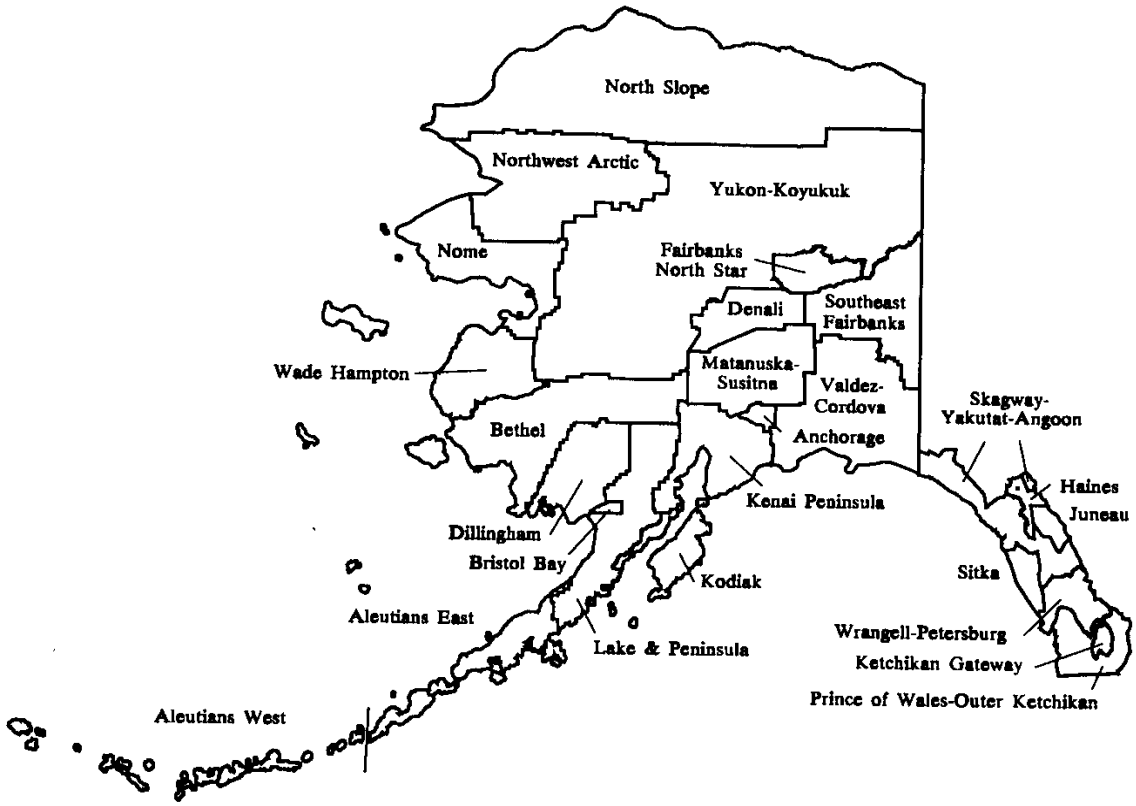
Alaska Solid Waste Regionalization Report



Prepared by

The Alaska Chapter of the

Solid Waste Association of North America

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Henry Friedman, CH2M HILL, Inc.

Michael Blair, Municipality of Anchorage, Solid Waste Services

Catherine Mayer, Kenai Peninsula Borough, Solid Waste Director

Karl Woodruff, Fairbanks North Star Borough, Solid Waste Administrator

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CHAPTER 1
PREFACE

The state of Alaska has approximately 200 to 250 small open dumps that pose a reasonable threat to public health and the environment. Waste is managed poorly in many rural areas of Alaska because small communities often lack sufficient economic resources to properly manage waste. In addition, rural and small communities often lack specialists with the knowledge and skills necessary to properly manage the wide variety of wastes received. One strategy that some communities have developed to solve this problem is regionalization. Regionalization is a process whereby neighboring cities, villages, and boroughs pool resources to address local challenges. Through regionalization, rural and small communities often are able to accomplish together what is difficult to do individually.

Proper management of municipal solid waste (MSW) has become increasingly complex with the production and distribution of the wide variety of materials developed by our modern industrialized society. The days when it was safe to simply dump waste into an open pit and set it on fire are long gone. Many waste materials found today contain toxic chemicals that can harm human health and the environment if they are allowed to leach from the waste into the surroundings. Other solid wastes give off toxic air pollutants when open burned. Some wastes require special handling by trained personnel, such as medical waste and asbestos, to avoid the spread of disease or bodily damage. Some wastes require processing before disposal. For example, the gas contained in refrigerators must be removed before disposal because venting these gases can damage the protective ozone layer of the earth's atmosphere. Most rural and small communities lack the technical expertise needed to safely manage the full spectrum of waste items generated in their communities.

The cost of building and operating a sanitary landfill is beyond the economic reach of many rural and small communities. Federal and state standards for the design and operation of municipal solid waste landfills have increased in order to prevent health and environmental problems caused by poorly designed or operated landfills. It is no longer economically practical for each community in Alaska to construct and operate their own landfill in a safe and sanitary manner.

In addition, the implementation of integrated waste management using a complementary mix of waste prevention, recycling, combustion, and landfilling can present further challenges. While many communities recognize the benefits of integrated waste management, the implementation of integrated options is costly and complex. Through regionalization, effective recycling programs, sanitary landfills, and incineration facilities can be used by even the smallest of communities.

Regionalization of solid waste is working in Alaska. This report presents several case histories of regional programs in Alaska and possible regional districts for non-regionalized areas of the state. This report also provides a framework for the development of regional authorities in unorganized areas of the state.

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CHAPTER 2
CASE HISTORIES OF SOLID WASTE REGIONALIZATION IN ALASKA

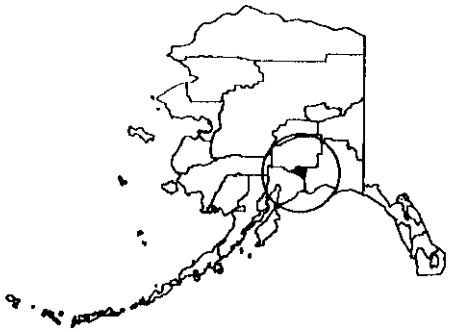
Introduction

This section presents several solid waste regionalization case histories. These histories provide insight into the regionalization process and how regionalization can improve the management of waste and reduce costs. The case histories include the following areas:

- Municipality of Anchorage
- Bristol Bay Borough
- Fairbanks North Star Borough
- Kenai Peninsula Borough
- Ketchikan Gateway Borough
- Kodiak Island Borough
- Matanuska-Susitna Borough
- North Slope Borough
- Southeast Alaska
- Tenakee Springs

Municipality of Anchorage

Background



The Municipality of Anchorage (MOA) Solid Waste Services Department (SWS) operates the single remaining municipal solid waste (MSW) landfill within the Municipality of Anchorage. This landfill, the Anchorage Regional Landfill (ARL), serves an area-wide population of approximately 240,000 located in the communities of Anchorage proper, Eagle River, Birchwood, Chugiak, Eklutna, the Turnagain communities of Girdwood, Bird Creek, Indian, Portage, Whittier and the two military installations of Elmendorf Air Force Base (AFB) and Fort Richardson Army Base. A map of the Municipality of Anchorage solid waste service areas is shown in Figure 2-1. The location of the Anchorage Regional Landfill is shown in Figure 2-2.

In addition to the ARL, SWS operates four transfer stations. Two of the transfer stations are at the ARL, which includes a 3-trailer bay station open to the general public and a 2-trailer bay station dedicated to the use of Fort Richardson housing occupants. A single-trailer bay station at Girdwood began operation in August of 1993. The largest transfer station is the Central Transfer Station (CTS) located between 54th and 56th Avenues, off the Old Seward Highway. Waste is moved from the transfer stations to the landfill's working face in 120 cubic yard walking floor transfer trailers owned by SWS.

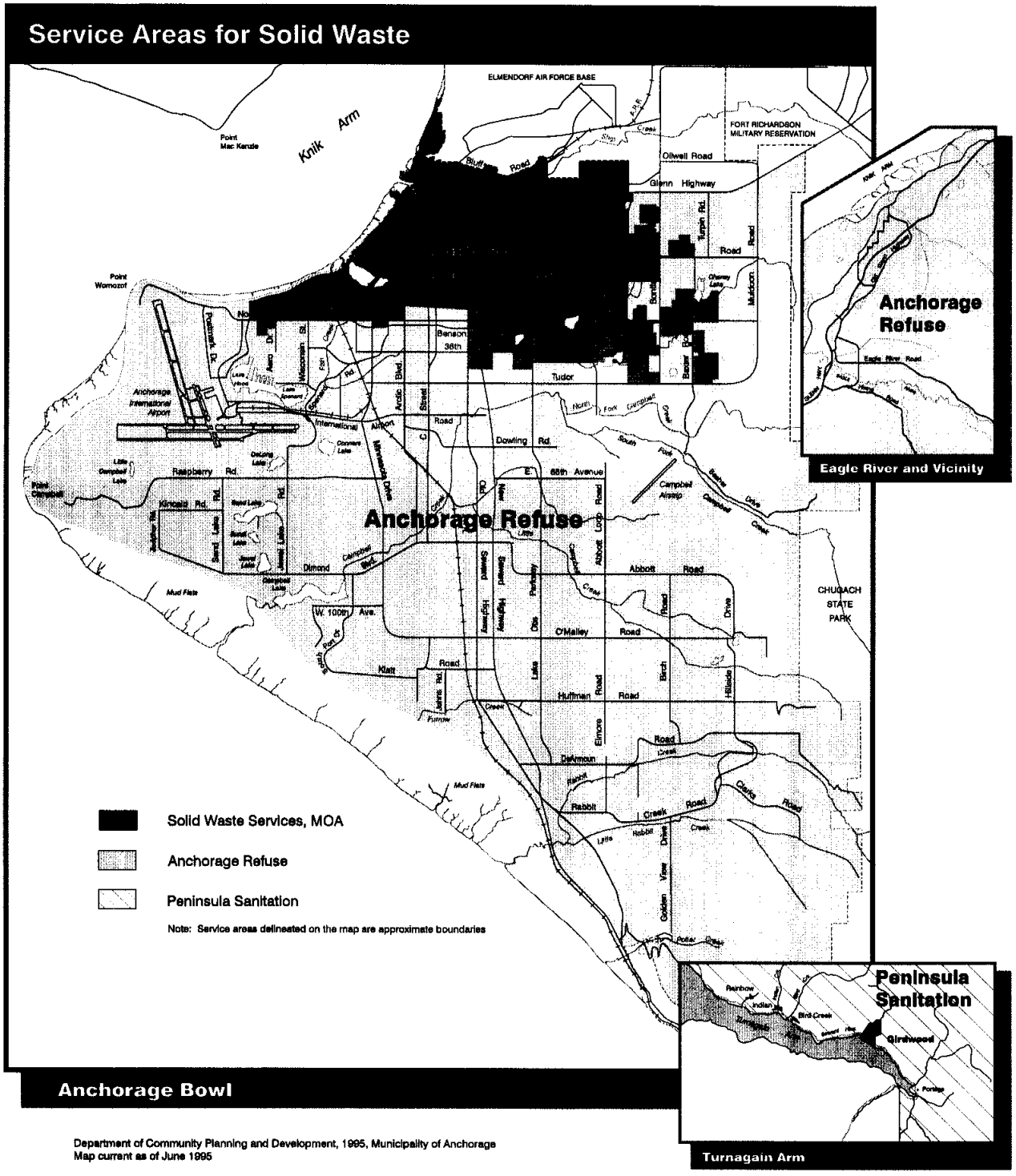


Figure 2-1 Municipality of Anchorage Solid Waste Service Areas

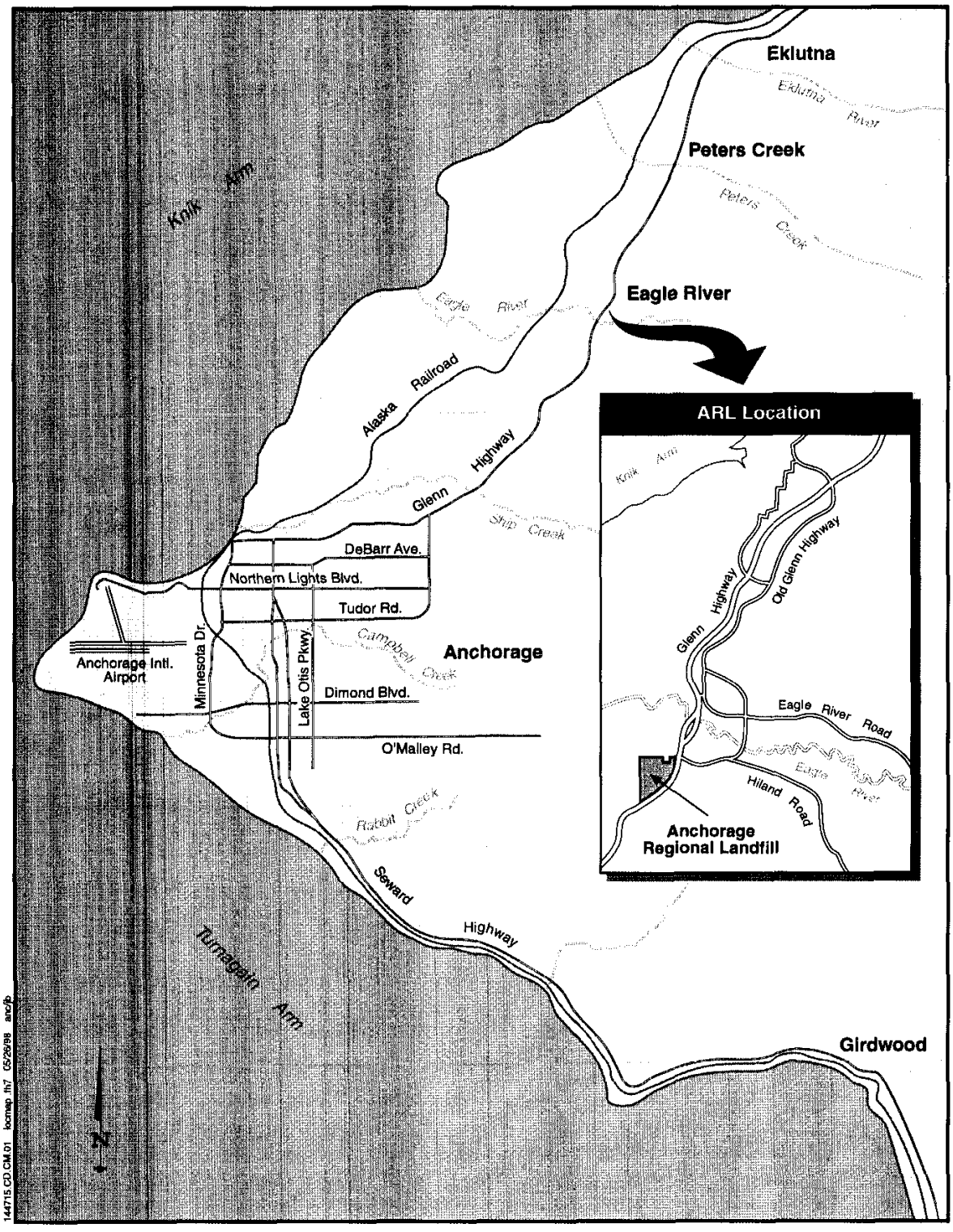


Figure 2-2 Location of the Anchorage Regional Landfill

Waste collected within Anchorage and Elmendorf is brought to the CTS by SWS Collections, Anchorage Refuse, Inc., several small private haulers and the general public. Waste generated from Eagle River and the communities north of Anchorage is brought to the ARL by Eagle River Refuse, small private haulers and the general public. Fort Richardson provides its own collection and hauling service, bringing its waste directly to the ARL. Elmendorf AFB began shipping its waste to the CTS after the Elemendorf Landfill closed in October 1992. Waste from the Turnagain communities is brought directly to the ARL. Construction debris, bulky or oversize items, brush and tree wastes and special wastes such as petroleum contaminated soils, asbestos and processed medical wastes, are taken to the ARL by private haulers. The ARL received 279,805.52 tons of MSW in 1992, which is equivalent to an annual average of 766 tons per day. The solid waste is compacted at the working face of the landfill.

