, transport issues, and other relevant factors. The outcome of the assessment would be recommended location for the medical waste incinerator and the air emission standards that should apply.

4. *Specification for Incinerator*

Considering the results of the environmental assessment report, a performance specification for an appropriate incinerator would be prepared. As part of this task, a review of incineration

options would be undertaken which investigated and compared suitable incinerator types, costs, performance, capacity, emissions, reliability, fuel supply, complexity etc.

5. *Conduct Tender Process for Provision of a Medical Waste Incinerator*

Tender documentation for provision of a medical waste incinerator would be prepared. This would include a specification and contract documentation. Tenders would be called and a preferred supplier selected.

6. *Installation of Incinerator*

The medical waste incinerator would be installed and commissioned by the selected equipment supplier.

To ensure effective and efficient long term operation of the medical waste incinerator, as part of the contract to provide the incinerator, the equipment supplier would be required to provide formal training of appropriate Department of Health staff in the operation and maintenance of the incinerator.

7. *Development and Implementation of a Medical Waste Separation Program*

The development and implementation of a proper waste separation program is an integral component of any project for improving waste management at the hospital and medical clinics. This needs to happen to ensure that the correct wastes are going to the incinerator for disposal, as well as reduce the risks to staff and public associated with current practices. Otherwise, the incinerator may under or over utilised.

This task will encompass the following:

- i) reviewing existing medical waste management practices and procedures;
- ii) developing an appropriate and acceptable system for the separation of medical waste at the hospital and the 4 medical centres. This activity would need to include extensive consultation with the administrators and staff of the hospital and the medical centres;
- iii) establish the medical waste management systems, including obtaining the necessary equipment / containers;
- iv) train all relevant staff at the hospital and the medical centres in the new medical waste management procedures.

Costs and Resources

The estimated costs and resourcing of the project are shown in the attached Table.

Program

The suggested implementation sequence and task durations are shown on the attached Table.

ISSUES

Technical Feasibility

Modern medical waste incinerators can be complex pieces of equipment to operate and maintain, particularly if the incinerator requires sophisticated air pollution control measures. The need for sophisticated air pollution control measures will be determined during the environmental assessment of the project. Information gathered during this Project indicates that there is a lack of local knowledge on incinerators and consequently formal training of Department of Health staff in the operation and maintenance of the incinerator is considered an important aspect of the project.

Implementation

The co-operation of the 4 medical centres would be required if they are to be included in the project.

The co-operation of the Health Department and Department of Agriculture will be required.

As identified above, a modern medical waste incinerator can be a complex piece of equipment if sophisticated air pollution control equipment is required. If not, then implementation of the project will be relatively straight forward and simple. If sophisticated air pollution control equipment is required then installation and commissioning of the incinerator will be more complex and therefore more difficult.

Likely Success

Given the interest shown by the Department of Health and the DEC, it is considered that the project has a good chance for success, although there may be some difficulties to overcome in installation and commissioning if sophisticated air pollution controls are required.

There are some concerns about the ability of the Department of Health to operate and maintain a new incinerator if sophisticated air pollution controls are required on the incinerator. A significant training program would be required to address this concern.

Risks

There is the potential for the cost of the project to significantly increase if sophisticated air pollution controls are required on the incinerator, and this will be dependent on the location of the incinerator and the air emission standards applied.

Sustainability

There is concern regarding ongoing funding for the operation and maintenance of the incinerator. Proper operation of the incinerator will require substantial ongoing funds for fuel (diesel) plus ongoing maintenance. To ensure this happens the Government of Samoa should commit itself to meeting operational and maintenance costs. To minimise these costs the Department of Health could charge the 4 private medical waste incinerators for managing their wastes.

The proposed training components of the project (for Department of health staff) ie. in equipment operation and maintenance would contribute to improving the sustainability of the project, by improving self sufficiency.

POTENTIAL IMPACTS OF THE PROJECT

Environmental

The objective of the project is to improve medical waste management in Apia by providing a new incinerator. This would reduce the impacts of the existing incinerator e.g. discharge of smoke and other pollutants, and remove the public health risks associated with current sharps disposal at the Tafa'igata waste depot.

However, careful consideration needs to be given to the potential impacts of a medical waste incinerator (from air emissions), although this needs to be considered in the context of existing practices. It is proposed that this issue would be addressed in Task 2 when an environmental assessment of the project is undertaken.

If sophisticated air pollution controls are required, there may be a need to treat and dispose of wastewater generated by the equipment.

Social

No negative social impacts are anticipated as a result of the project.

Financial and Economic

No negative financial and economic impacts are anticipated as a result of the project, although the Government of Samoa would need to increase the Department of Health's budget to cover the costs of operating and maintaining the incinerator. As identified above, funds could be obtained by charging the 4 private medical clinics for managing their medical wastes.

Trade and Commerce

The project will involve the importation of the incinerator and associated equipment. The project would have little benefit for local businesses.

Institutional

Existing Department of Health staff will require training specifically focused on the operation and maintenance of the incinerator, however, no other impacts are anticipated.

DETAILED OUTLINE OF SHORTLISTED PROJECTS

Project	Intended Outcome	Project Tasks	Project Sub-Tasks	Resources JICA	Local	Estimated Cost (AU \$)	Likely Duration (mths)
7. <i>Medical Waste Management in Apia</i> 7.1 Provision of a new incinerator to the Department of Health for disposal of hospital and other medical waste	A mechanism for appropriate disposal of medical waste from the hospital	(i) Undertake detailed waste characterisation study, encompassing hospital and medical centres (ii) Investigate the opportunity to utilise the existing quarantine waste incinerator at the airport to dispose of medical waste (iii) Undertake environmental impact assessment and obtain approvals (iv) Determine performance requirements for incinerator e.g., air emissions, noise, fuel supply, etc., and identify appropriate incinerator type and location. (v) Prepare and call tenders for an incinerator (vi) Construct and commission the incinerator (assumes no special air emissions controls) (vii) Develop and implement medical waste separation program		Consultant - 4 weeks	Dept Health Officer - 4 weeks (part time)	\$30,000	3
			(a) Assess suitability of burning medical waste in the airport incinerator	Consultant - 1 week	Agriculture Officer	\$3,750	1
			(b) Identify possibility of an agreement being reached between Health Department and Agriculture Department	Consultant - 1 weeks input over 4 weeks	All relevant Government Staff	\$7,500	
				Consultant - 20 weeks	DEC Officer - 20 weeks (part time)	\$100,000	6
				Consultant - 4 weeks		\$15,000	2
				Consultant - 6 weeks	Dept of Health Officer - 6 weeks (part time)	\$15,000	3
			(a) Provide, install and commission incinerator	Contractor - 16 weeks Consultant - 16 weeks	Dept Health Officer - 16 weeks (part time)	\$150,000	3
			(b) Undertake training of Dept of Health staff in operation and maintenance of the incinerator	Equipment supplier - 1 week	DEC Staff (2) - 1 week	\$10,000	
			(a) Review and develop medical waste separation program	Consultant - 6 weeks	Dept of Health Officer - 6 weeks (part time)	\$22,500	1
			(b) Establish system / program	Consultant - 2 weeks	Dept of Health Officer	\$50,000	
			(c) Undertake training of all relevant staff	Consultant - 2 weeks	Dept of Health Officers, Hospital Staff and Medical centre staff	\$25,000	0.5
							1
						Travel and Accommodation Vehicle Use	\$35,500 \$9,000
					Total	\$473,250	21

PROJECT PROFILE No. 8

TITLE: Provision of Septage / Sludge Disposal Facility for Apia

RATIONALE:

Currently, septage / sludge is disposed of at the Tafa'igata waste depot in excavated pits. This activity would be having a detrimental impact on the underlying groundwater, as a result of the percolation of the septage into the underlying strata and consequently the groundwater. The effect of the septage disposal activities could be worse than the effects of the landfilling operation, due to the highly permeable strata underlying the site and the highly mobile septage (liquid). Possible effects of the operation would include contamination of the groundwater by organic matter, nutrients, faecal matter/bacteria, and other contaminants that may be in the septage eg. oil, chemicals etc.

To overcome the impacts of this operation, it is proposed that a more environmentally friendly sludge management facility be constructed at the waste depot.

It should be noted that although a centralised sewerage system is proposed, the sewerage system will only cover a small part of the Apia town centre (low lying areas). The areas outside of the town centre will still rely on septic tanks for wastewater disposal. As a result there will be a long term need for a septage / sludge management facility. Depending on the type of centralised sewage treatment system installed, septage / sludge may not be able to be disposed at the centralised treatment facility.

DESCRIPTION OF THE PROPOSED PROJECT

Objective

The objective of the project is to overcome the current impacts of the existing septage / sludge disposal activities at the waste depot by establishing a more environmentally friendly facility to manage the septage / sludge.

Outputs

The outputs of the project will be:

1. A report outlining the options for septage / sludge management and the preferred strategy for managing septage / sludge generated in Apia;
2. Documentation for the construction of the facility eg. engineering drawings, specification and contract;
3. A new septage / sludge management facility at the Tafa'igata waste depot.

General Scope

The project will encompass the investigation and assessment of options to manage the septage / sludge generated in Apia, design and documentation of the selected sludge management facility, construction and commissioning of the sludge management facility, and training of appropriate DEC

staff in the operation and maintenance of the facility. These activities are described in more detail in the following section.

Detailed Tasks

1. Investigation and assessment of septage / sludge management options

To ensure the most appropriate septage / sludge disposal facility is established, it is proposed to undertake a detailed investigation and assessment of existing sludge management practices, and a detailed review of options for managing the septage / sludge. The aim of the investigation is to identify and define the preferred sludge management process. This may encompass establishing a sludge drying bed at the Tafa'igata waste depot along with a facility to treat the resulting liquid. The dried sludge could be used as a raw material in a composting operation.

2. Design and documentation of the selected sludge management facility

Once the preferred sludge management facility is defined, the necessary documentation for construction of the facility would be prepared. This would include engineering drawings, specification, and contract documentation.

3. Construction and commissioning of the sludge management facility

Tenders would be called for the construction of the sludge management facility. A contractor would be engaged and the facility constructed. Assuming the facility is a sludge drying bed, construction would encompass excavation, concrete works, erection of metal roofing (possibly), and installation of a septic tank type treatment facility for treatment of the wastewater from the drying bed. It is proposed that a consultant would be engaged to supervise the construction of the facility. Alternatively the Department of Public works may be used.

4. Training of DEC staff in the operation and maintenance of the sludge management facility

To ensure proper operation and maintenance of the sludge management facility, it is proposed that the appropriate DEC (or Public Works) staff would be trained to undertake such.

Costs and Resources

The cost and resources required for the project are shown in the attached Table

Program

The suggested implementation sequence and task durations are shown in the attached Table.

ISSUES

Technical Feasibility

The project may introduce new technologies and equipment to Samoa. As a result, in evaluating the suitability of such processing options there will be a need to consider local skills and the ability to operate and the equipment, and if selected ensure that appropriate training is provided.

Implementation

The responsibility for operation and maintenance of the septage / sludge management facility needs to be addressed. Although the DEC run the waste depot it may be more appropriate for the septage / sludge facility to be managed by Public Works or the Water Authority, as they would already have the necessary skilled staff for such.

In addition, the skills of Public Works or the Water Authority may be utilised to assist with the project, including construction of the facility.

Risks and Likely Success

Risks to the success of the project include:

- co-ordination between the relevant Samoan Government Departments eg. DEC, Public Works and the Water Authority;
- resolving who will be responsible for the operation and maintenance of the facility ie. DEC, Public Works or the Water Authority;
- identifying a long term source of funding for operation and maintenance of the facility.

Sustainability

To ensure proper operation and maintenance of the sludge management facility a source of sustainable source of funding will need to be identified. This may be from the Government, however, an alternative would be to implement user charges. Although this may lead to illegal dumping of septage / sludge elsewhere causing pollution of local waterways.

