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**OPERATIONAL PLAN
FOR SOLID WASTE MANAGEMENT**

GOVERNMENT OF AMERICAN SAMOA

MAY, 1973

PREFACE

Not unlike other communities in the continental United States, solid waste disposal on American Samoa has attained an ever increasing importance in consonance with the increase in population, rapid pace of economic development and increase in sophistication and affluence of the local residents. The more sophisticated American way of life has brought about an increase in the quantity of waste generated per capita and an increase in the costs of disposal of these wastes.

Recently, public awareness of the importance of maintaining a healthful environment is increasing worldwide. The pollution of air, water, and soil which existed in the past is no longer tolerated.

The preparation of this plan was financed in part by the Solid Waste Management Office, Environmental Protection Agency, Grant No. L-009007.

PURPOSE AND SCOPE

This Report is the result of studies and investigations carried out for the purpose of developing an optimum Operational Plan for the Collection and Disposal of Solid Wastes on American Samoa for the 30 year period from 1970 to 2000.

Comprehensive studies were made of the present practices of the Solid Waste Management Section of the Department of Public Works in the collection and disposal of solid wastes and the capabilities in equipment and personnel. Ways of improving these practices were proposed and requirements projected into the future.

The Conclusions and Recommendations are presented in the following pages in order to facilitate the review and analysis of the findings.

		Page
	Preface	
	Purpose and Scope	
	INDEX	
	Conclusions and Recommendations	
CHAPTER I	INTRODUCTION	1
CHAPTER II	TERRITORY OF AMERICAN SAMOA	4
	A. General	4
	B. Climate	4
	C. Geology and Topography	7
	D. Soil	9
	E. Government	10
	F. Population and Dwelling Distribution	12
	G. Land Use and Economy	19
	H. Transportation	22
	I. Samoan Living Pattern	25
CHAPTER III	REFUSE QUANTITIES AND COMPOSITION	30
	A. General	30
	B. Sampling	31
	C. Present Unit Generation Of Wastes	34
	D. Projection Of Refuse Quantities and Composition	37
	E. Automobile Disposal, Tutuila	43
CHAPTER IV	SOLID WASTE MANAGEMENT	47
	A. General	47
	1. Philosophy of Service Provided	47
	2. Manpower	50
	3. Equipment	55

	Page
B. Summary of Present Solid Waste Management Cost	56
I. General	56
2. Public Rate Schedule (Hypothetical Base)	63
C. Projected Solid Waste Cost	72
D. Refuse Collection Practices	78
E. Solid Waste Disposal Practices	82
CHAPTER V ALTERNATIVE WASTE DISPOSAL AND PROCESSING METHODS	84
A. Disposal at Sea	84
B. Composting	86
C. Incineration	88
D. Compaction	90
E. Shredding	97
F. Sanitary Landfill	99
G. Summary of Investigation on Waste Disposal	118
H. Basic Assumptions for Table V-1	121
CHAPTER VI ALTERNATIVE WASTE Collection Method	123
CHAPTER VII MANAGEMENT PLAN FOR REMOTE VILLAGES & OUTER ISLANDS	128
A. General	128
B. Tutuila	128
C. Outer Islands	130
CHAPTER VIII SOLID WASTE LEGISLATION	132
REFERENCES	139

Operational Plan for Solid Waste Management
Government of American Samoa

	LIST OF FIGURES	PAGE
FIG. II-1	American Samoa Location Map	5
FIG. II-2	American Samoa	6
FIG. II-3	Population of American Samoa, Years 1920 to 2005	14
FIG. II-4	Population Trends in American Samoa Based on Census 1900 - 1960	15
FIG. II-5	Tutuila Land Slope Map	18
FIG. II-6	American Samoa Territorial Highway System	23
FIG. III-1	Tutuila County Population Increase	40
FIG. III-2	Projected Daily Solid Waste Generated on Tutuila, 1960 to 2005	44
FIG. III-3	Projected Number of Vehicles to be Disposed of Annually	45
FIG. IV-1	Solid Waste Collection Route Assignment Map	48
FIG. IV-2	Present Organization of the Department of Public Works	51
FIG. V-1	Location Map of the Nine Alternatives Proposed for Sanitary Landfill Sites on the Island of Tutuila	108
FIG. V-2	Site Plans for Proposed Sanitary Landfill Sites Number 2,3 & 4	109
FIG. V-3	Site Plans for Proposed Sanitary Landfill Sites Number 5 & 6	111
FIG. V-4	Site No. 7 Plan Logatala Hill Proposed Sanitary Landfill Site as a Part of a Proposed Regional Park	114

Operational Plan for Solid Waste Management
Government of American Samoa

	LIST OF FIGURES	PAGE
FIG. V-5	Site No. 8 Plan, Proposed Sanitary Landfill Site	115
FIG. V-6	Pala Lagoon Marina, Site No. 9	117
FIG. V-7	Disposal Site No. 3 Proposed Future Land Use	120
FIG. VI-1	Location Map of Local Public Disposal Facilities "Green Box Concept"	124
FIG. VI-2	Facilities for Green Box Concept	125
FIG. VII-1	Proposed Solid Waste Sanitary Landfill Site for the Island of Tau	131

Operational Plan for Solid Waste Management
Government of American Samoa

LIST OF TABLES		PAGE
TABLE II-1	Population of American Samoa and Rates of Change 1920 - 1970	16
TABLE III-1	Typical Composition of Solid Waste on Tutuila	32
TABLE III-2	A Typical Week of Solid Waste Collection	33
TABLE III-3	Projected Solid Waste Generation on American Samoa, 1970 - 2005	39
TABLE III-4	Projected Refuse Composition, Tutuila	42
TABLE III-5	Registered Vehicles	45
TABLE IV-1	Solid Waste Management Employee Pay Schedule as of 1973	53
TABLE IV-2	Solid Waste Management Actual Cost for Fiscal Year 1972	59
TABLE IV-3	State, County, and Territory Solid Waste Management Cost Comparison	60
TABLE IV-4	Motor Pool Rental Rates for Solid Waste Collection Vehicles	61
TABLE IV-5	Solid Waste Section Equipment Monthly Rental Back-up (Proposed)	62
TABLE IV-6	Section of Solid Waste Management Monthly Administrative Costs (Hypothetical)	65
TABLE IV-7	Section of Solid Waste Management Monthly Commercial Collection and Disposal Cost (Hypothetical)	66
TABLE IV-8	Section of Solid Waste Management Monthly Residential Collection and Disposal Cost (Hypothetical)	67

Operational Plan for Solid Waste Management
Government of American Samoa

	LIST OF TABLES	PAGE
TABLE IV-9A	Section of Solid Waste Management Monthly Disposal Cost, Sanitary Landfill (Hypothetical)	68
TABLE IV-9B	Section of Solid Waste Management Monthly Disposal Cost, Transfer Station (Hypothetical)	69
TABLE IV-9C	Section of Solid Waste Management Proportioning Monthly Disposal Cost (Hypothetical)	70
TABLE IV-10	Section of Solid Waste Management Summary of Hypothetical Budget and Proposed Public Rate Schedule	71
TABLE IV-11	Section of Solid Waste Management Annual Collection Equipment Cost	75
TABLE IV-12	Section of Solid Waste Management Annual Collection Labor Cost	76
TABLE IV-13	Section of Solid Waste Management Annual Sanitary Landfill Cost	77
TABLE IV-14	Section of Solid Waste Management Annual Transfer Station Cost	79
TABLE IV-15	Section of Solid Waste Management Summary Sheet of Projected Annual Budget, 1974 to 1979	80
ENCLOSURE V-1	Request for Information on the Feasibility of Incineration in American Samoa	91
TABLE V-1	Section of Solid Waste Management Comparison of Proposed Waste Disposal Methods Estimated Cost	96
ENCLOSURE V-2	Estimated Cost of Pulverizing or Shredding Plant for Installation on Tutuila	100
TABLE V-2	Estimate of Cost and Estimated Useful Life (Shredding Plant)	102

Operational Plan for Solid Waste Management
Government of American Samoa

	LIST OF TABLES	PAGE
TABLE V-3	Summary of Operating Costs (Shredding Plant)	105
TABLE VI-1	Solid Waste Management Projected Annual Budgets, 1974 - 1979 (Cost Comparison Between Green Box and Present System)	127
TABLE VII-1	Estimate of Cost to Provide Equipment to Remote Villages	129
TABLE VIII-1	Compendium of American Samoa Laws Pertaining to Solid Waste	133
ENCLOSURE VIII-1	Format of Solid Waste Ordinances	136

CONCLUSIONS AND RECOMMENDATIONS

In the following pages we have separated our conclusions and recommendations into the headings of: Storage Practice, Collection Equipment, Disposal Methods, Village System and General. Under each of these categories we have given the conclusion and recommendations pertaining specifically to the heading.

Storage Practices

Conclusion

Allowing the practice of storing waste wherever and in whatever fashion suits the public defeats efficient collection, leaves unsightly roadway piles, adds to the litter problem, and provides no deterrent for vector breeding and animal rummaging.

Furnishing (free of charge) containers to the public has proven impractical. The public should be held responsible for furnishing proper storage, situating the container so that it is readily accessible, and maintaining in a tidy fashion the container and its area. Refuse bags, standard plastic and metal containers, and 55 gal. drums (with the top one quarter removed) should be the only permissible storage receptacles. Vegetation trimmings should be boxed or bundled and placed along side the container.

Recommendation

Clearly establish through new legislation the public's res-

Operational Plan for Solid Waste Management
Government of American Samoa

possibility to store and maintain their waste in a manner that facilitates collection and safeguards against unhealthy practices. Chapter VIII contains the format for such a law.

Utilizing the television and radio, alert the general public to the new legislation. Educate the populace (through mass media and the schools) to accept their responsibility to properly store solid waste for pickup. Diligently prosecute offenders who violate the new solid waste laws.

Collection Practices

Conclusions

Collection routes, pickup dates, and safety rules are weakly adhered to. Trucks are collecting an unsatisfactory average daily weight of less than 7000 lbs. (Honolulu union contract requires 22,000 lbs). Lack of public storage regulations and personnel training, disrupted route and crew assignments, poor roads and house density account for the low figure which should be 14-17,000 lbs. per truck per day.

Overtime is abused because supervisors neglect to place personnel in proper accounts as they are shifted between M&O Sections. Duplication of service occurs due to ill-defined limits of routes.

Vehicle fleet is only in fair condition despite being less than two years old.

Operational Plan for Solid Waste Management
Government of American Samoa

Motor Pool rental rates are neither properly applied nor adequately sufficient.

Record keeping necessary for scrutinizing the system is minimal.

No skill requirements are established for the different levels of responsibility.

Overall absenteeism is normal at 16 percent. However, because men are not required to stagger their vacations, there are short periods of extremely high absence when the essentially required work cannot be accomplished.

Skill necessary to operate and maintain equipment and to perform collection safely and efficiently is lacking.

To collect, dispose and return a commercial bulk container requires an average of 1 - 1-1/2 hours. This restricts the two hysters to 14 containers per day or 42 total (for a three day service).

Recommendations

The crux of most present problems is related to storage and routine. Through an updated, all-inclusive law (and its enforcement) more public responsibility to ease receptacle accessibility and to maintain uniform containers must be attained. Accompanying this public effort there must come the assurance of routine pickup. This routine will allow the refuse employee teams to concentrate on means to expedite their job.

Operational Plan for Solid Waste Management
Government of American Samoa

Rapid implementation of the section's proposed organization (Fig. IV-2) is necessary.

Examinations and certain skills must be established for the different levels of responsibilities (superintendent, leadman, and drivers). After the qualifications are written, all employees will be tested and placed. When there are more positions than properly qualified applicants (as suspected) the jobs will be filled on a temporary basis. After a short period expires and if the employee has been unable to satisfy the job requirements, he will be dismissed and another man given the opportunity. More responsibility for route and equipment must be assumed by the truck team.

In-field training seems the only method available by which to develop a vocation of skilled refuse handlers. To accomplish this a stateside superintendent who has depth of practical knowledge is necessary for the next few years. This individual must be able to train at all levels and coordinate a solid waste system that will have a good basis from its inception.

Agree upon new motor pool rates and maintenance schedule as proposed in Table IV-5. As rapidly as possible, lengthen the routes to obtain a daily collected amount of 14,000 pounds per route, a condition which will mean a decrease in the number of trucks

and men presently employed. Map these routes and retain them on file. These maps will clearly define the exact limits of each route, thereby eliminating duplication and overlooked areas.

The installation of the proposed Pago Bay Area transfer station will see the end of unproductive travel time by the Eastern District Collection trucks and will eliminate any need for a disposal area in that District. Also, commercial container collection capabilities will triple. A cleaner Bay Area is anticipated as the station will make it extremely convenient for the Bay Area residents and merchants to dispose of their own waste, as well as facilitate the effort of the GAS.