Solid Waste Services charges $45.00 per ton for MSW generated from within the Municipality. This fee is sufficient to pay for the regional solid waste management system.

Regional Efforts

The Greater Anchorage Area Borough (GAAB) and the City of Anchorage consolidated governmental functions and responsibilities in 1977 and formed the Municipality of Anchorage (MOA), the physical boundaries stretching from Portage in the Southeast to Eklutna at the North. Prior to 1977, the City of Anchorage and the GAAB each operated several separate landfill dump sites in what is now the MOA.

The GAAB maintained a landfill operation at the Spenard Landfill, located southwest of what is now the intersection of International Airport Road and Minnesota Drive. This landfill / dump was operated by the Borough Public Works Department between 1958 and 1977. The landfill was maintained by a crew consisting of four equipment operators, one scale attendant, and one operations foreman. Refuse was delivered to the landfill and dumped by private collection vehicles, commercial entities and individual residents. The refuse was spread and compacted at the working face by one wheeled compactor and one tracked dozer. The refuse was to be covered by imported cover material at the end of each working day. The operational life of this landfill was not expected to extend beyond 1978.

The communities of Eagle River and Chugiak were served by a privately operated 40 acre site south of the Eagle River and east of the Glenn Highway. The Chugiak Benefit Association leased the site in 1968 from the State of Alaska and operated it as an open dump until 1973 when it was closed because it encroached onto the Chugach State Park lands. The site was reopened in 1974 and operated by the GAAB until it was again closed in 1977.

There have been several dump sites that used to serve the Turnagain Arm communities. Prior to 1973, a dump site located in the flood plain of Portage Creek served the local residents. This site was closed by the United States Forest Service in 1973. An open dump site located in the Bird Creek Valley served the residents of the Bird Creek, Indian and Rainbow Valley. The community of Girdwood, prior to 1974, operated a landfill that served Girdwood, the Alyeska Village and Portage areas. This site had severe drainage problems with both surface and groundwater infiltration and at the insistence of the Alaska Department of Environmental Conservation, was closed. An alternative site was not selected; rather, Girdwood opted to contract with a private hauler to provide dumpsters for depositing and hauling of refuse, thus becoming one of the first true transfer sites in the Anchorage area. The refuse was hauled to the

Spenard Landfill. Eventually, with the closure of the Bird Creek dump, the transfer operation at Girdwood provided service to all of the communities along the north side of the Turnagain Arm.

The City of Anchorage maintained a landfill operation at Merrill Field between 1952 and its closure in 1987. Prior to 1952, it was an uncontrolled open dump site. The City also provided certificated collection service to an area roughly bound by Tudor Road on the South, Muldoon Road on the East, Knik Arm on the West and Ship Creek on the North. Collection services outside the City's certificated area were provided by private haulers. The Merrill Field Landfill operation accepted refuse from private haulers, businesses, and residential users, as well as the City's collection service.

Consolidation resulted in centralizing the management of solid waste operations within the new MOA. The Solid Waste Services Department was given responsibility of solid waste management within the Municipality. Collection services were maintained as prior to Consolidation, by the SWS within its certificated area and by private haulers outside of this area. Disposal activities, such as operation and maintenance of landfills, became the Municipality's responsibility, which resulted in the closure of the Spenard Landfill and the dumps in Eagle River and Bird Creek. Landfill operations were conducted at Merrill Field and at the newly opened Peters Creek Landfill. The Anchorage Regional Landfill was opened for operation in December of 1987. Merrill Field and the Peters Creek Landfills were closed at the same time. A summary of landfill closures within the Municipality of Anchorage are presented in Table 2-1.

Table 2-1
Summary of Landfill Closures in the Municipality of Anchorage

Location	Date
Portage Creek	1973
Girdwood	1974
Bird Creek	1974
Eagle River (Old Highland Road) Landfill	1977
Spenard (Borough/International Airport) Landfill	1977
Peters Creek Landfill	1987
Merrill Field Landfill	1987
Fort Richardson Landfill	1988
Elmendorf AFB Landfill	1992

Studies Accomplished to Date

Numerous solid waste management studies have been conducted since 1964. These studies evaluated many options for both the GAAB, the City, and the MOA. The prevailing suggestion for long-term solid waste management was the construction of one landfill capable of accepting

all of municipal solid waste generated within the boundaries of the MOA for many years into the future. The Anchorage Regional Landfill is the result of these studies.

The Comprehensive Development Plan for the Anchorage Regional Landfill, conducted by Harding Lawson Associates and published in June of 1993, was the most recent study. This plan addressed the staged development of the ARL to maximize its effective life and to adhere to the requirements of solid waste management regulations. The expected life of the ARL, according to this Plan, is to 2060.

Regional Solid Waste System Funding

The Solid Waste Services Department collections utility and disposal utility operations are funded through the tipping fees. These consist of: commercial user rates of $45.00 per ton (which includes the private and commercial refuse collectors and haulers); residential rates of $15.00 per month; refuse brought to the public sides of the transfer stations by private cars is charged at a rate of $5.00, while vans, pickups and trailers with a cargo space of less than 8' x 5 1/2' x 3' are charged $10.00 per vehicle; and 2 1/2 and 3-yard dumpsters are leased at a flat rate of $9.50 per month plus a minimum fee of $50.50 per month for a minimum of one pick up per week.

The Municipality of Anchorage maintains the official General Ledger accounting records for Solid Waste Services' accounts payable, journal entries, cash receipts and payroll records. These records are maintained in the MOA's Finance Department's Financial Information System (FIS) on an IBM 3090 mainframe system. Solid Waste Services maintains daily records for both Collections and Disposal Operations on its Hewlett Packard HP-3000 mini-mainframe system.

Solid Waste Services provides FIS with daily updates via data tape transfer. Timecard information is manually downloaded bi-weekly from SWS to the Payroll Section of the Finance Department. FIS provides SWS with monthly status reports for the previous month's activities and transactions. These status reports are received on the 15th of each month; consequently, there can be as much as a 30-day lag before the records maintained between SWS and FIS can be resolved.

Solid Waste Services' HP-3000 is updated for each scale transaction at either the ARL or the CTS through a program referred to as the Weigh-3000. The scale transaction update contains date, time, location, customer identification, customer account number (if assigned), commodity of refuse, vehicle gross weight and tare weight, net weight of refuse, cost per ton, and amount due. These transactions are resolved daily and reconciled into the SWS' Utility Billing System under the category of Weigh Station History. Weekly and monthly status reports are generated from this history file for various functions within the Department. Individual reports may be generated from the history file using a "DATA NOW!" program. This allows for the information to be displayed in various appropriate formats.

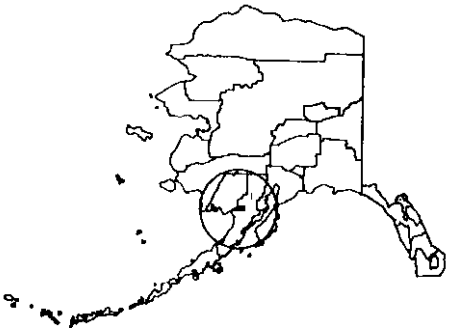
The Utility Billing System provides the daily update tape for the FIS. It also prints outs the monthly billing invoices sent to the Department's customers.

The use of SWS' HP-3000 has been expanded to track daily vehicle and equipment maintenance activities and fuel expenditures. Recently the landfill groundwater quality data management program has been transferred to the HP-3000, again using the DATA-NOW! program for recall

of the desired information. The landfill gas monitoring program information is the next being considered for this system.

Bristol Bay Borough

Background



The Bristol Bay Borough was incorporated as the State of Alaska's first borough in 1962 and functions as the governing body for the three unincorporated communities within its boundaries: Naknek, South Naknek, and King Salmon. The borough is located at the northeast end of Bristol Bay and extends from Katmai National Park on the east to the western shore of Kvichak Bay, encompassing an area of about 500 square miles. The location of the borough is illustrated in Figure 2-3.

Municipal powers of the borough include solid waste management authority. There are three active solid waste landfills in the borough: the Naknek Landfill, the South Naknek Landfill, and the King Salmon Construction and Demolition (C&D) Waste Landfill. The general location of these landfills is illustrated in the following figure.

The Naknek Landfill is the largest landfill in the borough and serves the communities of Naknek, King Salmon, and several outlying areas. It has been in operation since the 1960s. The landfill facility includes a baler and a waste oil storage facility. Household hazardous waste, batteries, and waste oil are shipped out of the borough for recycling or disposal. Some recyclables, such as aluminum beverage cans and other non-ferrous metals, are sorted out for recycling.

The borough operates a small landfill in South Naknek because the community is physically isolated by the Naknek River which separates the community from the road system that serves the Naknek Landfill. Some waste that is not suitable for disposal in the small South Naknek Landfill is also transported to the Naknek Landfill for processing and disposal. Transportation of waste from South Naknek to Naknek is usually limited to winter months when the river is frozen and can be crossed.

The King Salmon Air Force Station facility contractor operates the King Salmon C&D landfill within the station perimeter. This landfill is used exclusively for the disposal of demolition waste such as asbestos and building material debris. The landfill is near capacity and will probably be closed in the near future.

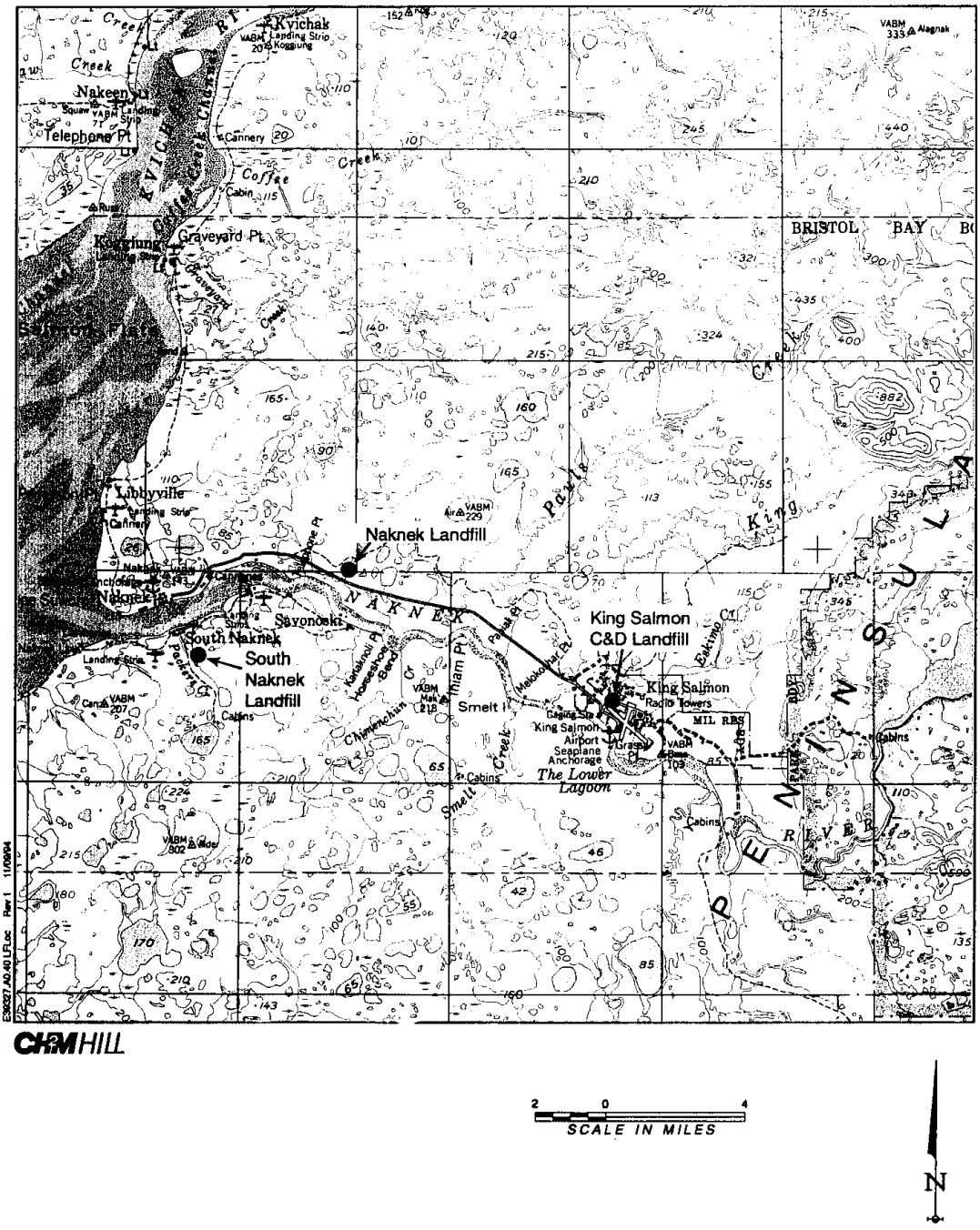


Figure 2-3 Bristol Bay Borough Landfills

Regionalization Efforts

The Naknek Landfill serves as the regional landfill for the Bristol Bay region. Several smaller dumps have been closed over the past 20 years in favor of using the Naknek Landfill facility. The United States Air Force (USAF) used to operate a municipal waste incinerator and dispose of the ash residue at the King Salmon Landfill until the municipal portion of the landfill was closed in the early 1980s. The USAF had difficulty operating the incinerator in compliance with air quality standards and the cost of operating the waste management system was relatively high, so they decided to shut down the incinerator and haul the waste to the Naknek Landfill. The USAF found that it was less expensive to haul its waste to the Naknek Landfill and pay the borough a disposal fee than operate its own system. Also, disposal of waste at the Naknek Landfill eliminated the non-compliance problems present with the Air Force system. The USAF is currently considering a backhaul system for dining facility cardboard and cans, since the food totes for the forward sites and long-range radar stations must be returned to Troop Support at Elmendorf Air Force Base in Anchorage. The station is also recovering heat from non-regulated oily absorbents in the "Smart Ash" energy recovery units. The National Park Service (NPS) also found that it had difficulty operating a sanitary landfill in Katmai National Park during the 1980s. The NPS found that it was almost impossible to keep the bears out of the Brooks Camp Landfill in Katmai and problems associated with bears feeding on garbage were increasing. In the mid 1980s the NPS installed a municipal waste incinerator and closed the landfill. All putrescible waste is carefully stored in bear-proof containers until it can be incinerated. The ash and non-combustible material is hauled by barge or airplane to King Salmon, then transported to the Naknek Landfill for disposal. The use the Naknek Landfill facilities has reduced environmental problems at Katmai National Park.

Several small fishing and hunting lodges in the region fly their waste into King Salmon, where the waste is transported to the Naknek Landfill. The use of the Naknek Landfill eliminates the need for many small dumps in the region. Some waste generated in the neighboring Lake and Peninsula Borough is also transported to the Naknek Landfill.