POTENTIAL IMPACTS OF THE PROJECT

Environmental

The objective of the project is to improve septage / sludge management practices and thus stop the impacts of current sludge disposal activities at the Tafa'igata waste depot ie. groundwater contamination. If successfully implemented, the project should achieve this objective. However, potential detrimental impacts on local waterways, from illegal dumping of sludge, should be considered when assessing implementation of a user charges system to fund the facility.

Social

The social benefits of the project would encompass a reduction in public health risks, particularly in the locality of the waste depot, due to reduced risks of groundwater contamination.

The impacts of any user charges would need to be considered.

Financial and Economic

Potential financial and economic implications of outcomes of the project include:

- increased costs for septage / sludge disposal;

As a result of the project, it is likely that the community as whole will be required to pay more, either directly or indirectly, for septage / sludge management. There will be a need to carefully investigate what are acceptable / sustainable increased costs for residential premises, particularly low income households. There will also be a need to develop strategies for those low income households which may not be able to cope with increased costs.

Trade and Commerce

Implementation of the project will result in increased septage / sludge management costs to commerce and industry. However, it is anticipated that the increased costs will more truly reflect real costs and will be minor compared to other business operating costs

Institutional

Operation and maintenance of the sludge management facility may require additional staff to be employed by either the DEC, Public Works or Water Authority.

In addition, it is proposed that relevant personnel will be trained in the operation and maintenance of the septage / sludge management facility.

DETAILED OUTLINE OF SHORTLISTED PROJECTS

Project	Intended Outcome	Project Tasks	Project Sub-Tasks	Resources JICA	Local	Estimated Cost (AU \$)	Likely Duration (mths)
8. Septage / Sludge Management 8.1 Investigation, design and development of an appropriate septage / sludge handling facility in Apia	A facility which manages septage and sludge in an environmentally friendly manner	(i) Investigate and assess in detail existing sludge management practices. Identify problems and investigate and assess options to overcome problems. Develop preferred sludge management plan. (ii) Undertake design and documentation of the preferred sludge management plan. This may involve design of a sludge treatment / disposal facility at the Tala'igata waste depot eg sludge drying beds. (iii) Construct and commission the sludge treatment / disposal facility (iv) Undertake training of staff in operation and maintenance of the sludge treatment / disposal facility	Wastewater consultant	Samoan Government Counterpart		\$50,000	3
			Wastewater consultant	Samoan Government Counterpart		\$100,000	3
			Wastewater consultant and Contractor	Samoan Government Counterpart		\$1,500,000	12
			Wastewater consultant and Contractor	Relevant Government staff		\$50,000	3
					Total	\$1,700,000	21

APPENDIX L

REPORT ON WASTE DEPOT VEHICLE SURVEY

JAPANESE INTERNATIONAL CO-OPERATION AGENCY

WASTE GENERATION ESTIMATE FOR
APIA BASED ON ANALYSIS OF
VEHICLES ENTERING THE
TAFU'IGATA WASTE DEPOT

March 1998

XP0014/RP03

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REVIEW AND APPROVAL RECORD					
REV	DATE	DESCRIPTION OF RELEASE	PREP'D	REV'D	APPR'D
0	30 Mar 98	Final Report	P. Ng.	S. Dever	S. Dever.

1. Introduction

As part of the JICA Project Identification Study on Waste Management in Samoa, CMPS&F undertook an analysis of vehicles entering the Tafa'igata waste depot. This was to obtain an estimate of the quantity and types of waste being disposed of at the waste depot.

This document outlines the methods employed in conducting the analysis; and provides a summary of the results obtained.

2. Method

The Department of Lands, Survey, and Environment; Division of Environment and Conservation (DEC) are responsible for managing and operating the waste depot. As part of this, they are responsible for staffing the waste depot; and inspecting and recording all vehicles entering the waste depot. The number and type of vehicles entering the Tafa'igata waste depot, on any given day, is recorded along with the types of waste the vehicle is carrying.

To obtain an understanding of the quantity and types of waste being landfilled at the Tafa'igata waste depot, CMPS&F analysed three (3) periods of records: August 1996; October 1996; and December 1996 - January 1997. These records are found in Attachment A.

To obtain an estimate of the types and quantity of the waste being landfilled, all vehicles entering the depot during the selected periods were classified into categories and assigned a weighting factor. The description of each category, and corresponding weight factors are presented in the table below:

Vehicle Type	Description	Weight Factor
<i>Small Vehicles</i>		
A	Car / Station Wagon	0.06 tonnes
B	Van / Utility / Trailer	0.3 tonnes
<i>Open Trucks</i>		
C	Single Rear axle with two rear wheels or four small rear wheels.	0.62 tonnes
D	Single rear axle with four small normal-sized wheels	1.16 tonnes

The vehicle category, description, and weight factors were adopted from the NSW EPA Solid Waste Landfill Guidelines (1996). It was assumed that Open trucks entering the waste depot carried only Municipal, and Commercial and Industrial waste.

The amount of waste entering the depot was estimated by multiplying the number of each vehicle type by its corresponding weight factor. This method assumes that on average, every vehicle carries into the waste depot an amount of waste equivalent to its weight factor. ie, on average, a 'Type A' vehicle enters the depot carrying 0.06 tonnes of waste.

3. Results

A summary of the results obtained from this survey is presented in the table below:

Month	No. of Days	Amount of Waste	Rate of Waste generation
August 1996	14 Days	164.4 tonnes	11.74 tonnes / day
October 1996	30 Days	160.8 tonnes	5.36 tonnes / day
December 1996	17 Days	162.7 tonnes	9.57 tonnes / day
January 1997	15 Days	111.0 tonnes	7.4 tonnes / day
TOTAL	76 Days	598.9 tonnes	7.88 tonnes / day

Results from the vehicle survey suggest that the rate of waste generation is approximately 2900 tonnes / yr. Assuming that the waste depot services 45,000 people, the waste generation rate of Samoa is about 64 kg / person/ year.

This vehicle survey also attempted to characterise the types of waste entering the waste depot. However, the waste types entering the depot varied greatly, both within and between vehicles; and no conclusive trends or results could be drawn from the data gathered. See Attachment A.

4. Discussion

The waste generation results from this vehicle survey do not compare well with a study undertaken by Gangaiya (1994). The study undertaken by Gangaiya (1994) was based on a survey of the rubbish collection system, and estimated that the waste generation rate of Samoa was 190 kg / person/ year, which is three times larger than the value obtained from the analysis of vehicles entering the waste depot.

Two possible reasons for the discrepancy between the results of this analysis and the study by Gangaiya have been identified:

1. The vehicle survey method of estimating waste generation involves the application of weight factors to certain vehicle types. These weight factors have been derived based on Sydney data. It is probable that the weight factors used to estimate waste generation rates are not entirely applicable to Samoa.
2. The vehicle survey method requires that all vehicles entering the waste depot be properly logged by the gate keeper. It is possible that certain vehicles might have been inadvertently omitted from the data records. If vehicles are able to elude the logging process, then not all the waste generated in Samoa have been considered, resulting in an underestimation of waste generation quantities.

5. Conclusion and Recommendations

The vehicle survey conducted by CMPS&F estimates that Samoa is generating waste at about 64 kg / person / year. However this value is very low and does not correlate well with other waste generation studies conducted in the area. Two possible explanations for the difference between results have been identified (See Section 4).

If data on the vehicles entering the Tafa'igata waste depot is continued to be collected, to allow the data to be used effectively, the following measures are recommended:

1. A more formal system for data logging be implemented, which ensures: all vehicles are identified and logged; the primary waste type is identified; and the waste source identified. See Attachment B.
2. A survey be undertaken to classify the vehicles entering the waste depot and specific local vehicle weight factors determined.

Until further study has been conducted into the waste generation rates in Samoa, it is not recommended that results from this report be used. Rather it is suggested that the waste generation rate of 190 kg/person/year (from the study undertaken by Gangaiya (1994)) be adopted.

ATTACHMENT A
RECORD OF VEHICLE LOGS

Vehicle Survey Summary Sheet : August

Date	Vehicle Types				Total	Waste Weights				Total		
	A	B	C	D		A+B	C+D	A	B		C	D
1/08/96 Thurs.	1	9	4	10	14	0.06	2.7	2.84	11.6	2.76	14.44	17.2
2/08/96 Fri.	1	11	4	9	13	0.06	3.3	2.84	10.44	3.36	13.28	16.64
3/08/96 Sat.	0	7	3	7	10	0	2.1	1.86	9.72	2.1	11.58	13.68
4/08/96 Sun.	0	0	0	1	1	0	0	0	1.16	0	1.16	1.16
5/08/96 Mon.	4	12	4	3	16	0.024	3.6	2.48	3.48	3.624	5.96	9.584
6/08/96 Tues.	0	5	5	9	14	0	1.5	3.46	12.04	1.5	15.5	17
7/08/96 Wed.	0	13	2	8	10	0	3.9	1.24	9.28	3.9	10.52	14.42
8/08/96 Thurs.	1	6	1	9	10	0.06	2.1	0.62	10.44	2.16	11.06	13.22
9/08/96 Fri.	0	5	2	9	11	0	1.5	1.24	10.44	1.5	11.68	13.18
10/08/96 Sat.	2	7	2	5	7	0.12	2.4	1.24	5.8	2.52	7.04	9.56
11/08/96 Sun.	0	0	1	1	2	0	0	0.62	1.16	0	1.78	1.78
12/08/96 Mon.	0	6	1	9	10	0	1.8	0.62	12.04	1.8	12.66	14.46
13/08/96 Tues.	0	4	3	7	10	0	1.2	1.86	9.72	1.2	11.58	12.78
14/08/96 Wed.	0	4	0	6	6	0	1.2	0	8.56	1.2	8.56	9.76
Totals	9	89	32	93	125	0.324	27.3	20.92	115.88	27.624	136.8	164.424
Percentage (%)	4.04%	39.91%	14.35%	41.70%	43.95%	0.20%	16.60%	12.72%	70.48%	16.80%	83.20%	100.00%