Disposal Methods

Conclusion

Limited experience in sanitary landfill operations combined with poorly trained personnel have created a relatively adequate but expensive disposal operation.

Past selection of landfill sites from free and easily obtainable government lands has contributed to uneconomical practices that seemingly outweigh the advantage. These one year sites have required costly expenditures for improvements (access roads, etc.) necessary to open and close disposal areas.

Operational Plan for Solid Waste Management
Government of American Samoa

Cover soils (cinders) have been imported and excessively used due to the shallow depths of refuse (cover to refuse ratios of 2:1 instead of 4:1 often occur). Lack of awareness by individuals of the cost associated with cover soil supply and the thick cover placement needed to minimize odors (landfills are often situated close to housing) create added expense.

Tractor operators are too frequently rotated to allow any one man the necessary time to become efficient in operating the landfill. Without operators qualified to take preventive maintenance care of the tractors, the heavy equipment is rapidly falling into disrepair.

Recommendations

A sanitary landfill is the disposal method best suited for American Samoa. All present waste (including automobiles) can be disposed economically in a well designed long life landfill as proposed in Chapter V.

Site No. 3, including a cover soil quarry (cinders) area, is the economical choice. However, the socio-political influences of the sites must be determined prior to proceeding towards acquisition. The sites, while desirable for their remoteness, are in lands where boundaries are ill-defined. This will undoubtedly entangle the GAS into a controversial court boundary dispute and possibly, unfavorable publicity.

Operational Plan for Solid Waste Management
Government of American Samoa

To retain capable personnel for long periods the landfills must contain an office, shop and other beneficial conditions to assure a tolerable working environment.

The long life sanitary landfill should include areas for segregating waste with salvage value. Materials amenable to composting and a holding area for junked vehicles (allowing used parts sale) are only two possible areas potentially profitable for scavenging.

Select an experienced man to be sent to school for heavy equipment training in the United States after contracting to assure his return to the Refuse Section for a minimum of two years.

Village System

While remaining totally sympathetic with the difficulty of hand burying daily solid waste, there remains no other available program that is more practical or not overtly expensive.

Incineration of combustibles, flattening of cans and other rudimentary volume reduction methods will minimize the work but not eliminate it.

Each mayor (pulenu'u) must design and advocate the program that best utilizes his village resources and land. GAS should continue to act in an advisory capacity.

Operational Plan for Solid Waste Management
Government of American Samoa

Bi-annually the Department of Health Sanitarian assigned to the village can coordinate a barging program designed for ocean disposing of village bulk waste (refrigerators, stoves, etc). When the surf is down the raft loaded items can be floated out to deep locations and dumped.

When (as in the case on the island of Tau) two or more villages are connected by a road, a government truck can be provided and a disposal area found.

The creation of the proposed sanitary landfill (Fig. VII-1) on Tau will enable that growing community to protect its magnificent island environment.

General

Chapter IV contains a cost breakdown for the three basic levels of solid waste management service; residential collection and disposal, commercial collection and disposal, and disposal of privately collected waste. Included in the recommended solid waste legislation should be a rate schedule that would reimburse the government for these services.

Individual payment for residential collection is presently impractical because no viable means has been found to associate the person to be billed with a particular container. This fact

Operational Plan for Solid Waste Management
Government of American Samoa

requires that residential collection continue to be funded through general revenues. The other two services can be funded by application of a rate schedule.

Should it prove desirable to turn solid waste management over to a private firm, the implementation of the proposals suggested in this report will make the GAS solid waste management a marketable business. Presently, a private firm cannot be expected to show interest (at a reasonable price) in today's system because there is no guaranteed permanent disposal areas or proven community willingness to comply with fundamental refuse management needs (e.g. proper storage, bill payment, etc).

There is no benefit in hiring a private management team to direct the GAS forces when they are able to hire their own manager for less than the profit margin that a private firm would require. However, the continual soliciting of private firm proposals for review will apprise the GAS as to what undertaking must be accomplished to entice outside interest. Eventually, the government will have a viable business, profitably saleable to many.

Another method possible for converting a public utility to a private business is in selling the system over a specified period of time to the employees. Annually, the employee receives a prescribed amount of stock shares depending upon his position and

Operational Plan for Solid Waste Management
Government of American Samoa

capabilities. Initially, the majority of the stock is held by GAS. Within a few years the stock of the employees grows until they have a major voice in the operation. Eventually, the GAS becomes a minor stockholder and the employees determine policy and profit.

As detailed in Chapter IV, to maintain a door to door collection system in the rural community of American Samoa it will cost GAS approximately \$350,000 a year. Ordinarily, less than half of this value is what most similar rural communities are willing to spend. For the GAS to slash its budget to this amount, a whole new philosophy of collection for the outlying areas must evolve (the Bay Area should retain door to door collection). Such an Environmental Protection Agency approved system as the "Green Box" concept when applied to Tutuila (Chapter VI) would greatly diminish governmental expenditure. No change need be undertaken to the present efforts towards a long service life sanitary landfill site or transfer station since these facilities are needed for either the present or "Green Box" systems.

I INTRODUCTION

This study has been prepared to assist the Government of American Samoa in developing a workable operation plan for solid waste management. This undertaking has involved the continued investigation and analyses of those solid waste problems peculiar to these island communities.

In an effort to simplify the comparison of the Solid Waste Programs of Pacific island communities, we have adopted a format similar in presentation to the reports of Guam and Hawaii. If it can be said that Hawaii, Guam, and American Samoa are basically culturally and geologically similar in character, then that factor which differentiates them is their stage of urbanization. Since American Samoa is the least developed community on such scale, she can benefit from the studies of Hawaii's and Guam's present problems, as well as consider adopting their proposed solutions.

Although a relatively small community by comparison to many mainland counties, the Government of American Samoa has developed an active planning agency. Samoa has been the benefactor of numerous inventory studies including geology, hydrology, agriculture, etc., and in recent years, has sponsored extensive planning studies for education, utilities,

economics, etc. The Office of Economic Development and Planning is now completing a general plan for Tutuila while continuing planning activities in other areas. These local planning studies and reports by other agencies, as listed in the bibliography, furnish comprehensive details on nearly all facets of government, economy, culture, etc., of the island. This reference material was the primary source of study and research which provided the necessary orientation and foundation for this investigation.

A fine cursory status report on refuse handling, written by D.J. Keller and L.P. Gazda, initiated a concerned effort by the Government of American Samoa to bring solid waste management into a planned organization. Our report, however, represents the first study based on developed data. Because the record keeping and accounting were started with this report, many of the conclusions reached have been made on a limited availability of data. Although the information contained herein is based on a minimum of records, it was deemed necessary for the sake of substance to present all facts as qualified statements. Future managers of the program should continue to revise all included figures and, when appropriate, review the conclusions accordingly, as experience develops.

American Samoa is a group of islands so populated and separated that no one solid waste management scheme can be applied to the entire group. This report attempts to resolve that problem by proposing two programs for the territory. One system will apply to the populated urbanized island of Tutuila. The other system, directly referred to in Chapter VIII, applies to the outer villages and islands.

To those familiar with the history of American Samoa's solid waste management, the first impact of this report may seem unnecessarily harsh. Due to the limited availability of time and space, we are unable to include the vast accomplishments already made by the Government of American Samoa (GAS) in this area. Diligent effort over the past few years has brought an end to open burning dumps and assured waste collection for ninety percent of the populace, exceeding the programs in Tahiti, Fiji, Western Samoa and New Zealand. The GAS has elected to be compared with stateside standards and as a consequence, suffers the criticism of highest quality. The results of such comparison will encourage the further development of the most efficient and suitable program.

II TERRITORY OF AMERICAN SAMOA

A. General

The Samoan Islands are an archipelago extending over a distance of 350 miles in the South Pacific, about 2,700 miles east of the northern tip of Australia and about 2,200 miles south of Hawaii (Figure 11-1). The group consists of 14 islands (Figure 11-2). Western Samoa, independent since 1968 (west of longitude 171 W), has a total area of 1,133 square miles and consists of two large (Upolu and Savaii) and six small islands.

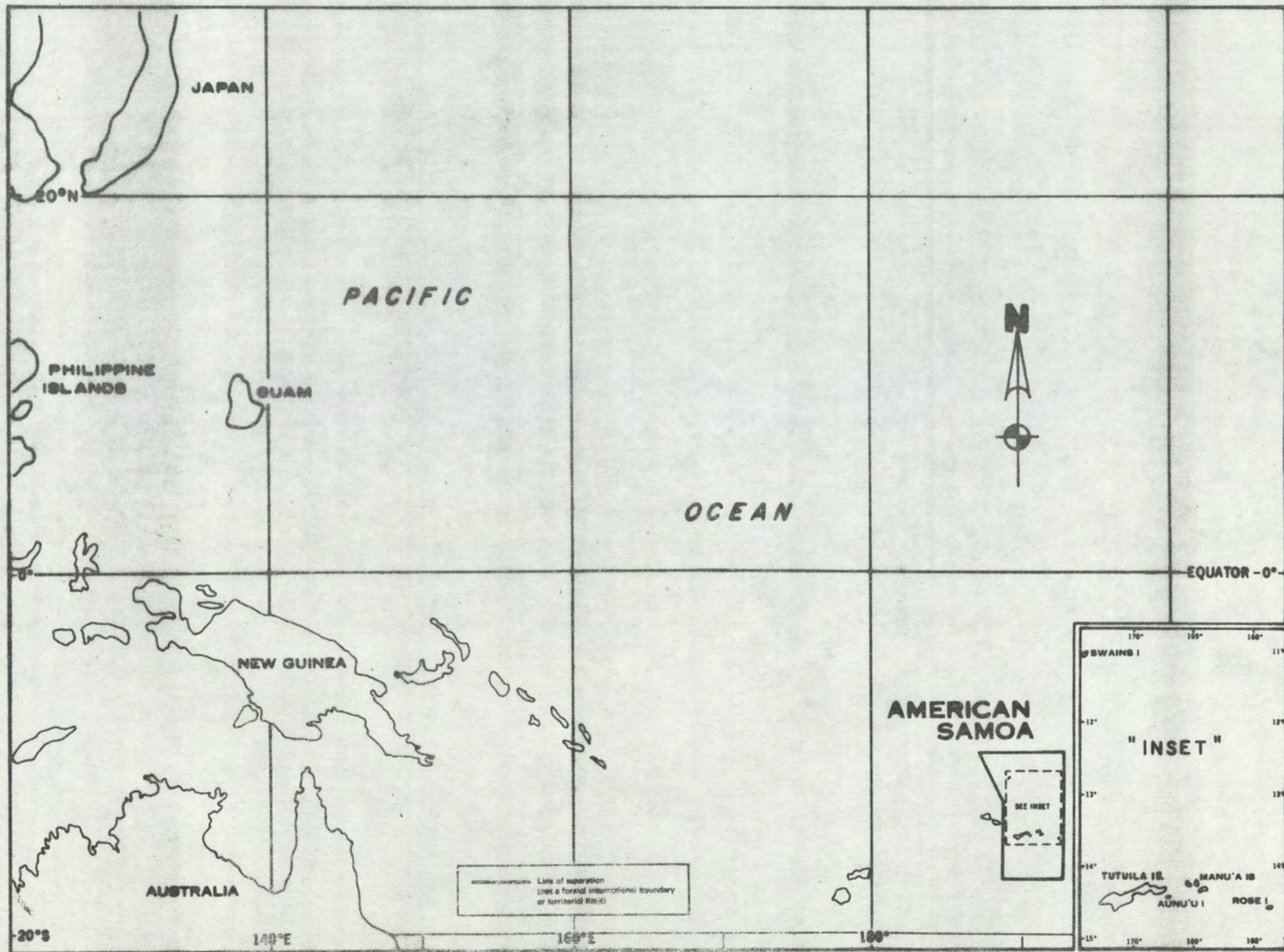
American Samoa, an unincorporated United States territory under the jurisdiction of the Department of the Interior, is a group of six islands (east of longitude 171 W) having a total area of 76 square miles plus tiny Swains Island, about 225 miles to the north.

The largest island of American Samoa is Tutuila, approximately 40 square miles in area with 92 percent of the total population of the island group. The small islands to the east include Aunu'u, Ofu, Olosega, Tau, and Rose (an uninhabited coral atoll).

B. Climate

American Samoa is warm and humid. The daily temperature range is small with little daily variation. Monthly means

AMERICAN SAMOA
LOCATION MAP



range from 80°F in July to 82°F in February, the hottest month. Midday temperatures of 90°F are common.

Rainfall on Tutuila averages nearly 200 inches per year. There is great variation in rainfall from year to year, from month to month and from day to day. In 1906, for example, rainfall was only 130 inches; 3 years later, rainfall measured 284 inches. February is usually the wettest and hottest month. June, July, and August are relatively dry with rainfall normally 12 to 15 inches per month.

