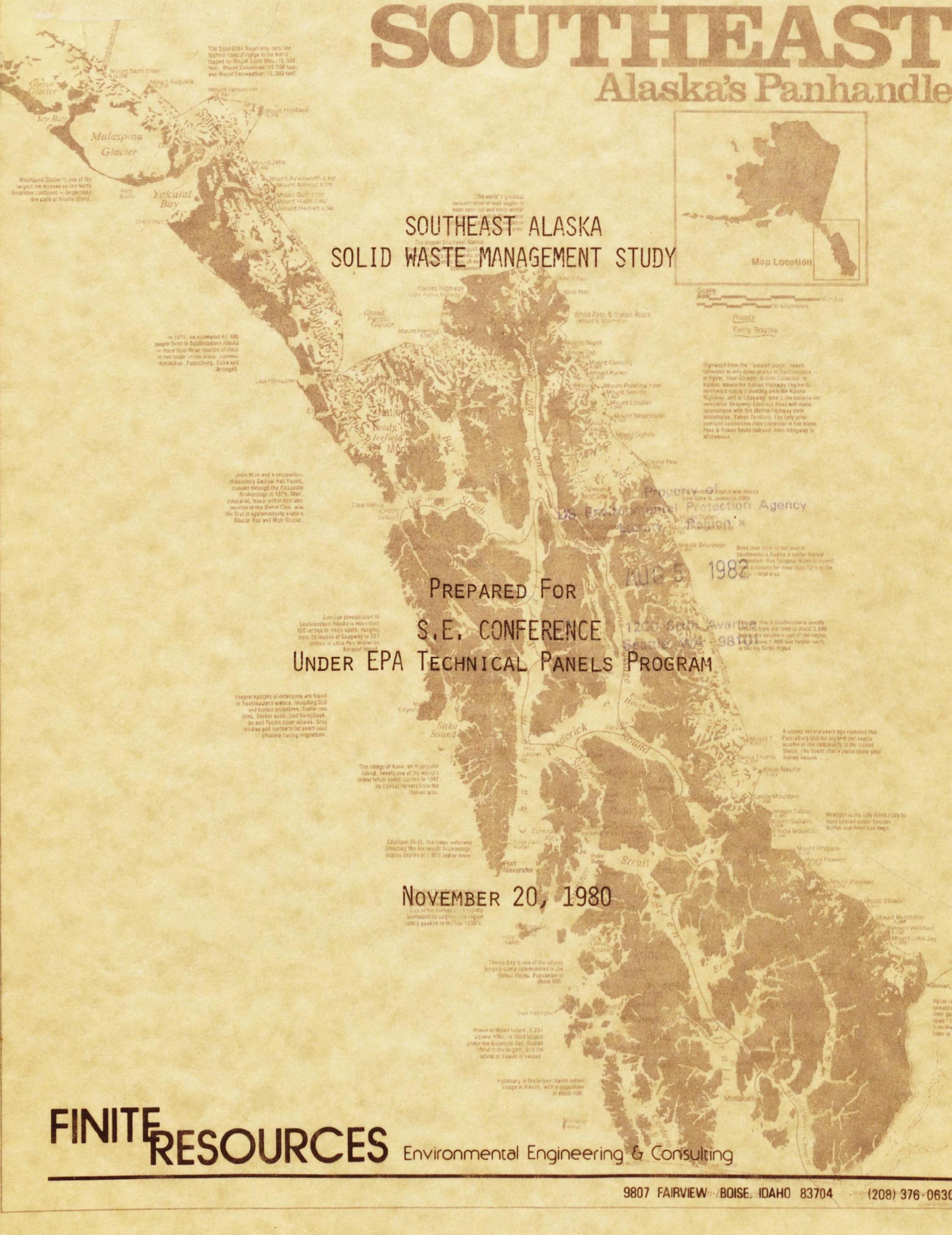

SOUTHEAST ALASKA
SOLID WASTE MANAGEMENT STUDY

PREPARED FOR

S.E. CONFERENCE
UNDER EPA TECHNICAL PANELS PROGRAM

NOVEMBER 20, 1980

FINITE RESOURCES Environmental Engineering & Consulting

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EPA 0504

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This report was prepared by Finite Resources, Inc., Boise, Idaho under sub-contract with Peat, Marwick, Mitchell and Company, prime contractors under the U.S. Environmental Protection Agency Region X Technical Panels Program.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT.)

APPENDICES

SCOPE

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In the fall of 1979, the officials of the S.E. Alaska Conference requested solid waste management technical assistance from the EPA as provided for under the technical panels program of the Resource Conservation and Recovery Act of 1976 (RCRA).

In response to the request Peat, Marwick, Mitchell and Co., the technical panels prime contractor for EPA Region X subcontracted with Finite Resources, Inc. to conduct a Phase I study. This consisted of attending a S.E. Conference meeting in Ketchikan and developing a proposal for a Phase II solid waste management study. (A copy of the proposal and plan outline are contained in Appendix A.)

After review of the Phase II proposal by the S.E. Conference, Peat, Marwick, Mitchell and Co. and EPA, Finite Resources made some requested modifications and EPA gave approval to proceed with the S.E. Alaska Phase II solid waste management study.

INTRODUCTION

INTRODUCTION

As is evident from the proposal in Appendix A, the strategy was to determine the current status of existing solid waste management systems in S.E. Alaska and then develop a technical analysis of alternative solid waste management systems which are reasonable and practical for the study area.

The relative feasibility of three basic solid waste management systems would then be determined on the following basis.

* A regional solid waste management system serving the entire S.E. Alaska Panhandle. This would entail using barges or the Marine Highway and a large central solid waste processing or disposal facility.

* Two or three subregional solid waste management systems serving logical waste sheds as determined by the geographic and transportation characteristics.

* Solid waste management systems based on the premise that each municipality or borough will operate their own solid waste management facility.

The initial step of the study was to physically inspect the existing solid waste management systems in each municipality or borough, that was active in the study, and meet with the local officials responsible for the operation of the solid waste management systems to gather fiscal and general demographic information and determine existing technical and environmental problems. The survey form in Appendix A was completed by most municipalities and/or boroughs and was used as an outline during the meetings.

During the initial survey, the status of existing management systems for municipal solid waste, junk automobiles and wood waste would be emphasized. However, the survey would also attempt to determine if there are potential energy markets if solid waste energy recovery systems prove to be feasible in any areas.

Finite Resources utilized fourteen days in S.E. Alaska for the survey with the itinerary established with the assistance of the Alaska Department of Environmental Conservation (ADEC).

S.E. ALASKA GENERAL CHARACTERISTICS

S.E. ALASKA GENERAL CHARACTERISTICS

As is evident from the map in Appendix B, S.E. Alaska is a rugged seaboard of mountainous islands and peninsulas with very few miles of highway.

The climate, geology and geography are not well suited for solid waste management, especially land disposal. The following specific characteristics outline some of the general solid waste management problems shared by almost all of the S.E. Alaska communities.

* Limited land area with the mountains virtually rising out of the sea makes land very valuable and solid waste disposal sites cannot compete with other types of land development. Numerous areas of muskeg or marsh land further limit what is suitable for conventional land disposal systems.

* Extremely high precipitation rates as rain or snow in conjunction with much lower evapo-transpiration rates results in the generation of leachate from land disposal sites. The leachate is primarily a hazard to surface water quality because of the unique geology and resulting absence of ground water in most areas of S.E. Alaska.

* A very limited soil depth in most areas of S.E. Alaska complicates the covering of the solid waste deposited at land disposal sites. This increases leachate generation and attracts such vectors as birds, flys and even bears which constitute a definite safety hazard for site users. In many areas the expensive practice of importing soil cover is even necessary.

* The only transportation modes which are available between most of the communities are air or marine. This definitely complicates the regional or subregional approach to solid waste management.

* Since most all goods and commodities related to the generation of solid waste are shipped in from outside the S.E. Alaska area the solid waste stream is very high in packaging waste and primarily paper and paper products.

During the course of the survey, it became evident that even "good estimates" of the solid waste generation rates or solid waste volumes were going to be very difficult to acquire. The survey sheets which were completed by most of the communities did provide some rough estimates of solid waste volumes. However, since the amount of solid waste available is an important parameter when used to size solid waste management facilities especially baling, shredding and energy recovery plants, better solid waste generation data was deemed a very high priority item.

Fortunately, Channel Sanitation, which is the private firm operating the Juneau sanitary landfill and collection service, weigh all of the solid waste that is delivered to that facility. The cooperation of Channel Sanitation and the efforts of the ADEC have resulted in some very good estimates of the solid waste generated in the Juneau area. This data will be used in conjunction with the Juneau population to calculate a solid waste per capita generation rate which will be used with the population information from the other S.E. Alaska communities and boroughs to estimate solid waste volumes.

The composition of the solid waste stream is also an important element especially for energy recovery systems since this affects the BTU value of the solid waste which of course affects the amount of energy that can be generated by a solid waste energy recovery facility. The results of numerous analyses and investigations reveal that a typical BTU range for residential solid waste is 4200 BTUs/lb to 4700 BTUs/lb. In view of the many independent surveys that support these figures, a value of 4500 BTUs/lb will be assumed for energy recovery computations in this report.

It is important to note that moisture content will significantly affect the available energy that can be extracted from the solid waste and this parameter may definitely warrant further investigation at a later time if solid waste energy recovery appears feasible for any of the communities because of the high precipitation rate characteristic of S.E. Alaska.

EXISTING MUNICIPAL/BOROUGH SOLID WASTE MANAGEMENT SYSTEMS AND VOLUMES

EXISTING MUNICIPAL/BOROUGH SOLID WASTE MANAGEMENT SYSTEMS AND VOLUMES

The following data for the S.E. Alaska municipalities and boroughs were obtained primarily from the survey trip, related follow up activities and the efforts of the participating communities and ADEC. Information is listed for the majority of the S.E. Alaska communities although the data is more complete for those communities that were active participants in the study and were therefore surveyed in person.

Appendix C contains information on the specific municipalities and boroughs including recent population estimates and Appendix D contains those survey forms that were completed by the S.E. Alaska communities.

The city and borough of Juneau will be analyzed first to allow the use of the solid waste per capita generation rate in the subsequent analysis of the other S.E. Alaska communities. Those communities using the same disposal site will be analyzed jointly.

After Juneau, the communities will be reviewed in the order surveyed during the trip.

I. CITY AND BOROUGH OF JUNEAU

A. Population

The information in Appendix C lists the population of the city and borough of Juneau at 23,115. However, during the survey the 1980 population was estimated at 25,000 persons. Local officials have estimated the area growth at approximately 5% per year primarily in the outlying areas of Mendenhall and Lemon Creek.

B. Solid Waste Volumes

As was previously referenced, Channel Sanitation, the operators of the solid waste collection and disposal service, weigh all the solid waste that is deposited at the Juneau sanitary landfill. The following tables have been derived from their weight records with assistance from ADEC accountants.

There are four major categories of solid waste depending on the method of payment of the disposal charge. These are cash, two charge columns and the Channel Sanitation collection vehicles. There were also specialized solid waste categories for auto and wood combined, white goods (primarily appliances) and wood crates and boxes.

Detailed record keeping of cash sales is a relatively new practice with information available for only April through June of 1980. There also appears to be a considerable variation for some of the smaller categories of solid waste such as white goods and auto/wood, but this is not significant when compared to the relatively larger magnitudes of the "cash" category hauled by individuals, the Channel Sanitation collection vehicles, the residential solid waste and auto and wood from charge accounts. The rather significant increase in the larger categories during the month of September has been explained as a general community clean-up month and would not necessarily be expected in other communities.

Table I contains the solid waste weights from the Channel Sanitation records.

Based on the following facts, observations and assumptions, the solid waste weights in Table I will be analyzed and adjusted.

* Channel Sanitation currently salvages auto hulks and other iron and steel products including white goods.

* The only categories of significant size to affect the daily solid waste tonnage are the first four columns (Individual, Channel Sanitation Vehicles, General Solid Waste from Charge Customers and Auto and Wood from Charge Customers). (For example, even totally deleting the auto and wood waste column from the April 1980 figure only incorporates a 2.4% error.)

* One of the charge customers is the City Parks Department and based on this information the auto/wood waste charge category will be assumed to be primarily wood waste. In view of the small percentage of error incorporated if this category were ignored completely this assumption is considered to be reasonable.

* Based on the preceding two assumptions and observations, only the first four columns in Table I will be used to calculate daily tonnages and per capita generation rates in Tables II and III.

TABLE I
Solid Waste Weights From Channel Sanitation Records (In Pounds)

Year/ Month	Individual Hauled Cash Sales	Channel Sanitation Collection Vehicles	General S.W. From Charge Customers	Auto and Wood From Charge Customers	White Goods From Charge Customers	Channel Sanitation Auto and Wood	Channel Sanitation White Goods	Wood Crates and Boxes
1979								
July	No records	No records	273,336	5,332	240			
August	No records	1,168,640	322,256	40,300	100			
Sept.	No records	3,870,249	297,129	45,671	17,223			1,200
Oct.	No records	1,533,130	258,392	38,760	840	604		
Nov.	No records	1,513,619	283,202	79,758		900		
Dec.	No records	1,351,478	221,692	33,804	1,203			
1980								
Jan.	No records	1,606,263	270,638	37,542				
Feb.	No records	1,454,179	251,672	40,667				1,800
March	No records	1,253,229	253,346	18,371	360			
April	483,630	1,476,053	306,220	56,513	4,227	2,106	740	
May	525,480	1,513,101	255,826	61,276	1,339	960	780	300
June	391,533	1,936,377	316,817	65,574	4,795	1,820		
July	246,142	(No figure)						

TABLE II
Solid Waste Totals

Year/ Month	Monthly 3 Column Total (Lbs)	Monthly 3 Column Total (Tons)	Monthly 4 Column Total (Lbs)	Monthly 4 Column Total (Tons)	Ratio Factor 4 Months/ 3 Months	Calculated Monthly 4 Column Estimate (Tons)
1979						
July	Insufficient Data	Insufficient Data	NA	NA		
August	1,531,196	766	NA	NA		950
September	4,213,049	2,106	NA	NA		2,611
October	1,830,282	915	NA	NA		1,135
November	1,876,579	938	NA	NA		1,163
December	1,606,974	804	NA	NA		997
1980						
January	1,914,443	957	NA	NA		1,187
February	1,746,518	873	NA	NA		1,082
March	1,524,946	762	NA	NA		945
April	1,838,786	919	2,322,416	1,161	1.26	
May	1,830,203	915	2,355,683	1,178	1.29	
June	2,318,768	1,159	2,710,301	1,355	1.17	

Average Factor
1.24

TABLE III

Year/ Month	Total Days in Months 7 Days/Week	Operating Days 6 Days/Week	Total Tons of Solid Waste Per Month	Daily Tonnage (6 Days/Week) Operation	Daily Tonnage (7 Days/Week) Operation	Per Capita lbs/Person-Day Based on (7 Days/Week)
1979 July						
August	30	25	950	38	32	2.56
September	30	25	2,611	104	87	6.96
October	31	26	1,135	44	37	2.96
November	30	25	1,163	47	39	3.12
December	31	26	997	38	32	2.56
1980 January	31	26	1,187	46	38	3.04
February	29	25	1,082	43	37	2.96
March	31	26	945	36	30	2.4
April	30	26	1,161	45	39	3.12
May	31	27	1,178	44	38	3.04
June	30	25	1,355	54	45	3.60
Averages			1,251	49	41	3.30

Total Estimated Tons/Year 15,012

* The Juneau sanitary landfill is operated on a 6 day per week basis. However, the per capita generation rate will be computed on a 7 day per week basis.

* Since information is only available for all four major columns for the months of April, May and June of 1980, the total solid waste tonnages and per capita generation rates will be based primarily on these months.

* In order to estimate the monthly totals for July 1979 through March 1980 where there is no information available on the volume of solid waste received from individually hauled cash sales, an extrapolation technique will be used.

  For the months of April, May and June of 1980 where the solid waste volume is available for *all four major* categories, a ratio of the four categories versus three categories will be determined. An average ratio will then be calculated and used to extrapolate a four category total for the months of July 1979 through March 1980 (Table II).

  If the three calculated ratios are reasonably close, this assumption is probably somewhat valid. However, it is important to note that the extrapolation technique does assume that a proportional or equal number of individuals deliver solid waste to the site in the winter and in the summer and this may not be true.

* After the four category total has been estimated a daily tonnage will be determined on the basis of 6 days per week and 7 days per week respectively. The 6 day per week figures are extremely useful for application to solid waste processing and energy recovery facilities since this is the most common operating schedule (Table III).

  The population estimate for Juneau of 25,000 will be used to calculate the per capita generation rates of pounds of solid waste per person per day. The per capita figure is based on continuous solid waste generation 7 days per week.

An analysis of Table III reveals the following very interesting facts and conclusions.

* The expected seasonal fluctuation in solid waste volume is not evident from the figures in Table III. The variation in the monthly solid waste figures is almost random and this fact, although somewhat unusual, supports the use of

average daily tonnages and per capita generation rates. This will also simplify the analysis for the other communities without sacrificing significant accuracy.

* The average per capita generation rate of 3.30 lbs/person-day is somewhat lower than was qualitatively expected because of the importation of consumer goods. However, excessive packaging is practiced on a national basis and perhaps this should not be that surprising. The 3.30 figure compares favorably with the range of generation rates in Idaho of 2.9 to 4.0 lbs/person-day. The 6 day per week daily average of 49 tons is also in agreement with the 40 to 50 tons per day estimate made by Channel Sanitation during the survey.

* It is interesting to note that the extrapolation technique used to determine the solid waste volume estimates would if anything reflect a larger than actual solid waste stream. The calculated relatively low per capita generation rate further supports the extrapolation assumptions.

* The Juneau population estimate of 25,000 persons is a very sensitive variable when determining a per capita generation rate to be used for the other S.E. Alaska communities. For example, if the 23,115 population figure from Appendix C is used in the calculation, the resulting figure is 3.55 lbs/person-day.

  Based on this fact, and in order to help insure against under designing a solid waste management system, for the remainder of this study a S.E. Alaska per capita generation rate of 3.50 lbs/person-day will be used for the other S.E. Alaska communities.

C. Status of Existing Solid Waste Management Systems

1. Collection Service

Channel Sanitation operates the solid waste collection service in the Juneau area under a Public Utility Commission Franchise. The service is voluntary not manditory and this results in a large number of persons hauling their own solid waste to the disposal site (refer to Table I Cash Sales). This causes heavy traffic at the disposal site on Saturday and is also very energy intensive since a private automobile is not as efficient as a solid waste compactor truck. The collection service is entirely privately owned and operated and supported by monthly billings to customers by Channel Sanitation.

2. Disposal Site

The Juneau disposal site is operated as a sanitary landfill with a solid waste compactor unit probably achieving an in-place density of 800 to 1000 lbs/yd^3.

The site is located in a diked area and ground and surface water contamination may be a problem due to the proximity of the water and the high precipitation rate. The land available within the diked area under the current land use agreement is very limited and is projected to be totally used up in the near future unless the diked area can be expanded.

The disposal site is totally supported by revenues from the gate charge assessed at 1½¢ per pound with a minimum of $2.42 per load. The disposal cost for the Channel Sanitation collection vehicles is passed along to the customer in the collection billing.

3. Recycling

Channel Sanitation currently recycles auto hulks (which are crushed with a crawler tractor) and other ferrous scrap and uses their own barges to ship to markets in Vancouver or Seattle. Barging costs are estimated at $3,500 per 24 hour day including labor and the $100 to $200 per day lease of the barge. Market price is a critical factor. A minimum price to make the trip south economically feasible is $60 per ton of scrap and at the time of the survey the price was only $50 per ton.

The erratic fluctuation characteristic of scrap iron market prices increase the risk of the business venture. Since it takes from 6 to 14 days to make the trip the scrap iron price might be favorable when leaving Juneau yet be depressed when arriving at the market site.

Although the crawler tractor used to crush the junk autos does not achieve the volume reduction of a hydraulic car crusher, apparently Channel Sanitation cannot justify the expense of this specialized piece of equipment. However, the use of a car crusher might increase the number of junk autos that can be placed on a barge.

Some aluminum can recycling is practiced by a social club on a voluntary source separation basis.

II. KETCHIKAN GATEWAY BOROUGH AND CITIES OF KETCHIKAN AND SAXMAN

A. Population

The data in Appendices C and D report an area population within the Ketchikan Gateway Borough of approximately 13,464 persons. The population growth is estimated at 3% per year.

B. Solid Waste Volumes

The following solid waste figures have been calculated using the per capita generation rate estimate of 3.50 lbs/person-day in conjunction with the reported population of 13,464 persons.

Daily Tons Generated	=	24 tons/day
Weekly Tons Generated	=	168 tons/week
Total Annual Tonnage	=	8,600 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	28 tons/operating day

From Appendix D the city roughly estimated the landfill volume consumed to be 10,500 yd^3/year of solid waste and cover material compacted in place. Assuming 1,000 lbs/yd^3 in-place density this equates to 5,250 tons/year compared to the estimated 8,600 tons/year. However, the discrepancy can be at least partially explained by the use of the air curtain destructor at the site and some open burning.

C. Status of Existing Solid Waste Management Systems

1. Collection System

The city of Ketchikan currently operates a collection system serving the estimated 8,000 plus residents within the city limits. The collection system is estimated to cost approximately $263,000 per year and is supported entirely by the collection route customers.

Tongass Sanitation, a private solid waste collection contractor serves the borough residents and some commercial accounts within the city limits. The collection system is also financed by a user fee.

2. Disposal Site

The Ketchikan landfill is owned and operated by the city. It was originally in a deep muskeg ravine which has since been filled. The remaining land area is very limited with an estimated life of only two years if burning is continued to be allowed.

Cover material must be imported and adds substantially to the operational cost of the site. The limited cover material and the very high precipitation rate results in the generation of leachate of sufficient quantity to reach a small stream which is located adjacent to the fill area. There is no ground water at the site because of underlying bedrock.

Junk autos were a problem at the landfill site in the past because of the excessive landfill volume consumed by the disposal of auto hulks. However, recently Jim Church, a local private contractor, is salvaging the junk autos in the Ketchikan area and has even removed a large number of auto hulks from the landfill. This and recent improvements in site management and cover application frequency has improved the appearance of the site.

Burning at the facility continues to be a problem primarily due to fires being set illegally by users of the site and the poor performance of an air curtain type incinerator. The problems with the incinerator may be partially due to faulty trench construction in conjunction with attempts to burn waste other than brush and similar wood waste for which the unit was designed.

The city has been searching for alternative landfill sites due to the limited life expectancy of the existing facility. The acquisition of a site approximately 12 miles north of Ketchikan is being investigated. Based on visual inspections, the site appears to be suitable. However, the increased haul distance and associated costs have caused some concern.

The existing facility is financed by general fund monies and is estimated to cost approximately $100,000 per year. Since users residing outside the Ketchikan city limits are not taxed for the operation of the facility, a question of equitability is evident.

3. Recycling

As was discussed in a previous section, Jim Church, a private contractor, is currently recycling junk autos for salvage in Canada or Seattle. A 90,000 lb/in^2 hydraulic car crusher is used to prepare the autos for barging south. One major problem (in addition to the market price fluctuations) is a lack of sufficient land area for storage of the junk autos until a barge load has been accumulated.

Mr. Church is interested in salvaging junk autos from other S.E. Alaska communities but most lack sufficient storage area to allow the accumulation of 40 to 50 of the auto hulks required to make it feasible for him to transport the car crusher to the other communities.

A number of junk autos have been removed from the Ketchikan landfill with a minor $10 per car subsidy from the city. Mr. Church required the subsidy primarily because of the extra handling at the fill and the difficult access for trucks because of the steep narrow road to the site.

III. CITIES OF CRAIG AND KLAWOCK

A. Population

Based on the data from Appendices C and D the population of Craig and Klawock is 587 and 404 respectively. The disposal site, located between the two communities, serves the two community total of 991 persons with a possibility of also acquiring some solid waste from the small community of Hollis.

B. Solid Waste Volumes

The solid waste generated by the residents of Craig and Klawock are estimated below using the population data in conjunction with the Juneau per capita generation figure of 3.50 lbs/person-day.

Daily Tons Generated	=	1.7 tons/day
Weekly Tons Generated	=	12 tons/week
Total Annual Tonnage	=	620 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	2 tons/operating day

The city of Craig, operator of the disposal site, estimated that approximately 10,000 yd^3/year are collected and deposited at the disposal site. However, it is not known if this is loose, compacted on the truck or inplace at the fill.

C. Status of Existing Solid Waste Management Systems

1. Collection System

The city of Craig operates a collection route, in their jurisdictional area only, using a small 11 yd^3 compactor truck. The total cost is estimated to be $25,000 per year with $15,000 of the total acquired from user fees at the rate of $4.25 per residence. The remaining $10,000 per year is from general fund revenues.

Although the information was not totally clear, it appears the city of Klawock does not have a formal collection system. However, a private individual is providing some voluntary collection with a flatbed truck.

2. Disposal Site

The Craig-Klawock disposal site is operated by the city of Craig in a muskeg area, 3 miles northeast of Craig, owned by the Klawock-Heenya Native Corporation. Limited land area and a total absence of cover material on site are the primary problems with the facility. The site also generates leachate which may be contaminating Crab Creek which is a potential water supply.

Uncontrolled burning is also a problem which was of great concern at the time of the survey because of the forest fire hazard due to dry weather and possible loss of Native Corp. timber around the site. The fire danger did promote the importation of cover material from the city of Klawock and initiated the development of future plans to blast nearby rock for cover material.

Junk autos are not a severe problem because of the limited number of auto hulks. However, the junk autos do consume valuable land area when placed in the site.

The operation of the solid waste disposal facility is currently financed by the city of Craig and is included in their solid waste collection budget. However, the formation of a joint Craig-Klawock solid waste commission to manage the site and more equitably distribute operating and cover material costs was also discussed during the survey.

3. Recycling

No recycling is currently practiced in the Craig-Klawock area.

IV. CITY OF WRANGELL

A. Population

The population in both Appendices C and D list the city of Wrangell at 3,325 with an estimated annual growth rate of 2%.

B. Solid Waste Volumes

The following solid waste figures have been estimated using the Wrangell population in conjunction with the per capita generation rate of 3.50 lbs/person-day.

Daily Tons Generated	=	5.8 tons/day
Weekly Tons Generated	=	41 tons/week
Total Annual Tonnage	=	2,124 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	6.8 tons/operating day

The city reported (Appendix D) that approximately 9,500 yd^3 are delivered to the disposal site per year. If this is assumed to be compacted on the collection vehicle at approximately 400 lbs/yd^3 this converts to 1,900 tons per year which correlates closely with the above estimate.

C. Status of Existing Solid Waste Management Systems

1. Collection System

The city operates a 16 yd^3 compactor truck for residential and commerical collection which is financed by both user fees and the general fund which total to approximately $52,480 per year.

2. Disposal Site

The Wrangell disposal site is situated on city owned land and is also operated by the city. The two most significant problems which in turn cause secondary complications is the very limited land area and a total absence of cover material.

The lack of cover material attracts birds in large quantities which constitute a hazard to the jet airport which is within the two mile limit contained in FAA and EPA regulations. In addition, the limited land area promotes almost continual open burning in an attempt to conserve the site.