Vehicle Survey Summary Sheet : October

Date	Vehicle Types				Total	Waste Weights				Total				
	A	B	C	D		A + B	C + D	A	B		C	D	A+B	C+D
1/10/96 Tues.	0	8	2	7	8	9	17	0	2.4	1.24	8.12	2.4	9.36	11.76
2/10/96 Wed.	1	9	3	7	10	10	20	0.06	2.76	1.86	8.12	2.82	9.98	12.8
3/10/96 Thurs.	0	4	1	10	4	11	15	0	1.2	0.62	10.44	1.2	11.06	12.26
4/10/96 Fri.	0	10	5	10	10	15	25	0	3	3.46	11.6	3	15.06	18.06
5/10/96 Sat.	2	11	2	8	13	10	23	0.12	3.3	1.24	9.28	3.42	10.52	13.94
6/10/96 Sun.	0	0	0	0	0	0	0	0	0	0	0	1.26	14.08	15.34
7/10/96 Mon.	1	4	4	10	5	14	19	0.06	1.2	2.48	11.6	1.26	14.08	16.6
8/10/96 Tues.	1	5	1	9	6	10	16	0.06	1.5	0.62	10.44	1.56	11.06	12.62
9/10/96 Wed.	1	6	3	5	7	8	15	0.06	1.8	1.86	5.8	1.86	7.66	9.52
10/10/96 Thurs.	1	2	1	4	3	5	8	0.06	0.6	0.62	4.64	0.66	5.26	5.92
11/10/96 Fri.	1	4	2	11	5	13	18	0.06	1.2	1.24	12.76	1.26	14	15.26
12/10/96 Sat.	2	6	6	6	8	12	20	0.12	1.8	3.72	6.96	1.92	10.68	12.6
13/10/96 Sun.	0	0	1	0	0	1	1	0	0	0.62	0	0	0.62	0.62
14/10/96 Mon.	0	4	0	2	4	2	6	0	1.2	0	2.32	1.2	2.32	3.52
15/10/96 Tues.	1	4	4	6	5	10	15	0.06	1.2	2.48	6.96	1.26	9.44	10.7
16/10/96 Wed.	1	4	3	5	5	8	13	0.06	1.2	1.86	5.8	1.26	7.66	8.92
17/10/96 Thurs.	0	4	1	8	4	9	13	0	1.2	0.62	9.28	1.2	9.9	11.1
18/10/96 Fri.	0	7	3	9	7	12	19	0	2.1	1.86	10.44	2.1	12.3	14.4
19/10/96 Sat.	0	3	1	7	3	8	11	0	0.9	0.62	8.12	0.9	8.74	9.64
20/10/96 Sun.	0	1	0	0	1	0	1	0	0.3	0	0	0.3	0	0.3
21/10/96 Mon.	0	6	2	7	6	9	15	0	1.8	1.24	8.12	1.8	9.36	11.16
22/10/96 Tues.	0	9	4	8	9	12	21	0	2.7	2.48	9.28	2.7	11.76	14.46
23/10/96 Wed.	1	6	2	7	7	9	16	0.06	1.8	1.24	8.12	1.86	9.36	11.22
24/10/96 Thurs.	0	12	5	9	12	14	26	0	3.6	3.1	10.44	3.6	13.54	17.14
25/10/96 Fri.	0	4	4	9	4	13	17	0	1.2	2.48	10.44	1.2	12.92	14.12
26/10/96 Sat.	0	6	5	9	6	14	20	0	1.8	3.1	10.44	1.8	13.54	15.34
27/10/96 Sun.	0	0	1	0	0	1	1	0	0	0.62	0	0	0.62	0.62
28/10/96 Mon.	2	10	7	8	12	15	27	0.12	3	4.34	9.28	3.12	13.62	16.74
29/10/96 Tues.	0	1	3	5	1	8	9	0	0.3	1.86	5.8	0.3	7.66	7.96
30/10/96 Wed.	7	0	7	2	11	9	16	0	2.1	1.24	12.76	2.1	14	16.1
Totals	10	73	31	89	83	120	203	0.6	21.96	19.58	102.08	23.82	135.74	160.82
Percentage (%)	4.48%	32.74%	13.90%	39.91%	37.22%	53.81%	100.00%	0.366%	13.366%	11.91%	62.08%	14.49%	82.55%	97.81%

Vehicle Survey Summary Sheet : December

Date	Vehicle Types				Total	Waste Weights				Total				
	A	B	C	D		A+B	C+D	A	B		C	D	A+B	C+D
15/12/96 Sun.	0	0	0	1	1	0	0	0	0.62	1.16	0	0	1.78	1.78
16/12/96 Mon.	1	10	2	12	14	11	14	25	1.24	13.92	3.06	15.16	18.22	18.22
17/12/96 Tues.	0	9	3	8	11	9	11	20	1.86	9.28	2.7	11.14	13.84	13.84
18/12/96 Wed.	0	7	3	6	9	7	9	16	1.86	6.96	2.1	8.82	10.92	10.92
19/12/96 Thurs.	0	5	3	8	11	5	11	16	1.86	9.28	1.5	11.14	12.64	12.64
20/12/96 Fri.	0	5	4	5	9	5	9	14	2.48	5.8	3.06	4.64	9.78	9.78
21/12/96 Sat.	1	10	0	4	11	4	11	15	0.06	4.64	3.06	4.64	7.7	7.7
22/12/96 Sun.	0	0	1	1	2	0	2	2	0	1.16	0	1.78	1.78	1.78
23/12/96 Mon.	0	10	4	11	15	10	15	25	2.48	12.76	3	15.24	18.24	18.24
24/12/96 Tues.	0	3	2	7	9	3	9	12	1.24	8.12	0.9	9.36	10.26	10.26
25/12/96 Wed.	0	1	1	0	1	1	1	2	0.3	0.62	0	0.62	0.92	0.92
26/12/96 Thurs.	1	5	2	6	8	6	8	14	0.06	6.96	1.56	8.2	9.76	9.76
27/12/96 Fri.	2	3	1	7	8	5	8	13	0.12	8.12	1.02	8.74	9.76	9.76
28/12/96 Sat.	0	3	4	7	11	3	11	14	0	8.12	0.9	10.6	11.5	11.5
29/12/96 Sun.	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30/12/96 Mon.	5	9	1	8	14	9	14	23	0.3	9.28	3	9.9	12.9	12.9
31/12/96 Tues.	2	7	2	8	10	9	10	19	0.12	9.28	2.22	10.52	12.74	12.74
Totals	12	87	34	99	133	99	133	232	0.72	21.08	28.38	132.28	162.74	162.74
Percentage (%)	5.17%	37.50%	14.66%	42.67%	42.67%	42.67%	42.67%	100.00%	0.44%	16.04%	12.95%	70.57%	81.28%	100.00%

Vehicle Survey Summary Sheet : January

Date	Vehicle Types				Total	Waste Weights				Total		
	A	B	C	D		A+B	C+D	A	B		C	D
1/01/97 Wed.	0	3	1	1	5	0	0.9	0.62	1.16	0.9	1.78	2.68
2/01/97 Thurs.	0	7	1	4	12	0	2.1	0.62	4.64	2.1	5.26	7.36
3/01/97 Fri.	3	15	7	16	41	0.18	4.5	4.34	18.56	4.68	22.9	27.58
4/01/97 Sat.	0	0	0	0	0	0	0	0	0	0	0	0
5/01/97 Sun.	0	0	0	0	0	0	0	0	0	0	0	0
6/01/97 Mon.	1	4	3	6	14	0.06	1.2	1.86	6.96	1.26	8.82	10.08
7/01/97 Tues.	1	4	2	4	11	0.06	1.2	1.24	4.64	1.26	5.88	7.14
8/01/97 Wed.	0	2	2	6	10	0	0.6	1.24	6.96	0.6	8.2	8.8
9/01/97 Thurs.	0	3	1	6	10	0	0.9	0.62	6.96	0.9	7.58	8.48
10/01/97 Fri.	0	2	1	4	7	0	0.6	0.62	4.64	0.6	5.26	5.86
11/01/97 Sat.	1	10	2	9	22	0.06	3	1.24	10.44	3.06	11.68	14.74
12/01/97 Sun.	0	0	0	1	1	0	0	0	1.16	0	1.16	1.16
13/01/97 Mon.	2	10	2	11	25	0.12	3	1.24	12.76	3.12	14	17.12
14/01/97 Tues.	2	3	3	8	16	0.12	0.9	1.86	9.28	1.02	11.14	12.16
15/01/97 Wed.	0	5	3	7	15	0	1.5	1.86	8.12	1.5	9.98	11.48
Totals	8	60	22	68	158	0.48	18	13.64	78.88	18.48	92.52	111
Percentage (%)	5.06%	37.97%	13.92%	43.04%	100.00%	0.43%	16.22%	12.29%	71.06%	16.65%	83.35%	100.00%

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - AUGUST 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
1/08/96	A	-	general rubbish	0.06
	B	-	empty cans	0.3
	B	NPF	paper	0.3
	B	-	vegn, teafauua?, general rubbish	0.3
	B	?	vegn, grass	0.3
	B	Public Works Dept.	laupopa?, general rubbish	0.3
	B	Bank	paper	0.3
	B	Government	cardboard boxes	0.3
	B	Jin Ellie	cardboard boxes, general rubbish	0.3
	B	Tokelau	vegn	0.3
	C	Lin	empty boxes, general rubbish	0.62
	C	Health Dept.	syringes, general rubbish	0.62
	C	-	empty cans, cardboard boxes	0.62
	C	-	sheet steel, cardboard boxes, general rubbish	0.98
	D	STP (oil factory?)	dry coconut flesh	1.16
	D	-	old car wreck	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	Peleto Vaifou	general rubbish	1.16
	D	Leafu Vaifou	general rubbish	1.16
	D	Tino	vegn	1.16
	D	AGL	vegn, empty bottles, general rubbish	1.16
	D	Eli	sewage	1.16
	D	Public Works Dept.	sewage	1.16
	D	West End	general rubbish	1.16
			Sub total	17.2
2/08/96	A	Health Dept.	paper, general rubbish	0.06
	B	NPF	paper	0.3
	B	-	general rubbish	0.3
	B	Rothmans	general rubbish	0.3
	B	-	grass	0.3
	B	-	paper, empty cans, general rubbish	0.3
	B	Peace Corps	general rubbish	0.3
	B	Chevrolet	wire, vegn, general rubbish	0.3
	B	-	general rubbish	0.3
	B	WSLAC	paper	0.3
	B	-	vegn, empty cans, general rubbish	0.3
	B	Tokelau	vegn	0.3
	C	Health Dept.	syringe, paper, general rubbish	0.62
	C	West End	general rubbish	0.62
	C	Ungle Johny	general rubbish	0.62
	C	-	sheet steel, old car wreck	0.98
	D	Eli	sewage	1.16
	D	Sala	sewage	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	Petelo Vaifou	general rubbish	1.16
	D	Vailima Brewery	yeast, empty bottles, paper	1.16
	D	RVMP	drycoconut flesh	1.16
	D	AGL	vegn, empty bottles, general rubbish	1.16
	D	Tino	vegn	1.16
	D	Malua	sewage	1.16
	Palau	Nuu Crop	sheet steel, general rubbish	
			Sub total	16.84
3/08/96	B	Fili	general rubbish	0.3
	B	Government	general rubbish	0.3

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - AUGUST 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	B	-	oga bananas ?	0.3
	B	Ene	paper, general rubbish	0.3
	B	Sui	leaves, paper, grass	0.3
	B	Sui	paper, vegn	0.3
	B	Seueu	general rubbish	0.3
	C	Health Dept.	general rubbish	0.62
	C	West End	vegn	0.62
	C	-	general rubbish	0.62
	D	Petelo	general rubbish	1.16
	D	PEPSI	empty bottles, plastic	1.16
	D	Sala	general rubbish	1.16
	D	AST	paper, vegn	1.16
	D	Sala	sewage	1.16
	D	Sikoa	cans, empty kalone?, metal	2.76
	D	AGL	coconut leaves, aulama?, general rubbish	1.16
			Sub total	13.68
4/08/96	D	Health Dept.	general rubbish	1.16
			Sub total	1.16
5/08/96	A	-	general rubbish	0.06
	A	Letin Kamakoa	grass, vegn, general rubbish	0.06
	A	TiaTia	empty cardboard boxes, general rubbish	0.06
	A	Government	paper	0.06
	B	-	general rubbish	0.3
	B	-	car, general rubbish	0.3
	B	Vailima Brewery	general rubbish	0.3
	B	Talai	grass	0.3
	B	-	dry coconut flesh	0.3
	B	Government	grass, leaves, vegn	0.3
	B	-	sheet steel, general rubbish	0.3
	B	Tokelau	grass, leaves, vegn	0.3
	B	Siu	vegn, general rubbish	0.3
	B	-	vegn, banana stems	0.3
	B	-	general rubbish	0.3
	B	-	sheet steel, empty cans, general rubbish	0.3
	C	Craigs	grass, vegn	0.62
	C	Health Dept.	syringes, general rubbish	0.62
	C	Tents for Hire	vegn, general rubbish	0.62
	C	Linn	cardboard boxes, general rubbish	0.62
	D	Leafu	general rubbish	1.16
	D	Sikoa	grass, empty boxes, general rubbish	1.16
	D	AGL	empty bottles, general rubbish	1.16
			Sub total	9.8
6/08/96	B	NPF	paper	0.3
	B	Bank	paper	0.3
	B	Government	general rubbish	0.3
	B	-	grass, vegn	0.3
	B	Faasoo	bananas, general rubbish	0.3
	C	Health Dept.	general rubbish	0.62
	C	Tony Hill	sheet steel, empty cans	0.98
	C	MI	aulama?, general rubbish	0.62
	C	Mcdonald	general rubbish	0.62
	C	Linn	freezer	0.62
	D	Petelo	general rubbish	1.16
	D	Vailima Brewery	yeast, empty bottles	1.16