Relative humidity is always high in American Samoa, ranging from 70 to 90 percent during the wet season and from 60 to 70 percent during the dry season. Samoa is considered one of the most humid areas in the world.

C. Geology and Topography

Tutuila is of recent volcanic origin. The rock is porous basalt, ash, cinder and breccia with local sedimentary deposits of gravel and shale derived from the erosion and chemical decomposition of these volcanic rocks. Coral detritus from the reefs that rim the island form a narrow shelf along most of the coast.

Tutuila's topography is rugged. The island is a continuous, narrow, irregular, volcanic ridge rising steeply from the ocean. It is about 20 miles long, 6 miles wide at its widest extent and less than one mile wide where Pago Pago Harbor intersects the ridge near the center of the island on the south side.

The ridge rises abruptly from the sea. Numerous peaks range in elevation from 1,000 feet to 1,500 feet. Matafao is the highest peak at 2,141 feet. Several distinct volcanic craters are located in the southwest portion of the ridge island.

Steep slopes are typical of the island's topography. The only expanse of relatively flat to gently sloping land occurs on the southern side of the southwest half of the island in an area extending from Leone northeast to Nu'uuli. The Pago Pago International Airport is located adjacent to Pala Lagoon just southwest of Nu'uuli. The steep sided ridge forms a drainage divide for the entire island. Numerous short, intermittent streams with very steep gradients descend from the mountains forming steep sided valleys. Many of these streams form hanging valleys where water falls into the sea. Large streams

form wide, flat, delta-shaped valley floors where they emerge from the highlands to enter the sea. It is in these areas where rock and soil from the mountains has been carried down by the streams to be deposited that many of the village sites are located.

D. Soil

The steep slopes, heavy rainfall and rapid runoff tend to keep the natural residual soil cover thin (several inches to one foot in most areas).

The soil is held in place only by the dense growth of tropical vegetation. Though mud slides are numerous, it takes only a short time for a new layer of thin soil to develop. Beneath the thin soil layer the volcanic rock is highly porous and absorbent. The residual soil of the mountain, formed from the decomposed volcanic rock, is clay-like. The soil overlying the narrow belt of coral around the edge of the island is a sandy, organic material that also supports abundant vegetation. This soil cover is also very thin. The underlying coral detritus is highly porous and permeable. A few inland valleys contain thick deposits of alluvial soil. However, leaching (due to the heavy rainfall) depletes the soil of

most of its natural plant nutrient value. This problem makes commercial farming impossible without fertilization.

The unconsolidated ash and cinder deposits of recent volcanic origin have soil like characteristics. The granular, non-cohesive, angular particles can be easily excavated by hand. These deposits are highly porous and absorbent. The only cinder deposits lie along a ridgeline from Larsen Bay to Olotele Mt. This ridgeline must be considered the source of cover material for any sanitary landfill site. The only other possible cover material would be coral sands whose mining is now considered ecologically unacceptable by the Government of American Samoa.

E. Government

American authority resides with the Secretary of the U.S. Department of the Interior, as delegated by President Truman in 1951. Prior to 1951, authority was vested in the Department of the Navy. The territorial government is semi-autonomous rather than a branch of the U.S. Government as such. It operates under a constitution adopted in 1960 and obtains revenues from

Operational Plan for Solid Waste Management
Government of American Samoa

congressional appropriations as well as local income and excise taxes. The territorial government is represented in Washington through a Delegate-at-Large to Washington, an office created in 1970.

The Territorial government is an American-styled system with three branches. The Executive branch is headed by a Governor who is appointed by the U.S. Secretary of the Interior. A bicameral Legislature has law-making authority under the territorial constitution. Members of the House of Representatives are elected by adult suffrage for two-year terms and may include Samoans of all social strata. Senators are registered chiefs who are selected by county councils for four-year terms. The judicial branch includes a High Court and five district courts. The High Court contains a Chief Justice, two Associate Justices and four Associate Samoan judges.

For Administrative purposes, the Government of American Samoa operates at the local level through a network of villages, counties and districts. The system is administered by the Government's Office of Samoan Affairs. The officials representing the local units have little decision-making authority but are delegated some

administrative tasks and serve as liaison between the GAS and local residents and leaders.

Each village has a mayor or pulenu'u, who is selected by the village council to deal with government matters. The village council includes the various chiefs and talking chiefs of the village, who handle other village affairs as well. Each of the 14 counties has a County Chief selected by the County Council, which includes the pulenu'us and other leaders of the various villages within the County. The various counties are included in three districts - Western Tutuila, Eastern Tutuila, and Manu'a - which have district governors appointed by the Governor of American Samoa and district councils containing the county chiefs, village mayors and other village leaders.

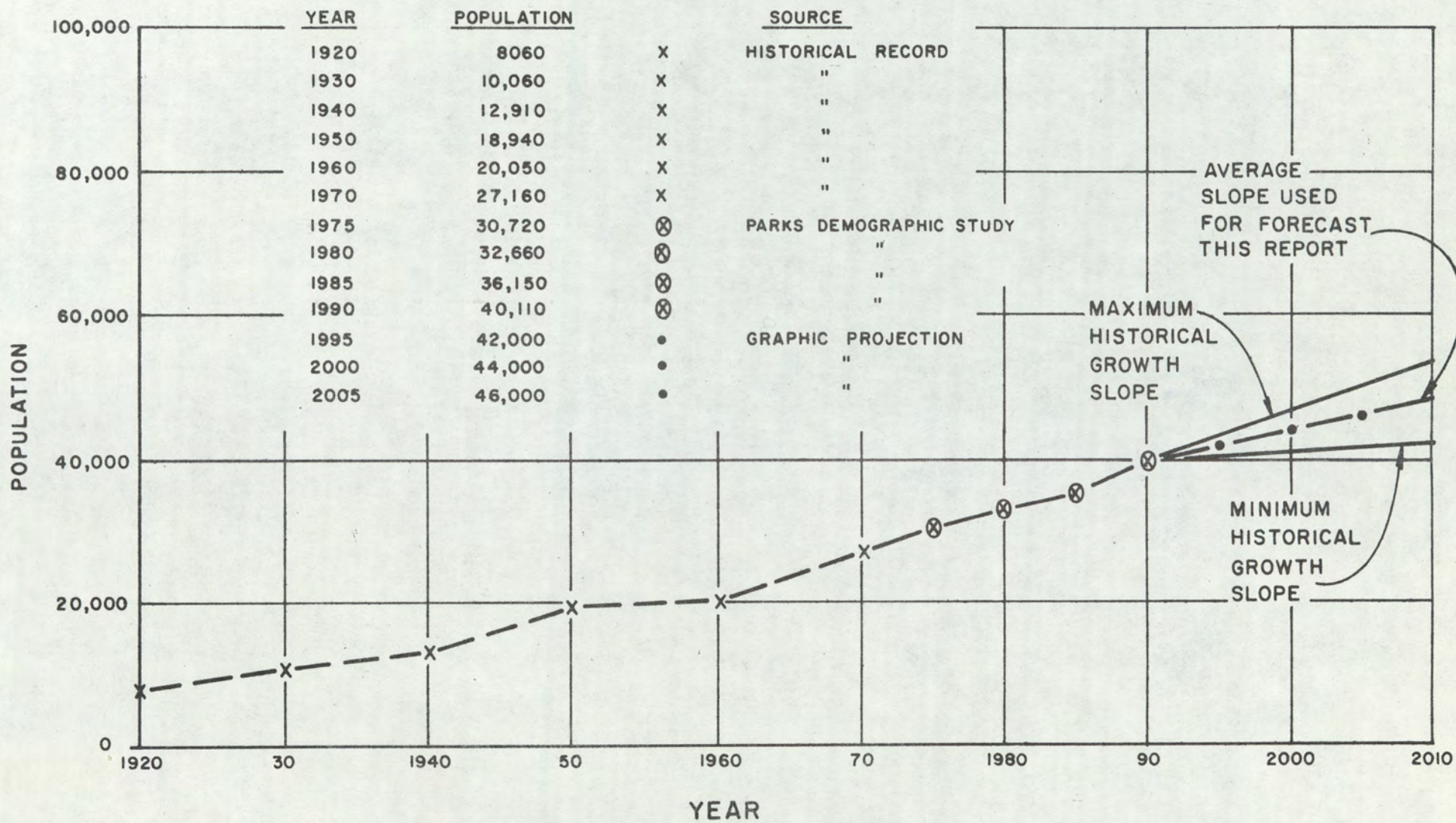
In American Samoa solid waste management is a government function, the management being a section of the Maintenance and Operation Division of the Department of Public Works.

F. Population and Dwelling Distribution

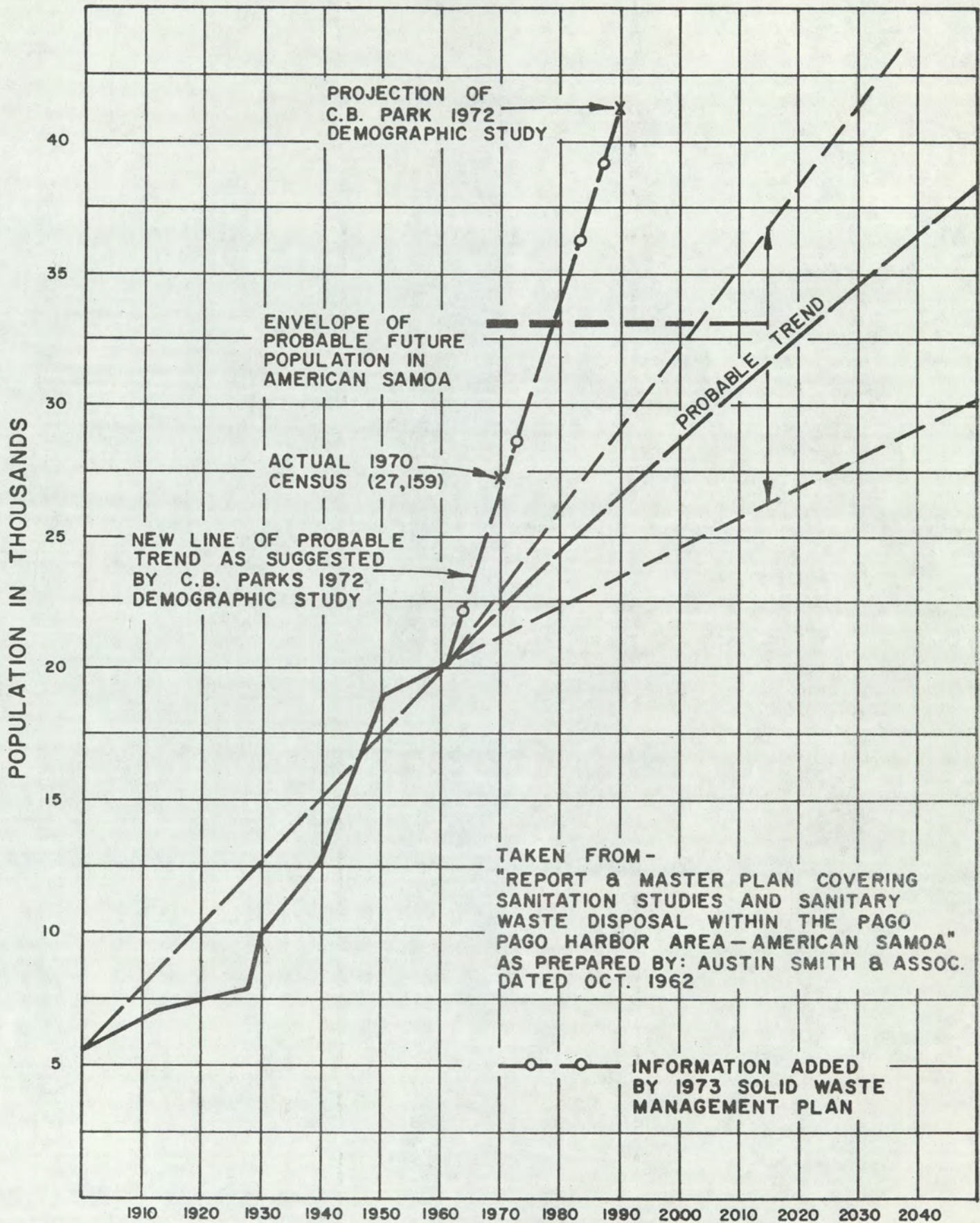
A thorough demographic study of American Samoa has been prepared by C.B. Park. The discussions and projections

of that report are accepted and used as basis for developing forecast in this plan. While Projection III, Constant Fertility & Constant Migration is the trend assumed for planning, it is wise as Park suggested, to continually re-evaluate this sensitive set of figures. The population projection is a main premise upon which many of this Solid Waste Management Plan's conclusions hinge. Dr. Park discusses in detail various causes and effects for a possible 25 percent range of error in his population projections. To emphasize how radically the population can change in American Samoa, a copy of a population projection prepared in 1960 is presented in Figure II-4. Even with a wide envelope of computed error, the actual growth exceeded expectation by nearly seventeen percent.