As is true with the other S.E. Alaska communities, the high precipitation rate generates leachate which may cause surface water pollution. Ground water is not present at the site because of subsurface geological conditions.

The cost for the site attendant and limited equipment operation is estimated at $15,000 per year.

Junk autos are not a problem at the site since a local individual acquires them from the city for storage on private property.

3. Recycling

The only recycling in Wrangell is the junk autos listed above which are primarily stored for used auto part sales.

V. CITY OF PETERSBURG

A. Population

From Appendix C the reported population is 3,197 with a growth rate of 2-4%.

B. Solid Waste Volumes

The population data in conjunction with the per capita generation estimate of 3.50 lbs/person-day result in the following estimates.

Daily Tons Generated	=	5.6 tons/day
Weekly Tons Generated	=	39 tons/week
Total Annual Tonnage	=	2,042 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	6.5 tons/operating day

The city did not have an estimate of the solid waste volumes.

C. Status of Existing Solid Waste Management Systems

1. Collection System

The city operates two compaction vehicles supported by user fees and general fund monies at an estimated annual cost of $40,000 per year. The landfill operation costs approximately $46,000 per year for a total of $86,000 per year solid waste management cost. The total $86,000 solid waste expenditure is funded by $72,000 in user fees and $14,000 from local taxes.

2. Disposal Site

The site is situated on muskeg and is owned and operated by the city. A crawler tractor is used to manage the waste but limited cover material restricts the operation. Open burning is also practiced almost continually for most of the solid waste deposited at the site.

The high precipitation rate and muskeg cause the generated leachate to remain on or near the land surface and creates a potential for contamination of a nearby stream. True ground water is not present at the site and therefore this contamination potential is non-existent.

Junk cars are disposed of at the site at an approximate rate of 12 per year, a practice which consumes a significant amount of usable landfill volume.

As was indicated in the preceding section the annual land disposal cost is $46,000 supported by user fee and general fund.

3. Recycling

A very limited amount of aluminum can recycling is practiced on a social group or individual basis.

VI. CITY AND BOROUGH OF SITKA

A. Population

From Appendices C and D the population in Sitka is approximately 8,787 with a 1% annual growth rate.

B. Solid Waste Volumes

The estimated per capita generation rate of 3.50 lbs/person-day is applied to the Sitka population to generate the following solid waste figures.

Daily Tons Generated	=	15.4 tons/day
Weekly Tons Generated	=	108 tons/week
Total Annual Tons	=	5,621 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	18 tons/operating day

Sitka officials estimated the annual in-place solid waste volume at the disposal site to be 23,400 yd^3. Assuming an in-place density of 800 lbs/yd^3 this converts to 9,360 tons per year. This does not correlate well with the per capita derived estimate. One possibility is that the city estimate included cover material. Also if the city estimated the volume based on one ton per person per year as was indicated during meetings, this is approximately 5 lbs/person-year and does not agree with the 3.50 generation rate.

C. Status of Existing Solid Waste Management Systems

1. Collection System

A privately operated manditory collection service requires two 25 yd^3 and one 20 yd^3 packer trucks. Approximately

2,327 residential and commercial customers utilize the collection service. The system is financed entirely by user fees which totals approximately $179,634 per year. The city would like to replace the larger 25 yd^3 packer truck with another 20 yd^3 unit because they are better suited for the Sitka road conditions.

2. Disposal Site

The disposal site is owned by the city and operated under contract by a private corporation. The city also owns a solid waste shredder for increased volume reduction, which at the time of the survey was not operational.

The soil is reported to be a mixture of volcanic ash and glacial till which, according to city officials, requires screening and processing to remove the volcanic ash. Apparently, if the ash is not removed, the cover material flows uncontrollably when wet. The availability of cover material and site land area are both very limited.

As is characteristic of other S.E. Alaska sites, the high precipitation rate generates leachate which may contaminate ground or surface water. Some leachate collection is practiced with ultimate deposition in a municipal sewage system. The amount or percent of leachate that is actually collected or treated is not known. However, if secondary municipal sewage treatment is initiated in the future, the heavy metals usually found in solid waste leachate may adversely affect the aerobic digestion process.

The current cost of the landfill operation is $130,000 per year with an estimated future cost of $220,000 per year. The reason for the increase was not explained and it is also not certain if the annual figure includes the operational costs of the shredder.

3. Recycling

Approximately 100 junk autos per year are barged south for salvage by a private individual. The junk autos are not crushed before shipment.

Some aluminum can recycling is practiced by social clubs and private individuals on a very limited basis.

VII. CITY OF SKAGWAY

A. Population

The reported Skagway population from Appendix C is 877 persons. However, because of the tourist nature of the community during the months (May through September) when the tourist trade is at the maximum level, it is estimated that the city population doubles. Tourists from cruise ships are not included in this summer total.

B. Solid Waste Volumes

Because of the heavy tourist trade compared to the relatively low permanent population, the solid waste generation figures will reflect the seasonal fluctuations. The solid waste generation rates calculated for Skagway will be computed on the following basis:

* The per capita generation rate of 3.50 lbs/person-day will be applied to the estimated 877 permanent residents for the months of October through April.

* In order to approximate the increase in commercial solid waste from tourism, the 3.50 lbs/person-day will be used with 1754 persons for the month of May through September. This assumption is based primarily on input from the city solid waste personnel that during the tourist months the solid waste collected is approximately twice that of the volume during the winter months. (This does not include solid waste from cruise ships)

* Based on information from the city solid waste personnel each cruise ship removes from 3 to 7 yd^3 of solid waste (on truck compacted volume) depending on the size of the ship. In the absence of better data, it will be assumed that an equal number of each size ship dock at Skagway thereby resulting in an average of 5 yd^3 per ship of solid waste at an estimated density of 400 lbs/yd^3. This equates to one ton of solid waste per ship. This assumption and the 1980 cruise ship schedule which indicates that 90 cruise ships dock in Skagway from May through September result in an additional 90 tons of solid waste generated during the tourist months.

Tourist-Month Solid Waste Volumes will be calculated for the estimated 1,754 persons using the 3.50 generation rate and the cruise ship solid waste will be added to the sub-total.

Tourist Months (May through September, 153 days)

Daily Tons Generated = 3.1 tons/day

Weekly Tons Generated	=	22 tons/week
Sub-Total Tons Generated (153 Days)	=	474 tons
Cruise Ship Tons	=	90 tons
Total Tons Generated	=	564 tons
Daily Tons Available For a 6 Day/Week Processing Facility	=	4.3 tons/operating day

Non-Tourist Months (October through April, 212 days)

Daily Tons Generated	=	1.5 tons/day
Weekly Tons Generated	=	11 tons/week
Total Tons Generated	=	318 tons
Daily Tons Available For a 6 Day/Week Processing Facility	=	1.8 tons/operating day

Total Annual Tons	=	882 tons/year

C. Status of Existing Solid Waste Management Systems

1. Collection System

A city owned and operated collection route serves approximately 280 residential and 36 commercial customers. The residential user fee is $3.60 per month for once per week service of two cans. Commercial charges are based on the number of cans and frequency of collection. The recently purchased 20 yd^3 compactor truck has the capability of emptying 2 or 3 yd^3 bins which are currently being used by commercial accounts.

2. Disposal Site

The site is located on the side of a hill in plain view of the city and is an aesthetic problem. Both land area and cover material are very limited and as a result the site burns almost continually. The equipment used to work the site is very old and should be replaced if a true landfill operation is implemented.

Ground or surface water contamination does not appear to be a critical problem although any leachate generated would definitely drain down the hillside towards the river.

Domestic pigs feeding at the dump site could constitute a public health hazard if slaughtered and sold. However, this has not been documented as an actual problem.

The city is investigating the suitability of an alternate site location in bottom land near the river. Test holes have been excavated with ground water encountered at an 8 to 12 ft. depth. The proximity of the ground water, cobbly porous soil and a high precipitation rate indicate ground water could be contacted by leachate. However, the actual impact on the ground water is not known.

If a move is made to the new site, the creation at a solid waste budget for the site operation and the purchase of landfill equipment would probably be necessary. There is currently no budget for the existing site. Trench excavation at the proposed site could be contracted to reduce the size of the landfill equipment required.

Junk autos are currently being buried in lieu of recycling because of the small number of such vehicles and the distance to markets.

3. Recycling

None is practiced in Skagway

VIII. CITY OF HAINES

A. Population

From Appendix C the reported population for Haines is 1,366 with approximately 1,100 in the city limits. The annual growth rate was not estimated.

B. Solid Waste Volumes

The base solid waste generation rate will be determined by the population and per capita generation rate of 3.50 lbs/person-day. However, there is also additional solid waste from the Alaskan ferries and the park service.

Frank Shull, the operator of the collection and disposal system estimate 260 ferries per year with each generating approximately 8 yd^3 of loose solid waste. At 200 lbs/yd^3 this results in approximately 208 tons per year of solid waste from the ferries. An additional 54 tons per year is collected from the park service.

Daily Tons Generated	=	2.4 tons/day
Weekly Tons Generated	=	17 tons/week
Sub-Total Tons Generated	=	870 tons/year

Ferry Solid Waste	=	208 tons/year
Park Service Solid Waste	=	54 tons/year
Total Tons Generated	=	1,138 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	3.6 tons/operating day

The solid waste contractor indicates the collection route generates approximately 240 yd^3 of loose solid waste for the four tourist months of the year and 160 yd^3 per week for the remaining eight months. This totals to approximately 9,760 yd^3 per year of loose solid waste. Assuming a 200 lb/yd^3 density for loose solid waste this converts to 976 tons per year which compared relatively well with the previously estimated 1,138 tons per year.

C. Status of Existing Solid Waste Management Systems

1. Collection System

As indicated previously, the collection service is privately owned and operated. Three packer trucks are utilized with the most service provided by a 20 yd^3 unit. Although there is a manditory collection ordinance in effect it is not enforced and only about 60% public participation is realized.

The collection service extends out into the borough 27 miles north and south to Chilcat Park. The route is financed by a user fee with approximately 250 to 350 residential and commercial customers or pick up points with a total estimated annual cost of $80,000.

2. Disposal Site

The Haines landfill has good loam and gravel cover material in greater amounts than most of the other sites in the S.E. Alaska area. The cover material is applied on a regular basis and no burning is practiced. Two D-6 size crawler tractors and one front end loader are used to manage the site.

Even with the cover material application, leachate is still generated because of the high precipitation rate. Surface water contamination does not appear to be a significant problem and ground water is not currently monitored at the site. The land area is somewhat limited with only an estimated five years of remaining site life unless additional land is dedicated or acquired.

Overall, the site is one of the better small land disposal sites in the S.E. Alaska area. Unfortunately, the site is supported only by collection system revenues and, according to the private contractor, is currently operating at a loss. Estimated annual cost of operating the site is $30,000.

Some junk autos have been deposited at the site in the past but most are salvaged. Some junk autos have also been dumped near the ocean over a ledge at what is termed as garbage point. This has created an aesthetic problem and is a source of complaints from tourists.

3. Recycling

Approximately two years ago, Channel Sanitation removed and salvaged approximately 110 junk autos. However, with only approximately 20 junk autos per year generated in Haines, land area for storage is a problem. An accumulation of between 50 to 100 autos is necessary to make salvage economically feasible.

The following S.E. Alaska communities and villages were not active study participants and were therefore not visually inspected or surveyed. The information in the following paragraphs has been taken from published population data with solid waste data as provided by the ADEC. The solid waste volumes or weights have been computed from the 3.50 lbs/person-day generation rate.

Since leachate generation is inevitable due to the high precipitation rate in the S.E. this item will not be addressed under each individual city. However, if it is specifically known that leachate creates surface or ground water contamination it will be noted.

IX. CITY OF ANGOON

A. Population - 541

B. Solid Waste Volumes

Daily Tons Generated	=	0.9 tons/day
Weekly Tons Generated	=	6.6 tons/week
Total Annual Tons	=	329 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	1.1 tons/operating day

C. Status of Disposal Site

Uncontrolled open burning is practiced at the site. The frequency or type of cover is not known. Some junk autos are also reported at the facility.

D. No recycling is practiced.

X. CITY OF HOONAH

A. Population - 1,093

B. Solid Waste Volumes

Daily Tons Generated	=	1.9 tons/day
Weekly Tons Generated	=	13 tons/week
Total Annual Tons	=	694 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	2.2 tons/operating day

C. Status of Disposal Site

Open burning is practiced at the facility. There is a good probability that a nearby surface water ditch has been contaminated with leachate. The status of the ground water is unknown. Cover frequency is not known but since bears are considered a major problem at the site, cover must not be applied regularly.

D. No recycling is practical in Hoonah.

XI. CITY OF HYDABURG

A. Population - 381

B. Solid Waste Volumes

Daily Tons Generated	=	0.7 tons/day
Weekly Tons Generated	=	4.9 tons/week
Total Annual Tons	=	256 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	0.8 tons/operating day

C. Status of Disposal Site

Uncontrolled open burning is practiced. The site is located in a water filled gravel pit and the effluent appears to enter the Hydaburg River. No cover is applied and rats are very common.

D. No recycling is practiced in Hydaburg.

XII. CITY OF KAKE

A. Population - 710

B. Solid Waste Volumes

Daily Tons Generated	=	1.2 tons/day
Weekly Tons Generated	=	8.4 tons/week
Total Annual Tons	=	438 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	1.4 tons/operating day

C. Status of Disposal Site

Burning is reportedly not frequently practiced. There is some possibility of surface water contamination. Bears are a problem at the site thus indicating the lack of a regular cover frequency.

D. No recycling is practiced in Kake.

XIII. CITY OF KASSAAN

A. Population - 38

B. Solid Waste Volumes

Total Annual Tons	=	25 tons/year

C. Status of Disposal Site

Burning is reportedly not regularly practiced. There is no application of cover material.

D. No recycling is practiced in Kassaan.

XIV. CITY OF METLAKATLA (NATIVE VILLAGE)

A. Population - 1,119

B. Solid Waste Volumes

Daily Tons Generated	=	2.0 tons/day
Weekly Tons Generated	=	14 tons/week
Total Annual Tons	=	730 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	2.3 tons/operating day

C. Status of Disposal Site

Open burning is practiced and cover material is not applied.

D. No recycling is practiced in Metlakatla.

XV. CITY OF PELICAN

A. Population - 221

B. Solid Waste Volumes

Daily Tons Generated	=	0.4 tons/day
Weekly Tons Generated	=	2.8 tons/week
Total Annual Tons	=	146 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	0.5 tons/operating day

C. Status of Disposal Site

Frequent burning is practiced. Surface water contamination is a possibility but has not been documented. Cover is reported to be applied on a weekly basis.

D. Recycling of aluminum cans is being considered.

XVI. CITY OF YAKUTAT

A. Population - 442

B. Solid Waste Volumes

Daily Tons Generated	=	0.8 tons/day
Weekly Tons Generated	=	5.6 tons/week
Total Annual Tons	=	292 tons/year
Daily Tons Available For a 6 Day/Week Processing Facility	=	0.9 tons-operating day

C. Status of Disposal Site

Burning is practiced at the site. Bears have been a problem at the site but increased burning in recent years have minimized this safety hazard. Junk auto recycling of approximately 40 to 60 stockpiled cars is practiced. An estimated 6 to 10 autos are generated each year.

D. No recycling is practiced in Yakutat.

WOOD WASTE

WOOD WASTE

I. GENERAL INFORMATION

Sawmills and pulp mills are two of the primary wood waste generators. However, as was evidenced by the survey trip, most of the companies are independently developing solutions to their wood waste problems.

The production of electricity from water-wall wood waste boilers is the most common management technique. Some of the wood waste boilers and other energy recovery systems are not yet operational and are in various stages of planning or development. However, even with the utilization of incinerators or other energy recovery units, it must be realized that disposal is required for certain components of the wood waste. Land disposal and intertidal fills are two options for ultimate disposal. Leachate generation and the resulting negative impact on water quality is a major consideration and concern.

It is important to recognize that wood waste incinerators cannot process municipal solid waste properly due to the heterogeneous nature of solid waste and the related handling problems. Air emissions, slagging problems and the incinerator residue from solid waste also creates technical problems which wood waste incinerators are not designed to handle. Because of the non-compatibility of wood waste boilers and residential solid waste, the timber companies do not want any of the solid waste generated by the municipalities and boroughs.

The reverse is not true. Wood waste can be processed in municipal solid waste incinerators. However, since most timber companies are solving their own problem and want the energy from the wood waste to offset the price of fossil fuels, there were almost no companies interested in a joint operation. S.E. Cedar was the only company that openly expressed an interest in using a municipal solid waste incinerator to process wood waste and the residential solid waste from the city. Their proposal would be to use the recovered energy from both waste streams to operate a kiln to dry lumber for the S.E. Cedar Co.

Most of the wood waste in S.E. Alaska contains an estimated 50% moisture content and relatively high concentrations of salt since the logs are typically rafted to the mill and are in direct contact with sea water. The corrosive affect of the salt on municipal solid waste incinerators is not known or documented. The timber companies report little affect on the wood waste boilers that are in operation except that in some instances the bark cannot be burned because the high salt concentration makes the stack gasses and smoke exceed particulate emission standards.

II. GENERAL WOOD WASTE VOLUMES

Although it is not directly applicable to the S.E. Alaska timber industry, the following are typical wood waste volumes which were acquired from the Idaho timber industry. The figures are for a cross section of the Pacific Northwest timber resource which is undoubtedly different than the predominately hemlock and cedars forests in S.E. Alaska.

The following weights are based on 1000 Bd. ft. of green lumber produced.

Green Lumber	2,800 lbs
Bark	900 lbs
Chips	800 lbs
Sawdust	600 lbs
Shavings (dry)	500 lbs
Trim Waste	200 lbs

The following weights or densities per unit of specific types of wood waste are also estimates for the same cross section of timber and is based on the fact that a unit is 200 ft^3.

Bark	3,600 lbs/unit
Sawdust	3,000 lbs/unit
Shavings	2,000 lbs/unit
Trim Waste (Hogged)	4,000 lbs/unit

III. WOOD WASTE SURVEY DATA

The following information was derived from meetings with some of the various timber industries in S.E. Alaska during the survey trip. The figures are estimates only based on very informal meetings and discussions and should be treated as such. The data will be grouped by Company name and plant location and listed in the order surveyed.

A. S.E. Cedar Co., Saxman

This is a cedar shingle mill located in Saxman which is just outside the city limits of Ketchikan. This was the only timber industry that expressed a definite interest in using a residential solid waste energy recovery incinerator to process the Ketchikan municipal solid waste and the cedar waste from the mill for cogeneration of electricity and steam for a kiln to dry cedar lumber. S.E. Cedar has a large stockpile of cedar bark and waste which resulted when they were required to shut down a teepee burner. They are therefore, interested in eliminating the stockpile and also generating the energy required for the mill.

In addition to the stockpiled wood waste, S.E. Cedar estimated that, when operating, the mill would generate approximately 200 yd^3 of wood waste per day. Based on a 5 day per week 11 month per year operating schedule, this is 1,000 yd^3 per week or 48,000 yd^3 of wood waste per year requiring disposal.

The energy requirements and solid waste energy recovery facility sizing will be determined in this section because of the interest expressed by S.E. Cedar in the energy recovery option.

The following energy requirements for the mill and kiln operation were estimated by S.E. Cedar.

* Approximately 800 Kw-Hr of electricity would be required for the mill per operating day.

* The mill would produce 240 squares per day of shingles with each square loosing approximately 50 lbs of water. This equates to 12,000 lbs of water that is required to be removed per operating day. Although the kiln is a batch operation that requires three or four days for a drying cycle the energy needs will be approximated on the basis of an operating day.

* Assuming the cedar enters the kiln at approximately 45°F and 130 psia approximately 1040 BTUs are required to evaporate one pound of water. To remove the total 12,000 lbs of water each operating day, approximately 12.5×10^6 BTUs of energy would be required.

* Assuming a 15% efficiency for the kiln, 8.3×10^7 BTUs of energy would be required per operating day. The efficiency is only an estimate but most units of this nature are quite inefficient.

* Approximately 873 BTUs/lb can be extracted from steam condensing at 130 psia.

* A typical modular solid waste energy recovery facility is reportedly capable of generating 5,000 lbs-steam per ton of solid waste. However, with the increased moisture content of the solid waste in S.E. Alaska, only 4,000 lbs/ton of solid waste will be anticipated. (However, the moisture content and assumption of 4,000 lbs of steam must be documented before any energy recovery facility is selected for implementation.)

A hypothetical solid waste energy recovery facility will be sized based on the previous information and assumptions.

$$(8.3 \times 10^7 \frac{\text{BTU}}{\text{Oper. Day}})(\frac{\text{lb-steam}}{\text{873 BTUs}}) = 9.5 \times 10^4 \frac{\text{lb-steam}}{\text{Oper. Day}}$$

$$(9.5 \times 10^4 \frac{\text{lb-steam}}{\text{Oper. Day}})(\frac{\text{1 Ton S.W.}}{\text{4,000 lb-steam}}) = 24 \frac{\text{Tons S.W.}}{\text{Oper. Day}}$$

This indicates that based on the very rough estimates of the energy requirements, kiln efficiencies and energy recovery system output 24 tons per day of solid waste would be required to supply the energy for the kiln. However, there are other factors which must be considered when matching potential steam customers and energy recovery facilities. These will be analyzed in depth in a later section of this report.

B. Alaska Timber Corp., Klawock

This is a large sawmill operation primarily producing cants and chips.

Alaska Timber Corp., is currently constructing a wood waste incinerator with two Erie City water wall boilers to be used to generate steam to produce electricity for the sawmill. Plans are to have the incinerator in operation before Spring of 1981.

Production rates and wood waste generation rates were not acquired during the interview. However, the wood waste incinerator is capable of processing 200 tons per day of wood waste and according to Alaska Timber Corp. officials, the mill generates more fuel than is needed. The large stockpile of wood waste is estimated by company officials to be enough boiler fuel to last approximately one or two years.

There has also been some discussion of selling electricity to the cities of Craig and Klawock, if there is a surplus.

C. Louisiana Pacific (LPK), Ketchikan

This large pulp mill utilizes two large power boilers burning a combination of wood waste and heavy oil to generate steam at 860 psi and 680° F to generate from 17 to 19 megawatts of electricity for on-site use in the plant.

The pulp mill incinerates from 900 to 1100 tons per day of wood waste comprised of hog fuel, bark and primary sludge. The composite mixture of wood waste is approximately 40 to 42% dry at the present time. However, there is some concern that when the facility begins producing secondary sludge in the very near future, the existing dewatering press will not adequately handle the sludge and the moisture content will be too high for incineration. This phenomenon has been experienced by the Alaska Lumber and Pulp (ALP) in Sitka. This is because of some technical problems with a Fulton bark press and ALP and LPK are currently conducting a joint experiment to see if a LMP bark press at LPK will dewater the sludge successfully. If not, this definitely increases the land disposal requirements for wood waste. The volume of secondary sludge will be approximately 3 tons of bone dry secondary sludge per day. At a 99% moisture content this equates to 300 tons of sludge per day.

The salt concentration in the wood waste (mostly in the bark) has not created any significant corrosion problems in the boilers. However, if plans are initiated to change from a hydraulic to a mechanical de-barker the salt concentration in the bark would increase and could possibly cause some corrosion problems.

In addition to the wood waste generated by the pump mill approximately 45 wet tons is reported to be acquired from the Ketchikan Spruce Mill and infrequently some is imported from the Alaska Timber Corp., in Klawock at a barging cost of $15 per unit.

LPK officials estimate that hemlock hog fuel has a heating value of approximately 4,500 BTUs/lb wet and hemlock bark ranges from 3,850 to 4,200 BTUs/lb.

D. Alaska Lumber and Pump (ALP), Wrangell

This sawmill utilizes three 8,000 lbs/hour and one 10,000 lbs/hour wood waste boilers to generate steam for the production of electricity for use in the plant. The boiler fuel is primarily hog fuel and sawdust.

The bark waste is being deposited in an approved intertidal fill approximately six miles north of the mill. Approximately 30 units per day of bark is deposited in the intertidal fill because, reportedly, the salt in the bark causes the wood waste boilers to exceed particulate emission standards. Using the Idaho wood waste figures the 30 units of bark equates to approximately 54 tons per day.

The volume of wood waste incinerated in the boiler was not acquired during the meeting with ALP officials. However, the wood waste volume can be roughly estimated using the Idaho figures and the reported 200,000 bd. ft. of green lumber produced each 12 hour operating day.

Based on 200,000 bd. ft. per day

Sawdust	=	60 tons/day
Trim Waste	=	20 tons/day

Therefore, a rough estimate is that approximately 80 tons per day of wood waste is used as boiler fuel.

E. Mitkof Lumber Co., Petersburg

This sawmill currently generates approximately 32 tons per day of wet wood waste. Some of the waste is currently being burned with auxillary fuel to prevent smoke with the remainder being deposited in an intertidal fill.

The company is currently investigating the feasibility of using a pyrolytic gasifier to produce methane gas from the wood waste to burn in a turbine to generate electricity.

Gas production data and electrical generation rates are listed below as reported by Mitkof Lumber. The viability of the proposal is not known or within the scope of this report. However, it should be noted that methane from pyrolytic units is usually low BTU gas which requires methanization to up grade it to pipeline quality.

* One ton of wood waste should produce 30,000 ft^3 of methane, 80 gallons of diesel oil, 40 gallons of octane gas and carbon.

* One ton of wood waste will produce approximately 1000 Kw hours of electrical energy.

* Approximately 35% of the usable energy is used in the gasifier to produce the gas.

F. Alaska Lumber and Pulp (ALP), Sitka

This pulp mill utilizes two hog fuel boilers to generate steam which is used to produce electricity to operate the plant. The boilers are fed a combination of wood waste supplemented with diesel fuel ranging from 1,300 to 1,800 bbl of oil per day depending on the moisture content of the wood waste. The electrical generators are capable of producing 27 megawatts at maximum capacity and usually operate at 94 to 96% of capacity or approximately 25 megawatts of power. The actual volume or tonnage of wood waste incinerated was not acquired during the survey.

The primary wood waste problem is the secondary sludge which has a very high moisture content (approximately 99% water). The sludge has an almost greasy texture which creates technical problems when attempts are made to dewater a sludge and bark mixture with a Fulton bark press. This is the main reason for the previously mentioned joint experiment with LPK. If a LMP bark press will dewater the mixture sufficiently enough to allow its incineration such a unit will be installed at Sitka.

At the present time, the bark is added to the sludge in a concentration of 20 to 1 respectively to solidify the sludge for easier handling. Over a 9 month period approximately 30,000 yd^3 of the sludge-bark mixture has been landfilled. The problem is becoming critical since one half the landfill volume has been consumed and the site has only been in operation for one year. A variance or waiver has been requested to allow the discharge of more of the secondary sludge to the sea but no decision had been made on the request at the time of the interview.

ALP also indicated that there is a problem with burning bark and exceeding particulate emission standards due to salt concentrations.

G. Schnabel Lumber Co., Haines

This lumber mill processes approximately 175,000 bd. ft. of logs per 8 hour operating day.

The mill generates approximately 50 units per day of bark and sawdust wood waste and plans to construct a wood waste boiler to generate electricity for the plant and possibly for the city of Haines.

The mill predicts 33 million bd. mean log scale for 1980, if an adequate supply of timber can continue to be acquired. There has been much opposition to logging in the Haines area that is creating supply problems for the mill.