Many of the fishing boats that are active in the Bristol Bay bring their waste to facilities in Naknek that are serviced by the Naknek Landfill. Many of these boats come from home ports in Washington state and other places outside of the borough. Solid waste generated during the fishing season is discharged by many boats at Naknek or seafood processing facilities, collected in dumpsters, and transported to the Naknek Landfill by the processing company or a private waste hauler. The availability of the Naknek Landfill reduces marine pollution by providing fishermen an alternative to ocean dumping.

Regional System Funding

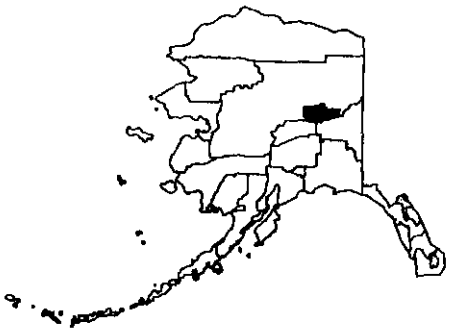
The borough levies a 3 percent fish tax to help pay for the solid waste management system. Federal facilities are charged a solid waste service fee based on the estimated quantity of solid waste delivered to the landfill.

The Bristol Bay Borough is in the process of reviewing landfill expansion costs for 1995 and methods of generating sufficient revenue to provide adequate waste management services. The cost of shipping out waste oil, batteries, junk vehicles, and hazardous wastes is expensive, but without this borough service, these wastes would probably be managed poorly with adverse

environmental consequences. The existence of the regional Naknek Landfill facility is seen as playing an important role in the economic and environmental health of the region.

Fairbanks North Star Borough

Background



The Fairbanks North Star Borough (FNSB) operates the main municipal landfill in the borough. This landfill serves a community population of approximately 80,000 people and annually takes in an average of about 220 tons per day of solid waste. The FNSB also operates one transfer station and 13 separate dumpster collection transfer sites. A map of the Fairbanks North Star Borough showing the landfill and transfer station sites is shown in Figure 2-4. The Fairbanks area is shown in Figure 2-5. These transfer sites received a combined total of 22,000 tons of waste in 1994. The FNSB landfill is operated with Borough employees and is open seven days per week. The transfer station operation is contracted out to a local solid waste hauler. The 13 dumpster sites are unmanned and are operated by two different contractors. One contractor uses 35-yard roll-off containers, while the other uses 10-yard containers. The containers are placed at various locations throughout the Borough and are designed for household waste only. Bulky and oversize items are required to be taken to the landfill. The FNSB pays the contractors to collect and haul the solid waste to the landfill. The FNSB charges $40.00 per ton for municipal solid waste originating from within the Borough.

The solid waste was compacted in a Harris Press Baler at the landfill facility. The baled waste was trucked to the working face of the landfill where it was stacked and covered. Approximately 61 percent of the waste tonnage was baled, the remaining 39 percent was placed in the loose fill area of the landfill. Since 1997, the borough stopped using the baler and now compacts the waste in the landfill.

Other operating landfills in the borough include the Fort Wainwright municipal landfill operated by the United States Army, the Arctic Surplus Construction and Demolition (C&D) Waste Landfill (reported as inactive or closed) operated by a private operator, and the Earth Movers, Inc., C&D Landfill operated by another private operator.

Regionalization Efforts

The current FNSB landfill site was established in 1963. The City of Fairbanks operated the landfill until September of 1972. At that time, a city ordinance was adopted which provided for the assumption of non-area wide garbage and solid waste disposal powers. The FNSB assumed ownership of the landfill and all of the landfill operating costs in July of 1973. The landfill was then operated by City of Fairbanks employees under Borough supervision. The Borough assumed operation of the landfill in January of 1975 by contracting with a private firm for the landfill operations while providing Borough supervision. The borough took over all aspects of the landfill operation in June of 1989. Since that date, the landfill has been operated by the Borough with Borough employees.

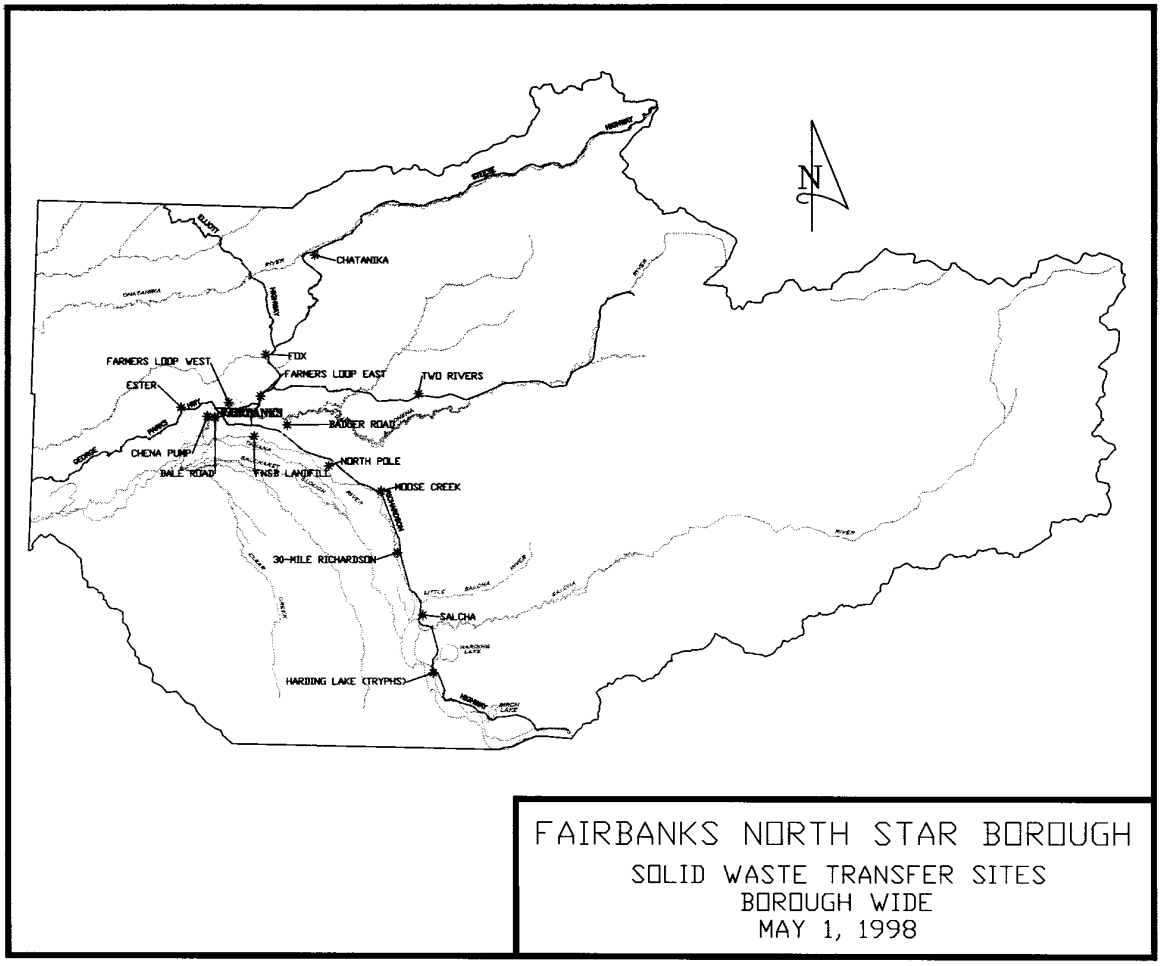


Figure 2-4 Fairbanks North Star Borough Landfill and Transfer Station Sites

The placement of dumpsters throughout the borough has eliminated the need for individual landfills at each community. Solid waste is collected and hauled to the FNSB Landfill from communities as far as 75 miles away. The Eielson Air Force Base, located 23 miles from Fairbanks, closed its municipal landfill in 1990 and is now hauling its waste to the FNSB Landfill. Eielson installed a refuse-derived fuel pelletizer for paper waste and is modifying it to include plastics. The pellets are designed to substitute for coal in a power plant. Eielson hopes to accept paper product waste from Fairbanks and Fort Wainwright. It is expected that the Army will soon close the Wainwright Landfill and begin using the FNSB Landfill in the near future.

Planning Efforts

Numerous studies have been conducted in the past. The most recent study was prepared in 1994 by Dames and Moore in association with R.W. Beck to develop a long-range solid waste management plan. The plan is a comprehensive approach outlining waste reduction and recycling, collection and transfer service, special waste handling, and system alternatives. The final recommendations, which are being implemented, include: a vertical expansion of the existing landfill, the development of a pelletizing operation to reduce the volume of

combustible material destined for the landfill and provide supplemental fuel for the coal power plant, and the eventual design of a lateral landfill expansion.

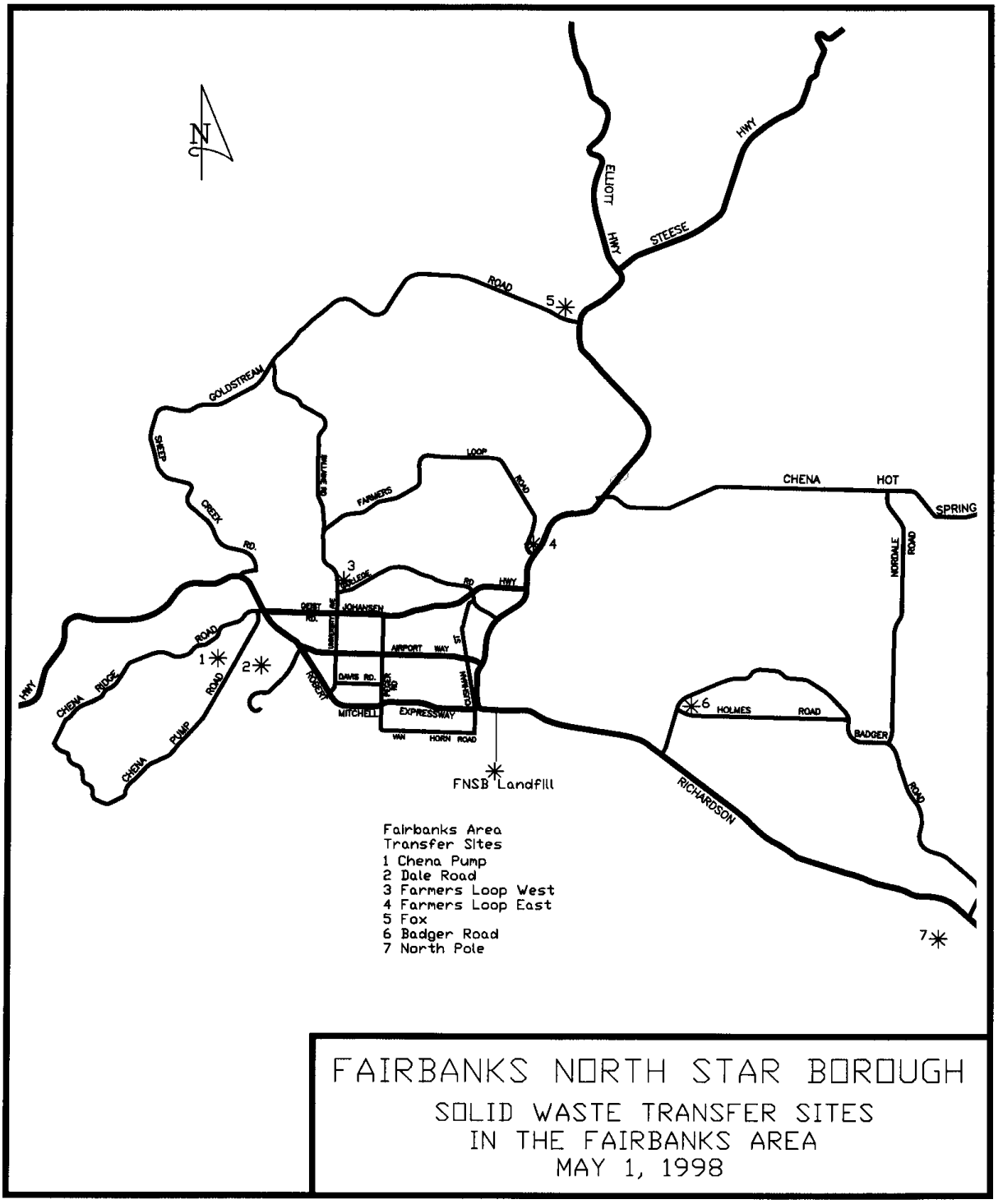


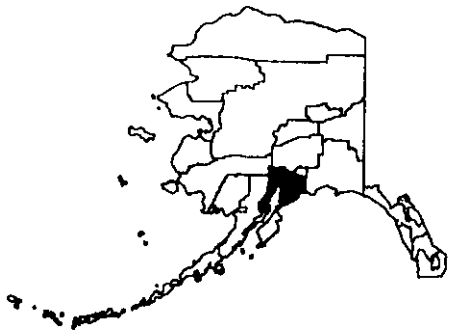
Figure 2-5 Fairbanks North Star Borough, Fairbanks Area

Solid Waste System Funding

The borough funds the solid waste management system through non-areawide taxes, revenues provided by the state, and a $40.00 per ton tipping fee. The FNSB maintains the accounting records consisting of collection and disposal expenditures and sale and revenue journals. The landfill keeps a daily expenditure "soft" ledger. The ledger is reconciled monthly to the records kept on the mainframe computer system at the Borough offices. A network system to allow direct access to the mainframe is being considered, but implementation has not begun. Records of daily sales and revenue received are also kept. The landfill has a computerized invoicing system that tracks all tonnage, sales and revenue. This data is transferred into "EXCEL" spreadsheets for ease of manipulation.

Kenai Peninsula Borough

Background



Solid waste management authority was assumed by the Kenai Peninsula Borough in 1974. At that time, the borough took over the management responsibility for numerous landfills and dumps previously operated by the cities or other entities within the borough boundaries.

There are 6 cities and 10 unincorporated communities in the borough with a total population of 44,400 in 1995. The cities include Homer, Kachemak, Kenai, Seldovia, Seward, and Soldotna. Some of the larger unincorporated communities include Nikiski, Ninilchick, Anchor Point, Port Graham, Nanwalek (formally English Bay), Sterling, Cooper Landing, Moose Pass, Tyonek, Beluga, and Hope. A map of the Kenai Peninsula Borough is shown in Figure 2-6.

The major population area of the borough is served by the Central Peninsula Baler Facility (CPBF) in Soldotna, which serves about 35,000 people and manages an annual average of about 115 tons per day of solid waste, with tonnages ranging from 15 to 450 tons per day due to seasonal variations. This landfill serves all the communities along the highway system within the borough except for the city of Homer, which has its own baling facility and landfill and manages approximately 6,000 tons per year. The CPBF was constructed in 1992 at the site of the old Soldotna Landfill and significantly upgraded the previous operation. The CPBF includes: a baler to compact waste, a household hazardous waste collection center, and a recycling area. Baled waste is placed over previously filled areas of the Soldotna Landfill and the site is expected to have sufficient capacity to last up to the year 2005. Additional land is available within the CPBF property boundaries to provide the borough with sufficient landfill space to last an additional 50 years.