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - AUGUST 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	D	Iron Steel	sheet steel, paper, general rubbish	2.76
	D	Vaifou	general rubbish	1.16
	D	Public Works Dept.	sewage	1.16
	D	Tino	vegn, general rubbish	1.16
	D	West End	general rubbish	1.16
	D	Eli	sewage	1.16
	D	AGL	vegn, empty bottles, general rubbish	1.16
			Sub total	17
7/08/96	B	Siu	general rubbish	0.3
	B	Tumama	grass, leaves, vegn, general rubbish	0.3
	B	NPF	paper	0.3
	B	-	general rubbish	0.3
	B	-	general rubbish	0.3
	B	Government	general rubbish	0.3
	B	FAO	empty cans, sheet steel	0.3
	B	FAO	sheet steel, empty bottles, grass	0.3
	B	WSLAC	paper	0.3
	B	Faasoo	grass, vegn	0.3
	B	-	general rubbish	0.3
	B	Tokelau	empty cans, cardboard boxes, general rubbish	0.3
	B	-	dry coconut flesh, vegn, general rubbish	0.3
	C	Health Dept.	general rubbish	0.62
	C	Lin	empty boxes, general rubbish	0.62
	D	Eli	sewage	1.16
	D	Public Works Dept.	sewage	1.16
	D	Sala	sewage	1.16
	D	Petelo	general rubbish	1.16
	D	Malua	sewage	1.16
	D	Vaifou	general rubbish	1.16
	D	West End	general rubbish	1.16
	D	AGL	vegn, empty bottles, general rubbish	1.16
			Sub total	14.42
8/08/96	A	CCK	general rubbish	0.06
	B	NPF	paper	0.3
	B	GMA	grass	0.3
	B	FAO	sheet steel, metal	0.3
	B	Siaoi	vegn	0.3
	B	-	empty cans, general rubbish	0.3
	B	Toni	general rubbish	0.3
	B	Sikui	empty cans, sheet steel, general rubbish	0.3
	C	Health Dept.	general rubbish	0.62
	D	Petelo	general rubbish	1.16
	D	Sala	empty cans, general rubbish	1.16
	D	Toni	paper, empty cans	1.16
	D	Lino	paper, general rubbish	1.16
	D	Manu	paper, general rubbish	1.16
	D	Tino	vegn	1.16
	D	AGL	empty bottles, general rubbish	1.16
	D	Sala	sewage	1.16
	D	West End	general rubbish	1.16
			Sub total	13.22
9/08/96	B	NPF	paper	0.3
	B	Siaosi	grass, vegn	0.3
	B	-	general rubbish	0.3

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - AUGUST 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	B	Toni	paper	0.3
	B	-	general rubbish	0.3
	C	Health Dept.	general rubbish	0.62
	C	Lin	empty cardboard boxes	0.62
	D	Vailima Brewery	dry coconut flesh, vegn	1.16
	D	Sala	general rubbish	1.16
	D	Petelo	bananas, general rubbish	1.16
	D	Public Works Dept.	sewage	1.16
	D	Sala	sewage	1.16
	D	Tino	vegn, general rubbish	1.16
	D	CCWS	general rubbish	1.16
	D	AGL	coconut leaves, paper, general rubbish	1.16
	D	West End	general rubbish	1.16
	Palau	Nuu Crop	empty cans, general rubbish	
			Sub total	13.18
10/08/96	-	MC	paper	
	A	-	grass, vegn	0.06
	A	Government	general rubbish	0.06
	B	Slaosi	general rubbish	0.3
	B	Sio	general rubbish, empty cans	0.3
	B	-	general rubbish	0.3
	B	-	general rubbish	0.3
	B	-	sheet steel, wire, paper	0.3
	B	-	cardboard boxes, wire, general rubbish	0.3
	B	-	sheet steel, wire, general rubbish	0.3
	B	Siu	-	0.3
	C	MI	coconut leaves, empty cans	0.62
	C	Health Dept.	paper	0.62
	D	Eti	sewage	1.16
	D	Petelo	bananas, general rubbish	1.16
	D	West End	general rubbish	1.16
	D	Sala	general rubbish	1.16
	D	AGL	empty bottles, general rubbish	1.16
			Sub total	9.56
11/08/96	C	Health Dept.	general rubbish	0.62
	D	Vaifou	general rubbish	1.16
			Sub total	1.78
12/08/96	B	Siu	grass, vegn, paper	0.3
	B	Npf	paper	0.3
	B	Vailima Brewery	general rubbish	0.3
	B	-	old car wreck, sheet steel	0.3
	B	Wesley Bookshop	paper	0.3
	B	Bank	paper	0.3
	C	Lin	empty cardboard boxes, general rubbish	0.62
	D	Public Works Dept.	sewage	1.16
	D	Petelo	general rubbish	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	West End	coconut leaves, general rubbish	1.16
	D	Leafu	general rubbish	1.16
	D	Eti	sewage	1.16
	D	-	empty cans, sheet steel, general rubbish	2.76
	D	AGL	vegn, empty bottles, general rubbish	1.16
	D	Tino	leaves, paper	1.16
			Sub total	14.46

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - AUGUST 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
13/08/96	B	NPF	paper	0.3
	B	Fale	general rubbish	0.3
	B	Talo	old car wreck, sheet steel	0.3
	B	Talai	grass, leaves	0.3
	C	Donbosco	coconut leaves, tane apa?	0.62
	C	Health Dept.	general rubbish	0.62
	C	Shipping Co operation	tusi lisiti ?	0.62
	D	STP (oil factory?)	dry coconut flesh	1.16
	D	Petelo	general rubbish	1.16
	D	Vailima Brewery	empty cans, empty bottles, general rubbish	1.16
	D	Leafu	general rubbish	1.16
	D	AGL	bottles general rubbish	1.16
	D	West End	ousa boxes ?, sheet steel, metal	2.76
	D	Sala valfou	paper, general rubbish	1.16
			Sub total	12.78
14/08/96	B	NPF	paper	0.3
	B	Siu	grass, leaves, paper	0.3
	B	Tumama	grass, paper, general rubbish	0.3
	B	?	metal	0.3
	D	STP (oil factory?)	dry coconut flesh	1.16
	D	Public Works Dept.	sewage	1.16
	D	Siaosi	sewage	1.16
	D	Eki	sewage	1.16
	D	.	metal	2.76
	D	Toni	dry coconut flesh	1.16
			Sub total	9.76

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - OCTOBER 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
1/10/96	B	Kepa	banana leaves, general rubbish	0.3
	B	NPF	paper	0.3
	B	Health Dept.	general rubbish	0.3
	B	-	general rubbish	0.3
	B	-	empty cans, sheet steel, wire	0.3
	B	Government	general rubbish	0.3
	B	-	general rubbish	0.3
	B	-	paper, general rubbish	0.3
	C	Taupulego	general rubbish	0.62
	C	Craig	vegn	0.62
	D	Tino	vegn, coconut leaves, paper, general rubbish	1.16
	D	Sala Vaifou	paper, general rubbish	1.16
	D	Vailima Brewery	empty bottles, paper, yeast	1.16
	D	Malaculu	general rubbish	1.16
	D	Public Works Dept.	sewage	1.16
	D	Malua	sewage	1.16
	D	STP (Oil Factory ?)	paper, dry coconut flesh	1.16
			Sub total	11.76
2/10/96	A	Post Office	paper	0.06
	B	Siu	vegn, general rubbish	0.3
	B	Siu	paper, vegn, general rubbish	0.3
	B	NPF	paper	0.3
	B	-	empty cans, sheet steel, wire, general rubbish	0.3
	B	-	vegn, empty cans, general rubbish	0.3
	B	Bank Government	paper	0.3
	B	-	old car wreck	0.3
	B	WSLAC	paper	0.3
	B	-	banana stems, manioka?	0.3
	C	-	wire, empty ? (atigi ogauau)	0.62
	C	Health Dept.	general rubbish	0.62
	C	LDS	vegn, general rubbish	0.62
	D	Sala Vaifou	paper, general rubbish	1.16
	D	Public Works Dept.	sewage	1.16
	D	Government	empty cans, general rubbish	1.16
	D	West End	paper, general rubbish	1.16
	D	Tino	general rubbish	1.16
	D	Malaculu	general rubbish	1.16
	D	-	bananas	1.16
			Sub total	12.74
3/10/96	B	NPF	paper	0.3
	B	EPC	paper, general rubbish	0.3
	B	-	TV, combiuter ?, metal, piece of palpa?	0.3
	B	-	sheet steel, metal, mafa?	0.3
	C	Health Dept.	general rubbish	0.62
	D	Sala Vaifou	general rubbish	1.16
	D	Leafu	empty bottles, general rubbish	1.16
	D	Public Works Dept.	sewage	1.16
	D	Malaculu	general rubbish	1.16
	D	Public Works Dept.	vegn	1.16
	D	-	vegn	1.16
	D	Tino	vegn, general rubbish	1.16
	D	Alecana	paper, general rubbish	1.16
	D	STP (Oil factory ?)	dry coconut flesh	1.16
D	Faasoo Pali	metal, old car wreck	1.16	

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - OCTOBER 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
			Sub total	13.42
4/10/96	B	NPF	paper	0.3
	B	-	general rubbish	0.3
	B	-	general rubbish	0.3
	B	LSE	paper, empty bottles, general rubbish	0.3
	B	YMCA	aulama?	0.3
	B	Falai	grass, leaves, general rubbish	0.3
	B	-	paper	0.3
	B	Toulal	paper, general rubbish	0.3
	B	Petaco	paper, general rubbish	0.3
	B	WSLAC	paper	0.3
	C	Health Dept.	syringes, general rubbish	0.62
	C	Craig Const.	sheet steel, metal, wire	0.98
	C	Mc donald	general rubbish	0.62
	C	Lin	empty boxes, general rubbish	0.62
	C	-	paper, general rubbish	0.62
	D	Malaculu Vaifou	general rubbish	1.16
	D	Vailima Brewery	empty bottles, paper, yeast	1.16
	D	Public Works Dept.	-	1.16
	D	West End	general rubbish	1.16
	D	Eki	sewage	1.16
	D	-	paper, general rubbish	1.16
	D	Mao	leaves, bananas	1.16
	D	Tino	vegn, general rubbish	1.16
	D	Solomen Vaifou	general rubbish	1.16
	D	Petelo	bananas, vegn, general rubbish	1.16
	Palau	Natanua FAO	metal	
	Palau	Nuu Crop	general rubbish	
			Sub total	18.06
5/10/96	A	GSI	paper, general rubbish	0.06
	A	Saleilvi ?	empty cans, sheet steel	0.06
	B	Kiki	empty cans, general rubbish	0.3
	B	-	empty bottles, general rubbish	0.3
	B	-	general rubbish	0.3
	B	-	general rubbish	0.3
	B	Wesley Bookshop	empty boxes, paper	0.3
	B	-	general rubbish	0.3
	B	EPC Government	general rubbish	0.3
	B	Vailima Brewery	empty cans, general rubbish	0.3
	B	Tumama	general rubbish	0.3
	B	Siu	general rubbish	0.3
	B	-	empty cans, general rubbish	0.3
	C	Health Dept	general rubbish	0.62
	C	Health Dept.	syringes, general rubbish	0.62
	D	Public Works Dept.	sewage	1.16
	D	AST	-	1.16
	D	Faasoo Pati	taga? bananas , general rubbish	1.16
	D	Malaculu	general rubbish	1.16
	D	Eki	sewage	1.16
	D	West End	general rubbish	1.16
	D	-	TV, Masini Combiuter?	1.16
	D	Sala Vaifou	general rubbish	1.16
			Sub total	13.94
7/10/96	A	GSI	paper	0.06