To further complicate planning with population forecast, there seems to be no means by which to determine where on the islands and to which island the population will reside. Recent trends, as shown in Table II-1, indicate that the entire population will exist on Tutuila. To combat this over-crowding migration the government is presently stressing programs to develop outer islands.



POPULATION OF AMERICAN SAMOA, YEARS 1920 TO 2005



POPULATION TRENDS IN AMERICAN SAMOA
 BASED ON CENSUS 1900-1960

TABLE 11-1. POPULATION OF AMERICAN SAMOA
AND RATES OF CHANGE 1920-1970

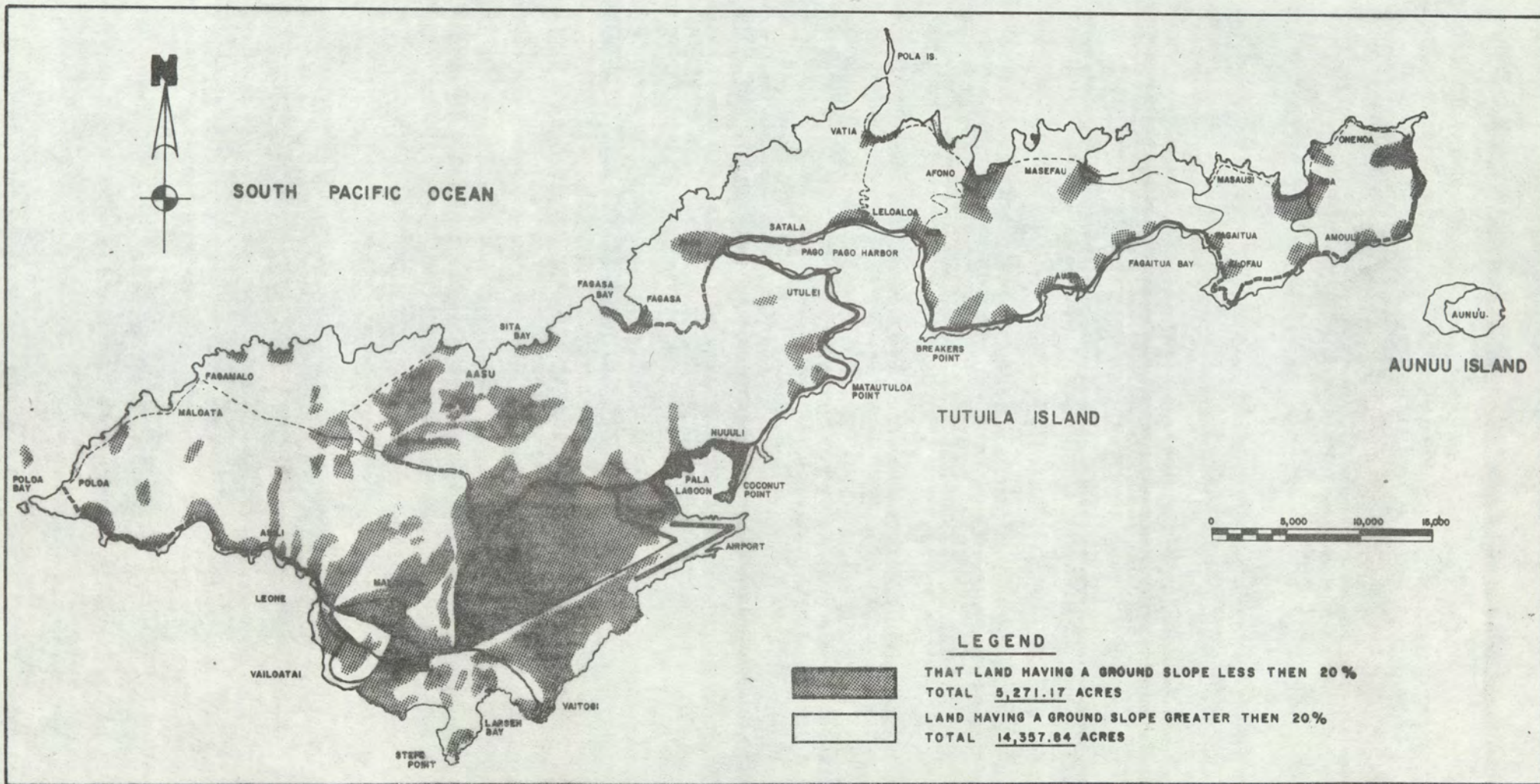
DISTRICT	1920	1930	1940	1950	1960	1970
Manua			2,597	2,819	2,695	2,112
Swains			147	164	106	74
Eastern Tutuila			6,733	10,624	11,137	15,955
Western Tutuila			3,431	5,330	6,113	9,018
American Samoa	8,056	10,055	12,908	18,937	20,051	27,159
Pct. Increase in Previous Decade		24.7	28.4	46.7	5.9	35.4
Average Annual Increase in Previous Decade		2.5	2.8	4.7	0.6	3.5

Source: U. S. Bureau of Census, 1950 Census of Population and 1960 Census of Population,
PC(1)-B56 American Samoa.

The new road, airport, harbor, and agricultural programs for the Manu'a Islands may provide sufficient incentive for islanders to move to the relatively vacant lands of that island group.

On Tutuila dwelling clusters have, for the most part, achieved densities as high as many recognized overcrowded Asian cities. On an overall basis there is approximately 1.2 acres per person on Tutuila compared to 11.3 acres per person in the United States. It must be assumed that high cluster densities will eventually continue to fill those lands shown in Figure 11-5 which have a ground slope less than 20 percent.

American Samoa does not have sufficient agriculture and industry to support its population at its present level of economy. The present employees of the Government of American Samoa represent 40 percent of the total employed population. Approximately 62 percent of the GAS budget comes from the United States Government through aids and grants. While effort is being made to entice industry to American Samoa the needs of the "population boom" are outreaching self-contained efforts and causing greater reliance on United States aid. When, in the



TUTUILA LAND SLOPE MAP

1950's, the United States drastically cut aid, the population increased at less than 0.5 percent annually. During the 1960's, with renewed United States support, the population has risen at 3 percent annually.

With no valid "classic" economy criteria (e.g. availability of natural resources) for guides as to what population can be supported, it is impossible to feel confident in any long range population projection. In any future revision of this report, review of population forecast must be a high priority.

G. Land Use and Economy

The most pervasive influence of the territorial government has been felt in the transformation of the Samoan economy from subsistence agriculture to a money economy with attempts to expand its economic base. Agriculture still consists largely of subsistence farming, mainly of taro, bananas, coconut and breadfruit for local consumption. It has limited export potential and, in fact, no longer supports even local needs. Most food, including even some canned fish, is now imported, as are most other commodities. These imports, though, are countered by more than double in dollar volume of

exports by private businesses, particularly the two tuna canneries, which are the largest private employers. Other private economic activity includes limited tourism (two hotels containing a total of 117 rooms and related services), some small wholesale and retail businesses, and some shipping and transportation services. Private enterprise, however, is reported to account for less than one-third of the territory's economic base. The Government itself is the dominant source of capital and expenditures and provides 40 percent of the territory's employment.

While individual income levels are low compared to the United States, they are much higher than in the Trust Territory and the other neighboring Polynesian areas. For the array of salaries reported in "Housing in American Samoa" the overall average hourly salaries were: Western Samoa at \$0.38; Fiji at \$0.43; American Samoa at \$1.14; and \$0.18 for the Trust Territory.

The present U.S. subsidy program and private business growth has tripled the median annual income for families in American Samoa during the last decade (\$767 in 1959 to \$2,397 in 1969). With a money economy the American

Operational Plan for Solid Waste Management
Government of American Samoa

Samoa is developing a material need. Import tonnage is anticipated to double by year 1980 from its present year 1972 figure of 197 tons.

It is hoped that American aid can be replaced by island industry. The economic development program calls for more outside investment and manufacturing for export (taking advantage of tax incentives and U.S. import quota exemption), expanded hotel and tourist related services, local market-oriented business development to increase income through import substitution, more utilization of the area's fisheries resources and increased agricultural production for local consumption.

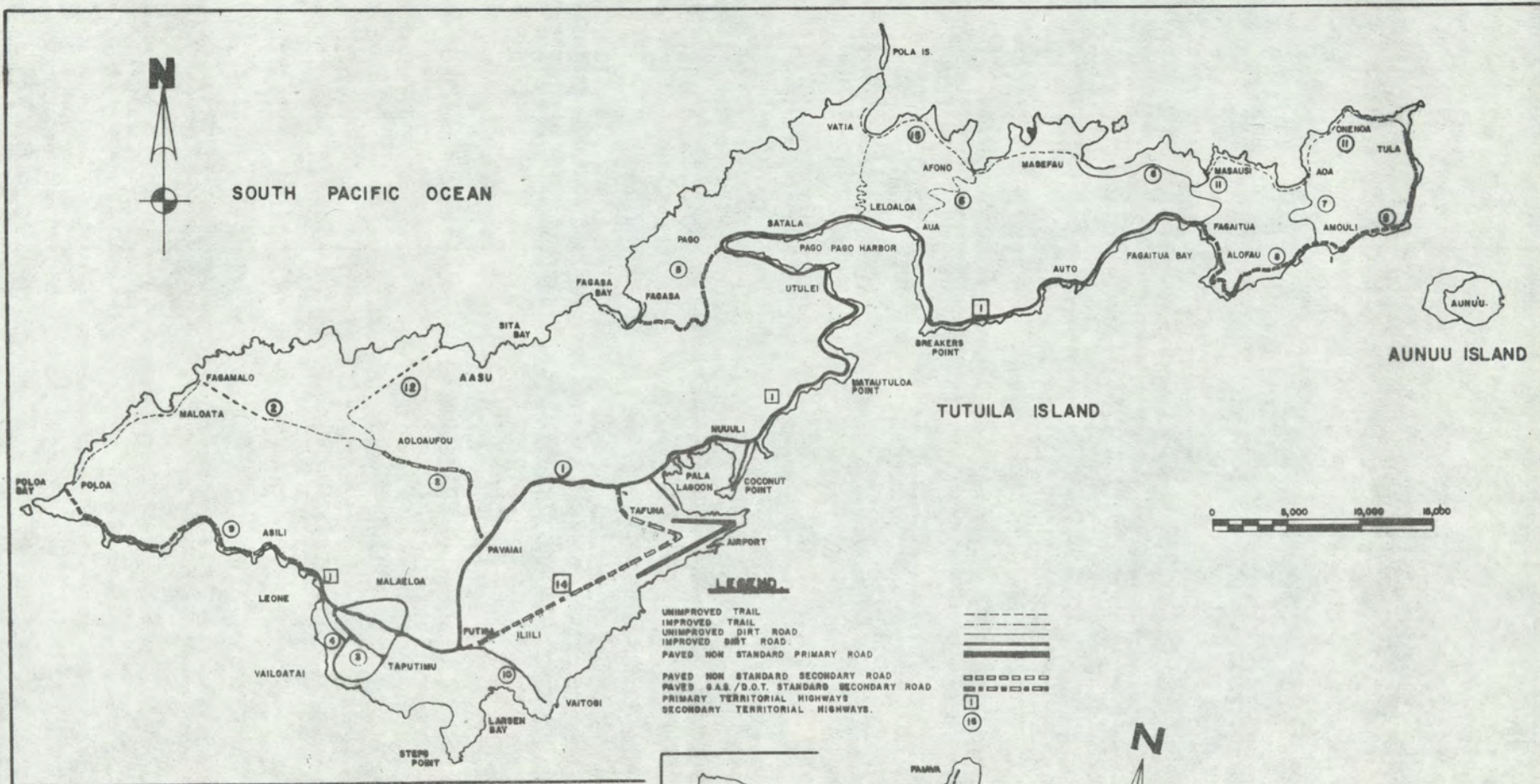
Developing such a self-sustaining economy will not occur without first resolving some perplexing problems. For example, there is a law requiring that no alien hold ownership to property or lease for longer than thirty years. This law stifles outside large capital investments that require the land to be held for collateral. Furthermore, land division will be difficult to deed and transfer since only seven percent of the land in American Samoa has a registered owner (all other land is communally owned and managed according to Samoan custom).

There exists a limiting skilled manpower pool. The desired rapid conversion from subsistence to money economy has required emphasis on education. While a relatively high level of literacy has been achieved, little vocational training is offered. A prospective employer must assume his work force will need extensive jobsite training.