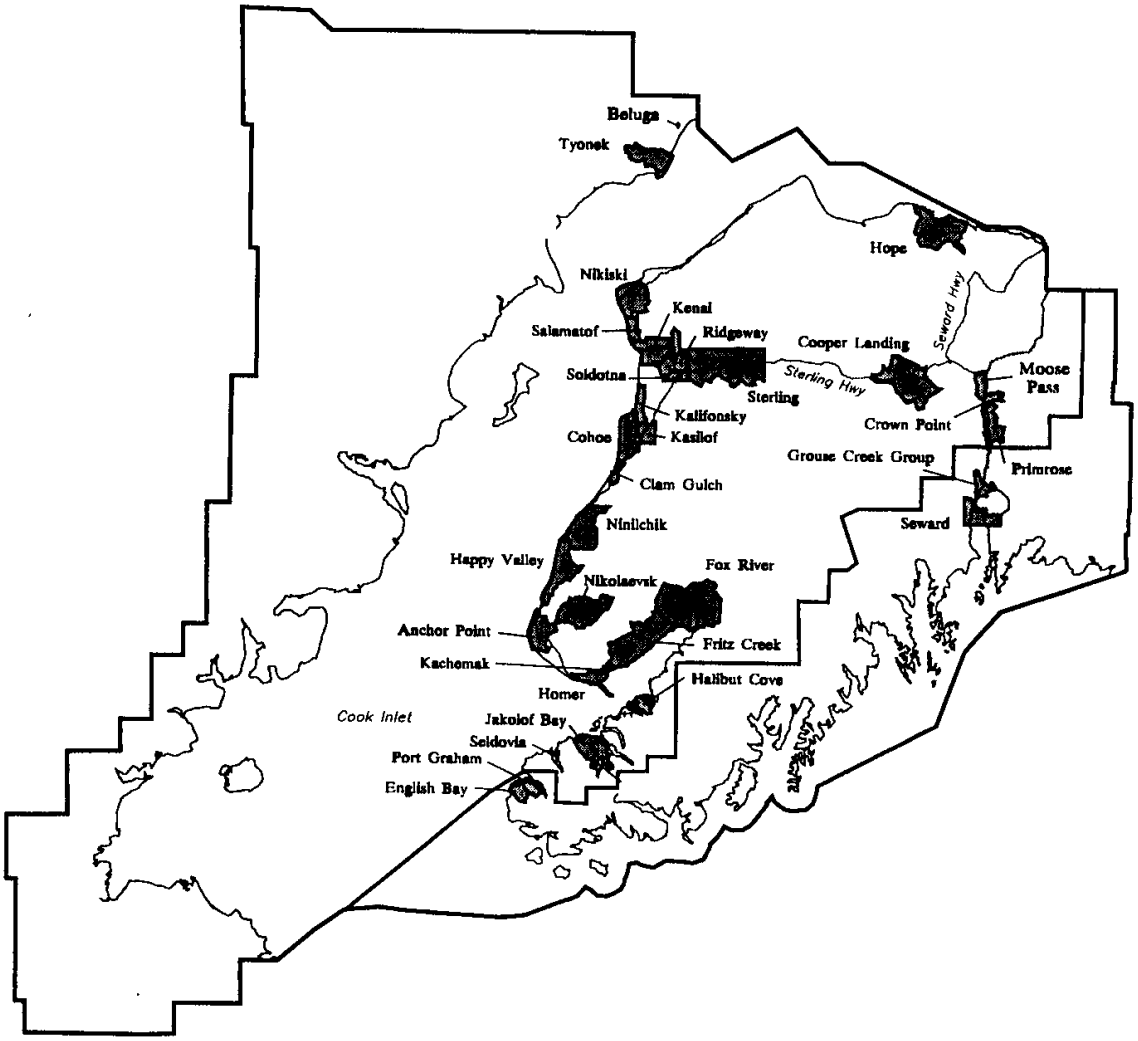


Figure 2-6 Kenai Peninsula Borough

The borough also manages drop boxes (dumpsters) at 8 locations, as well as transfer facilities in Nikiski, Kenai, Sterling, and Seward. All drop box sites utilize 40 cubic yard dumpsters and transfer facilities utilize 120 cubic yard walking floor trailers. The location of transfer sites is shown in Figure 2-7. The contractor is required to accomplish a recycling rate of 5 percent of the CPBF tonnage.

Other borough landfills are located in the remote communities of Seldovia, Tyonek, Beluga, Nanwalek, and Port Graham. These communities are accessible only by airplane or boat. There are also a few other small remote landfills associated with mining or logging operations.

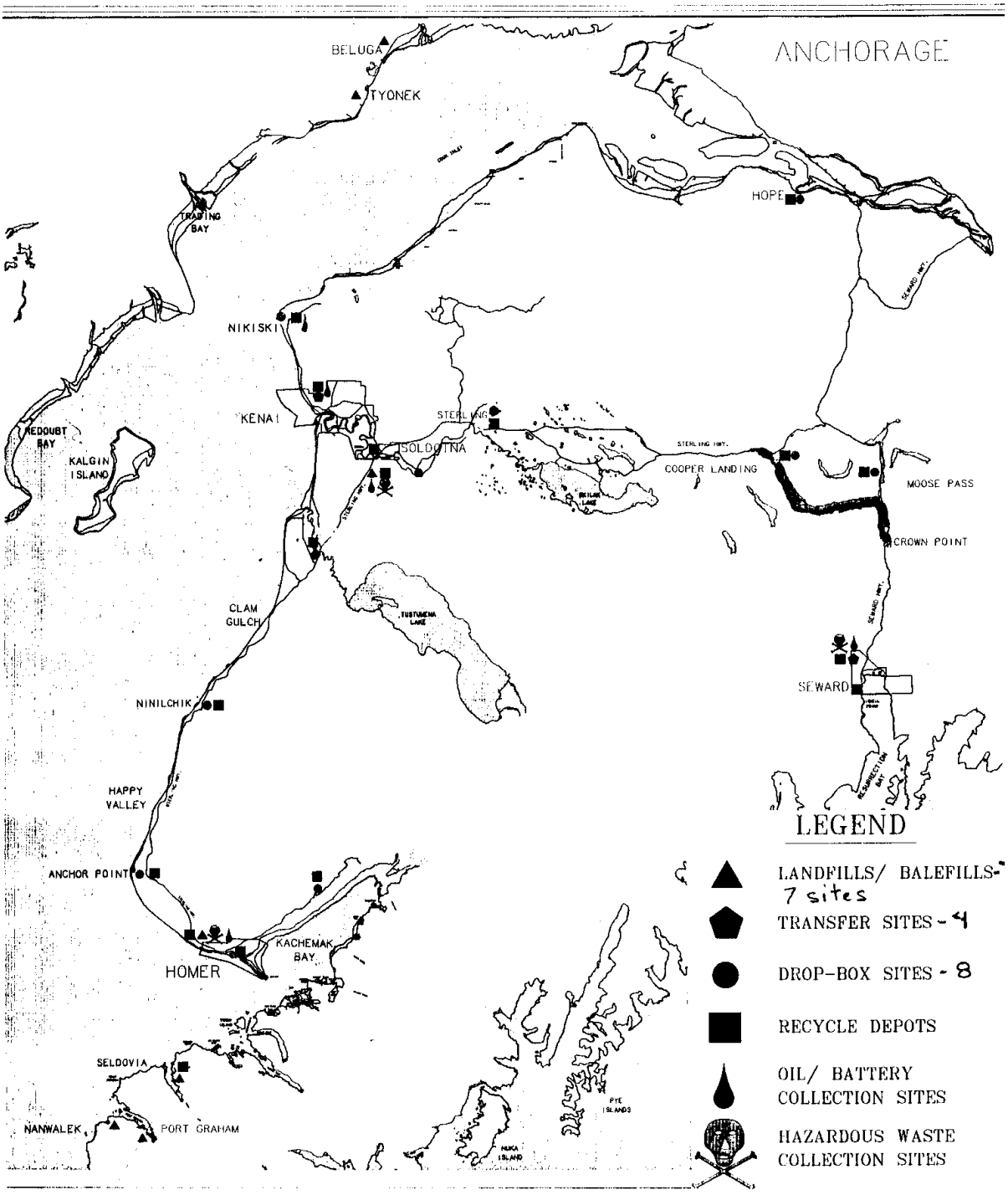


Figure 2-7. Kenai Peninsula Borough Transfer Site Locations

Regional Planning and Implementation Efforts

The borough has contracted several studies over the past 15 years in order to determine the most practical and economical means of managing waste in the borough. The first study was completed in 1980 and provided an inventory of facilities and recommended plan of action. Several coincineration studies were performed between 1980 and 1984 and based on the results from these studies, the borough did not construct any incineration facilities. A comparison of transportation costs for the Soldotna Landfill and Beaver Creek Sites was performed in 1985 and the borough decided not to develop the Beaver Creek site after it was determined to be the more costly option. Studies performed for the Sterling Special Waste site between 1986 through 1989 indicated that the operation of a separate industrial waste site was not economical. More recent studies have resulted in the formation of regional solid waste practices.

In 1989, the borough compared the costs of building a new landfill in Seward to the costs of hauling the waste to the CPBF, which is located 95 miles away. The existing landfill at that time had reached capacity and another alternative was needed. The study indicated that it would be less expensive to haul the waste to Soldotna rather than build and maintain a new landfill in Seward, so the borough built a transfer station and began hauling the waste to the CPBF in 1992. This option was strongly favored by Seward residents, who were opposed to the construction of a new landfill in Seward. Approximately 5,000 tons of waste per year is currently hauled out of Seward.

In 1993, the borough compared the costs of expanding the Homer Balefill and hauling the waste to the CPBF. It was determined that a vertical expansion of the Homer Balefill was the least costly alternative. Neighboring communities continue to use the Homer Balefill as their regional landfill.

New transfer station facilities were constructed in Nikiski and Kenai in 1994 and Sterling in 1997 to replace the smaller 40-cubic yard dumpsters. Waste is now collected in 120-cubic yard walking floor trailers. The use of larger containers has reduced hauling costs by over 50 percent of the cost of using 40-cubic yard containers. The borough may replace other small drop-box areas with larger transfer stations in the future.

As part of regionalization efforts, the borough has conducted several pilot programs to evaluate methods of transporting waste out of rural communities that are not on the road system. The borough has found that it is very difficult to manage landfills in a sanitary manner at remote locations and transferring the waste to well managed regional landfills may improve environmental conditions at remote locations. The borough has barged waste out of some communities on a few occasions and has tested a flyout program from the village of Nanwalek. The viability of these transportation options will be compared with the viability of expanding and upgrading landfills at remote communities.

Over the past 20 years, several landfills and dumps have been closed in an effort to minimize environmental problems and manage the waste in a more cost effective manner. Table 2-2 lists the main sites that have been closed. There are probably several additional sites that are not included in the table because the borough records do not include some of the smaller dumps that have been closed in the past.

Table 2-2 Kenai Peninsula Borough Landfill Closures	
Location	**Closure Date**
Cooper Landing	1974
Moose Pass	1974
Hope	1974
Kasilof	1974
Ninilchik	1974
Anchor Point	1974
Homer Bay Landfill	1979
Sterling Special Waste Site	1987
Kenai Landfill	1990
Seward Landfill	1991

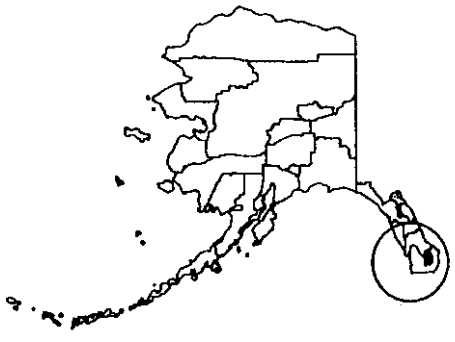
Solid Waste System Funding

The solid waste program has been and is currently funded mainly from the general fund. General fund revenue is generated through property taxes. User fees were implemented in May of 1993 for commercial disposal of C&D waste, junk automobiles, and other limited items. The Kenai Peninsula Borough solid waste program is managed as a special revenue fund. Additionally, the annual operating budget reserves funds to be utilized for landfill closure and post closure purposes.

Ketchikan Gateway Borough

Background

The Ketchikan Gateway Borough has a population of about 15,000 and manages average of approximately 40 tons per day of solid waste. Borough solid waste management facilities include a baler facility, landfill, two incinerators, and collection dumpsters. A map of the Ketchikan Gateway Borough is shown in Figure 2-8.



Regionalization Efforts

The Ketchikan Gateway Borough has recently taken a giant step in the process of regionalization. Starting in March of 1995, Ketchikan began shipping its waste by barge to Washington state for disposal. Waste is shipped in standard waste hauling containers that are off-loaded at a port in Washington. The waste containers are then added to municipal waste shipments from other cities and hauled to the Roosevelt Regional Landfill located in eastern Washington.

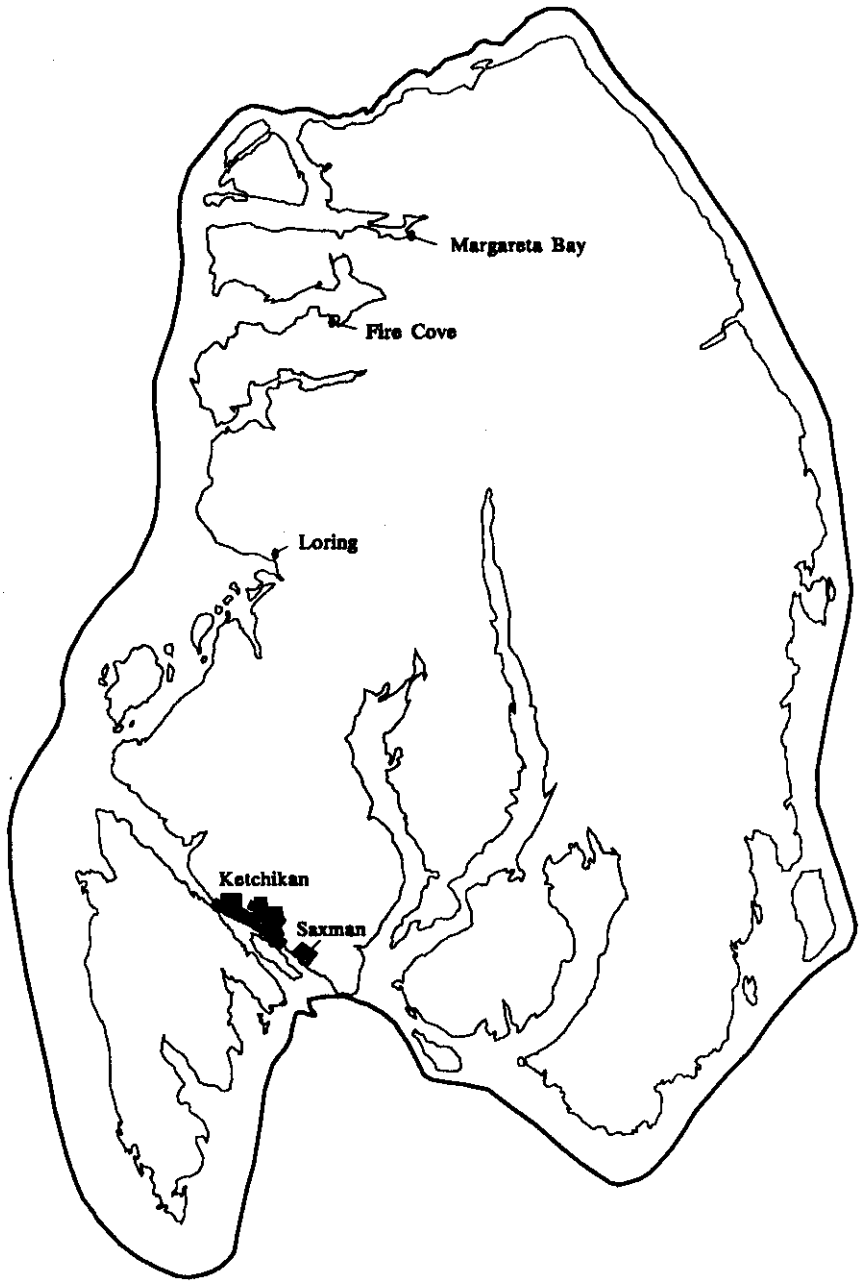


Figure 2-8 Ketchikan Gateway Borough

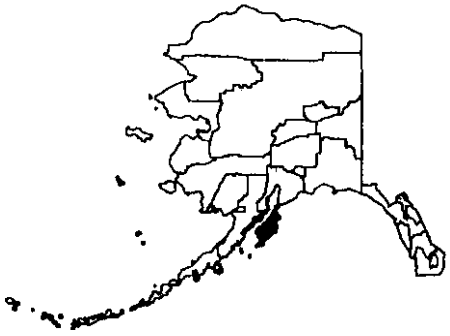
The borough decided to ship its waste out of the community after comparing the costs of upgrading and expanding the existing landfill. The full costs of the landfill, including closure, post-closure, monitoring, and long-term leachate treatment costs, were higher than shipping the waste out to a fully compliant landfill.