JICA SAMOA WASTE MANAGEMENT PROJECT
VEHICLE REGISTER - OCTOBER 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	B	Tumama	grass, paper, leaves	0.3
	B	NPF	paper	0.3
	B	-	vegn, sheet steel, general rubbish	0.3
	B	-	empty bottles, empty cans	0.3
	C	Health Dept.	general rubbish	0.62
	C	Dabozco?	aulama?, empty cans	0.62
	C	-	empty cans, empty bottles, sheet steel	0.62
	C	Lin	empty cardboard boxes, general rubbish	0.62
	D	Sala Vaifou	paper, general rubbish	1.16
	D	-	vegn	1.16
	D	Leafu	general rubbish	1.16
	D	Malaculu	general rubbish	1.16
	D	-	vegn, metal	1.16
	D	Sala	sewage	1.16
	D	Eki	sewage	1.16
	D	West End Waste End	general rubbish	1.16
	D	Tino	grass, vegn, paper	1.16
	D	Aiki	paper, general rubbish	1.16
	Palau	-	empty cans, empty bottles	
			Sub total	15.34
8/10/96	A	Sita	general rubbish	0.06
	B	NPF	paper	0.3
	B	-	mata?, sheet steel, metal	0.3
	B	Tuamuli	paper	0.3
	B	-	metal general rubbish	0.3
	B	-	paper	0.3
	C	Health Dept.	syringes, general rubbish	0.62
	D	Sala Vaifou	general rubbish	1.16
	D	Vaillma Brewery	cardboard box, empty bottles	1.16
	D	Malaculu Vaifou	general rubbish	1.16
	D	Uii	coconut leaves, vegn	1.16
	D	West End	general rubbish	1.16
	D	Palota	vegn	1.16
	D	Public Works Dept.	sewage	1.16
	D	Public Works Dept.	Eleai?	1.16
	D	Tino		1.16
			Sub total	12.62
9/10/96	A	-	vegn, general rubbish	0.06
	B	Siu	paper, grass	0.3
	B	Siu	general rubbish	0.3
	B	NPF	paper	0.3
	B	-	paper, general rubbish	0.3
	B	-	-	0.3
	B	WSLAC	paper	0.3
	C	Health Dept.	syringes, general rubbish	0.62
	C	Puloga?	vegn, general rubbish	0.62
	C	Lin	paper, general rubbish	0.62
	D	Sala Vaifou	paper, general rubbish	1.16
	D	Sala	sewage	1.16
	D	Malaculu Vaifou	general rubbish	1.16
	D	Malua	sewage	1.16
	D	Public Works Dept.	sewage	1.16
			Sub total	9.52
10/10/96	A	CCK	general rubbish	0.06

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - OCTOBER 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	B	NPF	paper	0.3
	B	Toelau	empty bottles, general rubbish	0.3
	C	Health Dept.	general rubbish	0.62
	D	Public Works Dept.	sewage	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	Malaculu	general rubbish	1.16
	D	Leafu	general rubbish	1.16
			Sub total	5.92
11/10/96	A	-	paper, general rubbish	0.06
	B	Faletolu	paper	0.3
	B	ISE	metal, empty cans	0.3
	B	Toketan	grass	0.3
	B	ACB	paper	0.3
	C	-	paper, general rubbish	0.62
	C	-	paper	0.62
	D	Tino	paper, general rubbish	1.16
	D	-	paper	1.16
	D	Sala Vaifou	paper, general rubbish	1.16
	D	Malacula	general rubbish	1.16
	D	Public Works Dept.	sewage	1.16
	D	West End	paper, general rubbish	1.16
	D	Eti	sewage	1.16
	D	Tino	general rubbish	1.16
	D	Health Dept.	general rubbish	1.16
	D	Vaillima Brewery	empty bottles	1.16
	D	West End	general rubbish	1.16
	Palau	Nuu Crop	general rubbish	
			Sub total	15.26
12/10/96	A	SGI	paper, general rubbish	0.06
	A	Government	paper	0.06
	B	-	general rubbish	0.3
	B	-	vegn, empty cans, general rubbish	0.3
	B	Siu	grass, vegn	0.3
	B	Siu	general rubbish	0.3
	B	-	empty cans, general rubbish	0.3
	B	-	empty cans	0.3
	C	Health Dept.	general rubbish	0.62
	C	Mcdonald	paper, general rubbish	0.62
	C	Craig's Compound	vegn	0.62
	C	Jehovah Witnesses T	aulama?, general rubbish	0.62
	C	Lin	cardboard boxes	0.62
	C	Sikoa	cardboard boxes	0.62
	D	SWP	sewage	1.16
	D	STP (Oil factory?)	dry coconut flesh	1.16
	D	Sala Vaifou	paper, general rubbish	1.16
	D	AST	sheet steel, leaves, general rubbish	1.16
	D	PEPSI	plastic bottles	1.16
	D	Sala	sewage	1.16
			Sub total	12.6
13/10/96	C	Health Dept.	general rubbish	0.62
			Sub total	0.62
14/10/96	B	-	empty cans, general rubbish	0.3
	B	Sikoa	empty cans, sheet steel, general rubbish	0.3
	B	-	sheet steel, metal	0.3

JICA SAMOA WASTE MANAGEMENT PROJECT
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Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	B	-	empty cans, grass	0.3
	D	Malaculu	paper, general rubbish	1.16
	D	Leafu	general rubbish	1.16
			Sub total	3.52
15/10/96	A	GSI	cardboard boxes	0.06
	B	NPF	paper	0.3
	B	Siu	paper, general rubbish	0.3
	B	-	paper	0.3
	B	Government	vegn	0.3
	C	-	empty cans, general rubbish	0.62
	C	Sita	paper, general rubbish	0.62
	C	Health Dept.	paper, syringes	0.62
	C	Lin	paper, general rubbish	0.62
	D	Leafu	general rubbish	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	Aiki	paper, general rubbish	1.16
	D	Public Works Dept.	sewage	1.16
	D	West End	general rubbish	1.16
	D	Malaculu Vaifou	general rubbish	1.16
			Sub total	10.7
16/10/96	A	CCK	general rubbish	0.06
	B	NPF	paper, general rubbish	0.3
	B	Government	general rubbish	0.3
	B	-	vegn	0.3
	B	WSLAC	paper	0.3
	C	Health Dept.	vegn, sheet steel	0.62
	C	Health Dept.	general rubbish	0.62
	C	-	pau seevae ? (?skins)	0.62
	D	Public Works Dept.	sewage	1.16
	D	Iron Steel	glass, leaves, general rubbish	1.16
	D	Sala Vaifou	paper, general rubbish	1.16
	D	Malaculu Vaifou	paper, general rubbish	1.16
	D	Pulega	aulama ?	1.16
			Sub total	8.92
17/10/96	B	Sui	general rubbish	0.3
	B	Sui	general rubbish	0.3
	B	NPF	paper	0.3
	B	Rothmans	paper, general rubbish	0.3
	C	-	paper, general rubbish	0.62
	D	Public Works Dept.	sewage	1.16
	D	-	vegn	1.16
	D	E Sagala	grass, vegn	1.16
	D	Health Dept.	syringes, general rubbish	1.16
	D	Sala Vaifou	paper, general rubbish	1.16
	D	Malaculu Vaifou	general rubbish	1.16
	D	Leafu Vaifou	general rubbish	1.16
	D	West End	paper, general rubbish	1.16
			Sub total	11.1
18/10/96	B	NPF	paper	0.3
	B	-	paper, general rubbish	0.3
	B	Sio	metal	0.3
	B	-	paper, general rubbish	0.3
	B	Tala	metal, paper, general rubbish	0.3
	B	-	paper, general rubbish	0.3

JICA SAMOA WASTE MANAGEMENT PROJECT
VEHICLE REGISTER - OCTOBER 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	B	WSLAC	paper	0.3
	C	Health Dept.	syringes, general rubbish	0.62
	C	Tilali ?	vegn, general rubbish	0.62
	C	-	paper, general rubbish	0.62
	D	Public Works Dept.	sewage	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	Vailima Brewery	cardboard boxes, empty bottles	1.16
	D	Mcdonald	paper, general rubbish	1.16
	D	Leafu	general rubbish	1.16
	D	Malaculu	general rubbish	1.16
	D	West End	paper, general rubbish	1.16
	D	Tino	paper, general rubbish	1.16
	D	-	sewage	1.16
	Palau	Nuu Crop	general rubbish	
			Sub total	14.4
19/10/96	B	-	general rubbish	0.3
	B	Suluei ?	empty cans, general rubbish	0.3
	B	-	general rubbish	0.3
	C	Health Dept.	general rubbish	0.62
	D	Public Works Dept.	sewage	1.16
	D	STP (Oil factory ?)	dry coconut flesh	1.16
	D	Vaifou	general rubbish	1.16
	D	Vaifou	paper, general rubbish	1.16
	D	Malau	sewage	1.16
	D	West End	general rubbish	1.16
	D	Eki	sewage	1.16
			Sub total	9.64
20/10/96	B	Health Dept.	general rubbish	0.3
			Sub total	0.3
21/10/96	B	NPF	paper	0.3
	B	Sui	grass, general rubbish	0.3
	B	Ligdiga ?	piece of (li) ?, general rubbish	0.3
	B	Faasoo Pali	bananas, general rubbish	0.3
	B	Vailima Brewery	paper, general rubbish	0.3
	B	-	empty cans, empty bottles, sheet steel	0.3
	C	Mcdonald	paper, general rubbish	0.62
	C	Health dept.	paper, general rubbish	0.62
	D	Sala	sewage	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	Eli	sewage	1.16
	D	Malua	sewage	1.16
	D	Malaculu Vaifou	paper, general rubbish	1.16
	D	Leafu Vaifou	general rubbish	1.16
	D	Henna	general rubbish	1.16
			Sub total	11.16
22/10/96	B	-	teulla?, general rubbish	0.3
	B	NPF	paper	0.3
	B	-	paper	0.3
	B	-	coconut leaves, paper, general rubbish	0.3
	B	-	general rubbish	0.3
	B	Fale tupe	paper	0.3
	B	Toelau	paper, general rubbish	0.3
	B	-	metal, paper, general rubbish	0.3
	B	Government	general rubbish	0.3