SEWAGE SLUDGE DISPOSAL

SEWAGE SLUDGE DISPOSAL

I. GENERAL INFORMATION

The construction and start up of increasing numbers of secondary municipal sewage treatment plants in S.E. Alaska is creating a disposal problem for the sludge from the waste water facilities.

Specialized sludge incinerators are currently being used by some S.E. Alaska communities but this practice is very energy intensive and expensive and has therefore come under severe criticism. In fact, because of some of the environmental and economic problems associated with secondary sludge disposal there is a faction that think the overall environmental impact would be minimized in sparsely populated areas of S.E. Alaska, if the sewage plants were limited to primary treatment with subsequent ocean disposal of the settled solids.

The controversial subject of ocean disposal of primary treated sewage and other sludge disposal alternatives should be investigated in detail in the forth coming ADEC - 208 Water Quality Sludge Management Study and is far beyond the scope of this report. However, there are some areas of interface with sludge and residential solid waste disposal which will be discussed on a preliminary basis.

II. LAND DISPOSAL OF SLUDGE AND SOLID WASTE

The high precipitation rates, geology and abundance of surface water in S.E. Alaska indicates that leachate will be generated from the land disposal of residential solid waste alone. The addition of sewage sludge which characteristically has a 94 to 95% moisture content only serves to increase the leachate production. Even if a vacuum filter is used the sludge can only be concentrated to approximately 20% solids. In addition, depositing sewage sludge at land disposal sites creates severe operational problems.

Based on the above information, the land disposal of solid waste and sewage sludge is not recommended for S.E. Alaska. Land spreading of sludge on forest land may be environmentally feasible yet is most likely not economically viable. However, this determination should be addressed in the 208 study and not this report.

III. CO-DISPOSAL OF SOLID WASTE AND SLUDGE IN MODULAR SOLID WASTE INCINERATORS.

The co-disposal of sludge and municipal solid waste has been discussed in numerous meetings and initially sounds like it has considerable promise. However, closer investigation reveals that there are certain technical factors that do not favor co-disposal by incineration. Two of the more important items are listed below.

With secondary sewage sludge ranging from 80% to 95% moisture content, this constitutes the addition of large quantities of water to a solid waste stream which will already be very high in moisture content because of the high precipitation rate in S.E. Alaska. This variable is even more critical if energy recovery is anticipated, since the moisture in the incoming solid waste stream significantly affects the recoverable energy.

Modular incinerator manufacturers indicate that sewage sludge can be handled in a modular solid waste incinerator without odor and technical problems up to a maximum of 14% to 20% by weight of the total incoming solid waste and sludge stream for a continuous feed unit and possibly up to 40% sludge for a batch feed. However, actual field testing has not been conducted at the higher sludge concentrations. It is also very important to recognize that sludge management must be engineered and designed into the unit before actual construction is commenced. Auger type sludge feeds or comparable feeding apparatus are examples of the specialized equipment needed.

The per capita solid waste generation rate is approximately 3.50 lbs/person-day. Based on information from waste water treatment manuals, it can be shown that the quantity of sludge from a given population far exceeds 14% or 20% of the solid waste and sludge total.

Basis: Sludge at 94% moisture has a sp.gr. of 1.03. Secondary sludge is generated at an approximate rate of 36 ft^3/1,000 persons.

$$(1.03\ \text{sp.gr.})\left(62.4\ \frac{\text{lb}}{\text{ft}^3}\right) = 64.3\ \frac{\text{lb}}{\text{ft}^3}\ \text{sludge density}$$

$$\left(\frac{36\ \text{ft}^3\ \text{sludge}}{1{,}000\ \text{persons}}\right)\left(64.3\ \frac{\text{lbs sludge}}{\text{ft}^3\ \text{sludge}}\right) = 2.32\ \frac{\text{lbs sludge}}{\text{person}}$$

% of total incoming stream that is sludge

$$\frac{(2.32\ \text{lbs sludge/person})\ \text{X}\ 100}{(2.32\ \text{lbs sludge/person}) + (3.50\ \text{lbs S.W./person}} = 40\%$$

This indicates that it would not be possible to incinerate all the sludge in the modular solid waste facility without far exceeding the 14% to 20% maximum sludge concentration for automatic feed units. The above figures indicate that if batch incinerators can actually operate at a 40% sludge concentration they could theoretically handle the sludge and solid waste generated in a community. However, it is important to realize that the above calculations and solid waste and sludge volumes are only estimates and are very near the sludge concentration limit of 40% which has not been proven through actual operation. Based on these facts, Finite Resources would not recommend designing a co-disposal system at least until the incinerator limitation and solid waste and sludge volumes could be verified.

In addition, with this high concentration of water in the feed stream large amounts of auxiliary fuel would undoubtedly be required which would substantially increase operational costs. Further it is important to note that batch incinerators would only be practical for relatively small solid waste volumes and are not recommended for large daily tonnages.

JUNK AUTO DISPOSAL AND SALVAGE

JUNK AUTO DISPOSAL AND SALVAGE

Landfill disposal of junk autos consumes large quantities of valuable landfill space and should not be practiced if there are any possible alternatives. Stockpiling of auto hulks until a sufficient number have been accumulated is a much better alternative if the storage space is available. Unfortunately, with the limited land available in most S.E. Alaska communities storage areas are very limited. However, even in view of this difficulty, it is definitely more logical to temporarily use land area for storage than it is to permanently consume landfill space by disposing of an item that is currently recyclable.

As has been indicated in previous sections of this report the auto salvage business is somewhat risky because the market price for the salvaged ferrous metal can change significantly in the time it takes to barge the recyclables to markets in Canada or the Pacific Northwest.

There are currently four individuals or companies involved in some aspect of auto salvage or recycling operations. A brief description of each auto salvage operation will be listed below.

* Channel Sanitation, Juneau

  This solid waste and salvage contractor recycles junk autos and other ferrous metal utilizing a company operated barging system. A crawler tractor is used to crush the auto hulks. Since the barge reportedly exceeds the weight limit before the volume limit, better volume reduction is not deemed necessary according to Channel Sanitation. However, after visually inspecting a loaded barge it is highly probable that at a minimum a car crusher would improve the stability of the loaded barge. This company will salvage junk autos in most areas of S.E. Alaska provided there are enough auto hulks stockpiled to make the venture economically feasible.

* Jim Church, Ketchikan

  This private contractor specializes in junk auto salvage utilizing a hydraulic car crusher and related equipment. The company is located in Ketchikan where a large number of autos have been removed since the company has been in business. However, this company is also interested in salvaging junk autos from other areas in the S.E. if there are enough stockpiled.

* Jim Wickham, Sitka

  Junk autos in the Sitka area are salvaged and barged south by this private contractor in a non-compacted state. Activities in the past have been primarily limited to the Sitka area.

* Virgil Byford, Wrangell

  This private individual is primarily engaged in stockpiling junk autos for the sale of used auto parts in Wrangell. The junk auto bodies are not barged south for salvage at the present time.

TECHNICAL ANALYSIS OF ALTERNATIVE SOLID WASTE MANAGEMENT SYSTEMS

TECHNICAL ANALYSIS
OF ALTERNATIVE SOLID WASTE MANAGEMENT SYSTEMS

This section of the report will analyze the different types of solid waste processing and disposal systems which may be reasonable or practical for the study area. Large volume material recycling for residential solid waste is not considered a viable solid waste management option for S.E. Alaska and is therefore not considered in this study. The primary reasons are distances to southern markets and the technical and social problems affecting either mechanical or voluntary separation respectively.

Sanitary landfilling with leachate control, baling and balefill sites, shredding and landfilling and modular incineration with and without energy recovery are the solid waste management systems that will be investigated. The analysis will also include the technical and environmental details of each complete with pros and cons.

General ranges of capital costs and operating and maintenance costs will be listed, but the specific economics of different systems depend on the size of the facility and will therefore be analyzed in detail under specific applications for different communities.

It is very important to recognize that a land disposal site will be required even if some type of solid waste processing or volume reduction facility is selected. Shredding, baling, incineration and even recycling systems will require some type of ultimate disposal for residue and solid waste that cannot be processed.

Final deposition of solid waste must be on or in the land, air or water. It is virtually impossible to place all solid waste in the air and disposal at sea has considerable environmental opposition. Therefore, deposition of at least some of the solid waste on land is required. Because of the high precipitation rates characteristic of S.E. Alaska, leachate generation is inevitable by direct infiltration of precipitation and/or contact by surface or ground water. However, there are certain practices that can minimize the amount or strength of the leachate produced and the impact on the environment.

Unfortunately, in addition to being very expensive, some of the leachate control options may not be totally practical for S.E. Alaska because of the hydrology and geology and especially the high precipitation rate and limited soil depth, cover material and land area.

The following analysis of alternative solid waste management systems will stress the need for a minimization of the environmental impact of leachate by either treatment or a reduction in the amount or strength of the leachate produced. All alternatives are based on the assumption of a water saturated soil because of the high precipitation rate characteristic of S.E. Alaska.

The analysis of each specific solid waste management alternative will include a list of advantages and disadvantages of each system in order to allow a relative comparison of the different management options.

I. SANITARY LANDFILLS WITH LEACHATE CONTROL

Sanitary landfills have historically been a primary method of solid waste disposal in the United States. Unfortunately, in some instances the term sanitary landfill applies in name only since many such sites are nothing more than open burning dumps.

For the purpose of the analysis the term sanitary landfill will refer to a properly operated site with compaction and cover. Because of the inevitable generation of leachate from land disposal sites in S.E. Alaska the subject of leachate control will be stressed.

The actual site operational requirements such as cover frequency and leachate control is dependent on the interpretation of environmental statutes and regulations by Federal and State agencies and the following discussion is not intended to influence this fact.

Other than the regular application of compacted cover material, one of the simplest methods of decreasing leachate production which should be practical at all sanitary landfills is to intercept any surface water drainage upgradient or above the site. However, some sites in Alaska are located in muskeg over bedrock and simple interceptor ditches would simply not work. Relocation of the site appears to be the most practical solution in these situations. Unfortunately, in some cases this is the only land that is available. The construction of impermeable concrete or clay interceptor ditches may be a partial answer but at best it would be an expensive endeavor practical for only a few sites.

One method that has been recommended (blindly on many occasions) as a solution to the environmental problems associated with leachate production is to seal the landfill area with clay or artificial impermeable barriers. This technique in conjunction with interceptor ditches will decrease the time it takes for leachate to be produced and migrate off site. However, in any area where the precipitation rate exceeds the evapo-transpiration rate sealing the site and using surface water interceptor ditches does not alter the fact that leachate will be generated and will ultimately migrate off-site. This is especially true for an area like S.E. Alaska with extremely high annual precipitation rates. A simple mass balance illustrates this fact.

In - Out = Accumulation

After the sealed site reaches its volume capacity the water or leachate must flow out.

The obvious next step in minimizing the environmental impact of leachate from land disposal sites is to collect and treat it. Normally to be effective, leachate collection systems must be designed for the site before it is active. Different types of collection systems of varying degrees of sophistication are available ranging from simple layers of permeable material such as sand or ground placed over the impermeable seal, to complex piping with recirculation pumps.

The simplest approach (where geology allows) is to merely intercept the leachate as it leaves the site. This is of course impossible for sites without liners which are located over permeable soil causing the leachate to flow vertically down to ground water. However, the S.E. Alaska geology indicates that most leachate would actually surface because of bedrock.

After the leachate has been collected, it must be treated. This is both a complex and costly process at best. Because of the extremely high biological oxygen demand (BOD) and chemical oxygen demand (COD) characteristics of leachate from municipal solid waste extensive aeration and microbial action is required for treatment. However, because of the heavy metals present in most solid waste leachate, pretreatment is usually required to remove the heavy metals in order to not contaminate the aerobic bacteria. One simple method is addition of lime or similar alkali in order to precipitate out the heavy metals. The complexity of leachate treatment increases with each step and is usually quite expensive. The total cost associated with operating a sanitary landfill with a leachate collection and treatment system is dependent on the size of the operation.

The following is a concise list of the major pros and cons of landfills with leachate control including some which are unique to S.E. Alaska.

<u>Pros</u>

1. Processing of the solid waste is not necessary before deposition in the landfill.

2. Sanitary landfills have historically been the most economical disposal alternative for solid waste, requiring only one piece of equipment, such as a crawler tractor, at smaller sites. However, factors such as the importation of cover material and construction and operation of leachate collection and treatment systems increase landfill costs significantly.

3. Landfills are relatively simple to operate if an operational procedure report has been developed. However, the operation of leachate treatment systems can be somewhat complex.

Cons

1. To minimize leachate production cover material will be required and in some locations must be imported.

2. Since the solid waste is not processed in any manner to reduce its volume, landfill space or cover material is not conserved.

3. If sophisticated leachate collection and treatment is required, the site must be designed and constructed to accommodate a leachate control system which could be quite expensive.

II. SOLID WASTE BALING AND BALEFILL OPERATIONS

The baling of solid waste is actually an off shoot of metal scrap balers, hay balers and corrugate balers resulting from investigations to improve the efficiency of transporting solid waste long distances. As reported by EPA[1] there are three main types of solid waste balers which are listed below.

* High density balers in which non-processed solid waste is compressed at pressures high enough to eliminate the need for tie wires.

* A continuous push-through type developed from the hay baler which requires preshredding of the solid waste and utilization of tie wires.

* A baler developed from those used for corrugate recycling which bales non-processed solid waste with tie wires required because of the lower densities achieved.

The third type of baler which utilizes tie wires and requires no solid waste preprocessing is the most common for communities with the population range of those in S.E. Alaska. Therefore, this analysis will be limited to this type of baling system. The following are general technical and economic characteristics of this type of unit.

* The bales vary in size and density depending on the specific manufacturer but a typical bale size and density of a baling operation in northern Idaho is 66" X 42" X 30" weighing approximately 2300 lbs/bale which is a density of approximately 1300 lbs/yd^3.

* The processing capacity of balers range from 10 to 15 tons per day to over 500 tons per day.

* The initial investment costs are of course proportional to the size of the baler but range from approximately $175,000 for smaller units to larger multi baler systems costing 4 to 5 million dollars.

* The solid waste baling system in northern Idaho which is processing between 140 to 150 tons per day experienced a total capital cost of approximately $625,000 based on 1978-1979 monies. The major items are listed below.

  - The capital cost for the baler conveyor and wire tyer was approximately $240,000.

  - The capital costs for a building 100' X 120' was $200,000.

  - Two large front end loaders were $85,000 and $60,000 respectively.

* The cost of wire for the bales, which is sometimes overlooked, is approximately $1 per bale.

The following general pros and cons of baling and balefill operations are in order to allow a comparison of this option with the other management systems.

<u>Pros</u>

1. The density achieved in the bales in conjunction with the fact that cover material is generally not needed on the vertical face of the in-place bales approximately doubles the life of the land disposal site. (A net 50% volume reduction.)

2. A balefill operation is a simpler and cheaper operation than a conventional sanitary landfill.

3. The open vertical face of the balefill disposal site does not appear to attract vectors.

Cons

1. Contrary to some theories that baling prevents leachate production EPA studies and publications indicate that leachate is generated from balefill operations in sufficient quantities to require treatment.[1] One study revealed that leachate from a balefill operation was generated sooner and in greater quantities than from a conventional landfill. The same study indicated that in a saturated hydrologic situation the contaminant flux from a balefill operation was comparable to that of a conventional landfill of unprocessed solid waste.[2] However, it was also shown that the leachate from a balefill seemed to stabilize in a shorter period of time but would be generated longer than leachate from a conventional landfill.

2. Although some companies that sell balers claim that no cover material is required in order to minimize the infiltration of water, cover material should be placed over the top of the bales.

3. No utility is extracted from the solid waste stream. Ultimately, it is still merely being buried with no direct benefit to society.

4. As is true with any solid waste processing facility there are capital and operating costs inherent with a solid waste baling operation. Since in S.E. Alaska long distance transportation of the solid waste is not required the only offsetting cost that can be used to compare to the baling costs are the savings in landfill expenses associated with the use of less cover material and slower consumption of valuable site area.

5. The operation of a baler is not an extremely complicated or difficult job but qualified personnel are necessary.

6. The compaction associated with the actual baling operation generates leachate which would require treatment.

III. SOLID WASTE SHREDDERS AND LANDFILLS

The term solid waste shredder refers to many different types of processes which reduce the volume of the solid waste and converts it into a relatively homogeneous material. The most common types are hammer mills and shear units with many additional variations within these larger categories. (i.e. vertical shaft, horizontal shaft, etc.)

Shredders were investigated primarily as a volume reduction technique and preprocessing step for resource recovery and refuse derived fuel (RDF) incinerators. Since exotic mechanized resource recovery systems and RDF facilities are not practical for the population base of the communities in S.E. Alaska, this report will only analyze shredders used in conjunction with landfills.

EPA studies have shown that shredded solid waste did not attract vectors, support combustion readily or have an objectionable odor.[1] However, the major advantage of saving landfill space through simple volume reduction and not requiring daily cover at the disposal site is not totally applicable to S.E. Alaska because of the leachate potential due to the high precipitation rates.

Although the capital costs for shredders are usually somewhat lower than for solid waste balers, operation and maintenance costs are normally greater depending on which type of shredder is used. Solid waste is very abrasive and shears and hammer mills both require intensive maintenance on a regular basis. The primary problem is the heterogeneous nature of the solid waste. Some shredders such as hammer mills are well suited for some types of materials and shear units are better for other components of the solid waste stream but no one type is well suited for all the material that comprise residential solid waste.

The General Electric Company[3] has good examples of this problem. An automobile fragmentizer has problems with vinyl seat covers and a machine to size reduce concrete and large pieces of metal encounters difficulty with plastic bleach bottles. Shear types are well suited for wood but are dulled or destroyed when encountering metal or concrete objects.

Explosions in solid waste shredders are a major problem from the aspect of worker safety and damage or outright destruction of the shredder. There have been many recent incidents of explosions and fires in shredders. This is because the solid waste stream can contain flammable or explosive materials and shredders provide the conditions that can lead to explosions and fires such as enclosed spaces and metal-to-metal sparks.[4]

The following concise list of the pros and cons of solid waste shredders and associated landfill operations may also include some of the items contained in the previous paragraphs.

Pros

1. Landfill space is conserved due to the volume reduction of the solid waste. However, since daily cover will probably still be required due to the high precipitation rates in S.E. Alaska the savings will probably be somewhat less than the 50% savings assumed for baling.

2. The capital cost of a shredder is somewhat less than a baler and ranges from $120,000 for smaller units up into the millions for large facilities.

3. A landfill operation with shredded solid waste can achieve better in-place densities than a conventional landfill and creates less wear on landfill equipment.

4. Shredded solid waste in landfills reportedly does not attract vectors and will not support combustion.

Cons

1. Deposition of shredded solid waste in a hydrologically saturated media, such as is evident in S.E. Alaska, will increase leachate strength because of the greater surface area of solid waste available for contact with the water. The increase in leachate strength provides less time for natural attenuation by the environment and leachate treatment would probably be necessary.

2. Because of the high potential for leachate generation daily cover would probably be required. Therefore, the only conservation of cover material would be due to the volume reduction of the solid waste which is probably less than 50%.

3. No utility is extracted from the solid waste stream. It is merely being processed and deposited in the ground.

4. The capital and operational costs of the shredding can only be compared with the savings associated with the conservation of landfill cover material and site area since no revenues are realized directly from the shredding operation.

5. Landfill equipment to compact and cover the shredded solid waste would still be required.

6. Although shredding is not a complex operation qualified trained personnel are required to operate and protect the equipment from the solid waste that should not be shredded. Specialized maintenance personnel are also required.

IV. MODULAR SOLID WASTE INCINERATION WITH AND WITHOUT ENERGY RECOVERY

Modular solid waste incinerators usually have a primary chamber operated in a starved air mode and a second combustion chamber operated with excess air. Recent technological improvements in the design of the modular units have reduced particulate emissions without relying on auxillary fuel except during start-up and shutdown.

One of the most significant factors affecting the improved economic feasibility of modular solid waste incinerators has been the high and increasing cost of fossil fuels. Because of the high cost of fossil fuels modular solid waste incinerators with energy recovery (E.R.) capability are economically viable with the conventional fossil fuel boilers.

However, before an E.R. facility can be considered, even on a preliminary basis, there are two very critical prerequisites. There must be a guaranteed or at least reliable source of solid waste in large enough quantities to generate a sufficient amount of steam or energy to make the project worthwhile. A steam or energy customer must be available that is willing to purchase all or most of the steam at an equitable market price under the provisions of a long term contract.

There are of course many additional factors and variables that must be considered before implementing a solid waste E.R. system. But without the two above items there is no need to investigate further. In fact, because of the very limited population of many of the S.E. Alaska communities it is evident that there is probably not enough solid waste to make E.R. practical in those areas. However, if the advantages exceed the disadvantages and costs modular incineration without E.R. may be feasible for some of the smaller communities because of the high volume reduction and resulting conservation of cover material and disposal site area.

Modular solid waste incinerators range from small two to three ton per day batch units without E.R. to large automated systems designed to incinerate in excess of 500 tons per day with E.R. capability. E.R. is not recommended for any units processing less than eight to ten tons per day of municipal solid waste.

In order to avoid underestimating capital, operating and labor costs for modular incinerators the manufacturers of the units were contacted after the Juneau meeting and they provided the following current information and estimates. The capital costs are somewhat higher than the figures contained in the first draft to cover freight costs and the higher construction costs inherent in Alaska. Labor costs will also be calculated on the basis of annual salaries in lieu of cost per ton to reflect the higher salaries in Alaska.

The capital costs are listed in dollars per ton of daily processing capacity and include construction and freight costs but not land purchase. Labor and operating costs are dependent on specific size and application and will be itemized in a later section of this report.

* Batch units without E.R. $20,000 to $25,000/ton

* Automated continuous feed units without E.R. $25,000 to $27,000/ton

* Automated continuous feed units with E.R. $30,000 to $35,000/ton

Some incinerator companies also offer remanufactured used units, when available, at a substantial savings.

The following pros and cons will be for modular solid waste incineration with and without E.R. (Any difference will be noted.)

<u>Pros</u>

1. Both solid waste volume and weight reduction are realized from solid waste incineration. EPA funded studies reveal that residential modular incinerators achieve 94% volume reduction and a 55% weight reduction.[5] The volume and weight reduction would result in a very significant conservation of landfill space and cover material.

2. The incinerator residue is not totally inert and will generate leachate and cover material would probably be required. However, the incinerator residue has been used as a fill material for parking lots and similar applications where the residue is covered with asphalt or similar impermeable material to eliminate the direct infiltration of precipitation.

   With the saturated soil in S.E. Alaska this may not be acceptable but with the 94% volume reduction the amount of cover material required would be minimized and the area requiring leachate control would be very small. In addition, there is another important factor significantly affecting the amount and strength of the leachate. Since the solid waste is reduced in weight, only 45% of the total solid waste generated is placed in the ground and thus has the ability to leach. The other 55% has, in essence, been deposited in the air (in compliance with air emissions standards).

3. For the modular incinerators with E.R. capability there is a positive benefit derived from the solid waste as an alternative to fossil fuels. This is of course, not true for incinerators without E.R.

Cons

1. The capital and operating and maintenance costs of the solid waste incinerators are somewhat high when compared to conventional landfilling. However, these costs for the smaller units are generally of the same order of magnitude as baling and shredding systems. The capital cost of the larger E.R. facilities are higher than baling and shredding units but the revenue from energy sales tend to offset the costs.

2. Auxillary fuel as oil or natural gas is required to operate the solid waste incinerators but usually only during start-up and shutdown. However, the high moisture content of the solid waste in S.E. Alaska might affect the amount of fuel required and will definitely reduce the amount of energy that can be recovered from the solid waste stream. These areas will require further investigation.

3. Solid waste incinerators and especially the larger units with E.R. capability require trained and skilled operators.

4. Proper maintenance of the solid waste incinerators is very important. With the larger E.R. facilities this is very important since down time means no energy production. When the facility is shutdown capital costs and operating and maintenance costs continue without the benefit of revenues from energy sales.

5. Some slagging and related incidents with the incinerator residue has caused some difficulty with air injectors but recent technological improvements have reportedly solved these problems. It should be noted that the removal of the residue from the smaller batch incinerators is a labor intensive operation.

V. GENERAL DISCUSSION OF ALTERNATIVE SOLID WASTE MANAGEMENT SYSTEMS

There are a number of general qualitative observations that can be made based on the results of the preceding analyses and especially the pros and cons of alternative systems in conjunction with the solid waste volumes of the S.E. Alaska communities.

The small population of many of the cities and boroughs of S.E. Alaska almost preclude expensive solid waste processing facilities unless there are substantial advantages and savings associated with the system. It is not the purpose of this study to suggest or imply how solid waste regulations should be enforced but the interpretation and enforcement of State and Federal statutes will obviously affect the selection of solid waste management systems. For example, there has been some unofficial discussion of allowing some of the more sparsely populated areas in S.E. Alaska to burn combustible solid waste in specially prepared, controlled and possibly even enclosed areas. Finite Resources does not intend to discuss the advantages, disadvantages, logic or desirability of this concept. However, it is quite obvious that any decision on the regulatory acceptability of the concept will affect the selection of solid waste management systems one way or the other. The following discussion is restricted to the solid waste management systems previously analyzed and does not include the option of special burn areas.

Solid waste shredding units for landfilling will not be considered a viable option for the S.E. Alaska communities primarily because of the high probability of explosions and the associated repair costs and worker safety. The high maintenance costs, the leachate generation characteristics of the shredded solid waste, the anticipated less than 50% volume reduction of the solid waste, the most probable daily cover requirement and the need to operate a conventional sanitary landfill also influenced this decision.

Solid waste baling or incineration facilities both appear to be viable solid waste management options. Modular incineration appears to be somewhat superior on technical factors such as solid waste volume reduction (and even weight reduction for incineration), conservation of cover material and minimization of leachate generation and leachate strength. However, simplicity of operation and lower maintenance costs probably favor the baler. The revenue from energy sales for the large E.R. facility may partially offset the operating costs but the complexity of the facility operation is increased. Another important factor that must be considered is that for any solid waste processing facility to be realistically feasible it must be operating at or at least in the vicinity of its design capacity. For example, it would be absolutely illogical to operate a baler for a community that only generates one or two tons of solid waste per day since one bale weighs approximately two tons.

Leachate collection and treatment may be required for some of the landfills. However, it is important to note that this may not be practical or possible for all landfill sites because of adverse geological conditions. In addition, leachate control does not solve the very major problems of limited land area and cover material.

S.E. ALASKA REGIONAL
SOLID WASTE MANAGEMENT SYSTEM

S.E. ALASKA REGIONAL SOLID WASTE MANAGEMENT SYSTEM

I. GENERAL CHARACTERISTICS OF THE REGIONAL SYSTEM

The concept of a single centralized regional solid waste management system to serve the entire S.E. Alaskan Panhandle has been the topic of numerous meetings and conversations and initially appears to have some merit. However, during the investigations and surveys that preceded this report it became quite evident that the regional concept was probably not feasible. In addition to general economic considerations related to excessive transportation costs there are other more basic technical and practical problems associated with a regional approach to solid waste management in S.E. Alaska.