The Ketchikan Gateway Borough has solid waste management powers and serves as the regional solid waste authority. Smaller communities such as Saxman and a few logging camps haul their waste to Ketchikan for processing. Municipal waste is baled before shipment in order to minimize the number of shipping containers sent out. Cruise ships also discharge waste at the port of Ketchikan during summer months. Waste from foreign vessels is incinerated in accordance with the U.S. Department of Agriculture Plant Health Inspection Service (APHIS) requirements before shipment to the Roosevelt Regional Landfill. The borough has requested a waiver from the incineration requirement and APHIS may grant the waiver if the threat of diseases from unincinerated waste is low.

The economic and environmental benefits of shipping waste out to a well maintained and operated regional facility probably apply to most other southeast Alaska communities. Most communities in southeast Alaska have non-compliant dumps with associated environmental problems. The Ketchikan regional waste management system is an outstanding example of how a regional system can be developed to minimize environmental problems, reduce costs and take advantage of an intermodal transport arrangement.

Kodiak Island Borough

Background



The Kodiak Island Borough (KIB) is the solid waste management authority for the city of Kodiak and communities along the main road system, which extends about 45 miles from the city of Kodiak to the community of Chiniak in one direction, and about 10 miles in the other direction. The borough does not provide solid waste services to the other communities in the borough, which include Akhiok, Larsen Bay, Old Harbor, Ouzinkie, Port Lions, and Karluk. Each of these communities operates its own small dump.

The KIB Landfill is the regional landfill for the most populated portion of the borough and serves about 13,550 people, processing about 32 tons per day of solid waste. The landfill facility includes a baler and incinerator. The location of the landfill is illustrated in Figure 2-9.

Regionalization Efforts

In the past 10 years, three landfills along the highway system have closed, and waste generated in these areas is now transported to the KIB Landfill for processing and disposal. Smokey's dump was closed in the mid 1980s due to public concerns over the site. The dump accepted

primarily junk metal and was a scrap yard and metal recycling facility. The site was close to the Kodiak city limits and was in conflict with residential development. Some of the metal debris

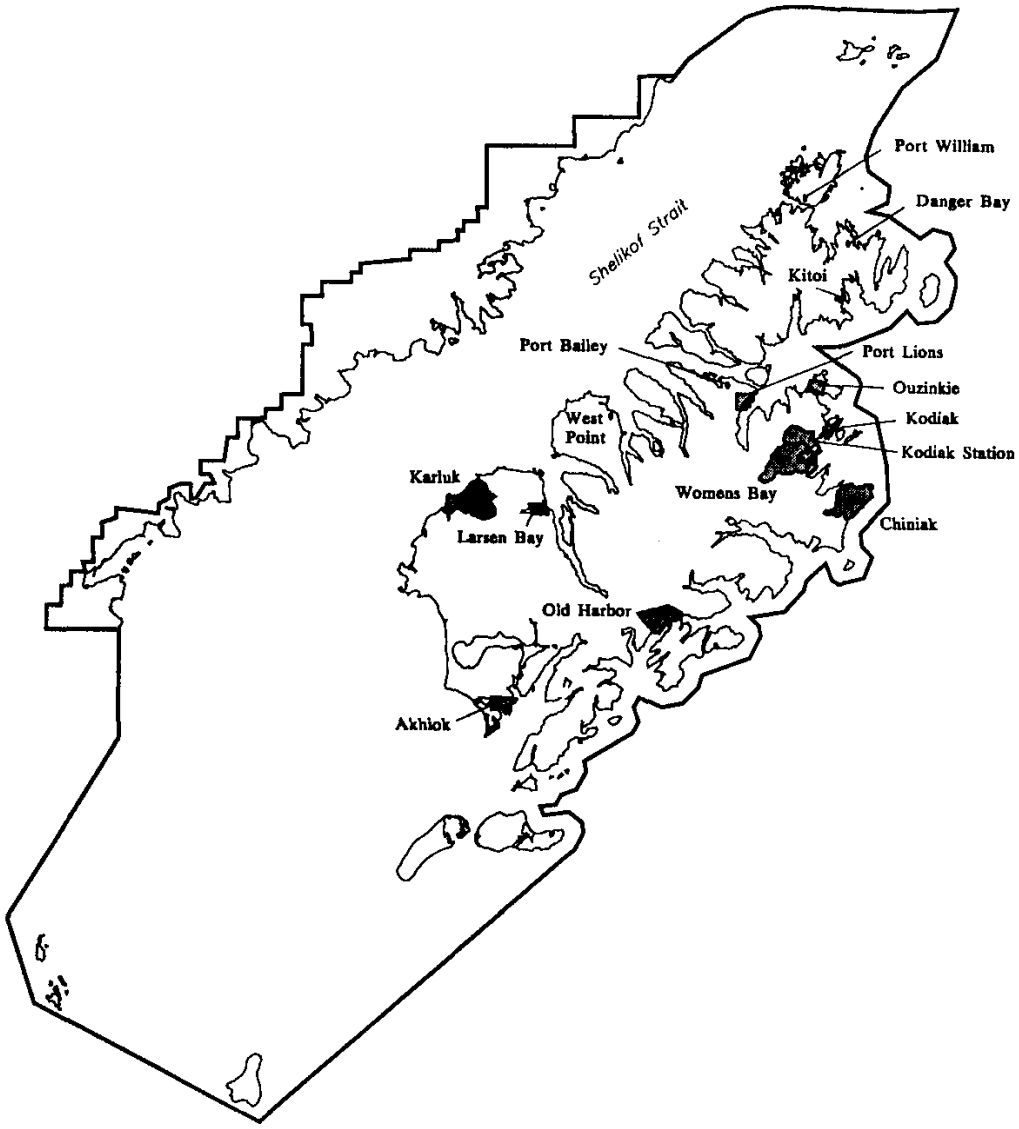


Figure 2-9 Kodiak Island Borough

from the dump was hauled to the KIB landfill in 1994 and the dump was capped in 1995. Junk metal is now taken to the KIB landfill for recycling or disposal.

A small dump serving the community of Chiniak was closed in 1987 and replaced with a dumpster. Chiniak is located about 45 miles from the city of Kodiak. The dump failed to meet regulatory standards and was closed before more stringent federal closure and monitoring requirements went into effect. Waste is now hauled to the KIB landfill.

The United States Coast Guard (USCG) Base at Kodiak operated its own landfill until about 1988. The USCG landfill served a population of about 2,500. The landfill had serious leachate problems and the USCG spent over one million dollars installing leachate controls. The leachate currently is directed to the sewer system and is treated at the USCG wastewater treatment facility. The cost of upgrading the landfill to meet sanitary landfill standards was found to be higher than the cost of hauling the waste to the KIB Landfill. Also, the capacity of the wastewater treatment plant was not sufficient to handle additional leachate that would result from a landfill expansion. The cost of expanding the capacity of the wastewater treatment plant was found to be cost prohibitive. Therefore, the USCG decided to close the landfill in 1988. The USCG currently pays the borough a disposal fee in order to use the KIB Landfill.

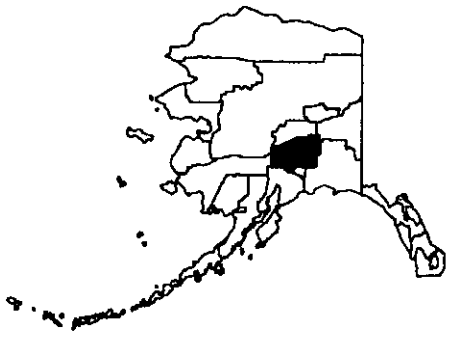
The KIB Landfill also serves as the disposal facility for other outlying areas. The borough pays for the placement of dumpsters at parks and recreation areas along the highway system. Also, dumpsters are placed at the Kodiak boat harbor and docks. The KIB Landfill therefore serves as the regional disposal facility used by the commercial fishing fleet operating in this region.

Regional System Funding

The borough operates the solid waste system as an enterprise fund. Waste management costs are included in the collection fee for city of Kodiak residents. Solid waste service area residents outside the city limits are charged a solid waste management fee along with other service fees.

Matanuska-Susitna Borough

Background



The Matanuska-Susitna Borough was formed in 1964 and assumed solid waste management authority sometime later. The first solid waste management plan for the borough was prepared in 1977 and revised in 1978. The latest updated plan was prepared in 1990.

There are three incorporated cities within the borough: Houston, Palmer, and Wasilla. There are also several unincorporated communities, such as: Willow, Big Lake, Kashwitna, Montana Creek, Sheep Creek, Talkeetna, Sunshine, Butte, Knik, Sutton, Chickaloon, Sheep Mountain, Eureka, Skwentna, and a few other small communities.

The borough currently operates one regional landfill located on the highway system and one small rural landfill in Skwentna. The borough also provides for the operation of 11 year-round transfer stations and several summer seasonal dumpsters at recreational locations. Waste from the transfer stations and dumpsters is hauled to the Central Landfill for disposal. The locations of borough waste management facilities are shown in Figure 2-10.

Regionalization Efforts

The population of the borough is approximately 50,000 and the Central Landfill annually receives an annual average of about 100 tons per day, making it the third largest landfill in Alaska. The Central Landfill is truly a regional landfill, serving all communities along the highway system in the borough. In 1984 there were about 14 dumps in the borough. All have been closed except for the Skwentna Landfill, which is located off the highway system. The

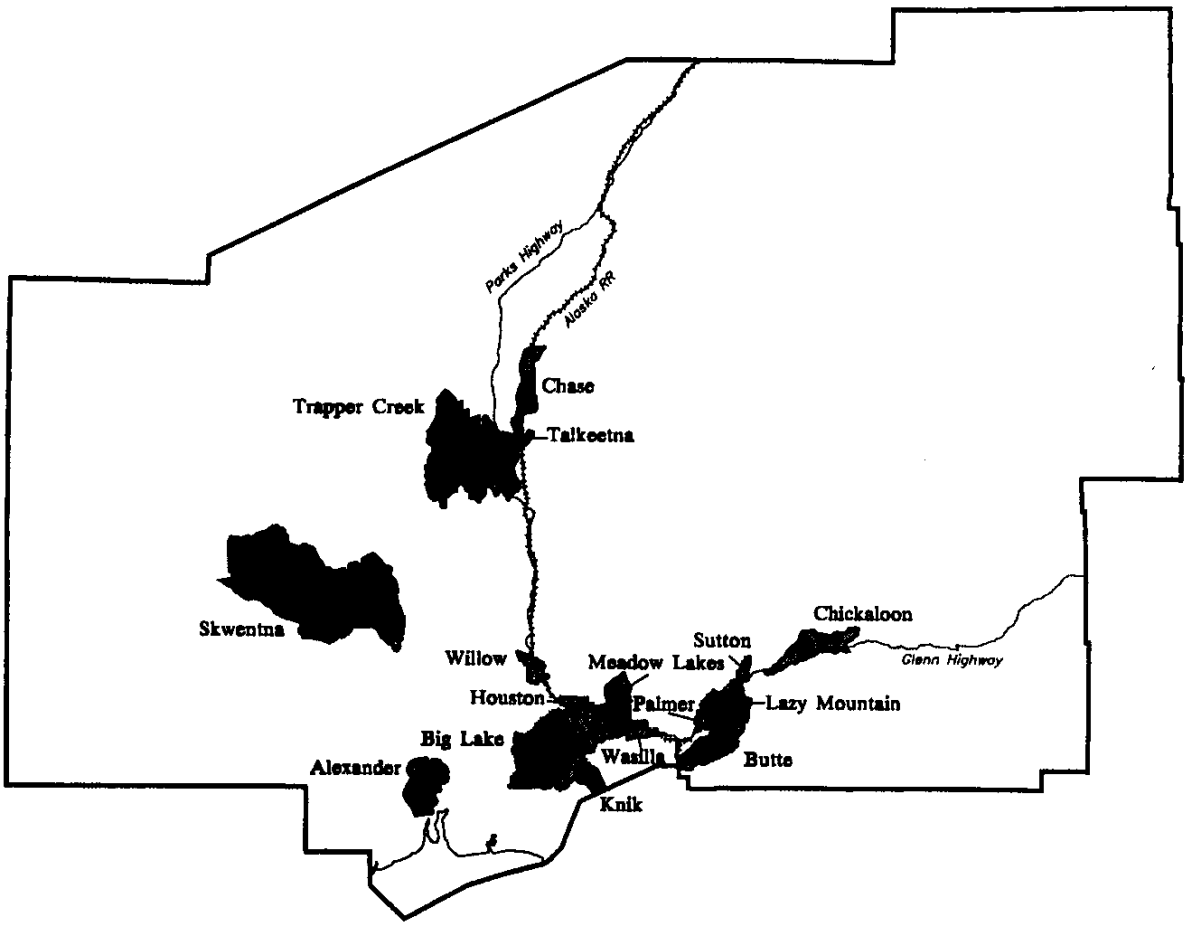


Figure 2-10 Matanuska-Susitna Borough

dumps were closed progressively over a ten-year period and have been replaced by transfer stations. Waste from the former dump site areas is now hauled to the Central Landfill for disposal. Table 2-3 lists the closure dates of landfills in the borough.

The closure of dumps met with public opposition in most cases, but environmental compliance problems and the high cost of maintaining a large number of small dumps forced the borough

to implement the closure program. Public opposition was quieted by the provision of suitable solid waste transfer station facilities at or near the former dump sites.

The 1977 *Matanuska-Susitna Borough Solid Waste Disposal Study*, prepared by Arctic Environmental Engineers, found that the Eureka and Lake Louise dumps were just as expensive to operate as a transfer station, but necessary landfill improvements and monitoring would make the landfills more expensive to operate in the future. Despite public opposition, the borough closed these landfills in 1984 to save money and reduce the liability associated with

Table 2-3
Mat-Su Borough Dump Closures

Location	Closure Date
Eureka (Glenn Highway)	1984
Lake Louise (Glenn Highway)	1984
Sutton (Glenn Highway)	1984
Knik (Knik Road)	1984
Willow (George Parks Highway)	1985
Palmer Correction Center (Glenn Highway)	1986
Goose Bay Correction Center (Knik Road)	1986
Butte (Boddenburgh Butte Road)	1987
Gracious House (Denali Highway)	1990
Brushkana (Denali Highway)	1990
Talkeetna (George Parks Highway)	1991
Sunshine (Glenn Highway)	1991
Big Lake (Big Lake)	1992
Houston (George Parks Highway)	1993

open dumps. Transfer stations were established to replace the dumps and have been found to be generally acceptable to the public.

The Sutton Landfill was closed during the same time period. The site was difficult to access and had relatively high operational costs compared to the quantity of refuse material accumulated. The landfill was a "gulch fill", the availability of cover material was low, and the close proximity of bedrock and high groundwater table made expansion both difficult and costly. A transfer station located closer to the central population area was found to be more convenient and less costly to operate than the landfill.