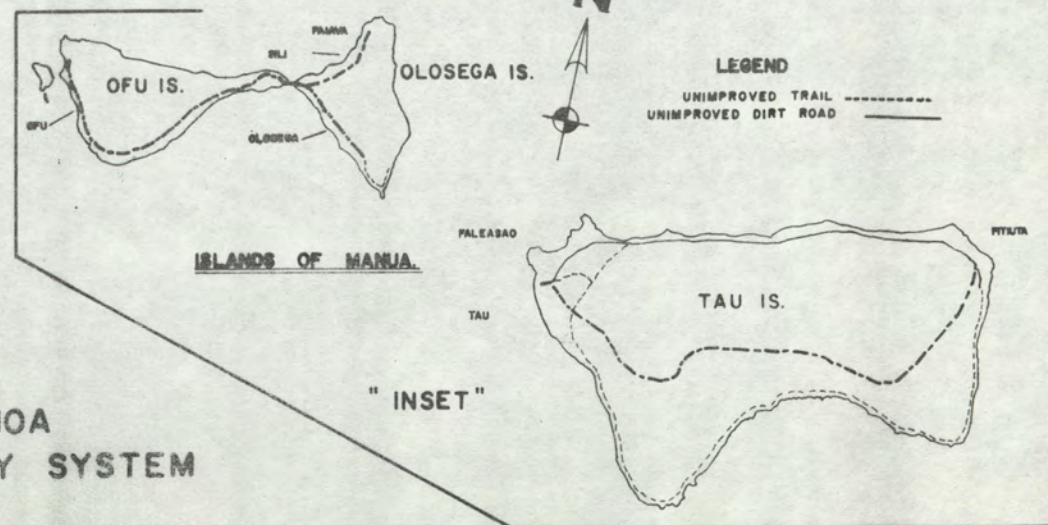
H. Transportation

Road construction has progressed far beyond development of other public utilities. As of 1971, the Territory had 44 miles of paved road and 33 miles of unpaved road. A two-lane paved road serves all villages on the south shore of Tutuila, from Poloa to Tula, a distance of 33 miles. Local roads within and to villages off the main road are usually unpaved and depend on funding entirely from local revenues. Only one out of seven miles of local streets is paved.

One paved road exists to the north shore of Tutuila, serving the village of Fagasa. The villages of Masefau, Masausi, Aoa, and Onenoa can be reached by unpaved roads which are rough in the wet season. Travel to other north shore villages and between villages is by trail or boat.



NOTE: DISTANCE BETWEEN MANUA AND TUTUILA ISLANDS NOT TO SCALE



AMERICAN SAMOA
TERRITORIAL HIGHWAY SYSTEM

Operational Plan for Solid Waste Management
Government of American Samoa

The Manu'a Islands have one eight mile primitive road on Tau. Otherwise, transportation between villages is by foot trail or boat. Transportation to and between the islands is also limited to boat. Boat travel is risky since the coastal villages have no sheltered moorings or harbor facilities. Roads in American Samoa are used extensively by pedestrians as well as cars, despite the obvious dangers to the pedestrians. Most sidewalks are in the Pago Pago Bay area.

Traditionally, dwelling locations in the village were tied to Samoan custom and located for convenient foot travel. The houses of one aiga were often placed in a row, marking the lands of that family and making convenient the extended family living pattern. With the present population growth the open spaces between structures are rapidly being filled in an historical fashion. This development pattern makes no allotment for vehicle thoroughfare. Roads skirt the edges of villages and are often crowded by structures built immediately after the street is installed. Traffic in and around villages is nearly impossible by motorized vehicles.

I. Samoan Living Pattern

A solid waste management plan must be groomed to fit the life style of the people it is to serve. The following discussion is presented to allow readers unfamiliar with "fa'a-Samoa", or Samoan way of life, the cultural background rudiments necessary to understand this report's overall objective of finding the refuse management system that fits the people.

The keystone of the "fa'a-Samoa" is the communal social structure, which contains the extended family (aiga) as the primary social unit, with a matai (or chief) directing the family's affairs. The "aiga potopoto" includes three kinds of "family" members--blood members, adopted titleholders and non-blood related titleholders, as well as the descendants and heirs to each of these. All members owe their loyalty and service to the aiga, through the matai, who manages the family lands and finances and appoints lesser matais to serve him and carry out certain responsibilities. In the society at large there is a complicated system of titled chiefs, high chiefs, paramount chiefs and talking chiefs which distribute power and influence as well as property. Nearly all land is communally held rather than individually owned.

Operational Plan for Solid Waste Management
Government of American Samoa

This structure is grounded in a non-Western communal value system in which little value is placed on individual autonomy, personal achievement and private property. Instead, traditional Samoans feel a fatalistic respect for God, respect for hierarchy, mutual dependence and reciprocal obligation and a sense of social balances which does not allow one person to get very far ahead of others. Under this scheme, the matais look after the economic welfare of their own. Socially, they regulate behavior and correct unacceptable forms. Politically, they come together in village councils to handle local affairs. Environmentally, they exercise responsibility for the area's limited natural resources.

In recent times, for better or worse, this traditional Samoan system has been undergoing rapid change and "modernization" in all of these respects. These changes have been taking place under the power, wealth and dominant influence of the United States Government and the territorial Government of American Samoa (GAS), which co-exists with the traditional village political system.

The American Samoan people live in very large households. There were 6.95 persons per household in 1970, compared

Operational Plan for Solid Waste Management
Government of American Samoa

to 5.73 persons in Micronesia (with its similarly young population) and a mere 3.1 persons in the United States.

The population of the Territory is extremely young. With a median age of only 16.1 years, almost half the population is under 15 years old. The age distribution in American Samoa is about comparable to Micronesia. The United States has a median age of 28 years, with only 28.5 percent of the population under 15 years old.

The impact of a changing economic system and expanded opportunities is beginning to be felt in the Samoan socio-cultural system. Traditional Samoan values and authority are being diffused as a result of education, conversion to a cash economy, desires for imported goods, and exposure to non-Samoan values and customs through television, tourists and returning relatives. They are reportedly being challenged by increased formation of nuclear families and values emphasizing individual achievement and opportunity.

These trends are likely to continue or accelerate, if more younger Samoans remain or return to take advantage of increased opportunities in their homeland. The

tendency in the past two decades has been for Samoans in the most productive working-age groups to seek better opportunities in Hawaii, the mainland United States or the U.S. Armed Forces. Government policy is to assure incentives to keep more of the productive group in Samoa. Many remaining or returning younger Samoans could be expected to resist submitting to the authority of the matai and turning over their earnings to him.

Unfortunately, complexing the problem of adapting life style is the accompanying situation of "modernization." The latter problem relates to the solid waste management in the following manner. The historical pattern of subsistence living created little waste. Of that waste, all was rapidly bio-degradable, for islander needs were satisfied with vegetation (baskets, housing, dress, food, etc.). Distant space housing, and the ever present natural process of jungle decay, allowed discharge of waste immediately outside the house (fale) with no obvious ill-health effects or social disfavor. Today with the advent of import products, plastic, synthetics and a host of "waste

Operational Plan for Solid Waste Management
Government of American Samoa

stream" items, this traditional waste disposal scheme can no longer be tolerated. Therefore, an extensive effort must be made to educate the Samoan away from "what comes naturally" to a concerned public that does not litter, properly stores waste for collection and assists the government to legislate for means to stem waste.

III REFUSE QUANTITIES AND COMPOSITION

A. General

A thorough knowledge of present refuse quantities and characteristics in American Samoa is essential background information by which forecast and similar planning aids can be developed. The absence of historical records other than those acquired during the last eight months makes it virtually impossible to establish trends, regulate vehicle use, assign personnel and determine other solid waste management functions. In American Samoa only those records associated with payroll and purchases have been kept. No public records have been maintained for the quantity of refuse hauled.

The disposal sites do not have scales or trained personnel responsible for keeping records. No spot sampling has been performed in the past. Fortunately, the present Samoan society is not complex. For this reason, one can feel relatively confident that the data compiled from sampling performed and records initiated within the short eight-month period of this report are reasonably representative. However, when a decision of major magnitude hinges upon some data contained herein, reassessment of the figures and sampling methods should be rigorously scrutinized.

B. Sampling

The type of individual and commercial waste can readily be identified at the landfill because there are clusters of individual living styles on Tutuila. Specific trucks were assigned to areas that depicted a particular mode of waste. The refuse collected from such sample areas was selected to represent the various private and commercial styles composing American Samoa (village, western-style housing, and various commercial types). The typical samplings were sorted for composition, weighed and measured for volume (Table III-1). Repeated test periods were selected at random in an attempt to note any possible variation over a period of time. Of all "grab sampling" to date, only minor variation of the results were found.

In anticipation of computing the public charge rate schedule shown in Chapter IV, percentages of waste associated with commercial collection, residential collection, and private disposal, were determined by recording significant information from all vehicles entering the landfill (Table III-2).

Although the 7-day sampling period ensured results would average out daily variations in refuse characteristics,

TABLE III - I

TYPICAL COMPOSITION OF SOLID WASTE ON TUTUILA

SOURCE AND TYPE OF WASTE	PERCENT BY WEIGHT	PERCENT BY VOLUME
<u>RESIDENTIAL SOLID WASTE: +</u>		
METAL AND PLASTIC	19	19
GLASS	29	8
COMBUSTIBLES	52	73
<u>OVERALL COMMERCIAL - INDUSTRIAL SOLID WASTE:</u>		
COMBUSTIBLE	73 TO 92	NOT DETERMINED
NON - COMBUSTIBLE	7 TO 28	"
<u>HOSPITAL WASTE:</u>		
COMBUSTIBLE	89	NOT DETERMINED
NON - COMBUSTIBLE	11	"
<u>SOLID WASTE FROM GOVERNMENT OFFICES AND SCHOOLS:</u>		
COMBUSTIBLE	84	NOT DETERMINED
NON - COMBUSTIBLE	16	"
<u>SOLID WASTE FROM SHIPPING PIER AREA:</u>		
COMBUSTIBLE	75	NOT DETERMINED
NON - COMBUSTIBLE	25	"
+ LOOSE DENSITY AS FOUND IN THE STORAGE CONTAINER		150 lbs/cu. yd.
TRUCK DENSITY (IZUSU COMPACTOR) AFTER COLLECTION		265 "
FIELD DENSITY AS FOUND AFTER PLACEMENT IN THE TAFUNA LANDFIELD FOR THIRTY DAYS		830 "

TABLE III-2
A TYPICAL WEEK OF SOLID WASTE COLLECTION*

SERVICE & TYPE OF VEHICLE	MONDAY		TUESDAY		WEDNESDAY		THURSDAY		FRIDAY		SATURDAY		SUNDAY		ROW TOTAL	
	TONS	%	TONS	%	TONS	%	TONS	%	TONS	%	TONS	%	TONS	%	TONS	%
Residential (GAS Collected)																
Compactors	15.1	56.8	13.6	33.8	14.8	41.8	7.0	21.9	9.3	36.0	4.5	26.9	-	-	64.3	35.0
Pickup (GAS)	2.5	9.4	3.9	9.7	2.2	6.2	1.4	4.4	1.6	6.2	2.3	13.8	0.8	10.5	14.7	8.0
Commercial (GAS Collected)																
Trailers	1.8	6.8	3.9	9.7	1.7	4.8	2.7	8.5	3.4	13.2	1.5	9.0	0.7	9.2	15.7	8.5
Containers	5.3	19.9	5.2	12.9	4.1	11.6	5.5	17.2	5.0	19.4	5.5	32.9	3.1	40.8	33.7	18.3
Private Collected																
Can Co.			4.6	11.5	2.4	6.8	1.3	4.1					3.0	39.5	11.3	6.1
Tuna (S. Kist)	1.9	7.1	3.9	9.7	5.3	15.0	3.6	11.3	6.5	25.2	2.4	14.4			23.6	12.8
" (VCamp)					3.2	9.0									3.2	1.7
Const. Debris							8.2	25.7			0.5	3.0			8.7	4.7
Others			5.1	12.7	1.7	4.8	2.2	6.9							9.0	4.9
Column Totals	26.6	100%	40.2	100%	35.4	100%	31.9	100%	25.8	100%	16.7	100%	7.6	100%	184.2	100%

Daily %
of Week Mon. @ 14.5 Tues. @ 21.8 Wed. @ 19.2 Thur. @ 17.3 Fri. @ 14.0 Sat. @ 9.1 Sun. @ 4.1

* THE WASTE DISPOSED ON THE PEAK DAY WAS 40.2 TONS AND ON THE AVERAGE DAY WAS 26.3 TONS

it could not account for seasonal variations. The climate of American Samoa is so uniform throughout the year that there is no particular change in living habits and consequently no related change in the constituent amounts of refuse produced throughout the year. Where the sampling procedure may show the greatest amount of error is in quantity of commercial solid waste. Commercial waste (particularly the canneries) and debris from construction projects peak due to several unpredictable variables. Therefore, it is possible to have sampled missing commercial peak loads and if so, the typical quantities presented in Table III-2 are less than the actual figures.