Since it is a basic fact that no one wants another persons problem, it is very evident for the regional concept to work, the solid waste must have some value. In basic terms this means the solid waste central processing facility must be either a material recycling center or an E.R. unit. Since material recycling has already been considered infeasible for S.E. Alaska the only remaining system is a solid waste E.R. facility. For a solid waste E.R. unit to be feasible a steam or energy customer must be acquired that can use at least 75% of the energy recovered from all the solid waste in S.E. Alaska. However, before a search is made for such a customer there are other issues that need to be analyzed that may reveal that the proposal is not viable.

II. ANALYSIS OF THE REGIONAL SYSTEM

The following data and details reveal the complications and problems associated with the concept of a regional solid waste management system based on the assumption of transporting all solid waste to a central solid waste E.R. facility. For the purpose of a hypothetical analysis this will be considered to be Juneau. It is evident that the only realistic transportation modes for the solid waste are the Marine Highway, open barges and container barges. Details associated with each of these will be analyzed as follow:

* A typical open barge will transport approximately 650 units of wood chips at 200 ft^3/unit. This converts to approximately 4,800 yd^3 of usable volume which would accommodate approximately 480 tons of loose solid waste. Using the solid waste generation rate for the city of Ketchikan of 24 tons per day it would require over 20 days to fill the barge. The problems with odors, birds and other vectors, litter and aesthetics for this waiting period would be significant.

* Loading and unloading the barge would be a difficult proposition because of the heterogeneous nature of the solid waste.

* In order to minimize back haul at least two barges would be required at a leasing rate of $750 per day for each barge or $6,000 for a four day trip.

* It costs between $3,000 and $3,500 per 24 hour day to operate a tug and single barge. Since it is estimated to require a minimum of two days to travel one way from Ketchikan to Juneau a round trip would cost approximately $12,000 to $14,000. Towing one barge is inefficient since the costs to operate the tug do not increase substantially if two barges are towed simultaneously. (Although, this is probably impossible due to lack of sufficient solid waste to fill two barges.)

* Assuming that an E.R. facility will generate 5,000 lbs of steam from each ton of solid waste (this is probably optimistic in view of the anticipated high moisture content of the solid waste) the 480 tons of solid waste on the barge would generate 2.4 million lbs of steam. If the steam were sold at the current competitive market price of $7.00 per 1,000 lbs the revenue would be $16,800 for the solid waste from the barge. This gross income does not even cover the barging and leasing costs without considering the operational costs of the E.R. facility.

* Considering the adverse economics of open barges, the utilization of container barges would require that the solid waste be compacted since the container barges are more expensive per yd^3 than open barges. However, even if a 4 to 1 compaction ratio were achieved in a stationary compactor or transfer station the cost of the processing equipment in addition to the barging costs would most likely exceed any value the solid waste might have as an alternative fuel.

* The Marine Highway system is a possible transportation mode. However, in addition to the questionable attitude of the State towards utilizing the Ferry system to transport 75 yd^3 solid waste transfer trailers the economics are not attractive. A compaction type transfer station would be required at a minimum capital cost of $200,000 in addition to annual operational costs and transfer trailers which cost $30,000 per unit with a minimum requirement of five trailers. These costs would all be in addition to the cost of $970 to ferry a single trailer one way.

The above analysis was very simplified and did not consider the logistics of collecting the solid waste from the smaller communities. However, even based on the results of the simplified example it is quite evident that a single regional solid waste management system for S.E. Alaska is not feasible and would actually be very energy intensive.

S.E. ALASKA SUB-REGIONAL
SOLID WASTE MANAGEMENT SYSTEMS

S.E. ALASKA SUB-REGIONAL SOLID WASTE MANAGEMENT SYSTEMS

I. GENERAL CHARACTERISTICS OF SUB-REGIONAL SYSTEMS

The primary purpose of sub-regional solid waste management systems is to group communities within given areas for inclusion in a solid waste management plan for the mutual benefit of all participants. As was true with the regional system there must be some advantage for one area to accept solid waste from another. For example if Ketchikan were to implement a solid waste E.R. system the solid waste from Craig and Klawock may prove to be of value if it could be economically transported. Another example is the Haines Sanitation Service collecting the Skagway solid waste and transporting it to the Haines landfill for disposal. Since this is a private enterprise venture the profit motive would be the primary reason for implementing the solid waste collection system.

II. IDENTIFICATION OF SUB-REGIONAL WASTE SHEDS

The following waste sheds have been hypothetically defined primarily on the basis of geographical proximity and ADEC knowledge of the local areas. Some of the waste sheds may actually be comprised of smaller more logical systems but it would be virtually impossible to list all the possible combinations.

The following waste sheds have been named only to avoid confusion.

A. Southern Waste Shed

		Daily Solid Waste (Tons)	
Area	Population	7 Days/Week	6 Days/Week
Ketchikan	13,464	24	28
Metlakatla	1,119	2	2.3
Hydaburg	381	0.7	0.8
Craig-Klawock	991	1.7	2
Hollis	(est) 200	0.35	0.41
Totals	16,155	28.8	33.5

B. Central Waste Shed

Area	Population	Daily Solid Waste (Tons) 7 Days/Week	6 Days/Week
Petersburg	3,197	5.6	6.5
Wrangell	3,325	5.8	6.8
Kake	710	1.2	1.4
Totals	7,232	12.6	14.7

C. Northern Waste Shed

Area	Population	Daily Solid Waste (Tons) 7 Days/Week	6 Days/Week
Juneau	23,115	41	49
Haines	1,366	2.4	3.6
Skagway	877 (Ave. of tourist and non-tourist)	2.3	3.1
Hoonah	1,093	1.9	2.2
Totals	26,451	47.6	57.9

The communities of Sitka, Angoon, Pelican and Yakutat are somewhat isolated and do not logically fit into any waste shed grouping.

An analysis of the solid waste generators in the Southern and Northern waste sheds reveal that there is only one major source of solid waste in each waste shed. The other generators are quite small and it is highly doubtful that it would be worthwhile to transport that small an amount of solid waste to the E.R. facility. The solid waste processing plant could only be logically located at the site of the major generators in the waste sheds which are Juneau and Ketchikan respectively.

The Central Waste Sheds largest solid waste generators are Petersburg and Wrangell which are approximately the same size. The entire waste shed only generates approximately 15 tons per day of solid waste and it is questionable if the energy recovered from this relatively small amount of solid waste would justify the transportation logistics and inherent costs.

III. ANALYSIS OF SUB-REGIONAL SYSTEMS

Many of the transportation problems listed in the previous section for the regional solid waste system are also appliable to the sub-regional waste shed and will not be repeated in the analysis of sub-regional waste sheds.

The following information, details and potential problems affect the feasibility of sub-regional solid waste management systems and especially the transportation of the solid waste.

* The relatively small volumes of solid waste generated in the communities preclude the use of open or containerized barges. The only reasonable transportation system would be to ferry either packer trucks or stationary compactors.

* A major difficulty in using the ferry system is matching the Marine Highway schedule to the needs of the solid waste system. The cities on the main ferry line would not be as unpredictable as the communities on the feeder lines. The smaller ferries which run the feeder routes cannot withstand the rough seas encountered during periods of inclement weather and this could delay the solid waste transportation.

* All transportation is energy intensive and for it to be practical the energy recovered at an energy recovery facility must be greater than the energy expended to transport the solid waste.

* Officials from the Marine Highway system have not been enthusiastic about transporting packer trucks or stationary compactors. They are concerned about the potential of fires, odor and leaching from the units.

In view of the above data and information in the preceding section and primarily due to the cost of the transportation and compaction equipment the feasibility or practicality of sub-regional systems is not good. However, in a few instances solid waste transportation may be realistically feasible. Since these are isolated cases and do not encompass an entire waste shed they will be addressed under individual systems.

S.E. ALASKA INDIVIDUAL CITY/BOROUGH SOLID WASTE MANAGEMENT SYSTEMS

S.E. ALASKA INDIVIDUAL CITY/BOROUGH SOLID WASTE MANAGEMENT SYSTEMS

I. GENERAL CHARACTERISTICS

Based on the solid waste generation estimates solid waste processing only appears to be logical for the more populated areas such as Juneau, Ketchikan and Sitka. However, if environmental regulations are stringently enforced some of the lesser populated areas may be required to implement substantially improved solid waste management systems.

The S.E. Alaska geology, hydrology and precipitation rates do not favor conventional landfill sites or leachate collection and treatment systems. Therefore, improvements in solid waste management should be directed towards minimizing the amount of solid waste requiring disposal and leachate control. This assumption definitely favors solid waste incineration. In addition, if the smaller communities are required to implement improved solid waste management systems small batch incinerators are some of the only units that can be acquired in a small enough size to operate at or near their design capacity.

Projected capital and operating costs for baling and E.R. facilities will be compared for Juneau and Ketchikan and only an E.R. facility will be analyzed for Sitka since they already have a solid waste shredder. The cost of small batch incinerators will also be listed for the other communities although the logic of actually implementing such a system will depend on many factors unique to each community. Examples are regulatory pressures and how critical the landfill space and cover material problem is in each specific area.

II. ECONOMIC ANALYSIS OF ALTERNATIVE INDIVIDUAL SOLID WASTE MANAGEMENT SYSTEMS

The cost figures used in the economic analysis are based on the best information available yet are only estimates used to provide order of magnitude costs for comparison of alternative solid waste management systems.

The cost of land for the processing facility or landfill is not included in the analysis for any alternative system and all are therefore on the same basis although the land required for the disposal of incinerator residue would be less.

A. Basis for Economic Calculations

The basis for the economic calculations will be listed in the following section for the E.R. facility, baler and batch incinerators.

1. Modular Solid Waste E.R. Facility

* Capital costs are estimated at $32,000 per daily ton of plant capacity. The annual capital cost payback will be estimated at 10½% for 15 years.

* Operating costs will be estimated at $5.50 per ton of solid waste processed. The following is an itemization of the cost cstimate

Auxillary Fuel	$ 1.00
Utility, water, power, chemicals	$ 1.50
Refractory Reserve	$ 0.50
Maintenance and Repair	$ 2.00
Residue Removal and Disposal	$ 0.50
Total	$ 5.50/ton

* Labor Cost Estimates

- 20 to 30 ton/day facility

3 Operators (at $40,000/yr)	=	$120,000/yr
1 Maintenance Supervisor (at $45,000/yr)	=	$ 45,000/yr
Sub-Total		$165,000/yr
25% Fringe Benefits approx.		$ 41,000/yr
Total		$206,000/yr

- 50 ton/day facility

Same as 20 to 30 ton except add one relief operator at $40,000 + 25% Fringe Benefits	$ 50,000/yr
Total	$256,000/yr

* For this analysis it will be assumed that the solid waste will be converted to process steam. Because of the high

moisture content of the solid waste it is estimated that only 4,000 lbs of steam can be generated from a ton of solid waste instead of the normal estimate of 5,000 lbs of steam per ton of solid waste.

* Revenue from steam sales will be computed at $7.00 per 1,000 lbs of steam which is approximately 20% less than the cost of steam generated from #2 fuel oil.

  Appendix E contains fuel oil energy and thermodynamic calculations including data to support the $7 per 1,000 lbs of steam which is actually 21% less than the cost to generate steam from #2 fuel oil. The annual revenue from steam sales will be dependent on the steam demand of specific customers and will be addressed under a subsequent section of this report.

2. Solid Waste Baling Facility

* Capital Cost Estimate

- Baler, Feed Conveyor and Wire Tyer	$240,000
- Metal Building (80' X 80')	$180,000
- Front End Loader (Landfill)	$ 60,000
- Fork Lift	$ 30,000
- Flat Bed Truck	$ 20,000
Total	$530,000

  Annual capital cost payback will be calculated at 10½% for 15 years. Based on the preceding capital cost estimate of $530,000, the annual capital cost payback is approximately $70,000 per year.

* Labor costs will be based on requiring one operator/ mechanic at $40,000 per year and a general labor at $25,000 per year. The total labor estimate is therefore $65,000 per year plus 25% fringe benefits for a total of approximately $81,000/year.

* Operational costs for the utilities, wire and miscellaneous expenses are estimated at $30,000 per year.

3. Solid Waste Batch Incinerators

* Capital cost estimates are listed for various sizes of incinerators including construction and freight costs.

The annual cost payback for each has been computed at 10½% for 15 years.

- Batch unit with 2 to 4 tons per day capacity is $170,000 or approximately $23,000 per year.
- Batch unit with a 6 to 8 tons per day capacity is $185,000 or approximately $25,000 per year.
- Batch unit with 10 to 12 tons per day capacity is $260,000 or approximately $34,000 per year.
- Batch unit with 25 tons per day capacity is $575,000 or approximately $76,000 per year.

* Automated continuous flow units are also available at an approximate $100,000 increase in price.

* Labor costs are dependent on size as is evident from the following estimates which are based on salaries and 25% fringe benefits.

- 2 to 4 ton/day 1 person part-time	=	$ 25,000/yr
- 6 to 8 ton/day 1 person full time	=	$ 50,000/yr
- 10 to 12 ton/day 1½ persons	=	$ 75,000/yr
- 25 ton/day facility		
1 Maintenance person	=	$ 50,000/yr
1 Operator	=	$ 50,000/yr
1 Standby and part-time ash removal	=	$ 25,000/yr
Total		$125,000/yr

* Operating costs are estimated at $4.50 per ton of solid waste processed based on the following itemized schedule.

Auxillary Fuel	$ 2.50
Utility, water, power	$ 0.50
Refractory Reserve	$ 0.50
Maintenance and Repair	$ 0.50
Residue Removal and Disposal	$ 0.50
Total	$ 4.50

B. Juneau Solid Waste Management Options

The following calculations are based on a six day per week solid waste facility operating at 49 tons per day.

Juneau E.R. Facility

Annual Cost Estimates

Capital Cost (Based on a 50 ton/ day unit at $1.60 million at 10½% for 15 years)	$212,000
Operating Cost ($5.50/ton at 49 tons/day for 312 days/year	$ 84,000
Labor Cost	$256,000
Total Cost Estimate	$552,000

Annual Revenue Estimate

There are two major factors that limit the amount of steam that can be generated and sold. The actual amount of solid waste available for incineration and the energy demand of the steam customer.

Normally it is advisable to compare steam demand and availability on a monthly basis in order to determine the quantity of steam that can be sold. However, preliminary calculations reveal that the solid waste E.R. facility can generate far more steam than is needed to heat four potential customers which are within a 2,000 ft. radius of an area where an E.R. facility could be located. Therefore, annual totals will be used to compute energy needs.

Appendix E contains thermodynamic calculations which reveal that approximately 115 lbs of steam can be generated from a gallon of #2 fuel oil This information and the gallons consumed on an annual basis in different buildings (supplied by ADEC and Channel Sanitation in Appendix F) will be used to approximate the amount of steam that could be sold.

Although there are numerous state office buildings that could be potential energy customers ADEC has indicated that four buildings are in close proximity to each other and a potential E.R. site. Since this logistical information is not available for the other structures the following four buildings and annual fuel oil usages will be used in this report. However, it is important to recognize that if some of the more energy intensive buildings (such as the state office building in Appendix F) could be acquired as energy customers more of the solid waste E.R. steam could be sold thus resulting in increased revenues.

Potential Steam Customer Fuel Consumption and Energy Demand.

City and Borough Swimming Pool

September 1979 through August 1980 delivered approximately	54,000 gallons

Harbor View

August 30, 1979 through June 26, 1980 (school year) delivered approximately	37,000 gallons

High School

July 18, 1979 through June 20, 1980 delivered approximately	72,000 gallons

Marie Drake

October 1979 through June 25, 1980 delivered approximately	25,000 gallons
Total Gallons Per Year	188,000

Using the steam generation factor of 115 lbs-steam per gallon of oil (from Appendix E) this means that approximately (188,000 gallons/year)(115 lbs-steam/gallon) = 21.62 million lbs of steam are needed each year to heat the three buildings and swimming pool.

Before steam revenues can be determined at $7 per 1,000 lbs of steam the steam demand must be compared to the steam available from the solid waste E.R. facility. Both the total annual availability and demand and the peak monthly availability and demand should be compared to insure that the E.R. facility can supply the needed steam even during peak monthly demands.

Total Annual Steam Available from the E.R. Facility

$$(49 \frac{\text{tons}}{\text{day}})(312 \frac{\text{days}}{\text{yr}})(4{,}000 \frac{\text{lbs-steam}}{\text{tons S.W.}}) = 61.15 \text{ million}$$

lbs of steam can be generated by the E.R. facility per year which is greater than the demand.

The peak fuel oil steam demand (Appendix F) was during the month of January, 1980 with approximately 27,000 gallons of oil. A comparison of this energy demand with the monthly solid waste steam generation rate indicates that even during the month of peak demand the E.R. facility could deliver the required amount of steam.

$$(27{,}000 \frac{\text{gal}}{\text{mo}})(115 \frac{\text{lbs-steam}}{\text{gal}}) = 3.11 \times 10^6 \frac{\text{lbs-steam}}{\text{mo}}$$

$$(49 \frac{\text{tons S.W.}}{\text{day}})(22 \frac{\text{days}}{\text{mo}})(4{,}000 \frac{\text{lbs-steam}}{\text{tons S.W.}}) = 4.31 \times 10^6 \frac{\text{lbs-steam}}{\text{mo}}$$

Therefore, the estimated revenue from steam sales can be based on the annual customer demand for steam previously estimated to be 21.62×10^6 lbs of steam/year.

$$(21.62 \times 10^6 \frac{\text{lbs-steam}}{\text{yr}})(\frac{\$7}{1{,}000 \text{ lbs-steam}}) =$$

$151,340/year or approximately $151,000/year

As was previously referenced there is a rule of thumb that at least 75% of the steam generated from an E.R. facility must be sold for the project to be economically feasible. Since the preceding calculations reveal that there is only a demand for approximately 35% of the available steam the economics are not favorable.

The E.R. facility will probably not be economically feasible unless a larger volume steam customer(s) can be acquired, especially in view of the high labor costs inherent in Alaska. For example if all of the generated steam could be sold at the 20% discounted price of $7/1,000 lbs of steam the steam revenue estimate would be as follows:

$$(61.15 \times 10^6 \frac{\text{lbs-steam}}{\text{yr}})(\frac{\$7}{1{,}000 \text{ lbs-steam}}) =$$

$428,050/year or approximately $428,000/year

Juneau E.R. Facility Estimated Economic Summary
(Annual Basis)

Cost	$552,000
Revenue	$151,000
Net Cost	$401,000

However if all the generated steam could be sold the net cost estimate would only be as follows.

Cost	$552,000
Revenue	$428,000
Net Cost	$124,000

Juneau Baling Facility Annual Cost Estimates

Capital Cost ($530,000 total)	$ 70,000
Plant Operation	$ 30,000
Labor	$ 81,000
Total	$181,000

Comparing the E.R. facility and baler cost figures reveal that the baler has a very significant economic edge unless a steam customer can be acquired that can purchase all or most of the steam generated by the E.R. facility.

C. Ketchikan Solid Waste Management Options

The following economic analysis is based on a six day per week solid waste facility operating at 28 tons per day.

Ketchikan E.R. Facility

This analysis is based on using the energy for space heating offices or the S.E. Alaska Corp. kiln or any other potential customers.

Annual Cost Estimates

Capital Cost (Based on a 30 ton/day unit at $960,000 at 10½% for 15 yrs.)	$127,000
Operating Cost ($5.50/ton at 28 tons/day for 312 days/yr)	$ 48,000
Labor Cost	$206,000
Total Cost Estimate	$381,000

Annual Revenue Estimate

From the wood waste section of this report it was roughly estimated that 95,000 lbs of steam would be required for each day the S.E. Cedar drying kiln was operated. Newly acquired figures from kiln manufacturers indicate that approximately 144,000 lbs of steam would be required for each operating day for a 120,000 bd. ft. kiln which would operate on a 3½ to 4 day drying period.[6] (However, these figures only reflect an 8 to 10% moisture content which may be low for S.E. Alaska.)

As was previously indicated, kiln sizing and energy requirements should be accurately determined if S.E. Cedar is to be a steam customer. Using the new figures it is evident that the kiln could use all the energy from the 28 ton/day of municipal solid waste and would actually require supplemental wood waste.

Assuming the sale of all steam that could be generated the estimated revenue would be

$$\left(28\ \frac{\text{tons}}{\text{day}}\right)\left(312\ \frac{\text{days}}{\text{yr}}\right)\left(4{,}000\ \frac{\text{lbs-steam}}{\text{tons S.W.}}\right) =$$

$$34.94 \times 10^{6}\ \frac{\text{lbs-steam}}{\text{yr}} \text{ at } \$7/1{,}000 \text{ lbs-steam} =$$

$244,580/year or approximately $245,000/year

Appendix F contains fuel oil consumption for the Ketchikan airport which is approximately 38,000 gallons/year and the Borough office which is approximately 4,700 gallons/year. Since the airport is more energy intensive this fuel consumption figure will be used to determine if space heating is a logical use for the solid waste E.R. steam. Using the 115 lbs-steam per gallon of fuel oil calculated in Appendix E in conjunction with the fuel usage allows the following calculation.

$$\left(38{,}000\ \frac{\text{gal oil}}{\text{yr}}\right)\left(115\ \frac{\text{lbs-steam}}{\text{gal oil}}\right) = 4.37 \times 10^{6}\ \frac{\text{lbs-steam}}{\text{yr}}$$

As was true with space heating in Juneau the energy requirement is considerably less than can be generated by the Ketchikan E.R. facility which was previously calculated to be 34.94×10^{6} lbs-steam/year.

The estimated revenue for space heating the airport is therefore

$$\left(4.37 \times 10^6 \frac{\text{lbs-steam}}{\text{yr}}\right)\left(\frac{\$7}{1{,}000 \text{ lbs-steam}}\right) =$$

$30,590/year or approximately $31,000/year

It is quite evident from the preceding calculations that process steam customers utilize far more steam than do space heating steam customers. However, this is actually not surprising since process steam machinery operate at far higher temperatures than space heating.

Ketchikan E.R. Facility Estimated Economic Summary (Annual Basis)

Kiln Drying (Process Steam)

Cost	$381,000
Revenue	$245,000
Net Cost	$136,000

Space Heating (Airport)

Cost	$381,000
Revenue	$ 31,000
Net Cost	$350,000

Ketchikan Baling Facility Annual Cost Estimates

Capital Cost ($530,000 total)	$ 70,000
Plant Operation	$ 30,000
Labor	$ 81,000
Total	$181,000

To reiterate, it is quite evident that most or all of the steam generated by the solid waste E.R. facility must be sold for the system to be economically feasible.

D. Sitka E.R. Facility

The following economic analysis will be based on a six day per week solid waste E.R. facility operating at 18 tons per day selling steam to one or more of the Sitka Schools for space heating.

Annual Cost Estimates

Capital Cost (based on a 20 ton/day unit at $640,000 at 10½% for 15 yrs.)	$ 85,000
Operating Cost ($5.50/ton at 18 tons/day for 312 days/yr)	$ 31,000
Labor Cost	$206,000
Total Cost Estimate	$322,000

Annual Revenue Estimate

The annual fuel demand for various schools in Sitka are contained in Appendix F. Since it is not known if one or more of the schools are close enough together to utilize the steam or hot water from the E.R. facility only one school will be used in this analysis. Since only the high school utilizes steam heat it is assumed to be the steam customer. However, it is important to note that the E.R. facility is compatible with hot water heat which can even be transported further than steam. One possibility would be to locate near the high school to generate steam and then pipe hot water to Blatchely Jr. High if the two are close enough together.

Using the approximated 69,000 gallons of oil per year consumed in heating the high school in conjunction with the 115 lbs steam per gallon of oil from Appendix E allows the computation of the steam needs for the high school.

$$(69{,}000\ \frac{\text{gal oil}}{\text{yr}})(115\ \frac{\text{lbs-steam}}{\text{gal oil}}) = 7.94 \times 10^6$$

$\frac{\text{lbs-steam}}{\text{yr}}$ at $7/1,000 lbs steam the estimated

$$\text{revenue is:}(7.94 \times 10^6\ \frac{\text{lbs-steam}}{\text{yr}})(\frac{\$7}{1{,}000\ \text{lbs-steam}}) =$$

$55,580/year or approximately $56,000/year

Total Annual Steam Available from the E.R. facility is:

$$(18\ \frac{\text{ton}}{\text{day}})(312\ \frac{\text{day}}{\text{yr}})(4{,}000\ \frac{\text{lbs-steam}}{\text{ton}}) = \$22.46 \times 10^6$$

$$\frac{\text{lbs-steam}}{\text{yr}}\ (22.46 \times 10^6\ \frac{\text{lbs-steam}}{\text{yr}})(\frac{\$7}{1{,}000\ \text{lbs-steam}}) =$$

$157,200/year or approximately $157,000/year

As was true with space heating steam customers in Juneau and Ketchikan there is not enough energy to consume very much of the available solid waste E.R. steam unless two or even three of the larger schools are close enough together to use the energy from a single E.R. facility.

Sitka E.R. Facility Estimated Economic Summary (Annual Basis)

Cost	$322,000
Revenue (High School Only)	$ 56,000
Net Cost	$266,000

If all the E.R. steam could be sold the economics improve but are still marginal due to the high labor cost and absence of economy of scale.

Cost	$322,000
Revenue (based on sale of all steam)	$157,000
Net Cost	$165,000

E. Batch Incinerator Costs for a 2 to 4 Ton Per Day Unit

As was indicated in a previous section of this report it may not be practical for the smaller communities to implement a solid waste incineration system unless there are overriding circumstances such as extremely limited land area or solid waste cover material or other critical factors.

The following alphabetical list of communities would fall in the capacity range of this size incinerator with the only variable being the operating cost based on the amount of solid waste processed. The capital cost and annual capital cost payback and labor costs would be the same for every community. The operating cost estimate does include residue removal and disposal.

Capital Cost Estimate is $170,000 or approximately $23,000/yr at 10½% for 15 yrs Annual Payback	$ 23,000
Annual Labor Cost Estimate including salary and fringe benefits for a part-time employee	$ 25,000
Sub-Total (constant for all communities)	$ 48,000

Annual Operating Cost Estimate is based on $4.50 per ton of solid waste processed at each community.

Area and Facility	Annual Cost Estimate
Angoon	
Operating Cost (1.1 tons/day)	$ 1,500
Total Cost	$50,000
Craig and Klawock	
Operating Cost (2 tons/day)	$ 2,800
Total Cost	$51,000
Haines	
Operating Cost (3.6 tons/day)	$ 5,100
Total Cost	$53,000
Hoonah	
Operating Cost (2.2 tons/day)	$ 3,100
Total Cost	$51,000
Hydaburg	
Operating Cost (0.8 tons/day)	$ 1,100
Total Cost	$49,000
Kake	
Operating Cost (1.4 tons/day)	$ 2,000
Total Cost	$50,000
Metlakatla	
Operating Cost (2.3 tons/day)	$ 3,200
Total Cost	$51,000
Pelican	
Operating Cost (0.5 tons/day)	$ 700
Total Cost	$49,000
Skagway	
Operating Cost (3.1 tons/day)	$ 4,400
Total Cost	$52,000
Yakutat	
Operating Cost (0.9 tons/day)	$ 1,300
Total Cost	$49,000

The constant labor cost of $25,000/year may be somewhat high for some of the small communities since they may only incinerate once per week but a constant salary is probably more realistic than a per ton cost for these small volumes.