The Knik and Willow landfills were closed in 1984 and 1985 due to litter problems, high maintenance costs, and environmental concerns. There was very little opposition to the closure of these landfills and the current transfer stations appear to be more acceptable to the public. The Knik Landfill site is now a ball field.

The state of Alaska closed the Palmer and Goose Bay Correction Center Landfills in 1986 because the cost of operating compliant landfills was too high. The landfills were closed before more costly federal closure requirements went into effect.

The borough closed the Butte Landfill in 1987 because of high operational costs and close proximity to a public school. The potential of groundwater contamination was a concern and the cost of a liner and leachate collection system was prohibitive. The borough decided that it would be less expensive to close the landfill and replace it with a transfer station. There was a substantial amount of public opposition to the closure, but complaints disappeared soon after a suitable transfer station was installed.

In 1990, the Bureau of Land Management (BLM) initiated a program to close illegal dumps on federal land. Six dumps along the Denali Highway were closed. Two of them were in the Matanuska-Susitna Borough, the Gracious House and Brushkana dumps, and were never sanctioned by the borough. There was no public opposition to these closures. A transfer station is provided by the borough at the Gracious Road House during summer months. The waste is hauled to the Central Landfill.

The Talkeetna, Sunshine, and Big Lake landfills were closed shortly after the 1990 *Matanuska-Susitna Borough Solid Waste Management Plan Update*, prepared by CH2M HILL, was released. The report indicated that the operation of these landfills was more expensive than operating transfer stations in their place. The landfills were closed before the more stringent federal landfill closure requirements went into effect.

The city of Houston was the last area of the borough to come under the regional solid waste authority of the borough. Until 1993, the city of Houston maintained its own landfill and was exempt from the borough solid waste service fee. The two other cities, Palmer and Wasilla, are charged for solid waste services based on a formula which relates each city's valuation to the total assessed valuation in the borough. Houston found it was financially unable to adequately maintain the landfill and that there were numerous environmental problems at the site. The city was cited several times by the Alaska Department of Environmental Conservation (ADEC) for solid waste violations and the landfill was ordered closed by the Department in the early 1990s. A transfer station is now provided for the community by the borough and the waste is hauled to the Central Landfill.

The closure of dumps and landfills in the borough has reduced the overall operating costs of solid waste management in the borough and has improved the environmental control of waste. The consolidation of waste sites to one regional landfill has allowed the borough to focus its attention and resources on upgrading the Central Landfill to meet current public health and environmental protection standards.

Solid Waste System Funding

The regionalization of solid waste management in the borough probably would not have occurred without the administrative and financial support of the Matanuska-Susitna Borough government. The borough provided the planning for solid waste management and contracted the studies that determined the most economical and environmentally sound plan of action for solid waste management. The administration and operational costs of the waste management system were paid through the collection of property taxes and special waste assessment fees to the city of Palmer and Wasilla. The current solid waste management system is operated as an

enterprise fund. A tipping fee is charged at the Central Landfill and at transfer stations in high population areas. Solid waste funds for more rural areas of the borough are collected through non-areawide taxes.

North Slope Borough

Background

The North Slope Borough maintains solid waste management powers and provides planning, administration, and funding for solid waste management. There are seven cities, one unincorporated village, and one industrial service area in the borough. The seven cities are: Anatuvuk Pass, Atqasuk, Barrow, Kaktovik, Nuiqsut, Point Hope, and Wainwright. The unincorporated village is Point Lay. The industrial area serviced by the borough is Prudhoe Bay. There is a landfill at each of the 9 locations. A map of the borough is shown in Figure 2-11.

Most or all of the landfills in the borough fail to meet today's municipal solid waste landfill standards. The harsh environment and small community size make waste management difficult. Permafrost and the long winters make conventional landfill operations impossible.

Regional Efforts in the Borough

The borough provides solid waste management administrative functions from its regional office in Barrow. An airport/landfill manager is responsible for providing oversight of the nine landfills in the borough. The borough recently issued a contract to a consultant to review solid waste management facilities and practices in the borough and provide recommendations for improvement. Without the regional planning efforts and financial support of the borough, the individual cities and communities would have a difficult time managing their waste.

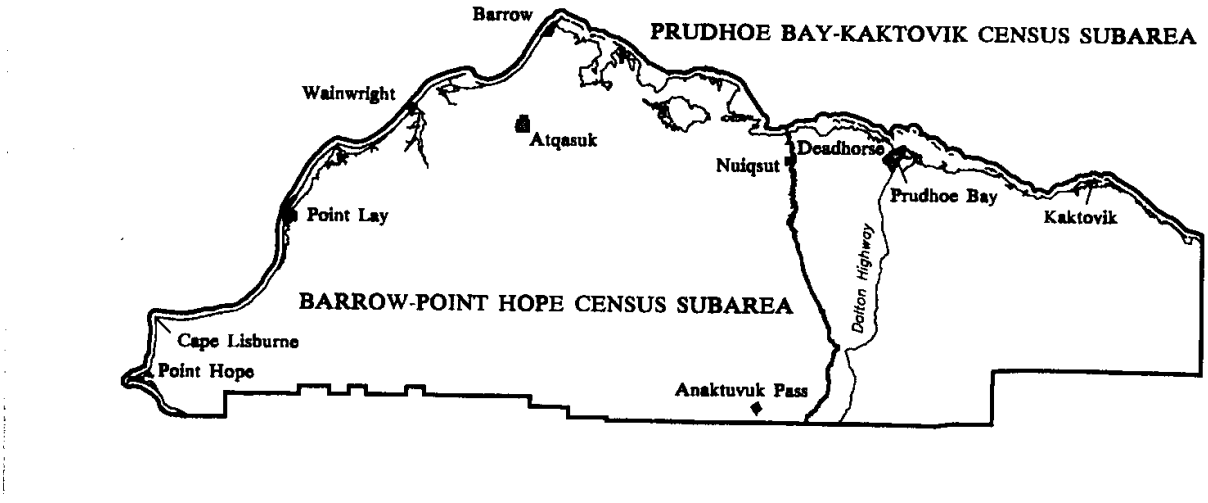
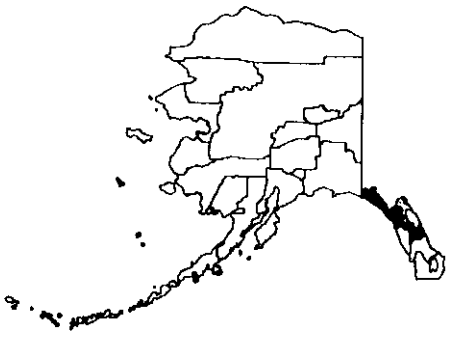


Figure 2-11 North Slope Borough

Southeast Alaska Communities



The communities of Southeast Alaska have coordinated regional solid waste management activities through the Southeast Conference. The largest communities in the region include Haines, Skagway, Juneau, Sitka, Petersburg, Craig, Hydaburg, Ketchikan, and Wrangell. A map of Southeast Alaska is shown in Figure 2-12. The Southeast Conference contracted two solid waste studies before implementing regional solid waste solutions. The first study was an assessment of existing solid waste management systems in the region and the second study was a regional recycling study.

Following completion of the studies in 1993, the Southeast Conference organized a scrap metal collection program in 1994 to haul out accumulated metals from southeast communities. Participating communities paid a proportional share of the costs of barging the metal to a metal recycling company in Washington state. Although the scrap metal barge was a one-time operation, future programs may be developed on an as-needed basis.

The Southeast Conference also organized a household hazardous waste collection program. Approximately $200,000 was granted to the Southeast Conference from the State of Alaska for the purchase of a mobile hazardous waste collection van with mini-laboratory. The van is stationed in Juneau and is transported by ferry to Southeast communities when needed. The Alaska Department of Environmental Conservation coordinates this operation. The Alaska State Ferry provides a 50 percent discount from regular hauling fees. Each community pays a proportional amount of the costs of shipping its household hazardous waste out of the state to a permitted recycling or disposal facility. The communities estimate that the cost of using the regional household collection van is less than half the cost of separately operating their own household hazardous waste management systems.

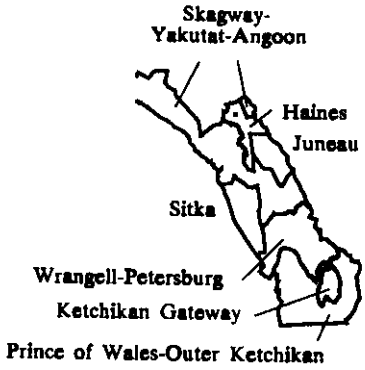


Figure 2-12 Southeast Alaska

Tenakee Springs

Tenakee Springs is a coastal community of approximately 100 people located in Southeast Alaska and can be seen in Figure 2-13. The City of Tenakee Springs is unique in that they do not have a landfill. All waste generated in the town is either burned by residents or is containerized and shipped to another town that has a landfill. Each household is responsible for managing their own waste. The community is accessible only by water and is serviced by the Alaska State Ferry System. Most of the waste generated in the community is transported out of town on the state ferry, but some waste is also hauled out by individuals in their private boats.

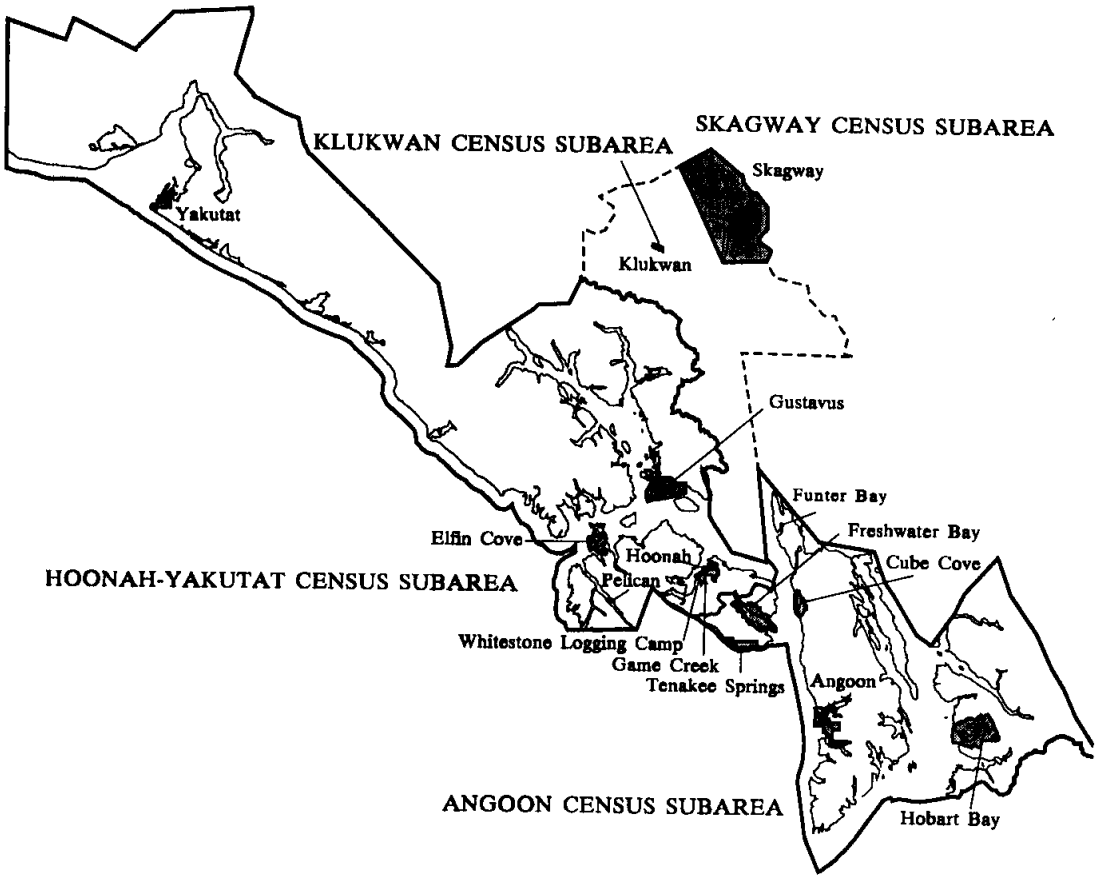


Figure 2-13 Tenakee Springs and the Upper Portion of Southeast Alaska

Summary and Conclusions

In all cases, regionalization of waste management has resulted in improved control and management of waste. In addition, in most cases regionalization has reduced overall waste management costs.

A review of these success stories can provide insight into the process necessary to implement a successful regional waste management program. Almost all regional programs included the following:

- An administrative body with control authority over waste management in the region;
- A planning process to determine the most suitable management options;
- A funding mechanism to pay for the capital and operating costs of the waste management system.

It appears that communities considering a regional waste management system should consider developing at least these three program components. Boroughs without solid waste powers should consider assuming these powers and developing a waste management program with sufficient staff and enforcement authority to administer the program. Communities without local or regional government should consider appointing a regional waste management authority to administer the waste management system. The regional solid waste authority must be given the authority to commission studies, charge fees necessary to operate the system, and enforce waste management objectives.

REGION.DOC

CHAPTER 3
REGIONAL SOLID WASTE STUDIES

Introduction

There have been several solid waste studies that have included a review of regional waste management opportunities in Alaska in addition to the studies and programs described in Section 2. A brief summary of the regional considerations in these studies is presented in this Section. The following reports were reviewed:

- Interior Alaska Solid Waste Management Study
- Denali Borough Solid Waste Study
- Cordova Solid Waste Management Plan Update
- Prince of Wales Island Solid Waste Study
- Aleutians East Borough Solid Waste Management Plan

Other regional solid waste studies that were completed too late to be included in this report include the following:

- Prince William Sound Waste Management Plan
- Federal Facilities Regional Solid Waste Studies
- Kodiak Island Borough Master Waste Management Plan

Interior Alaska Solid Waste Management Study

A study prepared in 1991 by HDR Engineering, Inc. evaluated the feasibility of establishing regional solid waste facilities along the highway system of interior Alaska. This study was funded by the state of Alaska and was administered by the Alaska Department of Environmental Conservation (ADEC). The study was initiated after the state began to close dumps along the highway. The Alaska Department of Transportation and Public Facilities (ADOT/PF) used to maintain small community dumps along the highway, but began closing the dumps in the mid-1980s in response to budget cuts. The commissioner of ADOT/PF was ordered by the governor in 1986 to cut the agency's budget and in an effort to reduce state spending he decided to close all dumps maintained by the agency. This decision resulted in the closure of 12 dumps along the highway system, affecting 15 communities. A map of the interior highway system is shown in Figure 3-1, with the recommended location of landfills (L) and transfer stations (T).

The dump closures created a solid waste crisis for the communities along the highway system. The state commissioned the solid waste study in a effort to develop a plan for the communities in the unorganized borough sections of the highway system.