C. Present Unit Generation of Wastes

By applying the weight of refuse presently generated per day to the serviced population (approximately 10 percent of the population lies outside the service areas) it was possible to determine the present per capita of solid waste generated in Tutuila. Based upon additional data gathered from the sampling program, the data was divided, separating the units between residential and commercial. From this data, it was determined that present daily

refuse generation varies as follows: village residential at 0.88 pounds per capita and western-style residential at 4.2 pounds per capita. The average figure for all of Tutuila including commercial waste, is 2.0 pounds per capita per day. Comparing this average with the national average of 4.5 and Honolulu at 7.8 pounds per capita per day, immediate generalizations occur. Such non-qualified general descriptions of the present solid waste are as follows:

The scarcity of second-hand items on the island (due to the growing material need of the Samoan and their increasing affluency) reflects at the landfill in a total absence of second-hand items that are salvageable. White ware, automobile parts, furniture, etc. do not appear. When such items do arrive, they have been extensively cannabalized.

Demolition, building materials and other construction debris usually constitute 20 percent or more of a community's waste. In Tutuila, this component of the waste stream (now at 5 percent) will probably realize the most rapid future growth, due to the present emphasis on construction.

Light reading material such as magazines and paperback books are extremely difficult and expensive to obtain. Only a small circulation weekly four-sheet newspaper exists. Most village families cook on open fires that use paper for starting fuel. These facts account for the large absence of newsprint at the landfill.

The combustibles are, on the most part, containers and their stuffings. Of this group, probably over a ton of cardboard a day is disposed.

Extremely few of the island's returnable deposit bottles were found in the waste. Of the glass found in the refuse, over 90 percent were beer bottles. The relative value to the islander of the deposit seems to warrant bottle return. If beer were sold in a returnable bottle, one residential collection trip in five may be eliminated as well as reduce a portion of the metal waste (beer cans).

Food costs are generally twice the comparable stateside prices. Piggeries and numbers of domestic animals are kept individually by most Samoans. These details account

for the fact that wet garbage composes less than 2% of the waste collected.

Sorting of salvageable items may become practical at the landfill. The community makeup, by coincidence, requires that different waste arrive already separated (e.g. Can Co. tin trimmings). With space, an alerted landfill manager and utilization of the island low salaried personnel, individual truck loads could be segregated out and the contents salvaged. Further discussion of this concept is presented in Chapter V of this report.

D. Projection of Refuse Quantities and Composition

The population projections used for this study were based upon Projection III, Constant Fertility and Constant Migration of C.B. Park's 1972 American Samoa demographic study. For data beyond the time projections of Dr. Park's report, a graphical extrapolation procedure was used (Fig. II-3). A more thorough discussion of population and controlling parameters is presented in Chapter II of this report.

Besides total numbers, other population characteristics such as location and character are of importance.

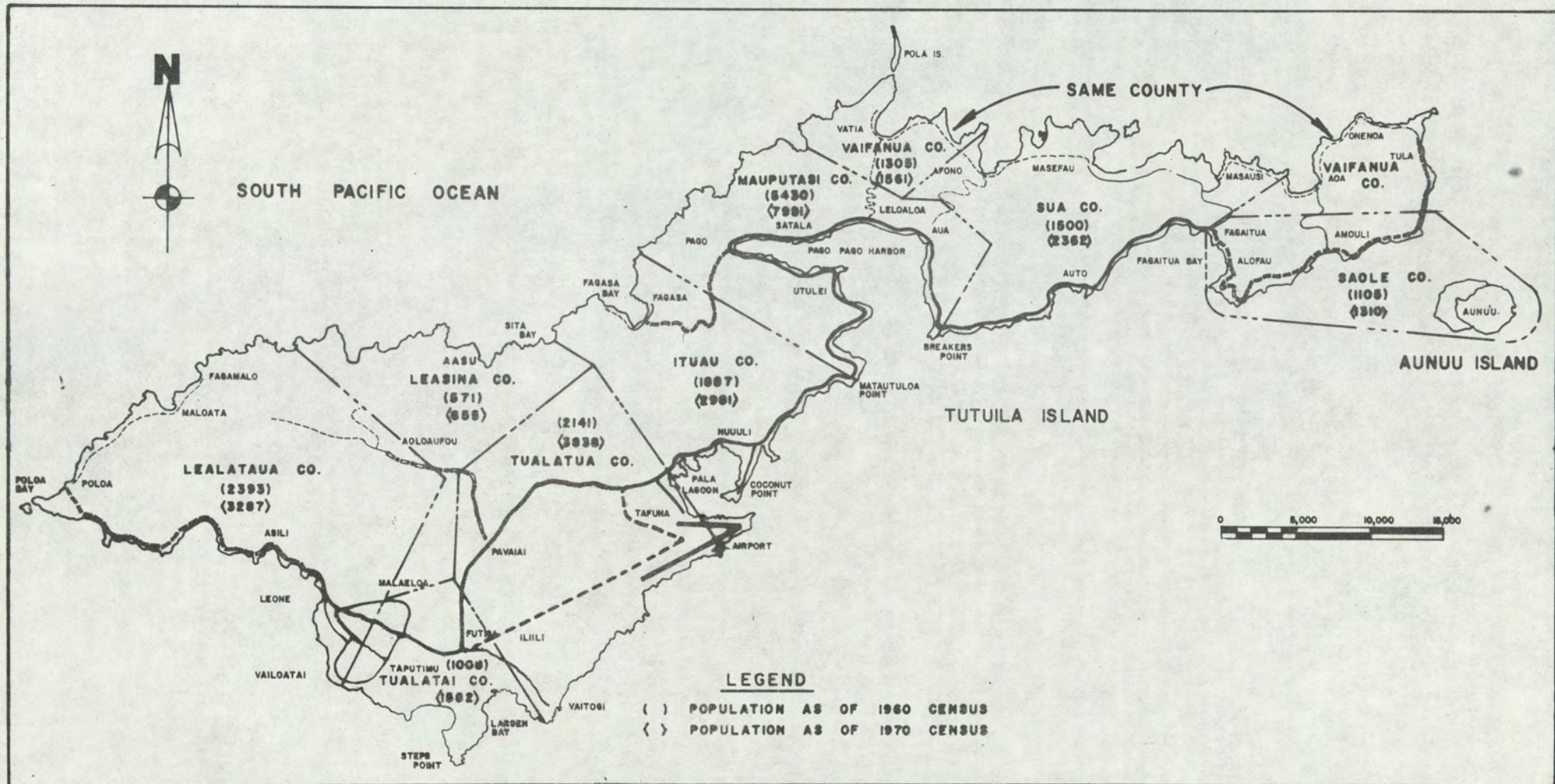
The purchase of tractor and truck and the design of the sanitary landfill site (with this report) for Tau indicates that the GAS recognizes the needs of the Manu'a Islands for mechanized solid waste management. Even though American Samoa's outer villages and islands will eventually receive further attention, those needs should remain within the scope of the "Village System" presented in a later chapter. The majority of budget and planning will continue to focus on the populated island of Tutuila. To account for the district differences between city and villages, the gross population was divided into the two divisions (Village System and Tutuila) in Table III-3. For further refinement, consideration was given to specific points of settlement. Two factors seem to direct settlement on Tutuila. Figure II-5 depicts the buildable lands (sloping less than 20 percent), while Figure III-1 indicates the migration to the Pago Harbor industrial center. It is interesting to note that the influence of one factor works to nullify the other. The Bay Area has minimum buildable lands available, while the Tafuna Plains, with its extensive suitable lands, has no employment opportunities. Action such as the GAS proposed industrial park in Tafuna will undoubtedly assure Tafuna of the majority of Tutuila's future settlement.

TABLE III-3
PROJECTED SOLID WASTE GENERATION ON AMERICAN SAMOA, 1970-2005

POPULATION				WASTE GENERATION					
Year	Total	Tutuila	Outer Villages	TUTUILA			OUTER VILLAGES		
				AVG. lb/ Cap.	Tons/Day	Tons/Year	AVG. lb/Cap.	Tons/Day	Tons/Year
1970	27,159	24,443	2,716	1.70	21	7,583	0.80	1.1	402
1975	30,720	27,648	3,072	2.17	30	10,950	1.02	1.6	572
1980	34,120	30,708	3,412	2.77	43	15,700	1.30	2.2	809
1985	37,280	33,552	3,728	3.53	59	21,540	1.66	3.1	1,129
1990	40,410	36,369	4,041	4.51*	82	29,930	2.12	4.3	1,563
1995	42,230	38,007	4,223	5.75	109	39,790	2.71	5.7	2,089
2000	44,130	39,717	4,413	7.34	146	53,290	3.45	7.6	2,779
2005	46,120	41,508	4,612	7.80+	162	59,130	4.41	10.2	3,712

* UNITED STATES NATIONAL AVERAGE

+ HONOLULU, HAWAII'S PRESENT PER CAPITA VALUE



TUTUILA COUNTY POPULATION INCREASE

With the completion (some already funded) of outer village-connecting roads (Figure 11-6), additional population will become included in the mechanized Tutuila refuse system. All factors considered, a 90/10 division of population was determined to exist and remain between Tutuila and "Village System" (Table III-3).

For this report, minimum attention was paid to composition of present and future waste other than those general comments stated in the previous section and as shown in Table III-1. Knowledge of detailed composition is a necessary factor when evaluating sophisticated systems and should the GAS elect to explore more elaborate methods, greater emphasis will have to be expended on detail composition. It was sufficiently accurate for this report to utilize the Daily Refuse Composition Projection of the City and County of Honolulu Solid Waste Management Plan (Table III-4).

Having established population, quantities of waste were computed by multiplying with an overall per capita generation value. This 1972 base number of 2 pounds per capita per day was increased at 5 percent annually as the stateside trend indicates (Table III-3). Because American Samoa is far behind in its per capita waste in comparison to the States (National avg. is 4.5 lbs.

TABLE III - 4
PROJECTED REFUSE COMPOSITION, TUTUILA

REFUSE COMPONENT	1975		1985		1995	
	TONS	%	TONS	%	TONS	%
COMBUSTIBLE						
PAPER	783	31	1,183	35	1,689	37
TRIMMINGS	451	18	756	22	1,202	26
RAGS	27	1	40	1	52	1
WOOD	496	20	496	14	516	11
FOOD	63	2	87	3	115	3
PLASTICS AND MISCELLANEOUS	28	1	44	1	65	2
NON - COMBUSTIBLE						
METAL	152	6	209	6	269	6
GLASS	76	3	107	3	141	3
DEMOLITION MATERIAL	469	18	497	15	516	11
TOTAL	2,545	100	3,419	100	4,565	100

NOTE: FOR THOSE YEARS AFTER 1995 THE COMPOSITION
WILL REMAIN AS SHOWN FOR 1995.

per capita), it is feared that greater acceleration of the "waste stream" may occur. The daily waste quantity projection for Tutuila (Table III-3) is shown graphically in Fig. III-2.

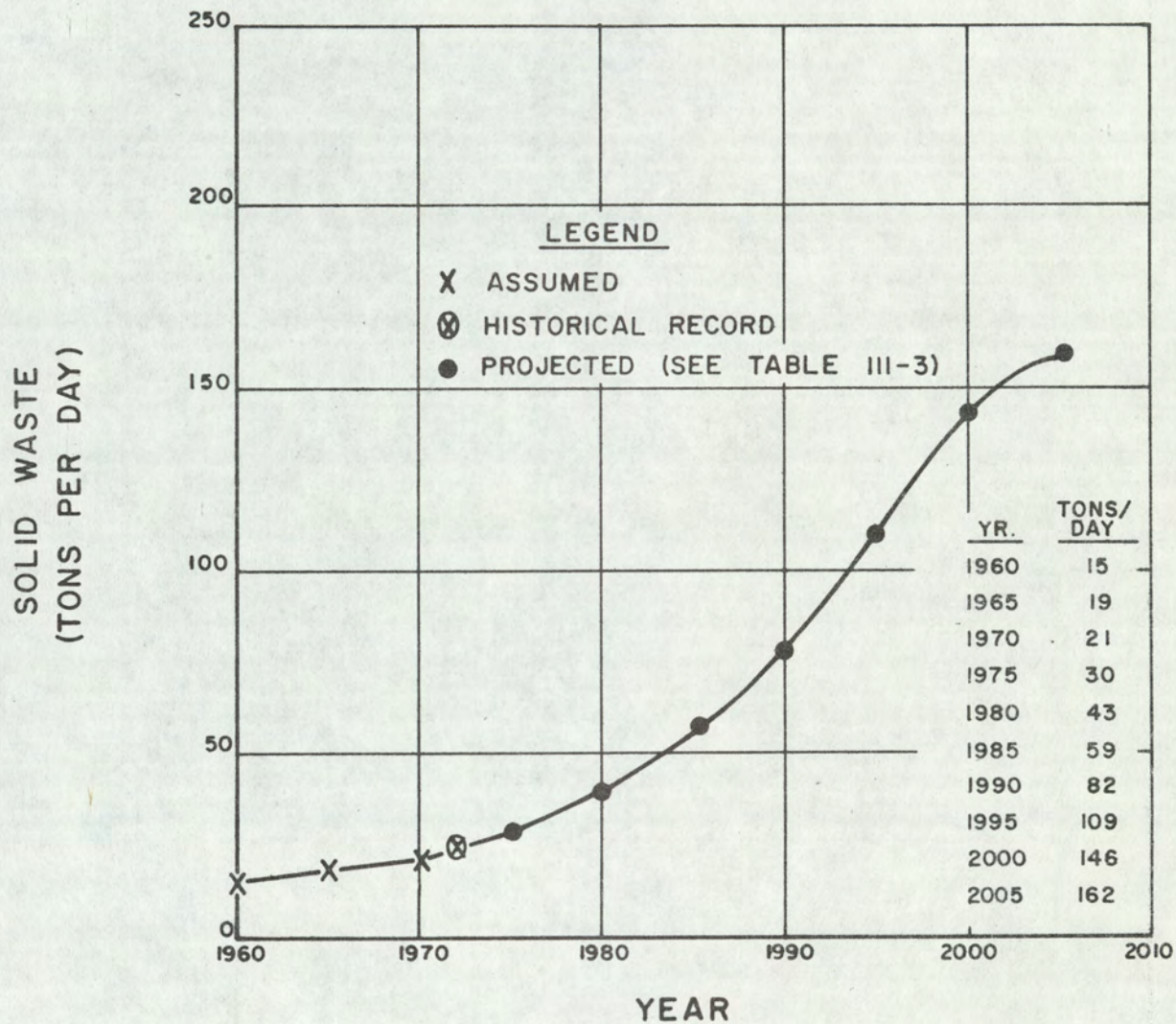
E. Automobile Disposal, Tutuila

There is presently no licensed automobile wrecker for a used-parts business in American Samoa. In the past, the Government of American Samoa has taken the responsibility and ensuing cost for most collection of and all disposal of abandoned automobiles.