F. Batch Incinerator Costs for a 6 to 8 Tons Per Day Unit

Only the communities of Wrangell and Petersburg fall within this range of daily operating capacity. The operating cost also includes residue removal and disposal.

Capital Cost Estimate is $185,000 or approximately $25,000/yr at 10½% for 15 yrs	$25,000
Annual Labor Cost Estimate including salary and fringe benefits for one full-time employee	$50,000
Sub-Total (constant for both communities)	$75,000

Annual Operating Cost Estimate is based on $4.50 per ton of solid waste processed.

Petersburg

Operating Cost (6.5 tons/day)	$ 9,100
Total Cost	$84,000

Wrangell

Operating Cost (6.8 tons/day)	$ 9,600
Total Cost	$85,000

The cities of Wrangell and Petersburg are at a very unfortunate size as it pertains to solid waste incineration. Alone neither is large enough to justify energy recovery, yet the cost to merely incinerate the solid waste is quite high. As was indicated in the sub-regional analysis for the Central Waste Shed it is somewhat doubtful that the amount of energy extracted from the solid waste sould justify transporting it by ferry from one town to the next. However, in view of the high batch incineration costs without E.R. and the fact that the city of Wrangell is being pressured to move their disposal site due to FAA regulations regarding birds and airports a hypothetical E.R. facility located in Petersburg will be analyzed. The availability of steam customers is not known nor is it obvious if there is enough energy recovered to even interest a steam customer.

G. Wrangell and Petersburg E.R. Facility

The following analysis is based on an E.R. facility in Petersburg processing the Wrangell and Petersburg solid waste of 13.3 tons per day on a six day per week basis. An estimate of ferry costs will also be included.

Ferry Costs

At 6.8 tons per day of solid waste this equates to 68 yd^3 of solid waste per day in an uncompacted state. Assuming a 3 to 1 compaction ratio this reduces to approximately 23 yd^3. A preliminary analysis of the Marine Highway summer schedule reveals that a system using a special pull-on-drop-off type stationary compactor and rail truck with extra compactor boxes the concept might be feasible. (Assuming the winter ferry schedule is frequent enough.)

The next step is to determine if the ferry cost is prohibitive. Assuming a compactor box of approximately 40 ft in length it would cost $80 per trip one way or $160 per round trip per container. Although a single container would not be transported every day the solid waste generated would have to ultimately be transported. Since stationary type compactors are rated at a 3 or 4:1 compaction ratio it is assumed that the daily solid waste volume could be placed in one compactor box.

Basis:

1 - 20 yd^3 compactor box per day transported on a six day per week basis of $160 per trip

$$\left(312\ \frac{\text{trips}}{\text{year}}\right)\left(\frac{\$160}{\text{trip}}\right) = \$50{,}000/\text{year approximately}$$

Petersburg-Wrangell E.R. Facility Economic Analysis

The facility will be based on incinerating 13.3 tons per day six days per week.

Capital Cost based on a 15 ton/day unit for $480,000 at 10½% for 15 yrs Annual Capital Cost Estimate	$ 64,000
Labor Cost (3 person estimate)	$150,000
Operating Cost Estimate	$ 23,000
Total Cost Estimate	$237,000

Annual Steam Revenue

$$\left(4{,}150\ \frac{\text{tons S.W.}}{\text{yr}}\right)\left(4{,}000\ \frac{\text{lbs-steam}}{\text{tons S.W.}}\right)\left(\frac{\$7}{1{,}000\ \text{lbs-steam}}\right) =$$

$116,200/year

Optimistically assuming sale of all the steam, the annual steam revenue rounds to $116,000

Net E.R. Facility Cost Estimate (Cost - Revenue)	$121,000
Adding in Ferry Cost Estimate	$ 50,000
Total Annual Cost Estimate	$171,000

This reveals that the E.R. cost estimate of $171,000 per year is almost identical to the $169,000 per year estimate for both cities to incinerate without E.R. However, the E.R. system estimate does not include the cost of the compactor units or truck and this fact in conjunction with the logistics of ferrying the waste reveal that a joint E.R. facility for Wrangell and Petersburg is probably not a viable alternative.

ECONOMIC SUMMARY OF EXISTING AND POTENTIAL SOLID WASTE MANAGEMENT SYSTEMS

ECONOMIC SUMMARY OF EXISTING AND POTENTIAL SOLID WASTE MANAGEMENT SYSTEMS

The projected annual cost estimates of the alternative solid waste management systems will be listed for each S.E. Alaska community or area for comparison with the annual cost of the existing disposal site operation where that information is available.

Area and Facility	Annual Cost Estimates
Juneau	
Existing Disposal Site	Unknown
E.R. Facility	
Four Schools Steam Customers	$401,000
With Sale of all Steam	$124,000
Baling Facility	$181,000
Ketchikan	
Existing Disposal Site	$100,000
E.R. Facility	
Airport Steam Customer	$350,000
Sale of all Steam to S.E. Cedar	$136,000
Baling Facility	$181,000
Sitka	
Existing Shredder and Disposal Site	$130,000
E.R. Facility	
School Steam Customer	$266,000
Sale of all Steam	$165,000
Wrangell and Petersburg	
E.R. Facility	$171,000 (plus cost of compactor units)
Wrangell	
Existing Disposal Site	$ 15,000
Batch Incinerator	$ 85,000
Petersburg	
Existing Disposal Site	$ 46,000
Batch Incinerator	$ 84,000

Area and Facility	Annual Cost Estimates
Craig and Klawock	
Existing Disposal Site	Unknown
Batch Incinerator	$ 51,000
Skagway	
Existing Disposal Site	No Budget
Batch Incinerator	$ 52,000
Haines	
Existing Disposal Site	$ 30,000
Batch Incinerator	$ 53,000
Angoon	
Existing Disposal Site	-
Batch Incinerator	$ 50,000
Hoonah	
Existing Disposal Site	-
Batch Incinerator	$ 51,000
Hydaburg	
Existing Disposal Site	-
Batch Incinerator	$ 49,000
Kake	
Existing Disposal Site	-
Batch Incinerator	$ 50,000
Metlakatla	
Existing Disposal Site	-
Batch Incinerator	$ 51,000
Pelican	
Existing Disposal Site	-
Batch Incinerator	$ 49,000
Yakutat	
Existing Disposal Site	-
Batch Incinerator	$ 49,000
Kassaan	
Very small at only 25 tons per year generated	

FUNDING ALTERNATIVES

FUNDING ALTERNATIVES

There are many funding alternatives available to communities and boroughs but most of the new grants and loans from the Department of Energy are reserved for alternative sources of energy and only the E.R. facilities would be eligible.

* Private Lease-Purchase Bonding Companies

  This option was used in this analysis to calculate estimated annual costs for the solid waste facilities.

* Revenue Bond

  This type of bond must be approved by the voters, however, a positive feature is that the payback is financed from the revenue of the operation such as the steam sales. The interest rate is usually significantly lower than the normal lending rate.

* General Obligation Bond

  This type of bond must also be approved by the voters and even has a lower interest rate than the Revenue Bonds. However, the General Obligation Bond is supported and paid off through property tax revenues and it is highly improbable that the residents would support it in view of the depressed economy.

* EPA Grants

  The urban policy grants are reserved for feasibility studies for energy and resource recovery projects with emphasis for distressed urban areas and not construction monies.

* State of Alaska grants may be available for certain solid waste management activities if a bond is approved by voters this fall. The regulations governing the grants are currently being finalized and should be available in the near future.

* HUD Community Block Grant Assistance

  Urban Development Action Grant (UDAG)

  This grant is primarily directed towards promoting economic development by stimulating industrial growth. There is a 3 to 1 leverage rule of private funds which means that for every $1 of grant funds spent industry would have to spend $3.

Small Cities Program

Certain solid waste activities may be eligible.

* USDA - Farmers Home Administration (FHA)

Resource Conservation and Development Loans

These loans are primarily oriented towards watershed and irrigation projects and must be approved by the Soil Conservation Service. However, there is some indication that solid waste facilities may be eligible.

Community Facility Loans

These loans may be used for waste disposal facilities and related equipment. Communities over 10,000 in population are not eligible.

Rural Industrialization Loans

These loans may also be directed for waste disposal improvements for areas under a 50,000 population.

* Department of Energy Grants and Loans

The Urban Waste Technology Program does have grant monies and loan guarantees available for energy programs. The funds are primarily research and development funds and the Department of Energy is interested primarily in funding research projects which emphasize new innovative technological advances. However, recent modifications in this legislation may increase the scope of projects that are eligible under the Urban Waste Demonstration Facility Guarantee Program released in the May 13, 1980 Federal Register.

* The Windfall Profits Tax Legislation signed into Law by the President on April 2, 1980, will directly affect solid waste E.R. programs in a positive manner.

  Four of the incentives that will directly impact waste to energy systems include the following.

  - a 10% Investment Tax through 1985 on the equipment and property needed.

- a credit worth $3 a barrel for the production of alternative fuels (approximately $4.20 per ton of solid waste converted to energy)
- an excise tax exemption for gasohol and other alcohol fuels through 1992
- allowing the use of tax exempt industrial development bonds to finance systems that produce steam or alcohol

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS AND RECOMMENDATIONS

To reiterate, the interpretation and enforcement of environmental regulations and the level of severity of the cover material and land area problems in conjunction with the economics of alternative solid waste management systems will actually determine what, if any, changes or improvements are made to existing solid waste management systems.

The practicality of requiring some of the smaller communities to implement expensive solid waste management systems such as batch incinerators is a valid question especially in view of the recent discussions pertaining to a special burn area. However, the only manner to reach an equitable practical solution to this and other regulatory questions is through negotiations and meetings with the local communities, the ADEC and the EPA.

Since the first draft of this report, the refinement of projected E.R. facility and batch incinerator capital costs and the reflection of the higher labor costs in Alaska have definitely affected the economic viability of the incineration system when compared to baling or other solid waste processes.

The inclusion of existing potential energy customer steam demands have also dramatically illustrated the importance of selling all or most of the E.R. steam. If most of the energy cannot be sold it is not E.R., merely expensive solid waste volume reduction.

Co-disposal of sewage sludge and municipal solid waste by incineration appears to be a very marginal proposal because of the relative volumes of these two waste streams and the high moisture content of both. Before investing in co-disposal further study is definitely recommended possibly under the 208 Sludge Management Study.

If it is determine that upgrading is necessary or if any improvements are voluntarily implemented and E.R. or incineration is selected the following recommendations may prove to be of assistance.

* E.R. facilities are very attractive since some utility is extracted from the solid waste stream. However, before any decisions can be made to implement a solid waste E.R. system acquisitions of a reliable steam customer that can use all or most of the E.R. steam, a long term contract, an equitable marketing formula and a clear legal title to the solid waste are absolute necessities.

* The operation of an E.R. facility requires trained skilled personnel and the importance of proper operation cannot be overemphasized. The plant must be operated on a profit motive basis. If the unit breaks down steam revenues stop but capital costs and most operational costs continue.

* If limited land area and a shortage of cover material is a critical problem batch incineration with solid waste volume and weight reduction may provide a long term solution. If the price of land for disposal sites is considered, what first appears to be excessively expensive incineration may not be unreasonable. However, it is important to note that some materials such as bulky solid waste is not suitable for modular incineration. To reiterate, the projected labor costs may be somewhat high for the small batch incinerators if local help can be acquired at a lower salary on a part-time basis. However, this determination is unique to each area and must be determined locally.

Junk auto salvage should be practiced whenever possible with the communities stockpiling the autos until a sufficient number has been accumulated to warrant a trip by the salvage company. Although storage requires land area it is only a temporary use and disposal in landfills permanently consumes valuable site volume.

REFERENCES

REFERENCES

1. United States Environmental Protection Agency. Decision-Makers Guide in Solid Waste Management. U.S. Government Printing Office, Washington, D.C., 1976.

2. Brunner, Dirk R., and Rittenhouse, Bonnie, "Baling and Balefilling of Municipal Refuse."

3. Solid Waste Management-Technology Assessment, by General Electric Company, Van Nostrand Reinhold-General Electric Series, 1975.

4. Duckett, E. Joseph, Director of Research, Schwartz & Connally, Inc. Washington, D.C., "Explosions-Approaches to Explosion Protection in Refuse Processing Facilities." Solid Wastes Management, Resource Recovery Issue, May 1980.

5. Small Modular Incinerator Systems with Heat Recovery, A Technical, Environmental, and Economic Evaluation, Prepared by Systems Technology Corporation, Xenia, Ohio, 1979.

6. Dry Kiln Manufacturers - Compliments of the WIDJAC Corp.

APPENDIX A

SCOPE OF WORK AND SURVEY FORM

TECHNICAL

PROPOSAL FOR A PHASE II

SOLID WASTE MANAGEMENT STUDY FOR S.E. ALASKA

I. INTRODUCTION

Based on the findings of a sub-committee on solid waste disposal the South East Conference requested assistance from EPA, under the technical panels program of RCRA, to conduct a solid waste management study in S.E. Alaska. Pursuant to this request Peat, Marwick, Mitchell & Co., the prime contractor for EPA Region X, negotiated a contract with Finite Resources, Inc. to conduct a Phase I solid waste management study which included a meeting with the representatives of the municipalities in S.E. Alaska and the development of this proposal for a Phase II solid waste management study.

II. BACKGROUND

A preliminary investigation was conducted to determine the status of the existing solid waste management systems in S.E. Alaska with special emphasis on recent activities of the S.E. Conference solid waste disposal sub-committee. A meeting was then conducted with municipal representatives on September 27, 1979 to discuss the solid waste management problems of S.E. Alaska and to determine which solid waste subjects the municipalities wanted to have investigated. It is interesting to note that due to the geographical, climatological and socio-economic similarities of the communities which comprise the S.E. Conference the solid waste management problems were very similar for each community as can be readily determined by analyzing the following concise list of the topics discussed at the meeting.

* Suitable land for disposal sites is extremely difficult to locate and acquire due to the very limited amount of land that is available in conjunction with the severe competition from residential and commercial land development.

* Acquisition of suitable ground for landfills was further complicated by the extremely high annual precipitation rate which creates leachate problems and also produces numerous areas of muskeg or marshes which are not generally suitable for landfilling.

* An additional factor complicating siting and operating a disposal site is the extremely limited supply of suitable cover material.

* Concern was expressed over the impact of the impending solid waste regulations for disposal sites under the Resource Conservation and Recovery Act (RCRA) and state open burning restrictions which are in effect.

* Due to the absence of automobile salvage and recycling programs the disposal of auto hulks in landfills rapidly consumes valuable disposal site volume. Much concern was expressed for the need for a junk auto salvage program and an almost unanimous request was made to investigate this subject area.

* Sewage treatment plant sludge disposal is also a problem due to limited land area and high precipitation rates and some communities requested that the co-disposal of solid waste and sludge be investigated.

* Wood waste from lumber mills was also of concern to the group especially due to the large volume of wood waste and the corrosion problems associated with incinerating the wood waste which contains large concentrations of salt from the ocean water. However, there was some indication that the lumber companies were in the process of solving much of the wood waste problem by the installation of on-site wood-waste boilers which are used to generate steam for the mill.

III. PROPOSAL FOR A PHASE II SOLID WASTE MANAGEMENT STUDY

In concise terms the proposed Phase II study is intended to determine the following:

* The status, cost and problems associated with each communities' existing solid waste management system.

* Develop an analysis of alternative solid waste management systems. The characteristics of each system would be listed including technical and economic details with pros and cons in order to allow the selection of an economically and technically viable solid waste management system or combination of systems.

* Distribute the results of the survey of existing systems and the analysis of alternative solid waste management systems to the municipal representatives for their input and to determine if there is a consensus of opinion.

* Develop and distribute the final Phase II report incorporating the comments and opinions of the municipal representatives.

The status of the existing solid waste management systems will be determined by personal interviews and meetings with municipal project participants and on-site inspection of existing facilities. This primary source of information will be supplemented by existing solid waste reports after they have been reviewed by the affected municipality to insure their present applicability and accuracy.

During the site inspections and interviews the characteristics and volumes of solid waste generated will be determined on a qualitative basis including estimates of the percent composition of the solid waste stream. However, if the analysis of alternative solid waste management systems favor energy recovery facilities a quantitative laboratory analysis of the solid waste stream may be warranted at a later date. The lab analysis would accurately determine the variables of the solid waste stream which significantly affect energy recovery such as moisture contact and associated BTU values.

The ADEC 208 Water Quality Management Planning Staff is currently finalizing plans to conduct a comprehensive sludge management study which will be initiated in the near future. The objectives of the study is to develop a set of guidelines for the selection of a sludge management system based on the sludge characteristics, climate, terrain and community socioeconomic conditions of different areas in Alaska.

In order to not duplicate the impending 208 sludge management study and at the request of EPA the proposed Phase II solid waste management study is not intended to be a comprehensive sludge management study. The Phase II study is envisioned as only investigating those sludge management practices which are compatible with solid waste management practices. Examples of compatible disposal practices would be conventional land disposal in landfills or aerobic compositing of a sludge and solid waste mixture. Conversely surface application or spreading of sludge on agricultural or forest lands is not acceptable for residential solid waste and solid waste energy-recovery modular incineration systems are not well suited for sludge disposal.

A. Existing Solid Waste Management Practices

Major Task A-1. Determine the status of the existing solid waste management system serving each community and borough.

* A data sheet will be sent to each municipality for review and familiarization prior to the interview with the consultant.

* Personal interviews or meetings will be conducted with municipal project participants, private solid waste contractors and a representative of the ADEC.

* Solid waste disposal site inspections will be conducted by the consultant, municipal project participants and an ADEC representative.

* The information gathered during the interviews and inspections will be supplemented with existing solid waste reports and other available on file data after this information has been reviewed by the affected municipalities to insure its current applicability and accuracy.

* Summarize the status and economics of existing solid waste collection and disposal systems.

An example of a data sheet is contained in Appendix A. However it is important to note that modification of the data sheet may be logical after it has been field tested.

Major Task A-2. Determine the magnitude of the wood waste problem and conduct a preliminary survey of potential markets for recovered energy.

* A telephone interview will be conducted with mills in the area to determine the volume of wood waste generated, anticipated trends in the generation rates of wood waste and planned wood waste management strategies (i.e. install a company owned wood waste energy recovery boilers in the near future).

* Desire of company to supply wood waste to city or borough.

* Desire of company to purchase energy from city or borough.

* Estimate % of NaCl present in wood waste.

* Preliminary survey of potential energy users.

Major Task A-3. Determine the magnitude of the automobile disposal problem.

* Use information from the Task A-1 data sheet to estimate the cost for the landfill disposal of an auto hulk.

* Conduct telephone interviews with the salvage dealers that may be interested in smashing and recycling cars and determine and document their economic needs and problems (i.e. excessive transportation costs and land area required for storage).

* Investigate the possibility of State operated barge-contained car smashers.

Major Task A-4. Determine current sludge disposal practices and requirements.

* Interview the ADEC 208 water quality representative to estimate future needs and the current status of sludge management.

* Determine the status and projected timetable of the proposed 208 sludge management study.

B. Analyze Alternative Solid Waste Management Systems

Major Task B-1. Determine alternative solid waste sheds or areas.

* Summarize general areas currently served by solid waste collection systems and disposal site service areas (information from data sheet).

* Group existing service areas into reasonable 2 or 3 sub-regional waste sheds based on population distribution, transportation routes (Ferry and highway) and other pertinent characteristics.

* Group existing service areas into one regional waste shed and identify tentative regional solid waste processing or disposal site areas.

Major Task B-2. Develop a technical and economic analysis or overview with pros and cons and risk elements for solid waste management systems which are reasonable or practical and environmentally acceptable for the study area. These alternative systems would include but may not be limited to improved landfilling with leachate control, solid waste shredding, solid waste baling and balefill operations, solid waste modular incineration with and without energy recovery (determining potential customers for energy would be a very important portion of the energy recovery systems).

* Develop a technical and economic analysis for new solid waste management systems including compatible sludge disposal options within the existing service areas.

* Develop a technical and economic analysis for new solid waste management systems including compatible sludge disposal options in the sub-regional areas or waste sheds identified in Task B-1.

* Develop a technical and economic analysis for a solid waste management system including sludge disposal options for the regional waste shed identified in Task B-1.

* Outline alternative management systems for the automobile disposal problem including economic comparisons of landfilling vs. private auto salvage to recycle the hulks.

* Summarize alternative funding mechanisms which may be used by each municipality, sub-region or region.

* Summarize the feasibility of cooperative energy recovery systems with generators of wood waste.

* Summarize the technical and economic feasibility of co-disposal operations with sewage sludge.

C. Gather and Tabulate the Comments and Opinions of Municipal and Borough Representatives.

Major Task C-1. Gather input to develop a consensus of opinion from the municipal representatives as to which solid waste system or systems is preferred.

* Distribute draft copies of the report to municipal representatives with a request for specific and direct comments and opinions.

* Conduct a meeting with municipal representatives to discuss the draft copy of the report.

* Tabulate the input from municipal representatives and redefine waste sheds based on the comments received.

* Determine which solid waste management systems are economically and technically feasible based on the population and solid waste volumes of the redefined solid waste sheds or areas.

* Develop and distribute the final copy of the Phase II Report which includes study participant comments.

IV. CONCLUSIONS

As indicated earlier two or three solid waste reports or studies have been completed for specific areas in S.E. Alaska and this information will be relied on to the extent it is useful in conjunction with the wealth of knowledge that is available from individuals in the private and public solid waste sectors.

Liaison activities with EPA, ADEC and especially the local municipalities will be stressed since the proposed study is for the benefit of the S.E. Conference.

N. ED BARKER, P.E.
President, Finite Resources, Inc.

APPENDIX A

S.E. ALASKA PHASE II

SOLID WASTE DATA SHEET

GENERAL INFORMATION

Name of City and/or Borough ____________________

Brief Description of Geographical and/or Political Boundaries ____________________

____

____

Population of City or Borough ____________________

Estimated Population Growth Rate ____________________

COLLECTION ROUTES

Owner ____________________ Operator/Manager ____________________

Number of Employees ____________________

Number and Type of Equipment ____________________

General Description of Areas Served by Collection Routes. ____________________

____

Estimated Number of Customers/Accounts

Residential (i.e. cans) ____________________

Commercial ____________________

____

Estimated Total Population Served by Collection ____________________

Estimated Volume or weight per day/wk or year ____________________

____

Estimated Cost of Collection System ____________________

Source of Funds ____________________

Comments or Problems with System (i.e. undersized, worn out) ____________________

____

____

DISPOSAL SITES

Type of Site (Land Disposal etc.)__________

Site Owner__________Operator/Manager__________

Land Owner__________

General Location of Site__________

Estimated Population Served by Site__________

% Private Drive Ins __________

% by Established Collection Systems__________

Land Characteristics (i.e. steep, rolling)__________

Soil Type__________

Approximate Size of Site Area__________

Site Volume Remaining__________

Estimated Remaining Life of Site__________

Estimated Waste Characteristics and Volumes (identify annual or other)

Residential/Commercial__________

Automobile__________

Wood Waste__________

Other (Identify)__________

Estimated Total Annual Solid Waste Volume or Weight (identify in-place or loose)

____

Estimated % Moisture__________winter

__________summer

Identify Problems with Site (i.e. Limited Land Area, Limited Cover, Wet, Leachate, Burning, Automobiles, Bears)__________

____

Identify Alternative Disposal Site Locations__________

____

Annual Cost of Site Operation__________

Source of Funds (i.e. User Fee, General Fund)__________

APPENDIX B

MAP OF S.E. ALASKA

SOUTHEAST
Alaska's Panhandle
Map Location
Scale
50 miles
50 kilometers
Roads
Ferry Routes
The Saint Elias Mountains form the highest coastal range in the world, topped by Mount Saint Elias (18,008 feet), Mount Vancouver (15,700 feet), and Mount Fairweather (15,300 feet).
Malaspina Glacier is one of the largest ice masses on the North American continent — larger than the state of Rhode Island.
The world's greatest concentration of bald eagles is seen each fall and early winter along the Chilkat River, near Haines . . . up to 3,500 eagles in one small area.
The annual Southeast Alaska State Fair is held each August at Haines, drawing participants and spectators from all over Southeastern.
In 1977, an estimated 47,500 people lived in Southeastern Alaska — more than three-fourths of them in five major urban areas: Juneau, Ketchikan, Petersburg, Sitka and Wrangell.
Highways from the ''outside world'' reach tidewater at only three places in Southeastern — at Hyder, near Stewart, British Columbia; at Haines, where the Haines Highway begins its northward run to a meeting with the Alaska Highway; and at Skagway, where the soon-to-be-completed Skagway-Carcross Road will make connections with the Alaska Highway near Whitehorse, Yukon Territory. The only other overland connection from tidewater is the White Pass & Yukon Route railroad, from Skagway to Whitehorse.
John Muir and a companion, missionary Samuel Hall Young, canoed through the Alexander Archipelago in 1879. Muir, naturalist, travel writer and later founder of the Sierra Club, was the first to systematically explore Glacier Bay and Muir Glacier.
The territorial capital was moved from Sitka to Juneau in 1906.
More than 95% of the land in Southeastern Alaska is under federal jurisdiction. The Tongass National Forest alone accounts for more than 73% of the region's total area.
Average precipitation in Southeastern Alaska is more than 100 inches in many spots, ranging from 26 inches at Skagway to 227 inches at Little Port Walter on Baranof Island.
The tree line in Southeastern usually extends from sea level to about 3,000 feet in the southern part of the region, and to about 1,800 feet farther north, in the Icy Strait region.
Several species of cetaceans are found in Southeastern waters, including Dall and harbor porpoises, Steller sea lions, harbor seals, and humpback, fin and Pacific killer whales. Gray whales and northern fur seals pass offshore during migrations.
A survey several years ago revealed that Petersburg had the highest per-capita income of any community in the United States. (No doubt after a particularly good fishing season . . .)
The village of Kake, on Kupreanof Island, boasts one of the world's tallest totem poles, carved in 1967 by Chilkat carvers from the Haines area.
Wrangell is the only Alaska city to have existed under Russian, British and American flags.
Chatham Strait, the major waterway bisecting the Alexander Archipelago, attains depths of 2,000 feet or more.
The first Southeastern Alaska canneries were established in 1878 at Klawock and Old Sitka. Size of the salmon pack rapidly increased throughout the region until it peaked in the late 1930's.
Thorne Bay is one of the largest logging-camp communities in the United States. Population is about 550.
Prince of Wales Island, 2,231 square miles, is third largest under the American flag. Kodiak Island is the largest, and the island of Hawaii is second.
Hyder residents sometimes call their quiet little town ''the friendliest ghost town in Alaska.''
Hydaburg is the largest Haida Indian village in Alaska, with a population of about 400.
Mount Saint Elias
Mount Augusta
Mount Vancouver
Mount Hubbard
Guyot Glacier
Icy Bay
Malaspina Glacier
Yakutat Bay
Point Manby
Ocean Cape
Mount Jette
Mount Aylesworth
Mount Armour
Mount Duff
Mount Wade
Mount Herbert
Haines Highway
to the Alaska Highway
Grand Pacific Glacier
Mount Harris
Chilkoot Pass
White Pass
White Pass & Yukon Route
railroad to Whitehorse
Mount Bagot
Snow Top
Mount Canning
Mount Pullen
Mount Poletica
Mount Service
Mount London
Mount Nesselrode
Mount Ogilvie
Devils Paw
Cape Fairweather
Brady Icefield
Monument
Lynn Canal
Cape Spencer
Cross Sound
Icy Strait
Mount Ogden
Mount Fremont Morse
Mount Brundage
Chichagof Island
Admiralty Island
Baranof Island
Sitka Sound
Mount Edgecumbe
Point Gardner
Frederick Sound
Kupreanof Island
Kuiu Island
Tebenkof Bay
Port Alexander
Mount T
Devils Thumb
Kates Needle
Castle Mountain
Mount Talbot
Mount Gallatin
Elbow Mountain
Mount Whipple
Mount Fawcett
Mount Pounder
Mount Stoeckl
Mount Middleton
Mount Willibert
Mount John Jay
Wrangell
Zarembo Island
Wrangell Island
Etolin Island
Sumner Strait
Coronation Island
Hazy Islands
Sea Otter Sound
Prince of Wales Island
Cape Addington
Revillagigedo Island
Ketchikan
Metlakatla
Forrester Island
Cordova Bay
Cape Muzon
Cape Chacon
Revillagigedo Channel
Portland Canal
To Cassiar Highway 37
Stewart, B.C.
United States-Canada Border
Dixon Entrance
This map is from Vol. 5, No. 2, ALASKA GEOGRAPHIC®, Southeast—Alaska's Panhandle.
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APPENDIX C