The study evaluated the economics of three scenarios representing different hauling and disposal philosophies. Scenario 1 uses the large regional landfill approach, with landfills located in Glennallen and Healy serving most of the study area. Scenario 2 is near the mid-point of the

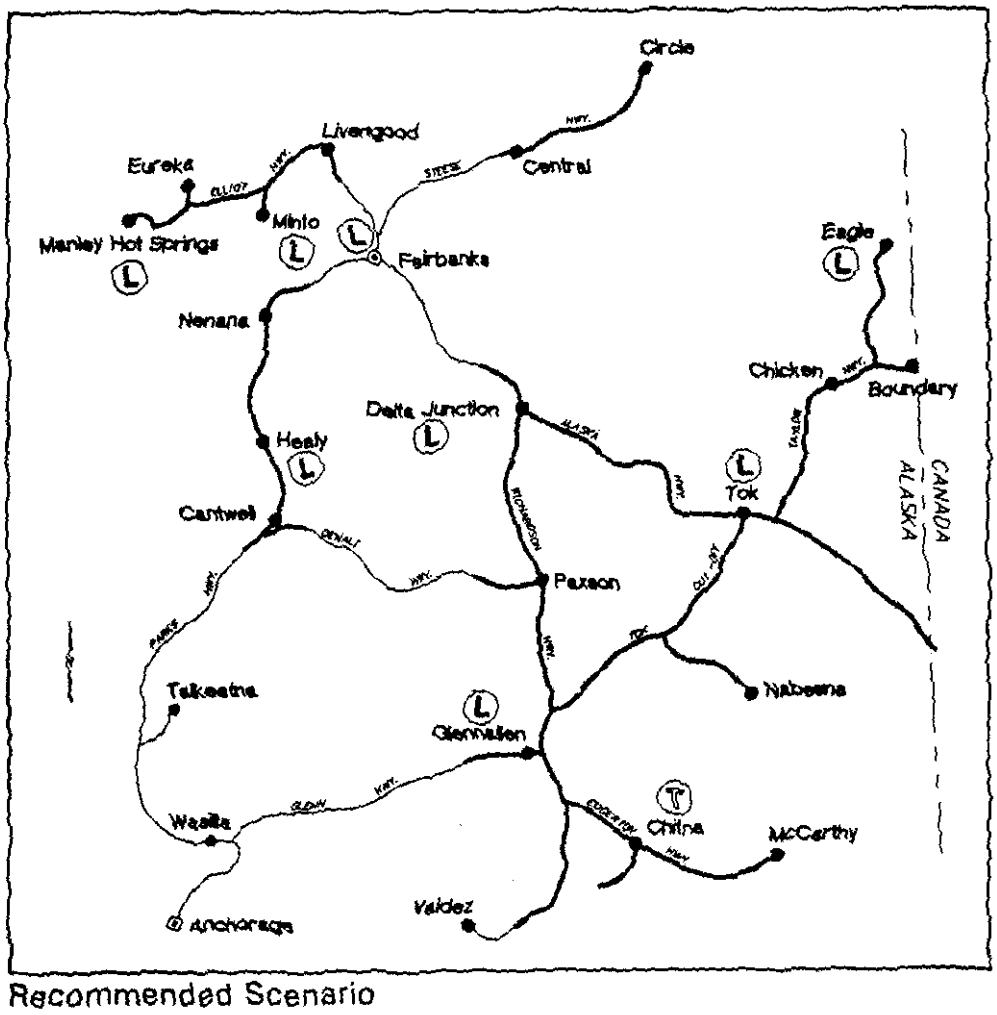


Figure 3-1 Interior Alaska Highway Communities

spectrum, with landfills in Glennallen, Tok, Delta Junction, and Healy. Scenario 3 favors the idea of using many local landfills, with a landfill in almost every community.

Scenario 2 was determined to be the most economical solution for the region. Three of the four regional landfills recommended by the study were still in operation in 1995. The Healy Landfill was closed in 1994, but the Anderson and Nenana landfills were still in operation and serving the region. As sanitary landfill standards continue to increase, the communities along the highway system may find it less expensive to maintain even fewer landfills rather than pay the expense of upgrading the existing landfills to meet new design and operation standards.

The study also recommended the formation of a solid waste management authority for the region or regions. The study area consists of multiple unincorporated communities and areas of sparse population lacking local government entities. Without an entity to administer the solid waste system, there is nobody to develop the funding, planning, and management of the

system. The report listed the following as possible options for the development of a solid waste management organization:

- Private corporation
- Public corporation
- New state agency or a new responsibility for an existing agency
- Coalition of communities
- Coalition of the existing companies that currently handle solid waste within the study area
- Coalition of government / private entities
- A borough formation in this area with assumption of solid waste powers

Denali Borough Solid Waste Study

Following completion of the interior highway solid waste study, the section of the study area along the George Parks Highway between Cantwell and Anderson became incorporated as the Denali Borough. The borough commissioned a solid waste study to determine the best waste management plan for the borough. The report titled *Solid Waste Management Alternatives in the Denali Borough* was prepared by Akins Associates in association with Terra Matrix, Inc., and was issued on November 17, 1993.

There were four landfills in the Borough at the time of the study. They were the Anderson Landfill, Clear Air Force Site Landfill, Healy Landfill, and the Cantwell Landfill. All the landfills in the borough would require significant improvements to meet sanitary landfill standards. The location of the Denali Borough is shown in Figure 3-2.

The consultant originally evaluated five alternatives, and reduced that number down to three alternatives for more detailed evaluation. The five alternatives reviewed were:

Alternative A: Continue With Existing Facilities:

Make the necessary upgrades to meet the October 1995 requirements for the Anderson, Cantwell, and Healy landfills.

Alternative B: Continue with a Subset of Existing Facilities:

Stop receiving waste at one or two of the existing facilities prior to the October 1995 deadline and upgrade the remaining facility(ies).

Alternative C: Develop a New Regional Denali Borough Landfill:

Under the control of the Borough, develop a new landfill to handle all of the Borough's solid wastes. Stop receiving wastes at the existing facilities prior to the October 1995 deadline.

Alternative D: Outside Party Develops New Regional Landfill:

Assist an outside party, such as the Alaska Railroad Corporation (ARRC) or the Alaska Resources Conservation Corporation (ARCC) to develop a regional facility to serve the Borough's needs. Stop receiving waste at the existing landfills prior to the October 1995 deadline.

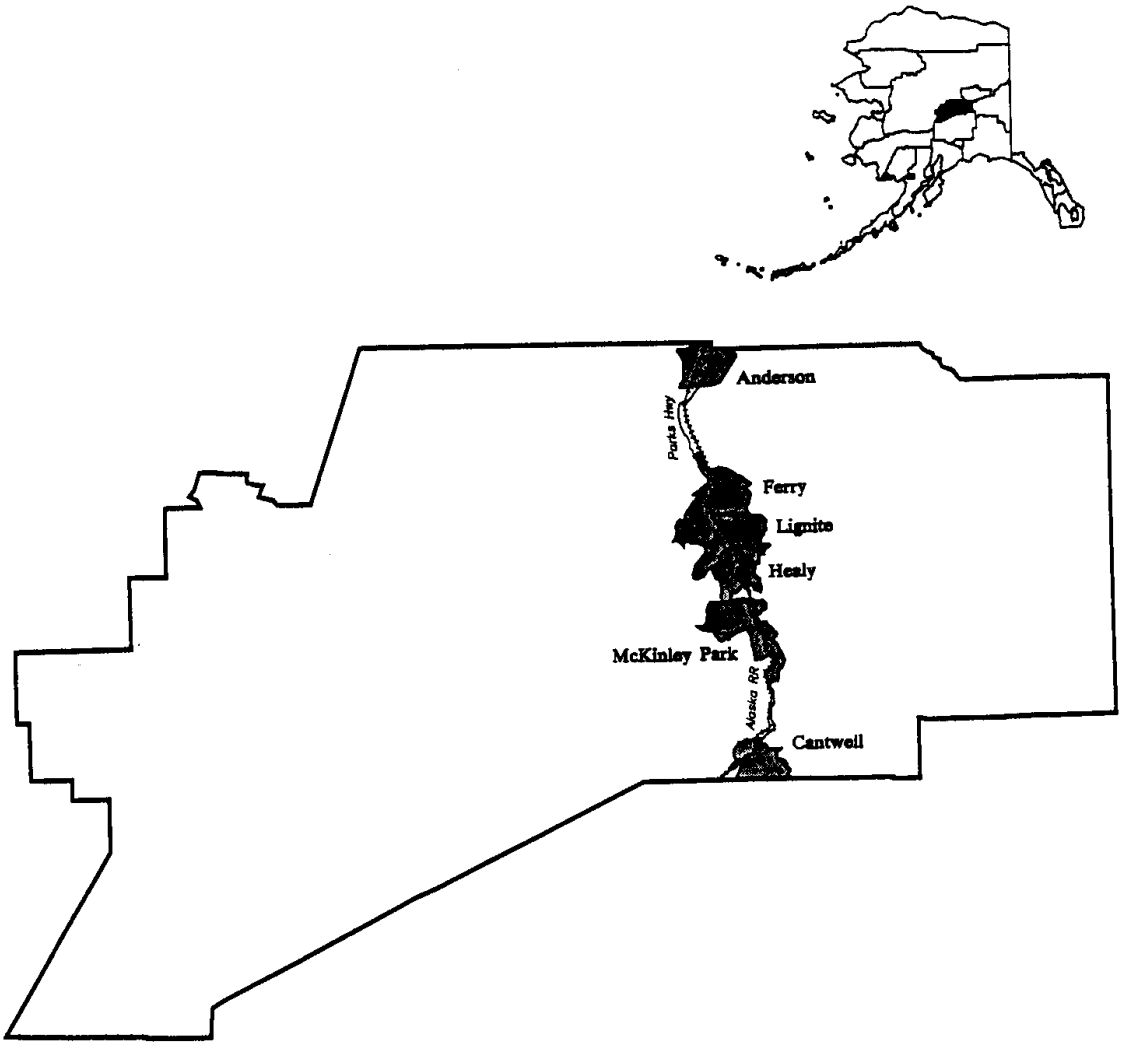


Figure 3-2 Denali Borough

Alternative E: Ship Wastes Out of the Borough:

Develop the necessary transfer station facilities to allow waste collection and shipment to another regional landfill, such as the Nenana city landfill, the Fairbanks landfill, or the Mat-Su Borough Central landfill. Stop receiving wastes at the existing facilities prior to the October 1995 deadline.

The following criteria were used in the evaluation of alternatives:

- Geologic and hydrologic conditions;
- Ease of access and permitting;
- Borough control over operations;
- Long-term liability;
- Haul distances;
- Final land use impacts; and
- Costs.

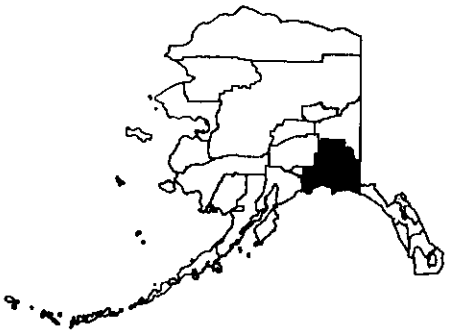
Alternative A, maintaining the three community landfills in the Borough, was eliminated from detailed study because of high costs and liability. Alternative D, waiting for development of a new regional landfill by a third party, was eliminated from further consideration because regional facilities were still in the early stages of planning and development.

The report recommended Alternative B, reopening the Healy landfill as a regional landfill for the Denali Borough, and establishing transfer stations at Anderson, Cantwell, and Denali Park. This option was found to be the least expensive and scored the best on the other criteria reviewed. The report also recommended closing the Cantwell and Anderson landfills. The Clear AFS landfill was not addressed because it is operated by the federal government.

In retrospect, it appears that the authors substantially under-estimated the costs of a compliant landfill. Shipping waste to the Fairbanks North Star Borough or the Matanuska-Susitna Borough would be a less expensive option than building and operating a compliant regional landfill. In addition to being a low cost option, Alternative E also scored equally well with Alternative B and Alternative C with regard to non-cost evaluation criteria.

The Denali Borough assumed solid waste management powers in November of 1994, and is taking the first steps necessary to properly manage wastes in the region. In 1996, the borough decided to build their own regional landfill. A special waiver was requested from the state that would allow an unlined landfill. The state approved the liner exemption after it was demonstrated by the borough that there was no potential for leachate to migrate from a selected site near the City of Anderson. The liner exemption significantly reduced the cost of constructing and operating a landfill and made the local landfill option less expensive than shipping borough generated waste to the neighboring Fairbanks North Star Borough or the Central Landfill in the Matanuska-Susitna Borough. The Denali Borough Regional Landfill was constructed in 1998.

Cordova



CH2M HILL completed a solid waste management plan update for the City of Cordova in 1993. The study reviewed a wide variety of waste management options for the city. The short-term option for the next 5 to 10years recommended continued use of the existing municipal landfill and the construction of a separate construction and demolition (C&D) waste landfill. The plan also recommended shipping the waste to a regional landfill facility once the existing landfill reaches capacity. The cost and difficulty of building and maintaining a new lined municipal landfill in Cordova were found to be greater than shipping the waste to a regional facility. Shipment to the "Lower 48" by barge was found to be the least expensive long-term solution. Shipping waste to a regional landfill in Glennallen was also considered, but found to be more expensive than shipping to the "Lower 48". The economics of a regional facility in Glennallen could change if other communities in the region were to share in the costs shipping waste and upgrading the Glennallen Landfill. A map of the Cordova and Copper River areas is shown in Figure 3-3.

After further review of landfill options in 1997, the City of Cordova decided to apply for a permit to construct an unlined landfill near Mile 17 of the Copper River Highway. Although an unlined landfill carries more risk than a lined facility, it is significantly less expensive than barging waste to the Lower 48. Their existing landfill is expected to be full in 1999 and the city will either build a new unlined landfill or ship the waste out.

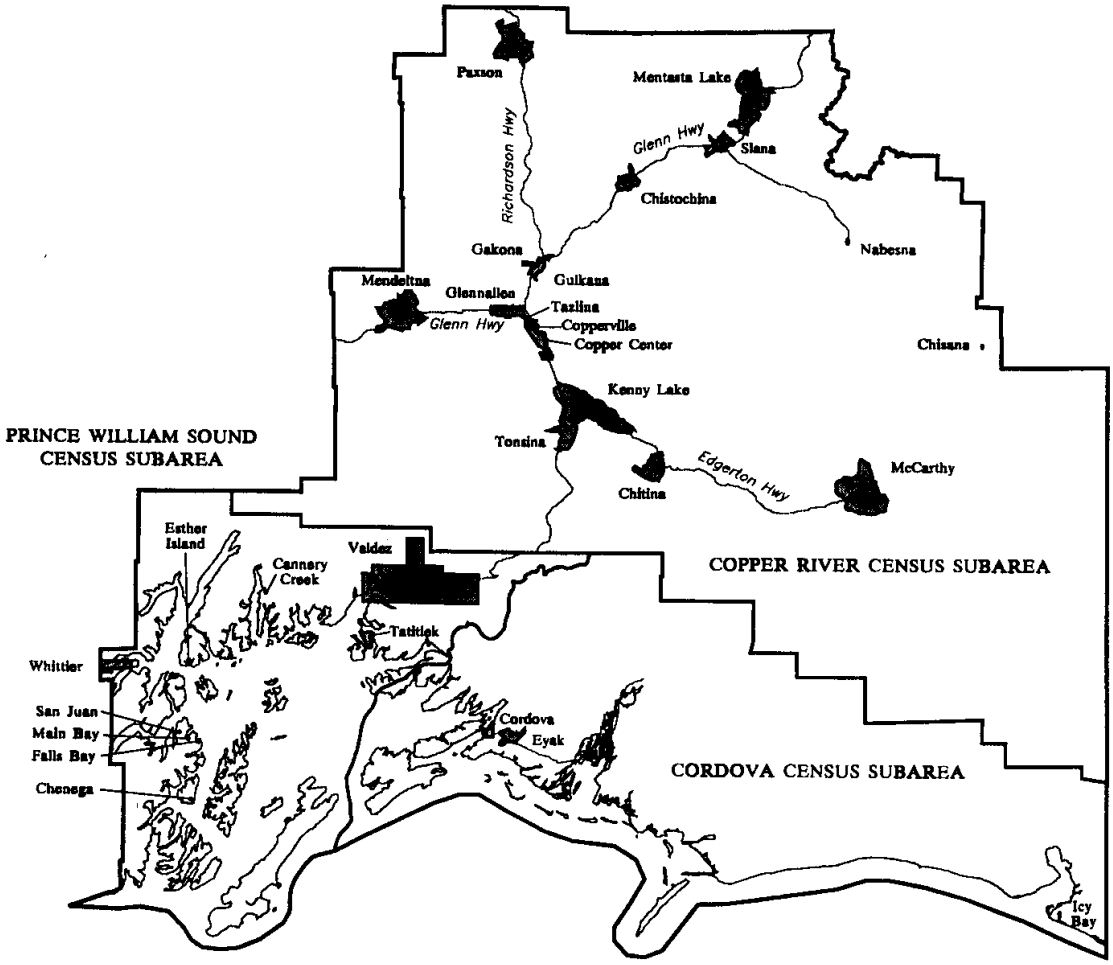


Figure 3-3 Cordova and Copper River Areas

Prince of Wales Island Solid Waste Study

In March, 1991, James M. Montgomery Consulting Engineers, Inc., *et alia*, through a grant from the Alaska Department of Environmental Conservation, published a solid waste management study evaluating several options for the eight Prince of Wales Island communities: Coffman Cove, Craig, Hollis, Hydaburg, Kasaan, Klawock, Thorne Bay, and Whale Pass. A map of the island is shown in Figure 3-4.