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - OCTOBER 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	C	Health Dept.	syringes, paper, general rubbish	0.62
	C	Pulega	aulama?, general rubbish, Pulupopo?	0.62
	C	-	vegn, general rubbish	0.62
	C	Lin	paper, general rubbish	0.62
	D	Public Works Dept.	sewage	1.16
	D	Sala	sewage	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	Vailima	empty bottles, paper	1.16
	D	Tino	paper, general rubbish	1.16
	D	Malaculu Vaifou	general rubbish	1.16
	D	West End	paper, general rubbish	1.16
	D	Leafu Vaifou	general rubbish	1.16
			Sub total	14.46
23/10/96	A	-	paper, general rubbish	0.06
	B	Sui	paper, general rubbish	0.3
	B	Sui	vegn, general rubbish	0.3
	B	NPF	paper, general rubbish	0.3
	B	-	banana leaves, paper, general rubbish	0.3
	B	-	general rubbish	0.3
	B	WSLAC	paper	0.3
	C	Jehovah Witnesses	aulama?, vegn, general rubbish	0.62
	C	-	old car wreck	0.62
	D	Public Works Dept.	sewage	1.16
	D	Ailiki	vegn, general rubbish	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	Malaculu	general rubbish	1.16
	D	Eil	sewage	1.16
	D	STP (Oil Factory?)	dry coconut flesh	1.16
	D	West End	general rubbish	1.16
			Sub total	11.22
24/10/96	B	-	general rubbish	0.3
	B	NPF	paper	0.3
	B	-	general rubbish	0.3
	B	Faasoo Pati	bananas, general rubbish	0.3
	B	Rothmans	coconut leaves, aulama?, general rubbish	0.3
	B	Faatoaga	paper, general rubbish	0.3
	B	-	paper, general rubbish	0.3
	B	Toelau	paper, vegn	0.3
	B	Peka	vegn, general rubbish	0.3
	B	-	metal, general rubbish	0.3
	B	-	paper, general rubbish	0.3
	B	Government	general rubbish	0.3
	C	Health Dept.	paper, syringes, general rubbish	0.62
	C	Sio	apu?	0.62
	C	Sefo	vegn, general rubbish	0.62
	C	Fitu	paper, metal	0.62
	C	Lin	paper, general rubbish	0.62
	D	Public Works Dept.	sewage	1.16
	D	-	metal	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	West End	paper, general rubbish	1.16
	D	Leafu Vaifou	general rubbish	1.16
	D	ACF	metal	1.16
	D	Malaculu	general rubbish	1.16

JICA SAMOA WASTE MANAGEMENT PROJECT
VEHICLE REGISTER - OCTOBER 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	D	SPT (oil factory?)	dry coconut flesh	1.16
	D	SPT (oil factory?)	dry coconut flesh	1.16
			Sub total	17.14
25/10/96	B	-	general rubbish	0.3
	B	Vailima	paper, general rubbish	0.3
	B	WSLAC	paper	0.3
	B	Tifaga	empty bottles, empty cans	0.3
	C	Pati	paper, general rubbish	0.62
	C	Pita	vegn, general rubbish	0.62
	C	Sefo	paper, general rubbish	0.62
	C	Health Dept	general rubbish	0.62
	D	Public Works Dept.	sewage	1.16
	D	SPT (oil factory?)	dry coconut flesh	1.16
	D	Vailima	paper, empty bottles	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	Public Works Dept.	vegn, general rubbish	1.16
	D	Malaculu Vaifou	general rubbish	1.16
	D	West End	general rubbish	1.16
	D	Malua	sewage	1.16
	D	Sala	sewage	1.16
	Palau	Nuu Crop	paper, vegn, general rubbish	
			Sub total	14.12
26/10/96	B	-	paper, general rubbish	0.3
	B	-	paper	0.3
	B	-	general rubbish	0.3
	B	Sio	general rubbish	0.3
	B	Sui	coconut leaves, general rubbish	0.3
	B	Sui	general rubbish	0.3
	C	Health Dept	syringes, general rubbish	0.62
	C	Sefo	paper, general rubbish	0.62
	C	Pulega	vegn, general rubbish	0.62
	C	Mcdonald	paper, general rubbish	0.62
	C	Falemoa	general rubbish	0.62
	D	Public Works Dept.	sewage	1.16
	D	PEPSI	paper, bottles	1.16
	D	Eli	sewage	1.16
	D	Sala Vaifou	paper, general rubbish	1.16
	D	Sala	sewage	1.16
	D	Malaculu Vaifou	general rubbish	1.16
	D	West End	paper, general rubbish	1.16
	D	West End	coconut leaves, paper, general rubbish	1.16
	D	-	empty cans, general rubbish	1.16
			Sub total	15.34
27/10/96	C	Health Dept.	syringes, general rubbish	0.62
			Sub total	0.62
28/10/96	A	-	paper, ulu leaves	0.06
	A	CCK	paper, metal	0.06
	B	Sui	paper, general rubbish	0.3
	B	Sui	coconut leaves, vegn	0.3
	B	NPF	paper	0.3
	B	Vailima Brewery	general rubbish	0.3
	B	Fale tupe	paper	0.3
	B	-	paper, general rubbish	0.3
	B	-	paper, metal, empty cans	0.3

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - OCTOBER 1996

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	B	Sau?	empty cans, empty bottles, general rubbish	0.3
	B	NPF	paper	0.3
	B	-	metal general rubbish	0.3
	C	-	metal, general rubbish	0.62
	C	Health Dept	syringes, general rubbish	0.62
	C	Lin	paper, general rubbish	0.62
	C	Ungle Johny	grass, general rubbish	0.62
	C	Pulega	vegn, coconut leaves, general rubbish	0.62
	C	Macdonald	paper	0.62
	C	Health Dept.	syringes, general rubbish	0.62
	D	Sala Vaifou	general rubbish	1.16
	D	Malaculu Vaifou	general rubbish	1.16
	D	Leafu Vaifou	paper, general rubbish	1.16
	D	Sala	sewage	1.16
	D	Tino	general rubbish	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	Vailima Brewery	paper, empty bottles	1.16
	D	West End	paper, general rubbish	1.16
			Sub total	16.74
29/10/96	B	-	paper, metal	0.3
	C	-	empty cans, general rubbish	0.62
	C	Samulu?	paper	0.62
	C	-	vegn, general rubbish	0.62
	D	Malaculu Vaifou	paper, general rubbish	1.16
	D	Public Works Dept.	sewage	1.16
	D	Tino	vegn, paper, general rubbish	1.16
	D	West End	pau?general rubbish, metal	1.16
	D	Toni	paper, general rubbish	1.16
			Sub total	7.96
30/10/96	B	Sui	vegn, paper, general rubbish	0.3
	B	Sui	grass, vegn, general rubbish	0.3
	B	NPF	paper	0.3
	B	WSLAC	paper	0.3
	B	-	paper	0.3
	B	-	paper, general rubbish	0.3
	B	Linga	paper, general rubbish	0.3
	C	Health Dept.	paper, syringes, general rubbish	0.62
	C	-	grass, general rubbish	0.62
	D	Malaculu Vaifou	paper, general rubbish	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	Malua	sewage	1.16
	D	Public Works Dept.	sewage	1.16
	D	West End	general rubbish	1.16
	D	Public Works Dept.	grass	1.16
	D	Health Dept.	syringes, general rubbish	1.16
	D	SPT (oil factory?)	dry coconut flesh	1.16
	D	Public Works Dept.	sewage	1.16
	D	Sala Vaifou	general rubbish	1.16
	D	Vailima Brewery	paper, empty bottles	1.16
			Sub total	16.1

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - DECEMBER 1996/JANUARY 1997

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
15/12/96	D	Sala Vaifou	general rubbish	1.16
	C	Petelo	syringes, general rubbish	0.62
			Sub total	1.78
16/12/96	B	Siu	paper, vegn, bananas, general rubbish	0.3
	B	NPF	paper, vegn, sheet steel, food, general rubbish	0.3
	D	Public Works Dept.	sewage	1.16
	D	Fatu Vaifou	sewage	1.16
	B	Vailima	paper	0.3
	B	-	sheet steel, wire	0.3
	D	Government	vegn, stones/rocks, soil	1.16
			paper, vegn, bananas, food, syringes, chemicals, general rubbish	0.62
	C	Health Dept.		0.62
	C	-	paper, vegn, metal, general rubbish	0.62
	D	West End	paper, vegn, wire, general rubbish	1.16
	B	Fale tupe	paper, vegn, general rubbish	0.3
	D	Hino Vaifou	paper, grass, wire, general rubbish	1.16
			glass, empty bottles, paper, grass, metal, bananas, general rubbish	1.16
	D	Sala Vaifou		1.16
	D	Saliva	paper, grass, metal, general rubbish	1.16
	B	-	wire, paper, general rubbish	0.3
	D	Vaifou	paper, sheet steel, bananas, general rubbish	1.16
	A	CCK	paper, vegn, sheet steel, wire, general rubbish	0.06
			paper, vegn, sheet steel, bananas, pawpaw, general rubbish	1.16
	D	Tino		1.16
	D	Public Works Dept.	sheet steel, metal, general rubbish	1.16
			empty bottles, paper, vegn, wire, metal, general rubbish	1.16
	D	AGL		1.16
	B	Oltosheet	paper, general rubbish	0.3
	B	-	sheet steel, paper, general rubbish	0.3
	B	-	grass	0.3
D	West End	paper, plastic, general rubbish	1.16	
B	-	vegn, general rubbish	0.3	
		Sub total	18.22	
17/12/96	D	Public Works Dept.	sewage	1.16
	D	STP (Oil Factory?)	dry coconut flesh	1.16
	B	Tolofa	sheet steel, wire, metal, general rubbish	0.3
	B	NPF	wire, metal, vegn, paper, general rubbish	0.3
			wire, sheet steel, grass, paper, empty bottles, general rubbish	0.3
	B	Sio		0.3
	C	Palaga		0.62
	C	McDonald	vegn, paper, general rubbish	0.62
	C	Health dept.	vegn, paper, food, syringes, general rubbish	0.62
	D	Vailima brewery	glass, empty bottles, paper, general waste	1.16
	D	Sala Vaifou	vegn, sheet steel, paper, general rubbish	1.16
			empty bottles, grass, wire, metal, general rubbish	0.3
	B	Seto		0.3
	D	West End	grass, vegn, wire, general rubbish	1.16
	B	-	grass, wire, general rubbish	0.3
	D	Tino	paper, vegn, wire, pawpaw, general rubbish	1.16
	B	Sale	paper, vegn, general rubbish	0.3
	B	Iosefa	paper, general rubbish	0.3
		paper, vegn, wire, pawpaw, general rubbish	0.3	
D	Malaulu Vaifou	paper, vegn, wire, food, general rubbish	1.16	
B	Ese Son	food, paper, general rubbish	0.3	

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - DECEMBER 1996/JANUARY 1997

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	D	AGL	paper, grass, vegn, metal, bananas, pawpaw, food, general rubbish	1.16
			Sub total	13.84
18/12/96	D	Public Works Dept.	sewage	1.16
	B	Siu	paper, grass, vegn, wire, general rubbish	0.3
	B	Siu	paper, vegn, bananas, food, general rubbish	0.3
	D	SPT (Oil Factory ?)	dry coconut flesh	1.16
	B	NPF	paper, grass, bananas, general rubbish	0.3
	D	Sala Vaifou	paper, wire, bananas, general rubbish	1.16
	D	Malaulu Vaifou	paper, vegn, sheet steel, bananas, general rubbish	1.16
	C	Health Dept.	paper, bananas, food, syringes, chemicals, general rubbish	0.62
	B	Mareta	paper, metal, pawpaw syringes, general rubbish	0.3
	B	Sio	paper, sheet steel, general rubbish	0.3
	B	##	paper, vegn, wire, metal, bananas, soil, brewery yeast, general rubbish	0.3
	B	-	paper, vegn, wire, metal, general rubbish	0.3
	D	Eli	sewage	1.16
	D	AGL	grass, vegn, bananas, pawpaw, food, general rubbish	1.16
	C	-	sheet steel, metal	0.62
	C	Ranny	paper, general rubbish	0.62
			Sub total	10.92
19/12/96	D	Public Works Dept.	sewage	1.16
	B	NPF	paper, vegn, food, general rubbish	0.3
	D	Vaifou	sewage	1.16
	B	-	paper, vegn, general rubbish	0.3
	D	Mona Vaifou	paper, grass, vegn, bananas, general rubbish	1.16
	B	Rothmans	paper, grass, wire, general rubbish	0.3
	D	Sala Vaifou	-	1.16
	D	West End	paper, grass, vegn, metal, general rubbish	1.16
	D	Eli	sewage	1.16
	C	-	paper, grass, wire, general rubbish	0.62
	D	Hino Vaifou	paper, grass, vegn, metal, pawpaw, food, general rubbish	1.16
	C	Greatif ?	dry coconut flesh	0.62
	B	-	paper	0.3
	B	-	wire	0.3
	D	Aggie Gren	paper, vegn, food	1.16
	C	HD	paper, food	0.62
	-	Waste Co	paper, grass, dry coconut flesh	
			Sub total	12.64
20/12/96	B	Sela	grass, paper, empty bottles	0.3
	D	Public Works Dept.	sewage	1.16
	C	Health Dept.	paper, pawpaw, food, general rubbish	0.62
	D	Vailima Brewery	empty bottles, paper, wire, metal	1.16
	D	Sala Vaifou	paper, grass, vegn, general rubbish	1.16
	D	Mona Vaifou	paper, grass, wire, metal, general rubbish	1.16
	B	NPF	paper, grass, vegn, bananas, pawpaw, general rubbish	0.3
	B	SioSiomaga	paper, empty bottles, vegn, general rubbish	0.3
	Palau ?	Nuu Crop	paper, vegn, wire, general rubbish	
	B	McDonald	paper, empty bottles, general rubbish	0.3