POPULATION DATA FOR THE COMMUNITIES

Angoon

P.O. Box 189
Angoon, Alaska 99820

Second Class City

Phone: (907) 788-3653

INCORPORATION DATE:	May 7, 1963
POPULATION:	541
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	2%
CITY COUNCIL MEETS:	Third Tuesday of Each Month

MAYOR: Richard George, Sr. 1980

CITY COUNCIL MEMBERS	
Wally Frank, Sr.	1980
David Willard	1980
Barbara Johnson	1980
Edward Gamble, Sr.	1981
Rodney Hunter, Sr.	1982
Albert Kookesh	1982

ADVISORY SCHOOL BOARD
- Daniel Johnson, Pres.
- Francine Willis
- Edward Gamble, Sr.
- Gertrude Demmert
- Cynthia Ann Williams

CLERK..Genevieve Guanzon
TREASURER....................................David Willard
ATTORNEY.....................................Bruce Monroe
CHIEF OF POLICE..............................Michael Nelson
FIRE CHIEF...................................Reginald Nelson, Sr.
HEALTH AIDE DIRECTOR.........................Barbara Johnson
SUPERINTENDENT OF SCHOOLS....................Joseph Kahklen

Craig

P.O. Box 23
Craig, Alaska 99921

First Class City

Phone: (907) 826-3232

INCORPORATION DATE:	March 1, 1922
POPULATION:	587
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	3%
CITY COUNCIL MEETS:	First and Third Thursdays

MAYOR: James F. Sprague 1981

CITY COUNCIL MEMBERS

Patrick Gardner	1980
Stan Marsden	1982
Richard Wayne	1982
Vesta Holter	1981
Carolyn Coats	1980
Lee Axmaker	1980

MUNICIPALLY OWNED UTILITIES
Water, Dock, Sewer
Refuse Collection

PLANNING & ZONING COMMISSION

Kim Patutzka	1980
Tom Abel	1982
Mary Lee Perkins	1980

SCHOOL BOARD

Jeanine Russell	1980
Joyce Jones	1980
John Staub	1981
Merle Snavely	1981
Shawn Christensen	1982

CLERK/TREASURER..............................Bonnie Wentworth
ATTORNEY.....................................L.B. Jacobson
CHIEF OF POLICE..............................Guy Geraghty
FIRE CHIEF...................................Lee Axmaker
EMERGENCY PREPAREDNESS DIRECTOR..............Guy Geraghty
HEALTH OFFICER...............................Margaret Hatch
PUBLIC WORKS DIRECTOR........................Brian Holter
ENGINEER.....................................Charles Pool & Associates
HARBORMASTER.................................Guy Geraghty
PUBLIC UTILITY MANAGER.......................Merle Snavley
PORT DIRECTOR................................Pat Gardner
WATER & SEWER SUPERINTENDENT.................Brian Holter
SUPERINTENDENT OF SCHOOLS....................Tyrus Brown
MAGISTRATE...................................Elizabeth Dennis
SECRETARY....................................Helen Gray
YOUTH CENTER DIRECTOR........................Pauline Hamilton
GRANT WRITER.................................Ronald Hatch

Haines

P.O. Box 576
Haines, Alaska 99827

First Class City

Phone: (907) 766-2231

INCORPORATION DATE:	January 24, 1910
POPULATION:	1,366
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	3%
CITY COUNCIL MEETS:	First and Third Mondays
MAYOR:	John D. Halliwill 1981

CITY COUNCIL MEMBERS	
Roy C. Clayton	1981
Arne Olsson	1982
Marvin P. Hartshorn	1981
Debra J. Schnabel	1980
John F. Tompkins	1982
Frank L. Wallace	1980

PLANNING & ZONING COMMISSION	
Annette Smith, Chrm	1982
Ken Gross	1981
Frank Haas	1980
Dick Jackson	1982
Tom Jackson	1981
Charles Jones	1980
Donna Truax	1982

MUNICIPALLY OWNED UTILITIES

Water, Dock, Sewer, Boat Harbor

CLERK.......................................Toni Enos
TREASURER...................................Edna Hatch
ADMINISTRATOR...............................Dan Bockhorst
ATTORNEY....................................Thomas Blanton
CHIEF OF POLICE.............................James E. Wadsworth
FIRE CHIEF..................................Frank Wallace
EMERGENCY PREPAREDNESS DIRECTOR..............Richard Jackson
HEALTH OFFICER..............................Dan Bockhorst
PUBLIC WORKS DIRECTOR.......................Ralph P. Anderson
HARBORMASTER................................Larry Munroe

Hoonah

P.O. Box 360
Hoonah, Alaska 99829

First Class City

Phone: (907) 945-3222/3202

INCORPORATION DATE:	June 8, 1946
POPULATION:	1093
REGULAR ELECTION:	First Tuesday in January
SALES TAX:	3%
CITY COUNCIL MEETS:	Second Tuesday of Each Month

MAYOR: Miles Murphy 1981

CITY COUNCIL MEMBERS

Kenneth Schoonover	1981
Corrine Thompson	1981
Albert Dick	1980
James Helmbree	1980
George Mills	1980
Kelly St. Clair	1981

PLANNING & ZONING COMMISSION

Adam Greenwald, Chrm.
Mike Thompson
Richard Bear
George Dultov, Jr.
James Erickson, Sr.
Kenneth Grant
Louis Underwood

MUNICIPALLY OWNED UTILITIES

Water
Dock
Refuse Collection

SCHOOL BOARD

Marlene Johnson, Pres.	1980
Melody DesRosiers	1981
Darling Joyce Mills	1981
Maxine Savland	1982
Lorin Bradbury	1982

CLERK....................................Judy Brown
TREASURER................................Neta Mills
ATTORNEY.................................L.B. Jacobson
VOLUNTEER FIRE DEPARTMENT HEAD...............Gerald Peterson
HEALTH OFFICER...........................Gertrude Wolfe
PARKS & RECREATION DIRECTOR..................Dan Donavon
SUPERINTENDENT OF SCHOOLS....................Tom Brown
WATER & SEWER SUPERINTENDENT.................Karl Greenewald, Sr.
HARBORMASTER.............................Gilbert Mills

Hydaburg

Box 49
Hydaburg, Alaska 99922

Second Class City

Phone: (907) 285-3761

INCORPORATION DATE:	1927
POPULATION:	381
REGULAR ELECTION:	November
SALES TAX:	None

MAYOR: Robert Sanderson 1980

<u>CITY COUNCIL MEMBERS</u>

Victor Burgess	1980
Matthew Charles	1980
Norman Charles	1980

<u>SCHOOL BOARD</u>

Freida Page, Pres.	1981
Victor Burgess	1980
James Lockhart	1980

<u>MUNICIPALLY OWNED UTILITIES</u>
Water, Refuse Collection

CLERK/TREASURER.............................Christine R. Peele
ADMINISTRATOR...............................Blanche D. Kelley
FIRE CHIEF..................................Arnold Edenshaw, Sr.
HEALTH OFFICER..............................Alma Cook/Karen Bernhardt
PUBLIC WORKS DIRECTOR.......................Paul J. Washington
HARBORMASTER................................William Kelley
PUBLIC UTILITY MANAGER......................Clarence Peele, Jr.
SUPERINTENDENT OF SCHOOLS...................Sasha I. Soboleff

City and Borough of Juneau

155 S. Seward Street
Juneau, Alaska 99801

Unified Home Rule Municipality

Phone: (907) 586-3300

INCORPORATION DATE:	July 1, 1970
POPULATION:	23,115
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	1% areawide; 2% service areas 1 and 2
ASSEMBLY MEETS:	First and third Thursdays of each month

MAYOR: W.D. Overstreet 1982

ASSEMBLY MEMBERS	
Fred Baxter	1980
Dianne Bergstrom	1981
Ernest Polley	1982
Alexander Hoke	1982
John Jensen	1981
Harry Aase	1980
Chuck Wells	1981
James Wakefield	1982

PLANNING & ZONGIN COMMISSION	
Kay Diebles, Chrm.	1980
James Triplette	1980
Hugh Grant	1980
Stanley Beadle	1981
Terry Quinn	1981
Ventura Samaniego	1981
Malcolm Menzier	1982
Robert Minch	1982
Marjorie Gorsuch	1982

SCHOOL BOARD	
Carole Burger, Pres.	1980
Marcia Freer	1981
Jim Wilson	1981
Bill Johnson	1982
Allan Barnes	1982
Mark Warner	1982
Gerry Jenkins	1980

MUNICIPALLY OWNED UTILITIES
Water, Airport, Dock

BOROUGH POWERS
Areawide: Fire coordination, civil defense, wharves & small boat harbors, library, assessment & collections, docks, education, planning, zoning, cemetary, ambulance, animal control, hospital, public health, airport, transit, court administration, business regulation, public utility regulation; Non-areawide: police, fire, water, sewer, streets

CLERK.................................E.J. Emery
MANAGER.................................Mar Winegar
ADMINISTRATIVE ASSISTANT.....................Kevin Ritchie
ATTORNEY.................................Lee Sharp
CHIEF OF POLICE.............................James Barkley
FIRE CHIEF.................................Doug Boddy
FINANCE DIRECTOR...........................James Kennedy
COMPTROLLER.................................Quinton Duxbury
ASSESSOR.................................Robert Howe
PUBLIC WORKS DIRECTOR.........................George Porter
WATER & SEWER SUPERINTENDENT...................Derwin Halverson
EMERGENCY PREPAREDNESS DIRECTOR.................Eugene McQueen
PLANNING DIRECTOR...........................Art Hartenberger
BUILDING OFFICIAL...........................Rao Gulur
ENGINEER.................................George Porter
PARKS & RECREATION DIRECTOR...................James Hall
PORT DIRECTOR.............................John Isadore
PURCHASING AGENT...........................August Grunow
AIRPORT MANAGER...........................Bill Palmer
HOSPITAL ADMINISTRATOR.......................Jim Burns
SUPERINTENDENT OF SCHOOLS.....................Donald MacKinnon
TREASURER.................................Ed Hildebrand

Kake

P.O. Box 500
Kake, Alaska 99830

First Class City

Phone: (907) 785-3804

INCORPORATION DATE:	1952
POPULATION:	710
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	3%
CITY COUNCIL MEETS:	First and Third Tuesdays
MAYOR:	Lonnie Anderson 1981

CITY COUNCIL MEMBERS

Henry Smith	1981
Wilbur Brown	1980
Jerry Kahklen	1980
Manuel Aceveda	1980
Norman Jackson	1981
Dan Stachowiak	1981

PLANNING & ZONING COMMISSION

William Cheney, Chrm
Bertha Cavanaugh
Cecelia Mills
Cornell Bean
Victoria McDonald

MUNICIPALLY OWNED UTILITIES

Water
Refuse Collection
Sewer
Liquor Store

SCHOOL BOARD

Shirley Jackson, Pres.	1980
Delbert Kadake	1980
Cecelia Mills	1982
Jerry Kahklen	1982
Pauline James	1981

CLERK..Fran Kraus
TREASURER....................................Bertha Cavanaugh
ATTORNEY.....................................L.B. Jacobson
CHIEF OF POLICE..............................Joel Jackson
FIRE CHIEF...................................Paul Demmert, Jr.
EMERGENCY PREPAREDNESS DIRECTOR..............Paul Demmert, Jr.
HEALTH OFFICER...............................Pauline Jones
PUBLIC WORKS DIRECTOR........................Paul Demmert, Jr.
ENGINEER.....................................Wilbur Brown
SUPERINTENDENT OF SCHOOLS....................Dave Dillman

Kassaan

Kasaan, Alaska 99924

Second Class City

Phone: (907) 542-8001

INCORPORATION DATE:	1976
POPULATION:	38
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	None
CITY COUNCIL MEETS:	Second Tuesday of Each Month

(no other information reported)

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Kenai

P.O. Box 580
Kenai, Alaska 99611

Home Rule City

Phone: (907) 283-7535

INCORPORATION DATE:	May 10, 1960
POPULATION:	4,421
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	3%
CITY COUNCIL MEETS:	First and Third Wednesday of Each Month

MAYOR: Vincent O'Reilly 1980

CITY COUNCIL MEMBERS	
Philip Aber	1981
Edward Ambarian	1980
Betty Glick	1982
Ronald Malston	1980
Raymond Measles	1982
Michael Seaman	1981

PLANNING & ZONING COMMISSION	
Phillip Bryson, Chrm.	1981
Sol Raymond	1980
Jerry Andrews	1982
Karen Mahurin	1982
Dave Curtis	1981
Dwain Gibson	1980
James Blanning	1981

MUNICIPALLY OWNED UTILITIES
Water, Airport, Sewer

CLERK....................................Janet Whelan
TREASURER................................Charles Brown
ATTORNEY.................................Ben Delahay
CHIEF OF POLICE..........................Richard Ross
FIRE CHIEF...............................Walter Winston
PUBLIC WORKS DIRECTOR....................Keith Kornelis
ENGINEER.................................William Nelson
PARKS & RECREATION DIRECTOR..............Kayo McGillivray
WATER & SEWER SUPERINTENDENT.............Clyde Johnson

Ketchikan Gateway Borough

344 Front Street
Ketchikan, Alaska 99901

Second Class Borough

Phone: (907) 225-6151

INCORPORATION DATE:	September 6, 1963
POPULATION:	13,463
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	1.5%
ASSEMBLY MEETS:	First and Third Mondays

MAYOR: Carroll Fader 1981

ASSEMBLY MEMBERS

Gary Emard	1981
Gary Elkins	1980
Len Laurance	1981
Robert Watt	1982
Helen Finney*	1980
Michael Kouni*	1982
Jack McBride*	1982
Walt Bolling*	1981
Normand Dupre*	1980
Charles Freeman*	1981
Edward Zastrow*	1981

*Denotes City Representative

BOROUGH POWERS

Areawide: Assessment & taxation education, animal control, airport, planning and zoning; Service areas: Mountain Point - water; Shoreline - fire

PLANNING & ZONING COMMISSION

Betty Streeper, Chrm.	1981
John Garland	1982
Darlene Crostick	1980
John Benson	1981
Doug Winscot	1981
Ralph Gregory	1982
Eric Muench	1980

SCHOOL BOARD

Kaye King, Pres.	1982
Jim Alguire	1982
Tom Carlin	1981
Cheri Davis	1981
Alaire Stanton	1980
Willard Jones	1980
Judy Montgomery	1982

CLERK..Tommy Nebl
REVENUE COLLECTOR............................Marie Westfall
MANAGER......................................Judith A. Slajer
ATTORNEY.....................................Russell W. Walker
PLANNING DIRECTOR............................Kathryn Carssow
SUPERINTENDENT OF SCHOOLS....................R.W. Stekl
AIRPORT MANAGER..............................Hank Wise
ASSESSOR.....................................Michael Worley

Ketchikan

P.O. Box 7300
Ketchikan, Alaska 99901

Home Rule City

Phone: (907) 225-3111

INCORPORATION DATE:	August 25, 1900
POPULATION:	8,542
REGULAR ELECTION:	First Tuesday of October
SALES TAX:	2.5%
CITY COUNCIL MEETS:	First and Third Thursday of Each Month
MAYOR:	John W. "Jack" Shay 1982

CITY COUNCIL MEMBERS	
Edward Zastrow	1981
Jack McBride	1982
Michael Kouni	1982
Helen Finney	1980
Normand Dupre	1980
Charles Freeman	1981
Walter Bolling	1981

MUNICIPALLY OWNED UTILITIES
Water
Electricity
Telephone
Dock
Refuse Collection

CLERK..Mary McKinley
FINANCE DIRECTOR...............................Allan Learned
MANAGER..James Van Altvorst
ATTORNEY.......................................Russell Walker
ASSISTANT ATTORNEY.............................Richard Treiser
CHIEF OF POLICE................................Ray Hackstock
FIRE CHIEF.....................................John Divelbiss
HEALTH OFFICER.................................Dr. A.N. Wilson, Sr.
ENGINEER.......................................Fred Monrean
HARBORMASTER...................................Sam Young, Jr.
PUBLIC UTILITY MANAGER.........................Donald Bowey
WATER & SEWER SUPERINTENDENT...................Bud Brostrom
SUPERINTENDENT OF SCHOOLS......................R.W. Stekl
PARKS & RECREATION DIRECTOR....................Jane Boubel

Klawock

P.O. Box 113
Klawock, Alaska 99925

First Class City

Phone: (907) 755-2261

INCORPORATION DATE:	October 29, 1929
POPULATION:	404
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	2%
CITY COUNCIL MEETS:	First and Third Tuesdays of Each Month
MAYOR:	Al P. Macaseat, Sr. 1980

CITY COUNCIL MEMBERS	
Sonja Armour	1982
Leonard Kato	1981
Rudolph Smith, Sr.	1980
Delores Peratrovich	1980
Dewey Skan, Jr.	1980
Roy S. Williams, III	1980

SCHOOL BOARD	
Sonja Armour, Pres.	1980
Robert Peratrovich	1981
Leonard Kato	1980
Donna Williams	1982
Selena McCurdy	1981

CLERK/TREASURER..Ruby Mae Smith
ATTORNEY..A. Fred Miller
POLICE CHIEF..Al Macasaet, Sr.
PUBLIC HEALTH NURSE..Kaaren Kubley
UTILITY CLERK..Karen Moore
WATER MANAGER..Theodore Roberts, Sr.
SEWAGE TREATMENT PLANT OPERATOR..............Rodney Skan
SCHOOL SUPERINTENDENT..William Suss
PARKS & RECREATION DIRECTOR..................Karen Moore
PURCHASING AGENT..Ruby Smith
MAINTENANCE..Gilbert Fred
HARBORMASTER..Dave Ernest
POWER PLANT OPERATOR..Robert Peratrovich, III
FIRE CHIEF..Jefferies Nickerson, Sr.

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Kobuk

General Delivery
Kobuk, Alaska 99751

Second Class City

INCORPORATION DATE:	1973
POPULATION:	60
REGULAR ELECTION:	First Tuesday in October

(no other information reported)

Metlakatla

P.O. Box 8
Metlakatla, Alaska 99926

Federal Law City

Phone: (907) 886-4868

INCORPORATION DATE:	1944
POPULATION:	1,119
REGULAR ELECTION:	First Tuesday in November
SALES TAX:	None
CITY COUNCIL MEETS:	First Tuesday of each month

MAYOR:	Stanley Patterson	1982

CITY COUNCIL MEMBERS	
Bernard Guthrie	1981
Jack Booth	1982
Edward Leask	1982
Frank Hayward	1982
Casey Nelson, Sr.	1981
Russell Hayward	1981

ADVISORY SCHOOL BOARD

Edward Gunyait, Pres.
Karen Thompson
Freida Haldane
Bruce Guthrie
Kathleen Guthrie

CLERK....................................Rosebelle Nelson
TREASURER................................Ronald Milne
FIRE CHIEF...............................Richard Johnson
HEALTH AIDE DIRECTOR.....................Karen Thompson
ENGINEER.................................Henry Littlefield
SUPERINTENDENT OF SCHOOLS................Larry Rocheleau
NATURAL RESOURCES DIRECTOR...............Gregory Argel
CITY PLANNER.............................John Pearson
JUDGE....................................Harris Atkinson

City and Borough of Sitka

P.O. Box 79
Sitka, Alaska 99835

Unified Home Rule Municipality

Phone: (907) 747-3294

INCORPORATION DATE:	December 2, 1971
POPULATION:	8,787
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	4%
ASSEMBLY MEETS:	Second and Fourth Tuesdays

MAYOR: John Dapcevich 1981

ASSEMBLY MEMBERS

Earl Richards	1982
Alice Johnstone	1982
Russell Wright	1981
Gordon Whitcomb	1981
Dan Keck	1980
Roberley Potter	1980

MUNICIPALLY OWNED UTILITIES
Water, Electricity, Airport, Landfill

BOROUGH POWERS
Areawide: Electric, water, garbage, sewer, streets, police, fire protection

PLANNING & ZONING COMMISSION

Bob Couch, Chrm.	1980
Michael Trent	1980
Ron McClain	1981
Taylor Potter	1981
Al Perkins	1982

SCHOOL BOARD

Laraine Glen, Pres.	1982
Colleen McFarland	1982
Carol Welsh	1980
Francis Eddy	1981
Karen Guymon	1981

CLERK....................Myrtle Flynn
ADMINISTRATOR....................Fermin Gutierrez
ATTORNEY....................Peter Hallgren
CHIEF OF POLICE....................Ed Thornton
FIRE CHIEF....................Martin Fredrickson
TREASURER/FINANCE DIRECTOR....................Richard Anderson
ASSESSOR....................John Stein
PUBLIC WORKS DIRECTOR....................Jerry Simpson
ELECTRICAL SUPERINTENDENT....................James Dwyer
WATER & SEWER SUPERINTENDENT....................Jerry Simpson
HEALTH OFFICER....................Dr. Edward Spencer
EMERGENCY PREPAREDNESS DIRECTOR....................Bennie Meyer
PLANNING DIRECTOR....................Richard Smith
BUILDING OFFICIAL....................Jerry Hughes
ENGINEER....................Eugene Rehfield
PARKS & RECREATION DIRECTOR....................Doug Dralle
PURCHASING AGENT....................Richard Anderson
AIRPORT MANAGER....................Michael Binkie
HOSPITAL ADMINISTRATOR....................Mark Hawkins
SUPERINTENDENT OF SCHOOLS....................John Coffee
MAGISTRATE....................Marilyn Hanson
HARBORMASTER....................Don Owens

Skagway

P.O. Box 415
Skagway, Alaska 99840

First Class City

Phone: (907) 983-2297/2298

INCORPORATION DATE:	June 6, 1900
POPULATION:	877
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	3%
CITY COUNCIL MEETS:	First and Third Thursdays of Each Month

MAYOR: Robert Messegee 1981

CITY COUNCIL MEMBERS	
Lillian Litzenberger	1980
James Richards	1981
Christopher Rohlf	1981
Oscar Selmer	1980
Marvin Taylor	1982
David Waugh	1982

PLANNING & ZONING COMMISSION	
Alvin Gordon	1981
Valerie Lawson	1980
Edith Lee	1982
Richard Sims	1981
Garrison Trozzo	1981
Robert Vaughn	1980

MUNICIPALLY OWNED UTILITIES
- Water
- Refuse Collection
- Sewer

SCHOOL BOARD	
Carl Rose, Pres.	1982
Gayle Chartier	1981
Leslie Fairbanks	1982
Paul Taylor	1980
Boyd Worley	1980

CLERK....................................Lorene Gordon
TREASURER................................Beryl Hosford
MANAGER..................................G.D. Acker
ATTORNEY.................................William Ruddy
CHIEF OF POLICE..........................James Hester
FIRE CHIEF/EMERGENCY PREPAREDNESS DIRECTOR...Carl Mulvihill
HEALTH OFFICER...........................Dr. Stanley Jones
PUBLIC WORKS DIRECTOR....................Don Buttle
HARBORMASTER.............................Raymond Calver
SUPERINTENDENT OF SCHOOLS................Nyal Worsham
PORT DIRECTOR............................Marvin Taylor
PUBLIC UTILITY MANAGER...................Donald Buttle
PURCHASING AGENT.........................Lorene Gordon

Pelican

P.O. Box 757
Pelican, Alaska 99832

First Class City

Phone: (907) 735-4101

INCORPORATION DATE:	1943
POPULATION:	221
REGULAR ELECTION:	First Tuesday in November
SALES TAX:	3%
CITY COUNCIL MEETS:	First and Third Mondays of Each Month

CITY COUNCIL MEMBERS	
Hugh Jewett	1980
Terry Wirta	1980
Susan Koby	1980
Becky Nash	1981
Dave Miller	1981
Gary Curtis	1981

SCHOOL BOARD	
Don Nash, Pres.	1981
Terri Joseph	1981
Cal Boord	1980
Edith Carlson	1982
Glen Bills	1981

MUNICIPALLY OWNED UTILITIES
Dock, Refuse Collection, Harbor

CLERK....................................Edith Carlson
TREASURER................................Louisa Whitmarsh
ATTORNEY.................................William Ruddy
FIRE CHIEF...............................Gerald Hewlett
HEALTH OFFICER...........................Steve Gage
PUBLIC WORKS DIRECTOR....................Hugh Jewett
HARBORMASTER.............................Gerald Hewett
SUPERINTENDENT OF SCHOOLS................Harry Davidson
PURCHASING AGENT.........................Edith Carlson

Petersburg

P.O. Box 329
Petersburg, Alaska 99833

Home Rule City

Phone: (907) 772-4511

INCORPORATION DATE:	April 2, 1910
POPULATION:	3,197
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	5%
CITY COUNCIL MEETS:	First and Third Mondays of Each Month

MAYOR: Richard Kito 1981

<u>CITY COUNCIL MEMBERS</u>

Lars Eide	1982
Art McTaggert	1981
Louis Severson	1980
Annie Slack	1980
Ted Smith	1982
Norma Tenfjord	1981

<u>SCHOOL BOARD</u>

Mike Dean, Pres.	1980
Patti Norheim	1982
Carson Boysen	1981
Wilmer Oines	1981
Bill Jones	1982

<u>PLANNING & ZONING COMMISSION</u>

Bob Jones, Chrm.
Dick Greseth
Arnold Fredrickson
Bill Grenier
Ken Welde
Dennis Murphy
Sunny Hicks

<u>MUNICIPALLY OWNED UTILITIES</u>

Water
Electricity
Dock
Refuse Collection
Sewer

CLERK/TREASURER....................................Jerry Van Vleck
MANAGER...Bruce Aronson
ATTORNEY..L.B. Jacobson
CHIEF OF POLICE...................................Robert Harrington
FIRE CHIEF..Dusty Rhoden
EMERGENCY PREPAREDNESS DIRECTOR..............Dusty Rhoden
HEALTH OFFICER....................................D.A. Coon
PUBLIC WORKS DIRECTOR.........................Dusty Rhoden
CITY PLANNER......................................William Jones
HARBORMASTER.....................................James Stromdahl
PUBLIC UTILITY MANAGER.........................William Mearig
WATER & SEWER SUPERINTENDENT..................Dusty Rhoden
SUPERINTENDENT OF SCHOOLS....................D.W. Schultz

Wrangell

P.O. Box 531
Wrangell, Alaska 99929

Phone: (907) 874-2381

Home Rule City

INCORPORATION DATE:	June 15, 1903
POPULATION:	3,325
REGULAR ELECTION:	First Tuesday in October
SALES TAX:	5%
CITY COUNCIL MEETS:	Second and Fourth Tuesdays
MAYOR:	Richard R. McCormick 1981

CITY COUNCIL MEMBERS

Kenneth Mason	1980
Robert M. Maxand	1980
G.K. "Ken" Bell	1981
Robert Grant	1981
Gregory McCormack	1982
Myron F. Myers	1982

PLANNING & ZONING COMMISSION

William Messmer, Chrm	1982
Janice Emde	1980
Jo Anderson	1980
Jess Howell	1980
Willy Campbell	1981
Larraine Kagee	1981

MUNICIPALLY OWNED UTILITIES

Water
Electricity
Dock
Refuse Collection
Hospital
Sewerage Treatment

SCHOOL BOARD

Pat Hall, Pres.	1981
Roy Martin	1980
Don Deschenes	1981
Anne Lowe	1982
David Shilts	1982

CLERK/TREASURER....................Joyce Rasler
ATTORNEY....................Edward Stahla
CHIEF OF POLICE....................William Klein
FIRE CHIEF....................Gordon Buness
EMERGENCY PREPAREDNESS DIRECTOR....................William Klein
HEALTH OFFICER....................Harriet Schirmer, M.D.
PUBLIC WORKS SUPERINTENDENT....................Herbert Ingram
ENGINEER....................Charles Pool
PORT DIRECTOR....................Richard Ballard
HARBORMASTER....................David Mork
SUPERINTENDENT OF SCHOOLS....................Robert McConnell

Yakutat

P.O. Box 6
Yakutat, Alaska 99689

First Class City

Phone: (907) 784-3323

INCORPORATION DATE:	June 22, 1948
POPULATION:	442
REGULAR ELECTION:	Third Tuesday of October
SALES TAX:	2%
CITY COUNCIL MEETS:	First and Third Tuesdays

MAYOR: Larry Powell 1980

CITY COUNCIL MEMBERS	
Evelyn Anderson	1980
Lowell Petersen	1980
Raymond Sensmeier	1980
Caroline Donohue	1981
Lena Farkas	1981
Ted Valle	1981

MUNICIPALLY OWNED UTILITIES
- Water
- Dock
- Sewer

PLANNING & ZONING COMMISSION	
Caroline Powell, Chrm.	1981
Neva Ogle	1981
Cameron James	1980
Raymond Sensmeier	1980
Gerald S. Pond	1980

SCHOOL BOARD	
Victoria Demmert, Pres.	1982
Joan Pond	1980
Susan Converse	1981
Raymond Sensmeier	1981
Evelyn Anderson	1980

CLERK.......................................Carol D. Dierick
TREASURER...................................Roy Bowman
MANAGER.....................................James M. Kohler
ATTORNEY....................................Hugh Fleischer
FIRE CHIEF..................................Jerry Pond
EMERGENCY PREPAREDNESS DIRECTOR.............Robert Anderson
HEALTH OFFICER..............................Vivan Lewis
SUPERINTENDENT OF SCHOOLS...................John Novak
PUBLIC WORKS DIRECTOR.......................Ronald C. Buller
HARBORMASTER................................Robert Anderson

APPENDIX D

COMPLETED SURVEY FORMS

CITY OF CRAIG

P. O. Box 23 • Craig, Alaska 99921 • (907) 826-3275

John Patterson

Mayor

September 25, 1979

The following information is provided by the City of Craig for the Proposed Solid Waste Study by the Environmental Protection Agency.