The statistics of vehicle ownership (Table III-5) indicate a pressing future need for the waste handling and disposal of the abandoned automobile and associated parts.

Recent proposed legislation limiting the size of vehicles and restricting their number has met defeat. Some roads to outlying villages are now funded and under construction; others are being planned (Fig. II-6). These factors would indicate that the trend toward increased automobile use will continue.

The results of a statistical method used to project the number of vehicles to be disposed of is presented in Fig. III-3. In computing these numbers, the following

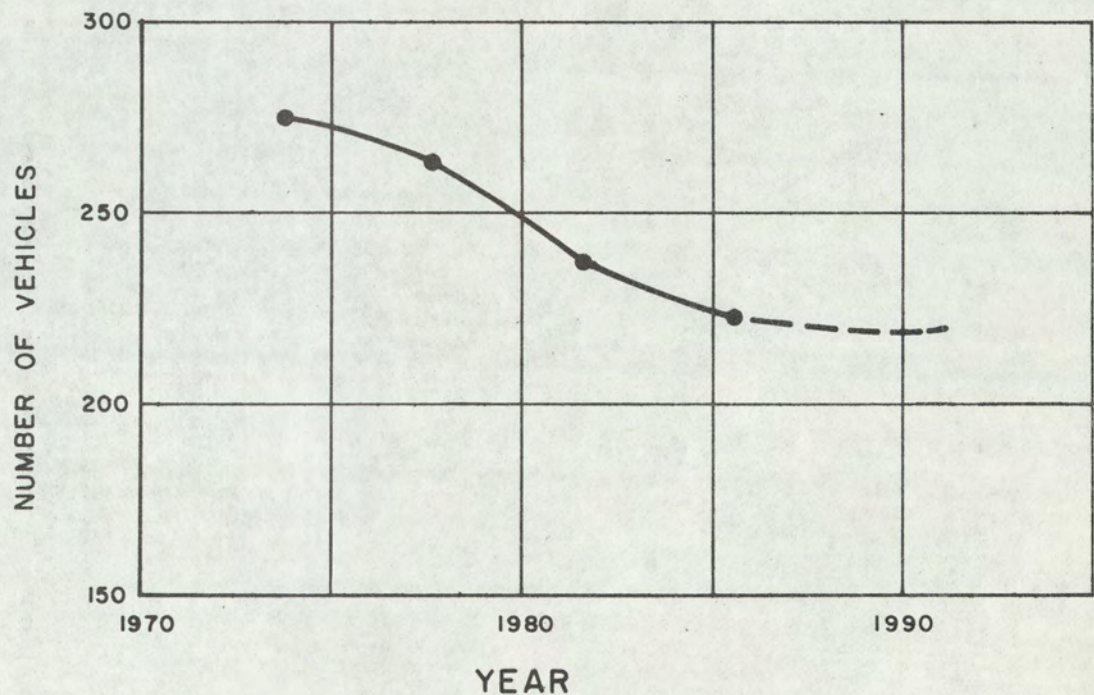


PROJECTED DAILY SOLID WASTE GENERATED
ON TUTUILA, 1960 TO 2005

TABLE III - 5
REGISTERED VEHICLES

TYPE OF VEHICLE	YEAR					
	1966	1967	1968	1969	1970	1971
PRIVATE	691	906	1200	1367	1538	2115
TAXI	104	104	92	91	90	88
BUS	139	161	160	167	141	197
CARGO	100	91	76	73	70	70
GOVERNMENT	UK	UK	UK	UK	271	286
TOTALS	1034	1262	1528	1698	2110	2756

UK - UNKNOWN



**PROJECTED NUMBER OF VEHICLES
TO BE DISPOSED OF ANNUALLY**

debatable assumptions were made:

The mean life span for vehicles is 7.6 years.

There are presently 12 persons per automobile.
By 1975 the ratio will reach eight persons per
automobile and remain there.

Statistical methods applicable in determining the
projected number of cars disposed of on mainland
U.S.A. are valid in American Samoa.

Should these assumptions prove valid, there will be 200
to 250 cars to dispose of annually.

IV SOLID WASTE MANAGEMENT

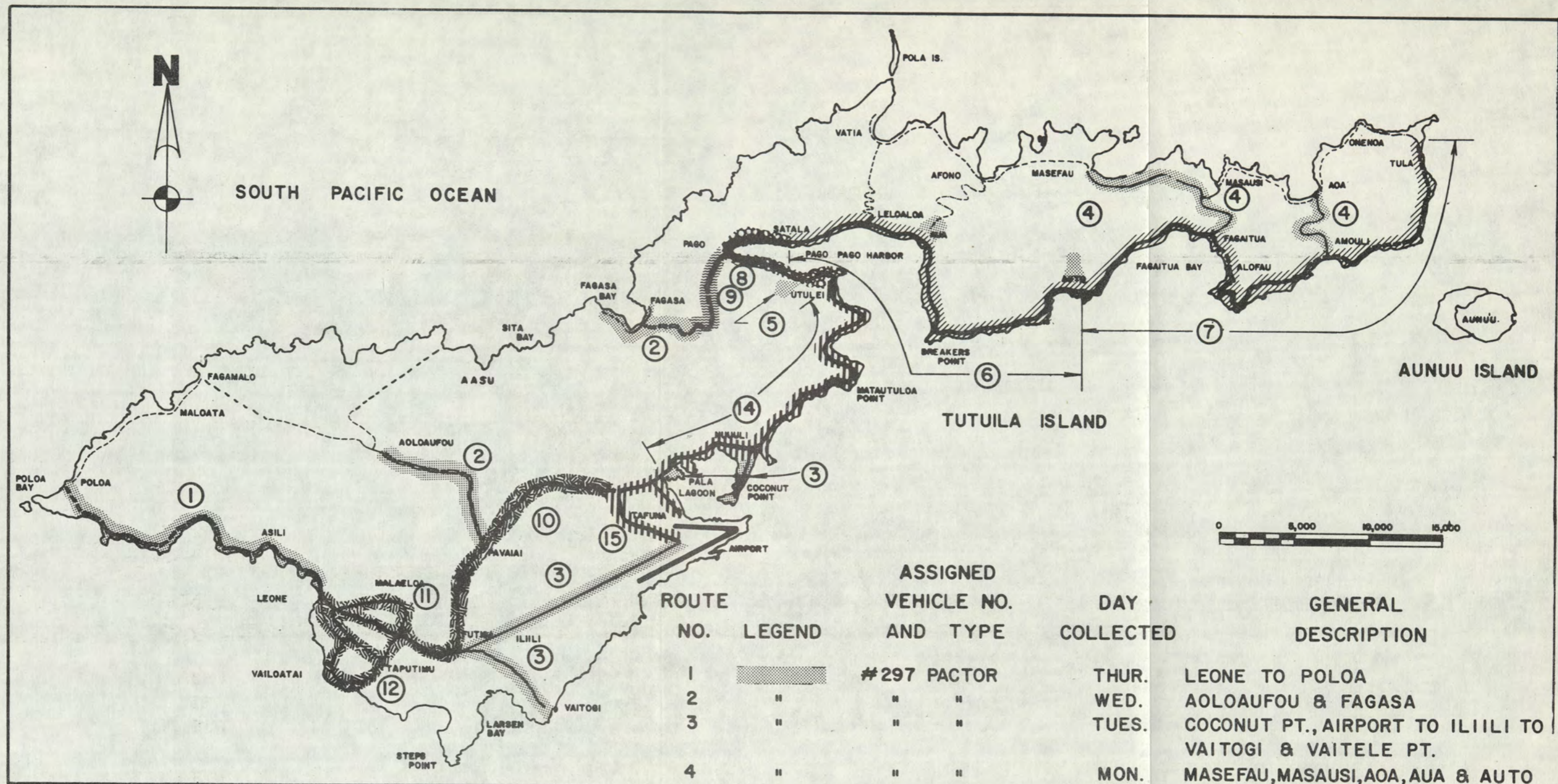
A. General

The solid waste program for American Samoa is totally administered by the Government of American Samoa (GAS). There are no private refuse companies servicing the islands for any component of the waste stream (including wrecked automobiles, butcher waste, paper products, etc.). The military complexes also depend on the GAS for its refuse management.

I. Philosophy of Service Provided

The GAS has elected to cater to the public in a zealous attempt to keep Tutuila free of solid waste. As shown in Figure IV-1, where access is marginal, weekly door to door collection is provided. In all except the Bay Area where access is good, bi-weekly door to door service is rendered. The Bay Area is collected daily (seven day basis) by compactor trucks. Commercial containers are collected at least every third day.

In the past the GAS has supplied waste receptacles upon request. Recently over 5,000 heavy duty 26 gallon plastic containers and lids were distributed to the public. The relative value of these containers by



**SOLID WASTE COLLECTION
ROUTE ASSIGNMENT MAP**

ROUTE NO.	LEGEND	ASSIGNED VEHICLE NO. AND TYPE	DAY COLLECTED	GENERAL DESCRIPTION
1		#297 PACTOR	THUR.	LEONE TO POLOA
2		" "	WED.	AOLOAUFOU & FAGASA
3		" "	TUES.	COCONUT PT., AIRPORT TO ILILI TO VAITOGI & VAITELE PT.
4		" "	MON.	MASEFAU, MASAUJI, AOA, AUA & AUTO
5		" "	FRI.	FAGASA & HAPPY VALLEY
6		#213 PACTOR	MWF	SATALA TO AUTO
7		" "	TThF	AUTO TO TULA
8		#214 PACTOR	MTWThFS	INTER. HOTEL TO SATALA
9		#132 DUMP PICKUP	TF	VAIPITO VALLEY
10		#236 PACTOR	TWF	AIRPORT RD. TO LEONE
11		" "	TTh	VAIALA - MALAELOA LOOP
12		" "	MW	VAILOATAI - TAPUTIMU LOOP
13		#132 DUMP PICKUP	MWThSSun	FAGATOGO, BACK ROADS
14		#237 PACTOR	TWF	INTER. HOTEL TO AIRPORT RD.
15		" "	TTh	AIRPORT RD. & TAFUNA HOUSING



ROUTE NUMBER
ROUTE NUMBER 13 IS NOT SHOWN. THIS IS THE ASSIGNED NUMBER FOR THE DUMP PICKUP ROUTE. A ROUTE THAT IS CHANGED DAILY DEPENDING ON NEEDS.

private individuals for other uses and the abusive use of the containers by both the public and GAS refuse collectors have seriously reduced the number of plastic containers. In most cases the plastic containers are being replaced with used 55 gallon drums and woven baskets (it is now the policy of the GAS not to furnish containers to the general public). Others elect to pile rubbish in any fashion near the street. Even though these piles may sometimes take as long as fifteen minutes to collect, GAS still provides the service.

The absence of curb and gutter and other street boundary defining improvements, or consistent house set-backs, leaves no guidelines for where to place the receptacle for collection. Present location of containers are situated more for the convenience of the homeowner than the collector. Often, though a home is within 25 feet horizontally, it will lie 20 feet vertically above the street due to steep island terrain. As described in Chapter II, there is minimum vehicle access between houses in villages. Collectors park on the outskirts of the village and then spend unreasonable time searching and carrying containers from within the settlement.