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - DECEMBER 1996/JANUARY 1997

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	B	-	paper, syringes	0.3
	C	Lin	paper, vegn, metal, bananas, general rubbish	0.62
	D	SPT (Oil Factory ?)	dry coconut flesh	1.16
	C	-	paper, sheet steel, wire, metal, general rubbish	0.62
	C	Palega	paper, vegn, metal, general rubbish	0.62
			Sub total	9.78
21/12/96	D	Public Works Dept.	sewage	1.16
	B	Sila	paper, vegn, metal, general rubbish	0.3
	D	Eti	sewage	1.16
	B	Health Dept.	paper, pawpaw, syringes, chemicals, general rubbish	0.3
	B	-	paper, sheet steel, wire, metal, bananas	0.3
	B	-	general rubbish	0.3
	B	-	general rubbish	0.3
	B	-	paper, metal, bananas, general rubbish	0.3
	B	Fale tupe	-	0.3
	D	Sala Vaifou	paper, vegn, wire, general rubbish	1.16
	B	Esi	paper, vegn, food, general rubbish	0.3
	D	West End	paper, grass, vegn, metal, general rubbish	1.16
	B	Siu	paper, grass, vegn, general rubbish	0.3
	B	Siu	paper, vegn, wire, general rubbish	0.3
	A	-	plastic, paper, general rubbish	0.06
			Sub total	7.7
22/12/96	D	Sala Vaifou	paper, vegn, bananas, general rubbish	1.16
	C	Health Dept	paper, vegn, food, syringes, chemicals, general rubbish	0.62
			Sub total	1.78
23/12/96	D	Public Works Dept.	sewage	1.16
	B	Siu	paper, grass, vegn, metal, general rubbish	0.3
	B	NPF	paper, general rubbish, grass, wire, food	0.3
	B	Patele	general rubbish	0.3
	C	-	paper, metal, dry coconut flesh	0.62
	D	Iron Steel	dry coconut flesh, paper, general rubbish	1.16
	Palau ?	Nuu Crop	paper, vegn, plastic	
	B	-	paper, general rubbish	0.3
	B	-	grass, vegn, general rubbish	0.3
	D	West End	sheet steel, metal, plastic, general rubbish	1.16
	D	Vaifou	sewage	1.16
	C	-	general rubbish	0.62
	B	-	general rubbish	0.3
	D	Malua	sewage	1.16
	B	-	paper, bananas, plastic, general rubbish	0.3
	D	Sala Vaifou	paper, plastic, bananas, general rubbish	1.16
	D	Fatu Vaifou	paper, bananas, pawpaw, plastic, general rubbish,	1.16
	D	Vaifou	bananas, plastic, general rubbish	1.16
	D	West End	sheet steel, wire, metal	1.16
	B	-	paper, metal, general rubbish	0.3
	C	-	paper, empty bottles, plastic	0.62
	B	-	vegn, plastic	0.3
	D	Tino	paper, grass, plastic	1.16
	D	Aiki	paper, sheet steel, plastic	1.16
	B	Teine	paper	0.3

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - DECEMBER 1996/JANUARY 1997

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	C	Health Dept.	paper, food, syringes, chemicals, general rubbish	0.62
			Sub total	18.24
24/12/96	D	Public Works Dept.	sewage	1.16
	D	West End	paper, sheet steel, food, plastic	1.16
	B	NPF	paper	0.3
	D	Vaifou	paper, bananas, plastic, general rubbish	1.16
	D	-	general rubbish	1.16
	B	Toyota	general rubbish	0.3
	D	-	paper, vegn	1.16
	D	Vailima Brewery	empty bottles, vegn, yeast, general rubbish	1.16
	C	Health Dept.	paper, chemicals, yeast, general rubbish	0.62
	C	West End	-	0.62
	B	Toelau	paper, grass, plastic, general rubbish	0.3
		GSI	paper	
	D	AGL	paper, general rubbish	1.16
			Sub total	10.26
25/12/96	C	Health Dept.	paper, plastic, general rubbish	0.62
	B	Ese's Son	paper, plastic, general rubbish	0.3
			Sub total	0.92
26/12/96	B	Francis	paper, plastic, general rubbish	0.3
	B	Faasoo Pati	bananas, plastic, general rubbish	0.3
	C	-	bananas, vegn, general rubbish	0.62
	B	Pati.M.	paper, grass, vegn, wire	0.3
	D	Vaifou	general rubbish	1.16
	D	-	paper, food, plastic, general rubbish	1.16
	D	Health Dept	general rubbish	1.16
	D	AGL	empty bottles, vegn, food, plastic, general rubbish	1.16
	D	Vaifou	paper, plastic, general rubbish	1.16
	A	Post Office	paper, plastic, general rubbish	0.06
	B	-	grass, vegn,	0.3
	C	-	general rubbish	0.62
	D	Vaifou	paper, plastic, general rubbish	1.16
	B	Runny	general rubbish	0.3
			Sub total	9.76
27/12/96	B	Siu	paper, grass, general rubbish	0.3
	B	Tumama	paper, grass, general rubbish	0.3
	A	-	paper, grass, wire, food, general rubbish	0.06
	B	NPF	paper, bananas, food, general rubbish	0.3
	D	Fatu Vaifou	paper, grass, wire, bananas, pawpaw, general rubbish	1.16
	C	GW	anlama???	0.62
	D	Vaifou	paper, bananas, plastic, general rubbish	1.16
	A	CSL	sheet steel, wire	0.06
	D	AGL	paper, vegn, food, plastic, general rubbish	1.16
	D	Public Works Dept.	sewage	1.16
	D	-	paper, vegn, wire, metal, general rubbish	1.16
	D	West End	paper, grass, sheet steel, wire, pawpaw, food, general rubbish	1.16
27/12/96	D	West End	paper, grass, sheet steel, metal, general rubbish	1.16
			Sub total	9.76
28/12/96	D	Public Works Dept.	sewage	1.16
	D	West End	paper, vegn, wire, metal, food, general rubbish	1.16

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - DECEMBER 1996/JANUARY 1997

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	C	-	paper, vegn, wire, metal, general rubbish	0.62
	C	-	grass, vegn, wire, general rubbish	0.62
	B	MacDonald	paper, metal, food, general rubbish	0.3
	D	West End	paper, grass, vegn, wire, bananas, general rubbish	1.16
	B	-	grass, general rubbish	0.3
	C	Health Dept.	paper, food, syringes, chemicals, general rubbish	0.62
	D	Fatu Vaifou	sheet steel, vegn, paper, general rubbish,	1.16
	D	Sala Vaifou	pawpaw, sheet steel, vegn, paper, general rubbish	1.16
	D	-	syringes, bananas, wire, vegn, paper, general rubbish	1.16
	C	Sila	wire, paper, general rubbish	0.62
	B	Sio	grass, general rubbish	0.3
	D	AGL	paper, vegn, wire, metal, food, general rubbish	1.16
			Sub total	11.5
30/12/96	D	Public Works Dept.	sewage	1.16
	B	Nuu Crop	paper, plastic, general rubbish	0.3
	B	NPF	paper	0.3
	B	Vailima Brewery	paper, general rubbish	0.3
	B	Jin Elley	sheet steel, general rubbish	0.3
	A	-	paper, plastic	0.06
	A	-	paper, wire	0.06
	B	Government	paper, vegn, plastic, general rubbish	0.3
	A	-	general rubbish	0.06
	A	-	sheet steel, metal	0.06
	C	Health Dept.	paper, vegn, pawpaw, food, syringes, chemicals, general rubbish	0.62
	D	Sala Vaifou	paper, grass, general rubbish	1.16
	D	Fatu Vaifou	paper, vegn, grass, bananas, pawpaw, food, general rubbish	1.16
	D	Leafu Vaifou	sewage	1.16
	D	West End	pawpaw, food, vegn, paper, general rubbish	1.16
	B	Fale Tupe	paper, general rubbish	0.3
	D	Vaifou	metal, paper, general rubbish, vegn	1.16
	B	-	grass, paper, general rubbish	0.3
	A	Timo CCK	vegn, paper, sheet steel, metal, general rubbish	0.06
	D	West End	vegn, paper, sheet steel, metal, general rubbish	1.16
	D	AGL	paper, vegn, general rubbish	1.16
	B	-	paper, vegn, general rubbish	0.3
	B	?	vegn, general rubbish	0.3
			Sub total	12.9
31/12/96	D	Public Works Dept.	sewage	1.16
	B	-	plastic, wire, sheet steel	0.3
	D	CSL	paper, plastic	1.16
	B	-	grass, vegn	0.3
	D	Vailima Brewery	plastic, yeast, paper, empty bottles	1.16
	B	-	grass, vegn, general rubbish	0.3
	D	Sala Vaifou	plastic, wire, paper, general rubbish	1.16
	D	Fatu Vaifou	plastic, paper, vegn, general rubbish	1.16
	C	Health Dept.	paper, plastic, general rubbish	0.62
	A	-	paper, plastic, general rubbish	0.06
	B	George	wire, sheet steel	0.3

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - DECEMBER 1996/JANUARY 1997

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	A	?	general rubbish	0,06
	D	Vaillima Brewery	dry coconut flesh	1.16
	D	West End	plastic, wire, general rubbish	1.16
	D	AGL	empty bottles, plastic, food, vegn, general rubbish	1.16
	B	Nuu Crop	general rubbish	0.3
	B	-	paper, general rubbish	0.3
	B	Government	paper, general rubbish	0.3
	C	Linn	-	0.62
			Sub total	12.74
1/01/97	D	Vaifou	general rubbish	1.16
	C	Health Dept.	plastic, food, general rubbish	0.62
	B	Ese's Son	food, general rubbish	0.3
	B	-	-	0.3
	B	-	general rubbish	0.3
			Sub total	2.68
2/01/97	B	Siu	grass, vegn, paper, general rubbish	0.3
	B	Tumama	grass, vegn, paper, general rubbish	0.3
	B	-	paper, wire, sheet steel	0.3
	C	Health Dept.	plastic, food, paper, general rubbish	0.62
	D	Sala Vaifou	plastic, grass, general rubbish	1.16
	D	Leafu Vaifou	plastic, wire, paper, general rubbish	1.16
	B	-	empty bottles, paper, plastic	0.3
	?	-	general rubbish	
	B	-	bananas, pawpaw, general rubbish	0.3
	D	AGL	empty bottles, vegn, plastics, food, general rubbish	1.16
	B	-	metal, sheet steel	0.3
	D	Eki	sewage	1.16
	B	-	general rubbish	0.3
			Sub total	7.36
3/01/97	D	Toyota	banana, general rubbish	1.16
	A	-	plastic, food, general rubbish	0.06
	B	NPF	paper	0.3
	C	Jehovah Witnesses	general rubbish	0.62
	D	West End	general rubbish	1.16
	D	Vaillima Brewery	plastics	1.16
	B	-	general rubbish	0.3
	D	Vaifou	sewage	1.16
	D	Public Works Dept.	sewage	1.16
	B	-	wire, sheet steel, metal, plastic	0.3
	B	-	vegn, general rubbish	0.3
	C	Health	plastic, paper, general rubbish	0.62
	D	Vaifou	paper, general rubbish	1.16
	D	Vaifou	plastics, paper, general rubbish	1.16
	D	Vaifou	plastics, paper, bananas, general rubbish	1.16
	B	-	sheet steel, vegn, grass	0.3
	B	-	grass, general rubbish	0.3
	B	-	general rubbish	0.3
	C	Ungle Johnney	plastic, general rubbish	0.62
	D	AGL	food, vegn, paper, general rubbish	1.16
	B	Apt Hoy ?	vegn, grass	0.3
	B	-	general rubbish	0.3
	D	Public Works Dept.	sewage	1.16