1. *The City of Craig is a First Class Municipality located on the West Coast of Prince of Wales Island with a resident population 587 persons.*

2. *Presently the City of Craig and the City of Klawock share the sanitary landfill area, however the maintenance of the landfill area is provided by the City of Craig. There are no areas which are not served at the present time.*

3. *Based on growth patterns and projection by the year 1995 the population of Craig is likely to increase by 80% primarily due to stepped-up logging, tourism, and government level activities.*

4. *Copies of the existing code for the City of Craig are attached.*

5. *Solid waste is collected in the City of Craig three times weekly for commercial businesses and public buildings, and the harbor facilities and once weekly for residential users. The solid waste collection is handled by two men from the Public Works Department. The area of collection is limited to the City limits of Craig. Craig recently purchased a new 1979 Ford Truck with an 11 cubic yard rear loader compactor. Businesses are being encouraged to purchase dumpsters to aid in the storage and collection of solid waste materials. The City of Craig's annual volume of solid waste is approximately 10,000 cubic yards and is composed of typical business and residential waste. We do not have any recycling operations of any kind and do not have presently any industrial wastes that must be disposed of.*

6. & 7. *The actual annual cost of the collection and disposal of solid waste for the city of Craig for FY 79 was $24434.* b,/2 person 45 $70/Ton

8. *The City of Craig funds the solid waste collection and disposal operations from a fee for service and the General fund. FY 1979 showed income from fee for service of $15206. Therefore the deficit of $9228 was made up from the City's general fund.*

9. *No private contractors are involved in solid waste collection or disposal in the Craig-Klawock area.*

At the present time no reports or studies regarding solid waste collection or disposal have been conducted in this area.

Solid Waste Disposal is an item that has been addressed in the CZMP and a copy of the latest draft has been included.

Ronald L. Hatch

Ronald L. Hatch

APPENDIX A

DRAFT

S.E. ALASKA PHASE II

SOLID WASTE DATA SHEET

GENERAL INFORMATION

Name of City and/or Borough City of Craig, Alaska 99921

Brief Description of Geographical and/or Political Boundaries

See attached map

Population of City or Borough 587

Estimated Population Growth Rate 800 by 1985

COLLECTION ROUTES

Owner City of Craig Operator/Manager City of Craig

Number of Employees one

Number and Type of Equipment one each 1979 Ford Truck with 11c.y. compactor

General Description of Areas Served by Collection Routes. All of Craig

Estimated Number of Customers/Accounts

Residential (i.e. cans) 175 residences/ 350 cans per week

Commercial 35 Commercial/1050 cans per week

Estimated Total Population Served by Collection 587

Estimated Volume or weight per day/wk or year 10000 c.y. per year

Estimated Cost of Collection System $25,000.00

Source of Funds $15,000.00 fee for service $10,000.00 General fund

Comments or Problems with System (i.e. undersized, worn out) Undersized and

useful likfe or area is depleted

DISPOSAL SITES

Type of Site (Land Disposal etc.) Land Disposal

Site Owner ______ Operator/Manager City of Craig

Land Owner Klawock-Heenya Corporation

General Location of Site Approximately 3 miles N.E. of Craig

Estimated Population Served by Site 900

% Private Drive Ins 25

% by Established Collection Systems 75

Land Characteristics (i.e. steep, rolling) Rolling

Soil Type Muskeg

Approximate Size of Site Area 100 feet x 400 feet

Site Volume Remaining None

Estimated Remaining Life of Site None

Estimated Waste Characteristics and Volumes (identify annual or other)

Residential/Commercial 10,000 c.y. annual

Automobile 15-20 annual

Wood Waste None

Other (Identify) None

Estimated Total Annual Solid Waste Volume or Weight (identify in-place or loose)

10,000 c.y.

Estimated % Moisture Unk winter

Unk summer

Identify Problems with Site (i.e. Limited Land Area, Limited Cover, Wet, Leachate, Burning, Automobiles, Bears) Limited land area, limited cover, leachate, Automobiles, wet, bears

Identify Alternative Disposal Site Locations None known

Annual Cost of Site Operation $25,000.00

Source of Funds (i.e. User Fee, General Fund) User Fee & General fund

APPENDIX A

S.E. ALASKA PHASE II

SOLID WASTE DATA SHEET

GENERAL INFORMATION

Name of City and/or Borough *Haines*

Brief Description of Geographical and/or Political Boundaries

Population of City or Borough *1100 city*

Estimated Population Growth Rate

COLLECTION ROUTES *HAINES SANITATION P.O. Box 413 Haines 99827*

Owner *Frank Shull* Operator/Manager

Number of Employees *2*

Number and Type of Equipment *3 trucks 2 cats 1 loader*

General Description of Areas Served by Collection Routes. *all of city north to 27 mile, south to chilcat park*

Estimated Number of Customers/Accounts

Residential (i.e. cans) *180*

Commercial *40*

Estimated Total Population Served by Collection *900*

Estimated Volume or weight per day/wk or year

Estimated Cost of Collection System *$80,000*

Source of Funds *self sustaining*

Comments or Problems with System (i.e. undersized, worn out) *need very long term landfill site to begin recycling plans & alternative energy exploration*

DISPOSAL SITES

Type of Site (Land Disposal etc.) land fill site

Site Owner Frank E. Shull Operator/Manager

Land Owner same

General Location of Site FAA road, East of Haines

Estimated Population Served by Site

% Private Drive Ins 1%

% by Established Collection Systems 99%

Land Characteristics (i.e. steep, rolling) slight grade

Soil Type loam - gravel

Approximate Size of Site Area 10 acre

Site Volume Remaining 70%

Estimated Remaining Life of Site 5 years

Estimated Waste Characteristics and Volumes (identify annual or other)

Residential/Commercial 15,200 annual

Automobile 20

Wood Waste 1,000

Other (Identify)

Estimated Total Annual Solid Waste Volume or Weight (identify in-place or loose)

16,000 yds^3 annual

Estimated % Moisture ______ winter

______ summer

Identify Problems with Site (i.e. Limited Land Area, Limited Cover, Wet, Leachate, Burning, Automobiles, Bears) limited area, limited cover wet

Identify Alternative Disposal Site Locations

Annual Cost of Site Operation 30,000

Source of Funds (i.e. User Fee, General Fund) Collection Co. sustains landfill at a loss.

CITY OF KETCHIKAN

334 FRONT STREET P. O. BOX 7300 TELEPHONE 907 225-3111

September 27, 1979

Mr. Ed Barker
Finite Resources
9807 Fairview Avenue
Boise, Idaho 83704

Dear Mr. Barker:

Pursuant to your request, I hereby provide the following information relative to the proposed solid waste study for Southeastern Alaskan municipalities:

1. The 1979 population of Ketchikan is 8,541.

2. The City of Ketchikan is responsible for collection and disposal for the population residing within the City limits. The City's sanitary landfill also serves the waste disposal needs of the Borough, which adds approximately 5,000 people to the population served by that facility.

3. Population growth in the Ketchikan area is approximately 3% per year.

4. Solid waste is managed under State guidelines and local ordinances. A copy of Chapte 7.16 of the Ketchikan Municipal Code (KMC) is enclosed.

5. Collection by the City of Ketchikan utilizes three 13 cubic yard packers and five employees. Disposal by the City of Ketchikan utilizes one International Harvester 175 dozer and two employees. The City has 2,200 weekly pick-up accounts. Approximately 150 private individuals or firms also dispose at the landfill weekly. An estimated 40,000 cubic yards of solid waste per year are disposed at the City's landfill. The material contains no industrial or unusual waste.

6. The annual cost of collecting solid waste by the City of Ketchikan is $252,000.

7. The annual cost of disposing solid waste for the City of Ketchikan and surrounding area is $84,900.

8. The City funds its current solid waste and disposal operation from fees charged for residential and commercial pick-ups and private disposal at the landfill. Fees are charged in accordance with KMC 7.16.

9. Tongass Sanitation provides solid waste collection services outside City limits and for certain commercial accounts within the City limits. Contact Andy Crowe, Tongass Sanitation, P.O. Box 7701, Ketchikan, Alaska 99901, phone number is 225-5561.

In addition, I am enclosing copies of reports or studies done by City staff over the last few years regarding solid waste collection and disposal. I will provide under separate cover, a copy of a coincineration report done several years ago by URS, the City's Wastewater Treatment Plant consulting engineers.

If you have further questions, please contact me. Thank you.

Sincerely,

James A. Van Altvorst
City Manager

Enclosures

cc: David Hanline, EPA, w/enclosures
Dick Stokes, ADEC, w/enclosures

APPENDIX A

S.E. ALASKA PHASE II

SOLID WASTE DATA SHEET

GENERAL INFORMATION

Name of City and/or Borough City of Ketchikan

Brief Description of Geographical and/or Political Boundaries City of Ketchikan and Ketchikan Gateway Borough

Population of City or Borough City - 8,293 City and Borough - 13,464 6/30/79

Estimated Population Growth Rate 3%

COLLECTION ROUTES

Owner City and Private Collector Operator/Manager City George Sivertsen Private Co. Andy Crowe

Number of Employees City - 5 Private - 4

Number and Type of Equipment City - 2 Heil Packers Private - 2 Packers

General Description of Areas Served by Collection Routes. City - Within City Limits Private - Borough and certain commercial accounts within City Limits

Estimated Number of Customers/Accounts

Residential (i.e. cans) City - 2,133, Private Co. - 400

Commercial City - 128, Private Co. - 80

Estimated Total Population Served by Collection 11,000

Estimated Volume or weight per day/wk or year 5,280 ton/year 10,500 CY compacted solid waste/year

Estimated Cost of Collection System $262,590/year

Source of Funds monthly collection rates assessed to users of system

Comments or Problems with System (i.e. undersized, worn out) Majority of the population within the City appear to be satisfied with the collection system. A number of Borough residents haul their own solid waste to the landfill and the accessability of the present landfill makes this inconvenient.

DISPOSAL SITES

Type of Site (Land Disposal etc.) Land Disposal

Site Owner City of Ketchikan Operator/Manager City of Ketchikan

Land Owner State of Alaska

General Location of Site Deer Mountain

Estimated Population Served by Site 11,500

% Private Drive Ins 30%

% by Established Collection Systems 70%

Land Characteristics (i.e. steep, rolling) Orignally a deep ravine

Soil Type Muskeg (Cover material is imported)

Approximate Size of Site Area 560' x 850'

Site Volume Remaining ± 33,000 cubic yards

Estimated Remaining Life of Site 2 years

Estimated Waste Characteristics and Volumes (identify annual or other)

Residential/Commercial See Solid Waste Incineration Report Charles Pool and Associates, Inc.

Automobile April 9, 1976 for this information

Wood Waste

Other (Identify)

Estimated Total Annual Solid Waste Volume or Weight (identify in-place or loose)

10,500 cubic yards compacted in place, plus 6,000 CY cover material

Estimated % Moisture very wet winter

moderately wet summer

Identify Problems with Site (i.e. Limited Land Area, Limited Cover, Wet, Leachate, Burning, Automobiles, Bears) All of the above! Area is very close to capacity and needs to be closed out.

Identify Alternative Disposal Site Locations Currently seeking a new site and new management plan!

Annual Cost of Site Operation $100,000

Source of Funds (i.e. User Fee, General Fund) General Fund

"City of Petersburg"

P. O. Box 329
Petersburg, Alaska 99833
(907) 772-4511

RECEIVED
OCT 17 1979
CITY MANAGER
CITY OF KETCHIKAN

October 11, 1979

James A. Van Altvorst, City Manager
City of Ketchikan
P.O. Box 7300
Ketchikan, Alaska
99901

Re: Solid Waste Study

Dear Mr. Van Altvorst: Jim

Here are answers to questions listed in your September 20, 1979 memo.

1. Population of Petersburg - 3,371 (local estimate)

2. Population of people served equals approximately 3,425. All areas are served.

3. The city's population growth has been erratic, but in the last two years has equaled approximately 4% a year. The population growth should continue in the 2% to 4% range.

4. Local refuse collection ordinances are attached.

5. (a) Collection equipment - 2 garbage trucks (only 1 capable of unloading dumpsters)
   Disposal equipment - 1 tractor
   (b) Staff - 1 truck driver
   1 landfill attendent
   (c) Residential - weekly service
   Commercial - up to daily service
   (d) Most garbage is from residential customers, with much cardboard and crating (wood) material

6-7. Cost of collection - $40,000.00 year
Cost of disposal - $46,000.00 year

Total $86,000.00 year

8. Cost of collection and disposal is as follows:

Collection fees	$72,000.00
Local tax subsidy	$14,000.00
Total	$86,000.00

"City of Petersburg"

P. O. Box 329
Petersburg, Alaska 99833
(907) 772-4511

9. The two largest canneries collect their own garbage, and dispose at city landfill. No crushing or shipping operations in the City.

Hope this information is helpful.

Sincerely,

Bruce Aronson
City Manager

Attachment

BA/plc

P.S. Let me know if more information is necessary.

CITY AND BOROUGH OF SITKA
DECEMBER 2, 1971

City and Borough of Sitka

P.O. BOX 79 · SITKA, ALASKA · 99835

September 24, 1979

TO: James Van Altvorst

FROM: Rocky Gutierrez

SUBJECT: PROPOSED SOLID WASTE STUDY BY THE ENVIRONMENTAL PROTECTION AGENCY

Since I will not be arriving in Ketchikan in time to attend the meeting scheduled with EPA on September 27, 1979, I am herewith sending you the information requested in your memo dated September 20, 1979.

1. Current population is approximately 8500.

2. Solid waste service area is approximately 8000±.

3. Growth projection is 10,000 by year 2000. Growth pattern in non-expansive.

4. Solid waste is managed under State guidelines and local ordinances.

5. Collection and disposal is by private contractor utilizing municipal-owned site and shredder. Volume is estimated at one tone per person per year and material contains no industrial or unusual waste.

6. Collection cost is $180,000/year.

7. Landfill cost is $130,000/year.

8. Our collection and landfill operations are operated on an enterprise basis.

9. None, excepting under contract with the municipality. Last year we exported approximately 250 junked vehicles via barge to Seattle and plan on doing the same this year. No crushing or shredding was involved. Project was handled by a private contractor with minimal municipal coordination.

APPENDIX A

S.E. ALASKA PHASE II

SOLID WASTE DATA SHEET

GENERAL INFORMATION

Name of City and/or Borough SITKA, ALASKA

Brief Description of Geographical and/or Political Boundaries BARANOF ISLAND, SOUTHEAST ALASKA

Population of City or Borough 8500

Estimated Population Growth Rate 1% PER YEAR

COLLECTION ROUTES

Owner MUNICIPALITY Operator/Manager MARCH INDUSTRIES

Number of Employees 6

Number and Type of Equipment 2 - 25 YD. PACKERS, 1-20 YD PACKER, 2 PICK-UPS

General Description of Areas Served by Collection Routes. SITKA AND ALL AREAS ACCESSABLE BY ROAD

Estimated Number of Customers/Accounts

Residential (i.e. cans) 2327 CUSTOMERS

Commercial NOT BROKEN OUT

Estimated Total Population Served by Collection 8500

Estimated Volume or weight per day/wk or year 15,600 C.Y. PER YEAR

Estimated Cost of Collection System $179,634 MAY 79 THRU APR. 80

Source of Funds CUSTOMER BILLING

Comments or Problems with System (i.e. undersized, worn out) NEEDS NEW EQUIPMENT - 25 YD PACKERS IS TO LARGE TO OPERATE UNDER ROAD CONDITIONS IN SITKA.

DISPOSAL SITES

Type of Site (Land Disposal etc.) SANITARY LANDFILL

Site Owner MUNICIPALITY Operator/Manager MARCH INDUSTRIES

Land Owner MUNICIPALITY

General Location of Site 1.2 MILES N.N.W OF CENTER OF TOWN

Estimated Population Served by Site 8500

% Private Drive Ins 33%

% by Established Collection Systems 67%

Land Characteristics (i.e. steep, rolling) ROLLING TO MODERATLEY STEEP

Soil Type VOLCANIC ASH, GLACIAL TILL, AND TALAS

Approximate Size of Site Area 7 ACRES

Site Volume Remaining 40,000 C.Y.

Estimated Remaining Life of Site 2 YEARS

Estimated Waste Characteristics and Volumes (identify annual or other)

Residential/Commercial 15,600 C.Y. PER YEAR

Automobile 100 PER YEAR (WE TRY TO BARGE OUT OF SITKA)

Wood Waste NEGLIGIBLE

Other (Identify) 7800 C.Y. PER YEAR MISC. BUILDING MATERIAL, METAL, WOOD, JUNK & DEBRIS

Estimated Total Annual Solid Waste Volume or Weight (identify in-place or loose)

23,400 C.Y. IN PLACE

Estimated % Moisture ________ winter

________ summer

Identify Problems with Site (i.e. Limited Land Area, Limited Cover, Wet, Leachate, Burning, Automobiles, Bears) ALL OF THE ABOVE. PARTICULARLY LIMITED COVER MATERIAL, LEACHATE, AND LIMITED LAND AREA.

Identify Alternative Disposal Site Locations OCEAN DUMPING OR BARGE REFUSE TO KRUZOF ISLAND AND ESTABLISH LANDFILL THERE

Annual Cost of Site Operation 120,000 PRESENT EST. 220,000 FUTURE

Source of Funds (i.e. User Fee, General Fund) CUSTOMER BILLING.

APPENDIX A

DRAFT

S.E. ALASKA PHASE II

SOLID WASTE DATA SHEET

GENERAL INFORMATION

Name of City and/or Borough City of Wrangell

Brief Description of Geographical and/or Political Boundaries located on the north portion of Wrangell Islad, with one road running south along Zimovia Straits about ten miles

Population of City or Borough 3,325

Estimated Population Growth Rate 2%

COLLECTION ROUTES

Owner City of Wrangell Operator/Manager Joyce Rasler, Acting City Manager

Number of Employees 2 1/2

Number and Type of Equipment Internationa Load Star 16yd gas truck

General Description of Areas Served by Collection Routes. same as political boundaries

Estimated Number of Customers/Accounts

Residential (i.e. cans) approx. 2,000 cans

Commercial 50 customers with 3 cans each = 150 cans

Estimated Total Population Served by Collection 3,325

Estimated Volume or weight per day/wk or year 8,500 cubic yds per year

Estimated Cost of Collection System approx ~~$50,000~~ 77,480 total collection & disposal per year 52,480

Source of Funds User fees, General Fund

Comments or Problems with System (i.e. undersized, worn out) undersized and worn out

DISPOSAL SITES

Type of Site (Land Disposal etc.) land disposal

Site Owner City of Wrangell Operator/Manager Joyce Rasler, Acting City Manager

Land Owner City of Wrangell

General Location of Site located 1 mile north of downtown Wrangell on northern most point of island

Estimated Population Served by Site 3,325

% Private Drive Ins 10%

% by Established Collection Systems 90%

Land Characteristics (i.e. steep, rolling) steep

Soil Type

Approximate Size of Site Area

Site Volume Remaining

Estimated Remaining Life of Site

Estimated Waste Characteristics and Volumes (identify annual or other)

Residential/Commercial 90%

Automobile none

Wood Waste 5%

Other (Identify) 5%

Estimated Total Annual Solid Waste Volume or Weight (identify in-place or loose)

approx. 9,500 cubic yds of solid waste per year

Estimated % Moisture winter

summer

Identify Problems with Site (i.e. Limited Land Area, Limited Cover, Wet, Leachate, Burning, Automobiles, Bears) limited land area, open burning, wet, and no cover material

Identify Alternative Disposal Site Locations unknown at present time

Annual Cost of Site Operation ~~[illegible]~~ $15,000 est

Source of Funds (i.e. User Fee, General Fund) User fees, General Fund

APPENDIX E

FUEL OIL ENERGY CALCULATIONS

APPENDIX E

FUEL OIL ENERGY VALUE AND STEAM COST CALCULATIONS

Basis of Calculations

* One gallon of #2 fuel oil has an approximate heating value of 140,000 BTU.

* Fuel oil boiler efficiencies range from 81½ to 84% (full fire efficiencies with the higher value achieved only with a stack economizer). 82% will be used in this analysis.

* Approximately 1,000 BTU is required to produce 1 lb of steam (this assumes some condensate return since approximately 1,175 BTU are required when using 60°F inlet water).

Fuel Oil Energy Value Estimates

The first set of calculations are to estimate the amount of steam generated from 1 gallon of fuel oil in order to ultimately determine the steam demand for space heating customers based on fuel oil consumption data.

$$(1.40 \times 10^5 \frac{\text{BTU}}{\text{gal \#2 oil}})(0.82 \text{ eff.}) = 1.15 \times 10^5 \frac{\text{BTU}}{\text{gal oil}}$$

This means $1.15 \times 10^5 \frac{\text{BTU}}{\text{gal oil}}$ is available to generate steam

$$(1.15 \times 10^5 \frac{\text{BTU}}{\text{gal oil}})(\frac{1 \text{ lb-steam}}{1{,}000 \text{ BTU}}) = 115 \frac{\text{lbs-steam}}{\text{gal oil}}$$

This factor needs only to be multiplied by the gallons of oil consumed to determine steam demands or requirements.

Steam Cost Estimates

The following calculations are to determine the therms of energy required to generate 1,000 lbs of steam and to determine the associated cost based on the price per gallon of fuel oil.

$$(1{,}000 \text{ lbs-steam})(1{,}000 \frac{\text{BTU}}{1 \text{ lb-steam}}) = 1 \times 10^6 \text{ BTU is required to}$$

generate 1,000 lbs of steam.

At an 80% boiler efficiency 1.25×10^6 BTU of fuel are required to generate 1,000 lbs of steam.

Converting this to therms, $1.25 \times 10^6 \text{ BTU} \left(\frac{1 \text{ therm}}{1 \times 10^5 \text{ BTU}}\right) = 12.5$ therms

of fuel to generate 1,000 lbs of steam.

$$(1.40 \times 10^5 \frac{\text{BTU}}{1 \text{ gal oil}})\left(\frac{1 \text{ therm}}{1 \times 10^5 \text{ BTU}}\right) = 1.40 \frac{\text{therm}}{\text{gal oil}}$$

At $1.00/gallon of oil

$$\left(\frac{\$1}{\text{gal oil}}\right)\left(\frac{1 \text{ gal oil}}{1.40 \text{ therm}}\right) = \frac{\$0.71}{\text{therm oil}}$$

Now compute the cost of 1,000 lbs of steam

12.5 therm to generate 1,000 lbs $\left(\frac{\$.71}{\text{therm}}\right)$ = $8.88 to generate 1,000

lbs of steam from oil

20% discount is $7.10 per 1,000 lbs
21% discount is $7.00 per 1,000 lbs

At $.90/gallon of oil

$$\left(\frac{\$.90}{\text{gal oil}}\right)\left(\frac{1 \text{ gal oil}}{1.40 \text{ therm}}\right) = \frac{\$.64}{\text{therm oil}}$$

Which is $8.00 to generate 1,000 lbs of steam

20% discount $6.40 to generate 1,000 lbs of steam

APPENDIX F

BUILDING HEATING FUEL CONSUMPTION DATA

RECEIVED
SEP 15 1980
FINITE RESOURCES

STATE OF ALASKA

JAY S. HAMMOND, GOVERNOR

DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

MAINTENANCE AND OPERATIONS
SOUTHEASTERN REGION

P.O. BOX 3-1000
JUNEAU, ALASKA 99802
(Phone: 789-0841, ext. 105)

September 8, 1980
432E

Mr. Brad Brinkman
Findley & Brinkman Law Offices
110 Seward Street
Juneau, Alaska 99801

Re: Fuel Consumption - Juneau Buildings
M3-507

Dear Mr. Brinkman:

I understand that you are assembling data for a feasibility study to ascertain the marketing potential for steam generated from the incineration of trash. At your request, I have compiled fuel consumption figures for State buildings in Juneau, covering the period July 1, 1979 to June 30, 1980.