In the past, when the population growth was slow, each small housing cluster had built and maintained an elevated rock wall enclosure for container storage. The

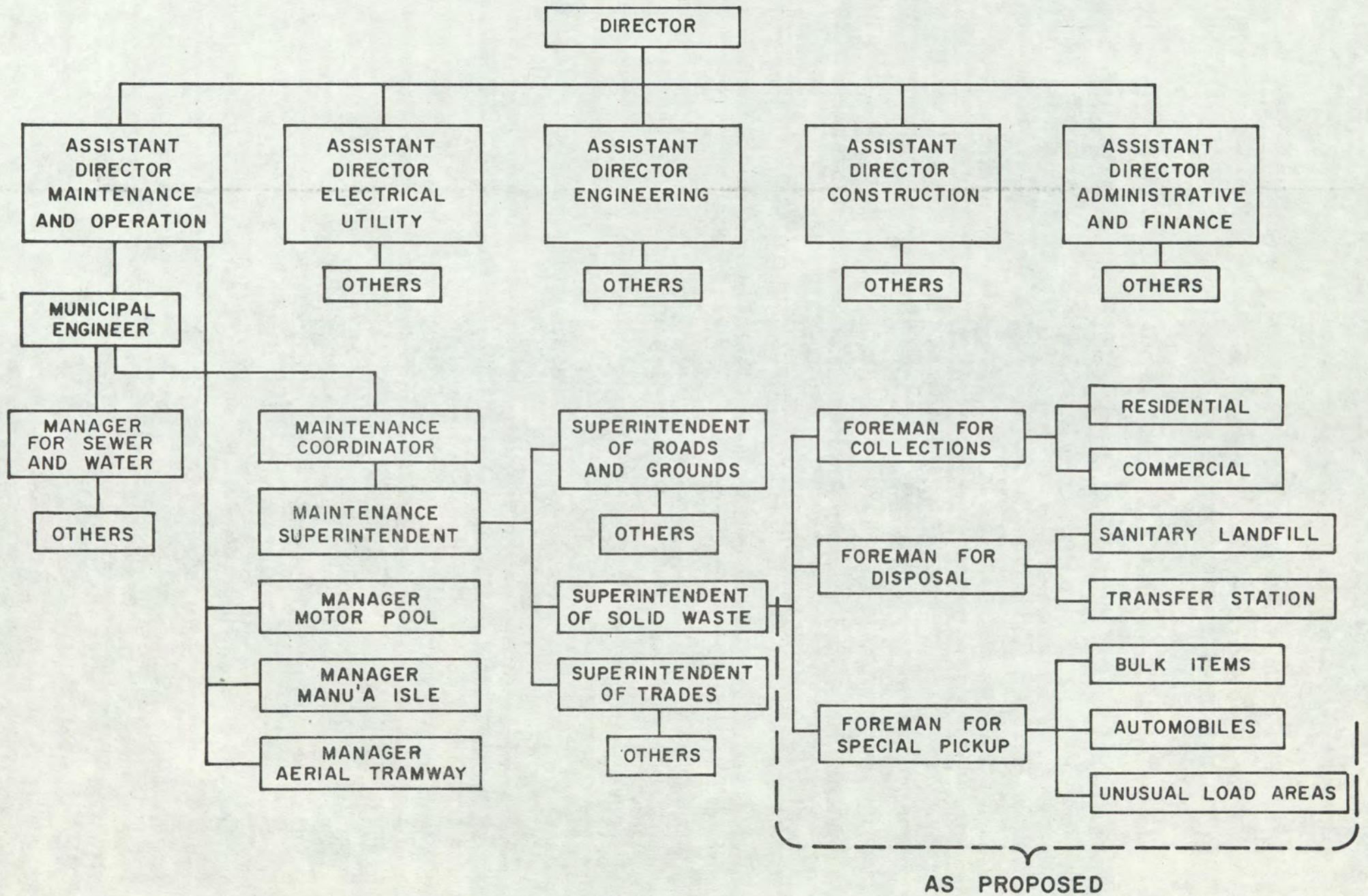
enclosure was located close to the street. These assigned spaces protected the refuse from rummaging and spilling by animals. Today this practice is seldom followed. Only where the old wall enclosures remain or in government housing, is there a semblance of uniform storage of solid waste.

The acceptance of random places, absent and varied shaped containers, the distant location of houses, and minimal streets and street improvements all greatly deter efficient collection (a significant reason behind the high cost indicated).

Commercial, domestic and special collection and disposal is provided through the general operating fund of the GAS. No individual collection or disposal charges are imposed for any service although an attempt to introduce commercial collection charges through legislative action was made, but died in committee.

2. Manpower

Solid Waste Management is a section of the Maintenance and Operation Division of the Department of Public Works (DPW), Figure IV-2. The superintendent directs a 31-man work force within which the chain of responsibility is ill-defined. Men of the Refuse Section and those in the Roads and Grounds Section are supplemented and borrowed as absentee problems develop and



PRESENT ORGANIZATION OF THE DEPARTMENT OF PUBLIC WORKS

the work load dictates. No skill requirements are established for foremen, crew chiefs, drivers, or operators as in established stateside firms.

Men interchange rolls regularly within the framework of a team. With team members constantly mixing, it is virtually impossible to impugn responsibility for specific acts of incompetence.

Absenteeism averages 16 percent compared to a 20 percent average in Guam. This value is normal for a trade that is reported nationwide to have a gross absentee problem. In the GAS, this annual average is not totally representative of the disruption that missing personnel play. The average Samoan receives annually twenty days of vacation time and 13 days of sick leave. Because of common ethnic, religious, and social customs, many personnel try to take the same days off. Therefore, there are short periods of extreme absenteeism. During such occasions, collection falls far behind, later requiring large amounts of overtime and route disruption.

The refuse section created a year ago was formed from existing employees of other sections. No salary incentive was made to entice men into this trade which

TABLE IV-1

SOLID WASTE MANAGEMENT
EMPLOYEE PAY SCHEDULE
AS OF 1973

	<u>Base Pay</u>	<u>Benefits</u>	<u>GAS Cost</u>
Starting Salary	\$1.05/hr.	30%	\$2,200/yr.
Aug. Salary*	1.29/hr.	"	2,673/yr.
Top Salary	2.37/hr.	"	4,939/yr.
Tractor Operators	1.49/hr.	"	3,099/yr.

Standard Work Week is 40 hours.

Overtime is paid at time and one-half of Base Pay.

Vacation Schedule

0-90 days employed	no vacation
1-3 years employed	13 days per year
3-15 years employed	19.5 days per year
15 years employed	26 days per year

There are 11 paid holidays per year. Employees are entitled to 13 days per year sick leave (accumulative).

*Average of all salaries paid in Solid Waste Section.

Operational Plan for Solid Waste Management
Government of American Samoa

is considered to be a socially unacceptable occupation to other Samoans. Starting employee salaries are \$1.05 compared to \$2.33 per hour in Guam. Top salary is \$2.37 for the GAS's refuse section. In previous years, the depressed salaries have not been totally realized because the average refuse employee earned 75 percent over and above his base salary in over-time.

Only one employee has previously worked for another refuse management company. With no experience, other operations to emulate, or vocational training, the GAS refuse section personnel have been learning by trial and error.

In a dangerous trade that has 57 percent more injuries than coal mining, one would expect the Samoan inexperience to portray a high percentage of injuries. The common attire (a wrap around cloth from waist to knee and rubber thongs) should also mean excessive accidents. Yet, there is no evidence that this is the case. Reports indicate that the equipment employed has inefficient (by today's standards) but safe moving components and that the Samoans accept small surface

injuries as normal routine. These factors form the basis for the low report of injuries. Anticipating possible problems, the GAS now requires gloves, pants and leather shoes be worn, although this policy is seldom adhered to.

3. Equipment

The GAS collection and disposal equipment consist of:

- 4 - Izusu 13 cubic yard compactors
- 1 - 4-wheel drive fastpack 13 cubic yard compactor
- 2 - Dempster Hysters
- 1 - Pickup with a refuse dump bed
- 1 - 4-wheel drive Jeep for trailer transporting
- 1 - Superintendent's pickup
- 26 - Hyster commercial 4 cubic yard containers
- 4 - Custom-built 4-6 cubic yard commercial trailers
- 1 - Dempster 16 cubic yard compactor
- 1 - D-6 Caterpillar tractor
- 2 - D-4 Caterpillar tractors

All equipment is no older than two years or has been rebuilt. Maintenance and repair is performed by other sections of the Department of Public Works.

The constant rotation of drivers and operators, lack of personnel training and experience, maintenance and repair in the responsibility of other departments, and existence of poor roadways, all contribute

to an accelerated deterioration of the equipment and the determination that these vehicles will not be operable after five years.

The present available equipment is well suited for the task. Should the dwelling density intensify, the roads improve, and the men's skill increase, then greater capacity and large-sized hopper opening compactor trucks will be needed. In general, specialized equipment is justified for the desired level of service provided by the GAS.

The refuse section is responsible for special pickup for bulk items, unusual waste and disguardered automobiles. These functions are performed with specialized equipment rented from other sources.

B. Summary of Present Solid Waste Management Cost

I. General

The Section of Solid Waste Management had a 1972 operating expense of \$246,000. A figure that does not include necessary components of cost was the section on autonomous organization. In the establishing of actual costs for any services, the indirect overhead and administrative costs have to be considered

as a part of the total cost. Even though the Solid Waste Management Section is presently supported by general operating funds, it is wise to think of the section as a semi-autonomous organization supported solely from revenues derived from a service charge. These indirect and administrative costs include employees' fringe benefits, public liability and vehicle insurance, depreciation, operating and repair costs of supervision equipment, supervision, administrative office cost, payroll and bookkeeping.

For Fiscal Years 1972 and 1973 the sanitary landfill is operated on Government land. Government land will not be available after this period. Therefore, land should also be included in future disposal cost. Generally, the increased land value brought about by filling a presently unusable piece of property will offset the purchase cost. Unfortunately, the GAS accounting procedure will not allow such a credit.

Only last year GAS saw the first separation of refuse management from the Roads and Grounds Section which previously performed the work. The cost breakdown

for solid waste operations is shown in Table IV-2. Overall unit costs are \$9.56 per person per year, or \$33.67 per ton per year. Table IV-3 provides comparative values of other communities' expenditures for refuse programs.

Equipment costs are in three categories: Motor Pool Section rental, new equipment purchase and Heavy Equipment Section charges. For bookkeeping purposes within the Department of Public Works (DPW), the refuse section owns only tractors used in the disposal operation.

Collection equipment is rented from Motor Pool. The rental schedule is purported to cover all repairs, maintenance, tires, fuel, a five year replacement fund and a general charge for the availability of a complete repair shop. The rates as shown in Table IV-4 are still in a state of flux, a condition due to an inability to supply operating odometers which are necessary to implement the rental schedule. Presently, underestimated mileages are used to compute the rent. Should the correct mileages be determined as estimated for this report (Column 06 of Table IV-4), the rental charges would be unfairly high. Table IV-5 represents another rental

TABLE IV-2

SOLID WASTE MANAGEMENT ACTUAL COST
FOR FISCAL YEAR 1972

<u>Description of Expense</u>	<u>Dollars Spent</u>	<u>Percent of Total</u>
Employees	\$106,860	43
Equipment (new purchase & replacement pool fund)	41,496	17
Contractual Services (special eq. rental, construction needs, and cover soil supplier)	78,179	32
Supplies and Materials	19,162	8
Miscellaneous	<u>108</u>	<u>0</u>
TOTAL	<u>\$245,805</u>	<u>100%</u>

Population of serviced area was 25,725. Overall average unit cost was \$9.56 per year per person. Tonnage of refuse disposed was 7,300 tons. Tonnage unit cost was \$33.67 per ton.

TABLE IV-3

STATE, COUNTY, & TERRITORY SOLID
WASTE MANAGEMENT COST COMPARISON

Location	Collect Per Week (Avg.)	Sup't. Annual Salary	Daily Ref. Tons/Day	Population Served	Cost Per Ton	Annual Budget	\$/Person Per Year
Tutuila, Am. Samoa	2 (Door to Door Pickup)	\$4,782	20	25,725	\$33.67	\$ 245,805	\$ 9.56
Guam	"	4,060	182	70,500	7.00	419,000	5.95
Chilton County Alabama	People take Refuse to Central Coll. Areas	4,600	30	26,000	14.00	35,078	1.35
Honolulu Hawaii	1 (Door to Door Pickup)	-	-	-	-	-	12.00*
Tacoma Washington	"	-	-	169,000	-	1,299,000	7.30
Miamisburg Ohio	"	7,280	-	13,000	-	131,000	11.25

* Honolulu distributes the waste management cost for its extensive tourist industry over its relatively small permanent residency.