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - DECEMBER 1996/JANUARY 1997

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	B	-	paper, general rubbish	0.3
	B	-	general rubbish	0.3
	D	Vaifou	paper, general rubbish	1.16
	B	Water Authority	vegn, general rubbish	0.3
	C	BOC Gases	general rubbish	0.62
	D	West End	general rubbish	1.16
	C	Health Dept	plastics, food, general rubbish	0.62
	D	Vaifou	paper, general rubbish	1.16
	D	West End	wire, metal, paper, general rubbish	1.16
	D	AGL	-	1.16
	D	-	paper, sheet steel, vegn, general rubbish	1.16
	B	Seine	general rubbish	0.3
	B	-	paper, sheet steel, general rubbish	0.3
	A	Government	sheet steel	0.06
	C	Lin	paper	0.62
	C	GSI	plastics, paper, general rubbish	0.62
	A	GSI	plastics, paper, general rubbish	0.06
	B	Siu	bananas, sheet steel, vegn, paper, general rubbish	0.3
			Sub total	27.58
6/01/97	B	Siu	paper, general rubbish	0.3
	B	NPF	paper	0.3
	B	-	-	0.3
	D	Sala Vaifou	empty bottles, vegn, paper, general rubbish	1.16
	D	Fatu Vaifou	vegn, paper, general rubbish	1.16
	D	West End	bananas, paper, vegn, general rubbish	1.16
	C	Health Dept.	food, syringes, chemicals, paper, general rubbish	0.62
	B	J Pavits	-	0.3
	C	Tampula	vegn	0.62
	A	-	paper, general rubbish	0.06
	D	Vaifou	general rubbish	1.16
	D	Ruddy Ott	soil, paper	1.16
	C	Tony Hill	general rubbish, suauu, tar	0.62
	D	AGL	food, pawpaw, bananas, paper, general rubbish	1.16
			Sub total	10.08
7/01/97	B	NPF	paper	0.3
	B	Vaillima Brewery	empty bottles, paper	0.3
	D	Malua	sewage	1.16
	C	Tony Hill	tar and suauu	0.62
	C	Health Dept.	food, paper, general rubbish	0.62
	A	-	general rubbish	0.06
	D	Sala Vaifou	paper, general rubbish	1.16
	D	Fatu Vaifou	paper, general rubbish	1.16
	B	Ligaliga	general rubbish	0.3
	D	AGL	general rubbish, vegn	1.16
	B	Government	grass, vegn	0.3
			Sub total	7.14
8/01/97	B	-	grass, paper	0.3
	D	Sala Vaifou	grass, paper, general rubbish	1.16
	D	West End	paper, general rubbish	1.16
	C	Health Dept.	grass, syringes, chemicals, plastic, general rubbish	0.62
	D	Fatu Vaifou	general rubbish	1.16

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - DECEMBER 1996/JANUARY 1997

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	D	Leafu	sewage	1.16
	D	Public Works Dept.	sewage	1.16
	B	-	paper, plastic, general rubbish	0.3
	C	Tony Hill	sheet steel, paper, tar	0.62
	D	AGL	vegn, general rubbish	1.16
			Sub total	8.8
9/01/97	D	Public Works Dept.	sewage	1.16
	B	NPF	paper	0.3
	B	-	general rubbish	0.3
	D	Sala Vaifou	general rubbish	1.16
	C	Health Dept.	plastic, syringes, general rubbish	0.62
	D	Fatu Vaifou	general rubbish	1.16
	D	Vaifou	general rubbish	1.16
	D	West End	general rubbish	1.16
	B	-	general rubbish	0.3
	D	AGL	plastic, food, vegn, general rubbish	1.16
			Sub total	8.48
10/01/97	D	Public Works Dept.	sewage	1.16
	B	NPF	food, paper, vegn, general rubbish	0.3
	D	Sala Vaifou	soil, vegn, paper, general rubbish	1.16
	C	Health Dept.	chemicals, syringes, vegn, paper, food	0.62
	D	Fatu Vaifou	grass, vegn, paper, general rubbish	1.16
	D	AGL	vegn, paper, food, general rubbish	1.16
	B	Faacoa Patl	paper, general rubbish	0.3
			Sub total	5.86
11/01/97	D	West End	vegn, paper, general rubbish	1.16
	B	Nassal	vegn, general rubbish	0.3
	B	ESE	bananas, food, paper, general rubbish	0.3
	B	-	wire, vegn, general rubbish	0.3
	B	Sila	vegn, grass, general rubbish	0.3
	A	-	sheet steel, food, paper	0.06
	B	-	vegn, grass, paper, general rubbish	0.3
	B	-	vegn, grass, general rubbish	0.3
	C	-	general rubbish	0.62
	D	-	vegn, paper, general rubbish	1.16
	D	West End	metal	1.16
	C	Health Dept.	general rubbish	0.62
	B	Toyota	-	0.3
	D	Vaifou	general rubbish	1.16
	D	Vaifou	general rubbish	1.16
	D	Molesi	paper	1.16
	D	Seti Pio ?	sewage	1.16
	D	Alesaana	paper, general rubbish	1.16
	D	RVM	grass, general rubbish	1.16
	B	Osgire?	grass	0.3
	B	Seine	paper, general rubbish	0.3
	B	Nissan	grass, vegn	0.3
			Sub total	14.74
12/01/97	D	Health Dept.	general rubbish	1.16
			Sub total	1.16
13/01/97	D	Seuseu (Army?)	food, general rubbish	1.16
	B	Siu	vegn, grass, general rubbish	0.3
	B	NPF	paper,	0.3

JICA SAMOA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - DECEMBER 1996/JANUARY 1997

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	B	-	sheet steel, metal,	0.3
	B	Sutusi	food, sheet steel, grass, general rubbish	0.3
	Palau	Nuu Crop	paper, wire, food, general rubbish	
	D	West End	plastic, paper, general rubbish	1.16
	B	Vaifou	sewage	0.3
	B	Bank Government	paper	0.3
	D	Iron Steel	vegn, sheet steel, bananas, dry coconut flesh	1.16
	D	Vaifou	bananas, pawpaw, vegn, paper, general rubbish	1.16
	A	-	plastic, paper, general rubbish	0.06
	D	Public Works Dept.	sewage	1.16
	D	Vaifou	empty bottles, grass, bananas, plastic, general rubbish	1.16
	D	Vaifou	plastic, bananas, paper, grass, general rubbish	1.16
	D	Vailima Brewery	yeast	1.16
	D	Public Works Dept.	sheet steel, grass	1.16
	C	Health Dept.	plastic, food, bananas, general rubbish	0.62
	B	Seuseu	vegn, grass, general rubbish	0.3
	C	-	general rubbish	0.62
	B	-	general rubbish	0.3
	B	Craig	paper, general rubbish	0.3
	D	West End	general rubbish	1.16
	B	-	sheet steel, paper, general rubbish	0.3
	D	AGL	empty bottles, vegn, food, general rubbish	1.16
	A	Jinnyu	bananas, general rubbish	0.06
			Sub total	17.12
14/01/97	D	Public Works Dept.	sewage	1.16
	B	NPF	paper	0.3
	C	Sikosi ?	general rubbish	0.62
	D	Vaifou	empty bottles, paper, general rubbish	1.16
	D	West end	empty bottles, paper, general rubbish	1.16
	D	Seuseu	vegn, general rubbish	1.16
	D	Vailima Brewery	empty bottles	1.16
	B	-	vegn	0.3
	B	-	bananas, general rubbish	0.3
	-	-	sheet steel, metal, paper, general rubbish	
	A	-	food, general rubbish	0.06
	D	West End	-	1.16
	D	Vaifou	-	1.16
	D	AGL	empty bottles, vegn, food, plastic, general rubbish	1.16
	A	Jihnyu	bananas, general rubbish	0.06
	C	Jehovah Witnesses	-	0.62
	C	-	vegn, grass, bananas, general rubbish	0.62
			Sub total	12.16
15/01/97	D	Public Works Dept.	sewage	1.16
	B	Siu	grass, paper, general rubbish	0.3
	B	Tumama	grass, paper, general rubbish	0.3
	B	NPF	wire, paper, general rubbish	0.3
	C	Mc Donald	food, grass, general rubbish	0.62
	B	-	-	0.3
	C	-	-	0.62
	D	Sala Vaifou	paper, general rubbish	1.16
	D	Vaifou	bananas, paper, general rubbish	1.16
	D	West End	plastic, paper, general rubbish	1.16

JICA SAMŌA WASTE MANAGEMENT PROJECT
 VEHICLE REGISTER - DECEMBER 1996/JANUARY 1997

Date	Vehicle Type (A - D)	Waste Source	Primary Type of Waste Material	Approximate Waste Qty (tonnes)
		Vehicle ID		
	D	-	bananas, pawpaw, vegn, general rubbish	1.16
	B	Tokelau	grass, vegn, general rubbish	0.3
	D	AGL	plastic, food, paper, general rubbish	1.16
	C	New One	vegn	0.62
	D	STP	dry coconut flesh	1.16
			Sub total	11.48

ATTACHMENT B
RECOMMENDED VEHICLE LOG

TAFALIGATA WASTE DEPOT

VEHICLE SURVEY

Objective: To record the number and type of vehicles using the waste depot and thus the quantity of waste being deposited at the waste depot. Also to determine when the depot is being used and what are the primary types of waste being disposed of at the waste depot

Vehicle Types:

Small Vehicles
A - car / station wagon
B - Van / utility / trailer

Open Truck
C - Single rear axle with two rear wheels or four small rear wheels
D - Single rear axle with four normal size wheels
E - Tandem rear axle (bogie drive)
F - Twin steer with twin rear axles
G - Tipping semi-trailer

Enclosed Truck and Compactor Trucks
H - Single steer with single rear axle
I - Single steer with tandem rear axle
J - Twin steer with tandem rear axle

Waste Source:

Domestic - waste from houses eg, household waste
Council - waste from Council activities eg. fill from road works
Commercial - waste from commercial premises eg. shops
Industrial - waste from industrial premises eg. factories
Building and demolition - waste from building / demolition sites
Agriculture - waste from agricultural activities eg. from farms
Other - other waste

Primary Type of Waste :

Food waste
Garden waste
Paper and cardboard
Glass
Plastic
Metal
Concrete
Wood
Ceramics, bricks, and tiles
Excavated fill material eg. soil and rubble
Mixed waste
Other

Time	Vehicle ID	Vehicle Type (A - L)	Waste Stream	Primary Type of Waste
2:00 - 3:00 PM				
3:00 - 4:00 PM				
4:00 - 5:00 PM				
5:00 - 6:00 PM				

Time	Vehicle ID	Vehicle Type (A - L)	Waste Stream	Primary Type of Waste
6:00 - 7:00 PM				
7:00 - 8:00 PM				