Building	Fuel Consumption [x 1000 gal]
State Capitol	65.2
State Office Building	222.9
Alaska Office Building	29.9
Subport Building	24.7
Alaska State Museum	16.6
Public Safety Building	8.4
1591 Glacier Avenue Building	15.9
Court & Office Building	114.1
Community Building	7.7
Archives & Records Center	10.4
DOT & PF SE Region Complex	37.2
Island Center Building (Douglas)	16.8
Swim	50.✓

Of course, a building's fuel consumption will vary considerably, depending on such factors as the number of heating degree days and inefficiencies in the heating and ventilation systems. It is not uncommon to see fuel use vary by as much as twenty percent from year to year.

Please let me know if further information is needed.

Very truly yours,

George C. McCurry

George C. McCurry
Buildings Manager

25A-T11LH

CI03U

2 - 3[illegible]

Name City + Borough

Address Swimming Pool

DATE 1979	GALS. DEL'D.	IN TANK	D.D. TO DATE	K	D.D. NEXT DELIVERY	DATE	GALS. DEL'D.	IN TANK	D.D. TO DATE	K	D.D. NEXT DELIVERY
2/12	1230	F	[illegible]		[illegible]	6/11	2256				
2/19	1583	F	[illegible]		[illegible]	6/29	2289	F	3581		3881
2/26	1561	F	2053		[illegible]	7/16	1696	[illegible]	[illegible]		4017
3/9	1701	F	2554		[illegible]	7/25	1224	[illegible]	[illegible]		[illegible]
3/21	1801	F	[illegible]		[illegible]	8/2	1166	F	[illegible]		4243
3/29	1634	F	[illegible]		1598	8/8	467	F	4113		4313
4/4 ?	1097	F	1558		1858	8/17	461	F	4201		8/31
4/12	1237	F	1531		2131	8/31	310	F	4355		4655
4/21	1116	N.F.	2089		4/27	9/18	2298	F	4579		4879
4/28	937	F	2252		2552	9/27	1174	F	4913		5213
5/11	1497	N.F.	2555		2755	10/8	1461	F	5222		5522
5/16	684	Full	2682		2982	10/15	995	F	5409		5709
5/24	315	F	[illegible]		3093	10/27	1659	69"	5779		6079
5/31	627	not full	3054		3354	11/6	1447	F	6122		6422
						11/10	547	not full	6344		6644

CI03 J

NAME City & Borough STREET TOWN PHONE

OWNER STREET TOWN PHONE

BURNER TYPE GRADE OIL 2

A	B	C	TANK	
			3000	K

SALESMAN Swimming pool

HOT WATER YES ☐ NO ☐ RESERVE USABLE DD

DATE	GALS. DEL.	IN TANK	D.D. TO DATE	K OR USABLE D.D.	D.D. NEXT DEL.	DATE	GALS. DEL.	IN TANK	D.D. TO DATE	K OR USABLE D.D.	D.D. NEXT DEL.
11/16/75	779	F	[illegible]		6960	2/11	1407	F	[illegible]		1847
11/26	1458	F	[illegible]		7376	2/19	1687	NF	1822		2222
12/4	1383	F	7314		7714	2/26	1415	F	2107		2507
12/11	1110	F	7718		8118	3/6	1514	F	2525		2925
12/17	1121	F	[illegible]		8426	3/17	1769	NF	3023		3423
12/26	1303	7¼"	8650		8950	3/27	1814	NF	3406		3806
12/31	1102	F	8915		9315	4/5	1783	NF	3720		4020
1/7	1267	F	9418		9818	4/12	1762	F	3944		4244
1/12	1256	F	9890		0290	4/21	1594	F	4276		4576
1/18	956	F	0369		0669	5/1	1654	F	4592		4892
1/26	1322	F	0671		1071	5/9	1138	F	4770		5070
2/1	1095	F	1034		1424	5/22	1775	F	5054		5359

DEGREE DAY CARD

CI03J

NAME City & Borough - Swimming Pool 2 - 3000

ADDRESS

DATE	GALS. DEL.	IN TANK	D.D. TO DATE	K OR USABLE D D	D.D. NEXT DEL.	DATE	GALS. DEL.	IN TANK	D.D. TO DATE	K OR USABLE D D	D.D. NEXT DEL.
6/5	1615	F	[illegible]		5470						
6/11	514	F	[illegible]		5640						
6/22	1085	F	5510		5713						
7/1	1311	F	[illegible]		5880						
[illegible]/11	1085	F	[illegible]		[illegible]						
[illegible]/22	1124	F	5980		6180						
[illegible]/5	1712	F	[illegible]		6401						
[illegible]/20	1572	F	6423		6628						
8/27	880	F	650[illegible]		6740						
[illegible]/5	1047	F	6723		7053						

79/80

**************** OIL RECORDS ****************

Auke Bay

	MONTH	GALLONS DEL.	PRICE	TOTAL DEGREE DAYS	GALLONS PER DEGREE DAY	DOLLAR AMOUNT
	8/2	809.7	691			559.50
	10/26	702.7	811			569.89
	10/5	682.0	811			553.10
	11/27	393.6	781			307.40
	11/21	1440.8	781			1125.26
starting tank	11/1	431.1	811			349.6[illegible]
	12/18	2113.7	781			1650.5[illegible]
	1/7	1277.6	811			1036.13
	1/20	1464.5	851			1246.2
	2/14	1810	856			1549.36
	3/7	1606.8	886			1423.6
	4/1	1582.7	886			1403.16
4/-6/80	[illegible]	3176.4	906			2877.82
		~~14315.9~~				~~11773.9~~
		17494.3		8894		14,651.7

79/80

**************** OIL RECORDS ****************

Capital

MONTH	GALLONS DEL.	PRICE	TOTAL DEGREE DAYS	GALLONS PER DEGREE DAY	DOLLAR AMOUNT
7/25	1097.0	.691			755.95
9/21	878.9	811	58		712.79
10/26	716.6	811	35		581.16
10/17 26	1753.2	811			1421.85
11/27	125.2	781	32		97.78
11/27	1001.1	781			781.86
11/14	1715.9	781			1340.12
12/12	1493.7	781	29		1166.58
12/28	1923.6	811	76		1560.04
1/10	1629.5	811	13		1321.52
1/21	1636.6	811	11		1327.28
2/8	1507.8	856	18		1290.68
2/20	2089	876	12		1829.96
3/12	2098.8	886	43		1859.54
4/11	1507.7	886	30		1335.82
3/29	1283.0	886			1131.74
5/5	2082.2	846	24		1761.57
6/25	43.9	.906	51		39.77
6/13	1543.6	.896			1,383.07
	26,127.3				21701.05

79/80

**************** OIL RECORDS ****************

Floyd Dryden

MONTH	GALLONS DEL.	PRICE	TOTAL DEGREE DAYS	~~GALLONS PER DEGREE DAY~~	DOLLAR AMOUNT
8/23	1922.1	771			1481.9[illegible]
10/25	1810.1	811			1467.99
10/16	1631.8	811			1323.3[illegible]
11/27	678.1	781			529.6[illegible]
11/27	2036.2	781			1590.2[illegible]
11/15	2237.9	781			1747.8[illegible]
12/18	620.0	781			484.2[illegible]
12/18	2742.0	781			2141.5[illegible]
1/10	2723.7	811			2208.92
12/29	2106.9	811			1708.70
1/22	1900.1	811			1540.9[illegible]
1/22	986.0	811			799.65
2/7	2117.0	856			1812.1[illegible]
2/14	1365.1	856			1168.5[illegible]
2/27	2062.4	876			1806.66
3/11	1361.5	886			1206.2[illegible]
3/11	1795.6	886			1590.90
4/7	2098.1	886			1858.92
4/30	2226.1	.846			1883.2[illegible]
4/30	1265.9	.846			1070.9[illegible]
6/2	1450.0	846			1226.7[illegible]
6/27	884.0	906			800.9[illegible]
5/31	1791.3	846			1515.44
5/31	1598.0	846			1351.[illegible]
	41409.9				34,317.5[illegible]

79/80

**************** OIL RECORDS ****************

GASTINEAU

MONTH	GALLONS DEL.	PRICE	TOTAL DEGREE DAYS	GALLONS PER DEGREE DAY	DOLLAR AMOUNT
9/20	1531.6	811			1242.13
10/26	1876.1	811			1521.52
11/27	40.7	781			31.79
11/27	2229.8	781			1741.47
12/20	1035.6	781			808.86
12/20	1041.2	781			813.12
1/11	2213.0	811			1794.74
1/31	2096.5	851			1784.12
2/27	1792.9	876			1570.58
4/14	450	886			398.70
4/12	2072.6	886			1836.32
5/21	2000.1	846			1692.08
6/20	682.0	906			617.89
	19062.1				15,853.32

79/80

***************** OIL RECORDS *****************

Glacier Valley

MONTH	GALLONS DEL.	PRICE	TOTAL DEGREE DAYS	GALLONS PER DEGREE DAY	DOLLAR AMOUNT
9/21	1090.7	811			884.56
10/27	1406.3	811			1140.51
11/27	2047.0	781			1598.71
Starting tank 10/31	285.6	811			231.62
12/22	1782.6	781			1392.21
1-2	1593.4	811			1292.25
1-25	1333.2	811			1081.23
2/13	2203.0	856			1885.77
2/14	725.2	856			620.77
2/27	1113.8	876			975.69
3/26	2107.7	886			1867.42
4/23	1700	886			1506.2
6/26	1441.0	906			1305.55
	17829.5				15,782.49

79/80

****************** OIL RECORDS ******************

HARBORVIEW

MONTH	GALLONS DEL.	PRICE	TOTAL DEGREE DAYS	GALLONS PER DEGREE DAY	DOLLAR AMOUNT
8/30	1100.1	811			892.18
10/27	1424.0	811	58		1154.86
10/11	558.8	811			453.19
10/10	1604.5	811			1301.25
11/27	2234.6	781			1745.22
11/27	1293.7	781			1010.38
12/20	1598.1	781			1248.12
12/18	2102.2	781			1641.82
1/7	2210.8	811			1792.96
1/10	2222.2	811			1802.04
1/21	2105.3	811			1707.40
1/21	2090.9	811			1695.72
2/5	2100	851			1787.10
2/6	1431.4	851			1218.12
3/19	2112.2	886			1871.41
2/28	1076.7	876			943.19
2/28	1785.6	876			1564.19
4/17	1850.0	886			1639.10
4/17	2078.0	886			1841.11
5/28	2096.3	.846			1773.47
5/29	1,219.5	846			1031.70
6/26	395.6	.906			358.41
					30,472.99
	36,690.5				

79/80

**************** OIL RECORDS ****************

HIGH SCHOOL

MONTH	GALLONS DEL.	PRICE	TOTAL DEGREE DAYS	GALLONS PER DEGREE DAY	DOLLAR AMOUNT
7/18	1797.2	.651			1169.98
8/16	1787.2	741	29		1234.32
9/10	[illegible]1.2	811	25		593.00
9/[illegible]	55	811			44.61
	1 empty	BBl			25.00
10/26	1524.0	811			1235.96
10/16	1786.8	811			1449.09
10/16	1255.0	811			1017.81
10/1	1806.7	811			1465.40
11/27	1942.8	781			1517.33
11/27	2044.0	781			1596.36
11/	652.7	781			509.76
11/8	2052.8	781			1603.24
12/17	1488.2	781			1162.22
12/18	2117.7	781			1653.92
12/18	2107.0	781			1645.57
12/7	2109.6	781			1647.60
1/9	2220	811			1800.12
1/8	1627.5	811			1319.90
1/3	2098.1	811			1701.56
1/14	2108.1	811			1709.67
12/28	2215.8	811			1797.01
1/28	2056.8	851			1750.35
1/28	1803.9	851			1535.12
2/7	2200	856			1883.20
2/14	2047	856			1752.23

HIGH SCHOOL 79/80

************** OIL RECORDS **************

MONTH	GALLONS DEL.	PRICE	TOTAL DEGREE DAYS	GALLONS PER DEGREE DAY	DOLLAR AMOUNT
2/21	2077.2	[illegible]			1821.28
2/14	1657.0	856			1418.39
3/11	1795.2	886			1590.55
	1300.0	886			1151.80
3/[illegible]	2079.6	886			1842.53
3/6	1192.9	886			1056.91
2/28	1776.6	886			1573.82
3/20	2097.5	886			1855.73
3/20	1352.2	886			1198.05
4/17	1200.0	886			1063.20
4/15	1791.0	886			1586.83
[illegible]	[illegible]	886			1859.18
4/29	2101.8	.886			1772.[illegible]
5/15	[illegible]	[illegible]			[illegible]
5/15	[illegible]	.88[illegible]			[illegible]
5/27	[illegible]				[illegible]
6/2	2042.0	.846			1727.53
6/20	1500.1	906			453.09
	[illegible]				1,1035.76

79/80

**************** OIL RECORDS ****************

MARIE DRAKE

MONTH	GALLONS DEL.	PRICE	TOTAL DEGREE DAYS	GALLONS PER DEGREE DAY	DOLLAR AMOUNT
10/27	644.0	811			522.37
10/27	1300.2	811			1054.46
9/28	1811.7	811			1469.29
11/27	2056.9	781			1606.44
11/27	246.4	781			192.44
12/20	637.3	781			497.73
12/17	1545.5	781			1207.0
1/7	2110.3	811			1711.45
1/23	2103.0	811			1705.5
2/11	2088.6	856			1787.84
3/3	662.3	876			580.17
3/3	2114.2	876			1852.07
4/1	2095.6	886			1856.70
4/1	1330	.886			1178.38
5/10	1135	.846			960.21
5/9	2093.7	.846			1770.17
6/25	1220.0	906			1105.32
	25193.4				21,057.58

79/80

**************** OIL RECORDS ****************

MT JUMBO

	MONTH	GALLONS DEL.	PRICE	TOTAL DEGREE DAYS	GALLONS PER DEGREE DAY	DOLLAR AMOUNT
	8/29	451.8	811			366.91
	8/30	489.6	811			397.07
	10/26	123.8	811			100.40
	10/26	100.2	811			81.26
	10/26	640.1	811			519.12
	10/3	589.2	811			477.84
	10/3	78.0	811			63.26
	11/27	435.0	781			339.74
Gym TANK	11/27	60.8	781			47.48
11/26	11/16	926.3	781			723.44
	12/20	1174.0	781			916.89
	1/5	777.9	.811			630.88
	1/18	943.8	811			765.72
	2/11	907.9	856			777.16
	3/5	1462.8	886			1296.04
	4/28	1256.0	886			1112.82
	3/27	1045.4	886			921.22
	6/12	1056.0	896			946.18
	6/26	299.7	906			271.53
		12818.3				10,759.16

	Gal. Used	Avg. Price Per Gallon	Total Year Cost	Total Deg. Day	Gal. Per Degree Day	Square Feet	Gal. Per Square Ft.
1974 - 75	364,400	$.3596	$131,000	8821	41.3	536,780	.679
1975 - 76	407,600	.3876	157,980	9020	45.2		.759
1976 - 77	335,676	.3990	133,900	7341	45.7		.625
1977 - 78	351,230	.4590	161,133	8681	40.5		.652
1978 - 79	344,349	.522	179,281	9167	37.6		.645
1979 - 80	268,347	.841	225,634	8894	30.2		.499

The reason for the great reduction in 1979/80 was due to closer monitoring of H & V Systems. Installation of time clocks, lowering of room temperature to 65°. Lowering temp. domestic Hot water to 120°. Reducing Boiler water and steam temperatures to a minimum, using outside temp. as guide. (Increase boiler temp. as temperature goes down). A change over in H.V. Systems in High School Auditorium and Gym and Harborview School to recycle inside air with mixture of 15% outside air. Re-calibration of thermostates and all pnematic and electric controls. Good cooperation from all district personnel.

ELECTRICAL

Actual dollars spent 1978-79 $161,516.00

Actual dollars spent 1979-80 $128,730.00

City and Borough of Sitka

P.O. BOX 79 · SITKA, ALASKA · 99835

RECEIVED
SEP 22 1980
FINITE RESOURCES

September 17, 1980

N. Ed Barker, P.E.
Finite Resources, Inc.
9807 Fairview
Boise, Idaho 83704

Dear Ed:

Dick Stockes called me and requested I send you the school's monthly fuel consumption. He also wanted to know about the supermarket next door to Blatchley Junior High School. That building is heated with electricity. If I can be of further help let me know.

Very truly yours,

Jerry D. Simpson

Jerry D. Simpson
Director of Public Works

JDS:glb

Enclosure

	Initials	Date
Prepared by		
Approved by		

Fuel Breakdown 1979-80

			1	2	3	4	5	6	7	8	9	10
	2.18		H.S.	Blatchley Blat	Bar	Alice Island	Lincoln	Etolin	Total			
Dollars	.617 - .677	July	998 97	3600 76	2231 48	-0-	42 70		6873 91			
	+277.68 Blat	August	280 46	3710 30	1410 92	—	5 18		5185 78			
		Sept	3150 84	2594 61	2494 80	187 88	203 28		8631 41			
		Oct	2902 13	1871 97	3120 04	286 44	321 09	* 102 12	11603 79			
	.74 gal	Nov	4523 62	4476 26	3414 36	352 98	332 26	855 44	13954 92			
	12' = .74 12.15 = 8c	Dec	8103 38	7276 10 (5048 50)	3855 76	1412 46	511 86	1028 72	22188 28			
	80¢ - 86¢	Jan	8527 06	9057 26	5049 46	1222 12	919 28	1080 26	29590 44			
	.867¢	Feb.	10437 64	8553 19	5783 24	1066 24	734 47	1164 24	27739 02			
	.867¢	March	7213 44	6868 38	4243 97	1257 15	492 45	702 55	20977 94	(15160.29 Pa)		
	.867¢	April	5312 10	5212 42	3511 35	731 74	607 56	769 90	19445 07			
		May	4217 16	3802 61	3621 79	769 90	363 67	363 07	13138 20			
		June	729 55	2834 38	898 26	314 25	24 26	49 13	4849 83	-153		
Gallons		July	1544	5517	3433	-0-	66		10560			
	+390 gal to Blat 8-31	Aug	317	2136	7073	-	8		11608			
		Sept	4092	3399	3240	244	264		11237			
		Oct	3769	6357	4052	372	417	* 138	15105			
		Nov	6113	5209	4614	477	449	1156	18018			
		Dec	10558	9505	5102	1845	681	1348	29039			
		Jan	10516	11114	6226	1445	1129	1331	31761			
		Feb.	12080	9898	6695	1237	850	1348	31199			
		March	8320	7922	4895	1450	568	1041	24196			
		April	6127	6012	4050	888	699	844	18620			
		May	4700	4246	7036	830	403	407	14622			
		June	787	3012	969	339	26	53	5186			

... 11.79

City and Borough of Sitka

P.O. BOX 79 · SITKA, ALASKA · 99835

RECEIVED
SEP 10 1980
FINITE RESOURCES

September 8, 1980

N. Ed Barker P.E.
Finite Resources, Inc.
9807 Fairview
Boise, Idaho 83704

Dear Ed:

As we discussed at the meeting we had in Juneau, I am enclosing the fuel consumption for our various schools here in Sitka. After looking atall the school sites, it appears that the High School, Blatchely Jr. High, and Alice Island schools sites would be compatible with an incinerator to furnish heat. Blatchley Jr. High and Alice Island have hot water heat and the High School is steam. I have discussed this with the superintendent of schools and his maintenance director. They are in favor of the idea so long as there is no odor or smoke and it is not unsightly.

Your cooperation in looking into our problem here in Sitka is appreciated. I am looking forward to your final draft on the S.E. Alaska Solid Waste Management Study.

Sincerely yours,

Jerry D. Simpson
Director of Public Works

Enclosure

dj

SITKA SCHOOL DISTRICT

FUEL CONSUMPTION COMPARISONS

July 1, 1978 through June 30, 1979 and July 1, 1979 through June 30, 1980

	1978-1979		1979-1980		
	gallons	cost	gallons	cost	%of savings
HIGH SCHOOL	89,442	$43,498.44	68,985	$56,931.26	23%
BLATCHLEY JR. HIGH	81,157	40,310.24	77,327	62,865.14	5%
BARANOF	80,830	39,990.31	49,405	43,426.43	39%
ALICE ISLAND	9,411	4,573.82	9,127	8,415.48	3%
LINCOLN	6,745	3,281.20	5,552	4.558.66	18%
* ETOLIN	-0-	-0-	7,666	6,277.27	
TOTALS	267,585	131,625.21	218,062	164,201.53	19%

Although the precentage of fuel consumption savings amounted to 19% total, the cost for less fuel was 20% higher. The factors involved in the savings of fuel were:

1. The effort by all the staff to conserve energy
2. The balancing of the systems by Honeywell and their efforts this past year to do the work for which they are contracted to do.
3. The efforts of the maintenance department to keep the heating systems operating efficiently.
4. Milder winter weather in 1979-80 school year.

* During the 1978-79 school year, Etolin was heated by the Baranof boilers. During the 1979-80 school year, Etolin was heated by its own boiler.

KETCHIKAN OFFICE

Month 1979	Electricity Amount (kwh)	Electricity Cost ($)	Natural Gas Amount (cu. ft.)	Natural Gas Cost ($)	Fuel Oil Amount (gal.)	Fuel Oil Cost ($)	Other Amount	Other Cost
February	5470	304.54			350	161.35		
March	5380	314.91			450	216.50		
April	5180	300.36			535	257.43		
May	5290	279.63			200	100.30		
June	5690	292.74			500	270.50		
July	4780	236.54			391	236.95		
August	4100	207.30			-	-		
September	4770	317.20			400	272.40		
October	4700	266.00			450	306.45		
November	4280	245.00			320	217.99		
December	4950	328.00			596	409.98		
Jan. '80	4800	319.00			736	571.23		
TOTALS	59,390	3401.22			4728	3021.08		

Energy costs and unit data totals:

Figure 2

TYPE	Annual Energy Units: Amount		Factor (see note below)		Annual Btu	Annual Cost
Electricity	59,390	kwh	x 11,600	=	688,924,000	$ 3,401.22
Natural Gas		cu.ft.	x 1,030	=		$
Fuel Oil (#2)	4,728	gal.	x 138,690	=	655,726,320	$ 3,021.08
Coal		sh/ton	x 24.5 million	=		$
Other				=		$
Other				=		$
				TOTALS	1,344,650,320 (12.a.)	$ 6,422.30 (12.b.)

Main Office 5,000 sq.ft.

Note: These energy factors must be used. For fuels not listed, refer to Engineering Reference Manuals.

Total BTU's (12.a) / Gross Square Feet (Item 6 Pg. 1) = 244,482 BTU's/Sq. Ft./Year

Total Energy Costs (12.b) / Gross Square Feet (Item 6 Pg. 1) = $1.17 $/Sq. Ft./Year

14. Energy Conservation Practices

Name and phone number of Building Energy Evaluator/Monitor:

Name ____________________ Telephone ____________________

Has an Energy Audit ever been performed? ___ Yes No X

Have any engineering studies ever been made? ___ Yes No X

Are there any Energy Management Practices in force? X Yes No ___

Has any energy conservation work been performed? ___ Yes No ___

Describe briefly cost and energy savings of any conservation measures previously implemented:

Timer placed on furnace - savings unknown.

15. Solar and Renewable Resource Potential:

a. Is there open land, parking area or yard which is not heavily shaded in the buildings immediate vicinity? X Yes No ___

b. Building location - Urban X Suburban ___ Rural ___

c. Is the building roof and/or south exposure heavily shaded for more than four hours a day? X Yes No ___

d. Number of stories in Building. 2

e. Building shape. Rectangular

f. Type of roof (i.e. flat, pitched, ect.) and exposure if pitched. Flat

g. Has roof any obstructions (chimneys, mechanical room etc.)? ___ Yes No X

h. Approximate amount of south facing glass to wall area, by percent (%). 0%

i. Type of southern exposure wall material. Masonry and wood

j. [illegible] and water heating systems [illegible] Basement

13. [illegible] From ________ 19__ To ________ 19__

Figure 1 **KETCHIKAN AIRPORT**

Amount	Electricity Amount (kwh)	Electricity Cost ($)	Natural Gas b. Amount (cu. ft.)	Natural Gas b. Cost ($)	Fuel Oil c. Amount (gal.)	Fuel Oil c. Cost ($)	Other: ______ d. Amount ( )	Other: ______ d. Cost ($)
1979 January								
February	56509	3176			2457	1108		
March	44814	2769			4865	2291		
April	44852	2624			2441	1174		
May	37516	2058			2400	1155		
June	40303	2140			2423	1166		
July	31616	1660			2412	1184		
August	31218	1587			2450	1228		
September	35821	2369			2451	1228		
October	34394	1946			2440	1222		
November	44830	2452			3711	2527		
December	38254	2536			4804	3272		
Jan. '80	45579	2980			4973	3834		
TOTAL a.	485,706	28,297			37,827	21,389		

Energy costs and unit data totals:

Figure 2

TYPE	Annual Energy Units: Amount		Factor (see note below)		Annual Btu		Annual Cost
Electricity	485,706 kwh	x	11,600	=	5,634,189,600	$	28,297
Natural Gas	cu. ft.	x	1,030	=		$	
Fuel Oil (#2)	37,827 gal.	x	138,690	=	5,246,226,630	$	21,389
Coal	sh/ton	x	24.5 million	=		$	
Other				=		$	
Other				=		$	
			TOTALS		10,880,416,230 (12.a.)	$	49,686.00 (12.b.)

30,000 sq ft Terminal

Note: These energy factors must be used. For fuels not listed, refer to Engineering Reference Manuals.

Total BTU's (12.a) / Gross Square Feet (Item 6 Pg. 1) = 366,838 BTU's/Sq. Ft./Year

Total Energy Costs (12.b) / Gross Square Feet (Item 6 Pg. 1) = 1.68 $/Sq. Ft./Year

14. Energy Conservation Practices

Name and phone number of Building Energy Evaluator/Monitor:

Name ______________________________ Telephone ______________________

Has an Energy Audit ever been performed? ___ Yes No X

Have any engineering studies ever been made? ___ Yes No X

Are there any Energy Management Practices in force? X Yes No ___

Has any energy conservation work been performed? ___ Yes No X

Describe briefly cost and energy savings of any conservation measures previously implemented:

Terminal heat has been set at 65 - 67 degrees and is maintained at such throughout the year.

15. Solar and Renewable Resource Potential:

a. Is there open land, parking area or yard which is not heavily shaded in the buildings immediate vicinity? X Yes No ___

b. Building location - Urban ___ Suburban ___ Rural X

c. Is the building roof and/or south exposure heavily shaded for more than four hours a day? ___ Yes No X

d. Number of stories in Building. 2 - 3 floors at FAA tower

e. Building shape. Rectangular

f. Type of roof (i.e. flat, pitched, ect.) and exposure if pitched. Flat

g. Has roof any obstructions (chimneys, mechanical room etc.)? X Yes No ___

h. Approximate amount of south facing glass to wall area, by percent (%). 0%

i. Type of southern [illegible]sure wall material. masonry

j. Location of [illegible] and water heating systems - such as inside/outside [illegible] 2nd floor