Accurate characterization of waste generation including assessment of current solid waste practices and demographic data for each affected community was accomplished. The communities represented a total population of approximately 3400 persons and generated approximately 4,100 tons (14,000 cubic yards) of municipal solid wastes (MSW) in 1990. This equated to about 11 tons per day or 6.5 pounds / person / day. The communities, with the exception of Hollis, disposed of their MSW in local landfills or dumps. Hollis residents transported their waste to the Klawock landfill. Only the Kasaan and Klawock landfills were permitted by ADEC at the time of the study.

Garbage collection service was available at Craig, Kasaan, Klawock, Hydaburg and Thorne Bay. Monthly rates ranged from $7.50 at Kassan to $15.00 at Thorne Bay. Hollis residents hauling their garbage to Klawock paid the normal gate fee. Residents of Coffman Cove and Whale Pass hauled their garbage to the local dump, but paid no charge. Of the communities maintaining a separate solid waste budget, only Kasaan showed an annual operating surplus of $800.00. On the basis of the estimated total annual tons of MSW produced and the actual funds expended, the average cost for collecting and disposing of the MSW was $16 / ton at Kasaan, $38 / ton at Thorne Bay, $78 / ton at Craig, $79 / ton at Hydaburg and $100 / ton at Klawock.

Municipal Solid Waste management options considered by the study were:

1. An improved landfill for each community;
2. a regional landfill serving all communities;
3. an incinerator and improved landfill for each community;
4. a regional incinerator and improved landfill serving all communities;
5. transshipment of all solid waste off-island;
6. source reduction;
7. recycling; and
8. regional composting facility.

The various options were considered and developed under the following assumptions:

1. Each facility is sized to adequately handle the projected twentieth year MSW loading.
2. Land costs are not included in cost estimates.
3. All capital items are constructed new and have a twenty year effective life.

4. All equipment is purchased new and has a ten year effective life.

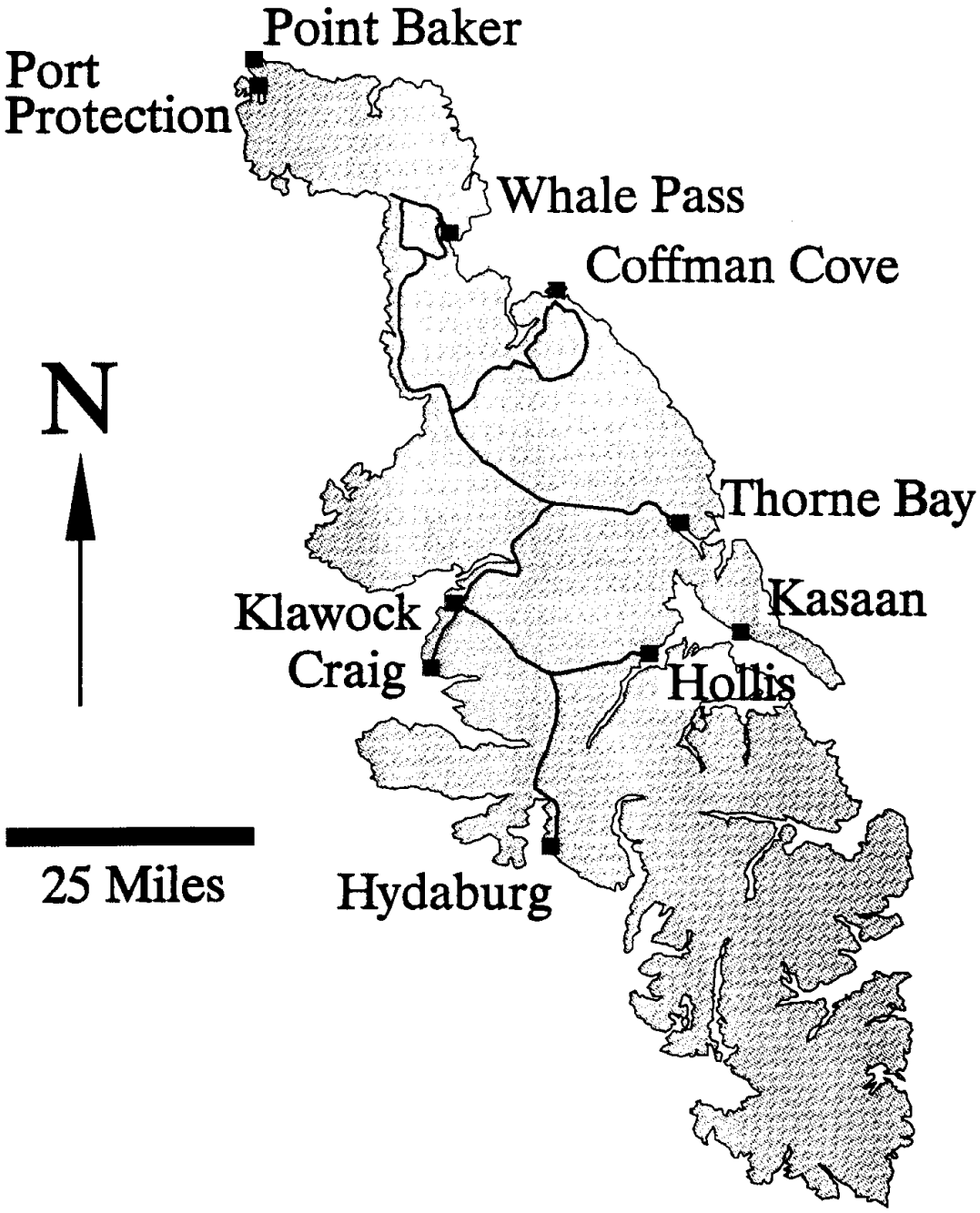


Figure 3-4 Prince of Wales Island

5. Labor rates, including all overhead costs, are: $19/hr for gate attendants, $25/hr for operators and $29/hr for management.
6. One man year equates to 2080 hours.
7. Costs for collection services within the communities are not included.
8. Kasaan is to be linked into the island's road network.
9. The roads from Control Lake to Coffman Cove and Whale Pass are to be state maintained.
10. Local projections of population growth will be valid for the 20 year planning period.

The MSW options were compared using the average cost per ton for disposal. This cost was calculated using the total tons of MSW processed during the 20 year period, based on the individual communities' projections of growth rate. The original capital cost for each facility was depreciated over the 20 year effective life, the equipment costs were depreciated over the 10 year effective life. Equipment and operations and maintenance costs were to increase during the planning period according to projected population growth rates. Future closure costs were discounted to present worth and distributed over the entire 20 year operating period.

Costs were developed for the following MSW management options:

1. Transshipment of MSW off-island, including intra-island transfer, with and without regional recycle;
2. Regional MSW composting, including intra-island transfer, with and without regional recycle;
3. Lined landfills for each community, with and without regional recycle;
4. Lined regional landfill, including intra-island transfer, with and without regional recycle;
5. Unlined landfills for each community, with and without regional recycle;
6. Unlined regional landfill, including intra-island transfer, with and without regional recycle;
7. Incinerators at each community with lined ash fills, with and without regional recycle; and
8. Regional incinerator with lined ash fill, with and without regional recycle.

Table 3-1 is a summary of the average cost per ton for each option; it shows the most expensive, generally, are those involving separate facilities for each community. Since capital, equipment and O&M costs do not proportionally decrease with the volume of MSW, each community would experience significantly greater unit costs were they to implement any option involving separate facility operations. Of the regional options, the lowest unit cost is for an unlined landfill facility, whether or not a recycle program is included. The next lowest cost alternative is for a regional composting facility, which costs 30 percent more than an unlined landfill without a recycle program, but only 8 percent more if a recycle program is included in both. The unit cost for regional lined landfill is 33 percent higher than for an unlined facility without recycle, and about the same as for a composting facility. If a recycle program is included, the lined

landfill is significantly more expensive than either of the other two (24 percent higher than the unlined landfill and 15 percent higher than the composting facility).

Table 3-1
Prince of Wales Municipal Solid Waste Options - Cost Summary

MSW OPTION	AVERAGE COST PER TON OF MSW							
	COFFMAN COVE	HOLLIS	HYDABURG	KASAAN	KLAWOCK CRAIG	THORNE BAY	WHALE PASS	REGIONAL
TRANS SHIPMENT								
TRANSFER INTRA-ISLAND								$27
TRANSSHIP OFF-ISLAND								$89
SUBTOTAL								$116
RECYCLE								$28
GRAND TOTAL								**$144**
COMPOSTING								
TRANSFER INTRA-ISLAND								$27
COMPOST FACILITY								$52
SUBTOTAL								$79
RECYCLE								$15
GRAND TOTAL								**$94**
LINED LANDFILLS								
TRANSFER INTRA-ISLAND								$27
LINED LANDFILL	$599	$806	$255	$1,129	$96	$139	$1,038	$53
SUBTOTAL	$599	$806	$255	$1,129	$96	$139	$1,038	$80
RECYCLE	$28	$28	$28	$28	$28	$28	$28	$28
GRAND TOTAL	**$627**	**$834**	**$283**	**$1,157**	**$124**	**$167**	**$1,066**	**$108**
UNLINED LANDFILLS								
TRANSFER INTRA-ISLAND								$27
UNLINED LANDFILL	$406	$567	$184	$816	$66	$92	$745	$33
SUBTOTAL	$406	$567	$184	$816	$66	$92	$745	$60
RECYCLE	$28	$28	$28	$28	$28	$28	$28	$28
GRAND TOTAL	**$434**	**$595**	**$212**	**$844**	**$94**	**$120**	**$773**	**$88**
INCINERATORS								
TRANSFER INTRA-ISLAND								$27
LINED ASHFILL	$137	$172	$59	$247	$27	$37	$222	$17
INCINERTOR	$200	$192	$134	$244	$95	$112	$215	$88
SUBTOTAL	$337	$364	$193	$491	$122	$149	$437	$132
RECYCLE	$28	$28	$28	$28	$28	$28	$28	$28
GRAND TOTAL	**$365**	**$392**	**$221**	**$519**	**$150**	**$177**	**$465**	**$160**

Unit costs for the regional transshipment facility are about 93 percent higher than the lowest cost option before recycle, and 65 percent higher with recycle. A regional incinerator is the most expensive option, with unit costs approximately 120 percent higher than for an unlined landfill without recycle, and about 84 percent higher if recycle is included.

Recycling increases the total unit cost for each option. Revenues received from the sale of recycled goods do not offset the expenses incurred to collect, process, and ship them to markets in Seattle. The immediate benefit from recycling, other than resource preservation, is that the effective life of the landfill option is extended.

Table 3-2 is a comparison of the various regional facilities incorporating O&M, equipment, capital and closure costs and the average cost per ton. This illustrates the large impact that relatively small increases in O&M costs and equipment costs have on the unit cost for a facility. Because capital costs are distributed over a 20 year life, a sizable increase in capital costs produces comparatively small increases in unit costs. If capital funding can be obtained for a project, it may be cost effective to accept higher capital costs to achieve lower operating and equipment costs over the effective life of the facility.

Table 3-2
Prince of Wales
Comparative Cost of Regional Facilities

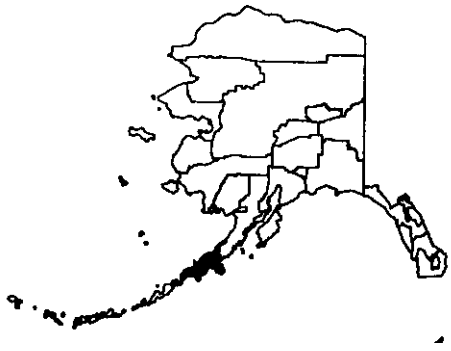
Item	Regional Transship Facility	Regional Compost Facility	Regional Lined Landfill	Regional Unlined Landfill	Regional Incinerator Facility
First Year O&M Cost	$481,520	$202,466	$160,98	$98,081	$439,059
Equipment Costs	$341,000	$358,600	$550,00	$550,000	$198,000
20 Year Capital Cost	$743,042	$1,835,435	$1,012,97	$456,264	$4,824,704
Closure Costs	$0	$34,200	$136,04	$136,049	$75,070
Average Cost/Ton (Facility)	$89	$52	$5	$33	$105
Average Cost/Ton Transfer Intra-Island	$27	$27	$2	$27	$27
Average Cost/Ton (W/O Recycle)	**$116**	**$79**	**$8**	**$60**	**$132**
Average Cost/Ton (Recycle)	$28	$28	$2	$28	$28
Average Cost/Ton Total	**$144**	**$94**	**$10**	**$87**	**$160**

While the regional unlined landfill is the lowest unit cost alternative, and there is sufficient expansion area at the existing Klawock dump site for a possible 50 years of future operation, the current state of flux with the revision of the ADEC solid waste management regulations renders this option questionable. The next best choice is, however, not immediately obvious. A regional lined landfill or a composting facility have virtually the same unit cost before recycling is factored in. If an aggressive recycle program were to be implemented the regional composting facility can gain a 15 percent cost advantage over the lined landfill.

Both the lined landfill and the composting facility have their own unique advantages and disadvantages. Design, construction and operation of a lined landfill is well understood and proven, though it does require the most land space of all the options considered. MSW composting is still a developing technology; there would inevitably be design, construction and operational difficulties encountered if such a facility were built on Prince of Wales Island. The regional composting facility would convert the garbage to a material that would be used as cover at the facilities' small landfill site. It is recognized that not all garbage can be converted into something useful. It might be possible to produce a marketable soil supplement, but the positive economics of this potential remains to be proven. The options of transshipment or incineration were found to be the most expensive of all those considered.

The study concluded that the most effective MSW management plan for the communities of Prince of Wales Island should include a balance of several efforts. The least costly to implement would be reducing the amount of MSW generated on the island. Next would be an aggressive island-wide recycle program. The ultimate solution will be for the communities to accept a complete island-wide MSW management facility, either a lined landfill or a composting facility located at the existing Klawock site.

Aleutians East Borough Solid Waste Management Plan



The Aleutians East Borough solid waste management plan was prepared by HDR Engineering, Inc., in 1990 and considers regional options for the borough communities of Akutan, Cold Bay, False Pass, King Cove, Nelson Lagoon, and Sand Point. The location of the Aleutians East Borough is shown in Figure 3-5. Solid waste facilities location, design and regulatory criteria were selected on the basis of: existing state and federal requirements and the specific environmental and economic character of the borough region. Site specific characteristics which could significantly affect suitability of alternatives, for example, the existence of local or regional transportation systems

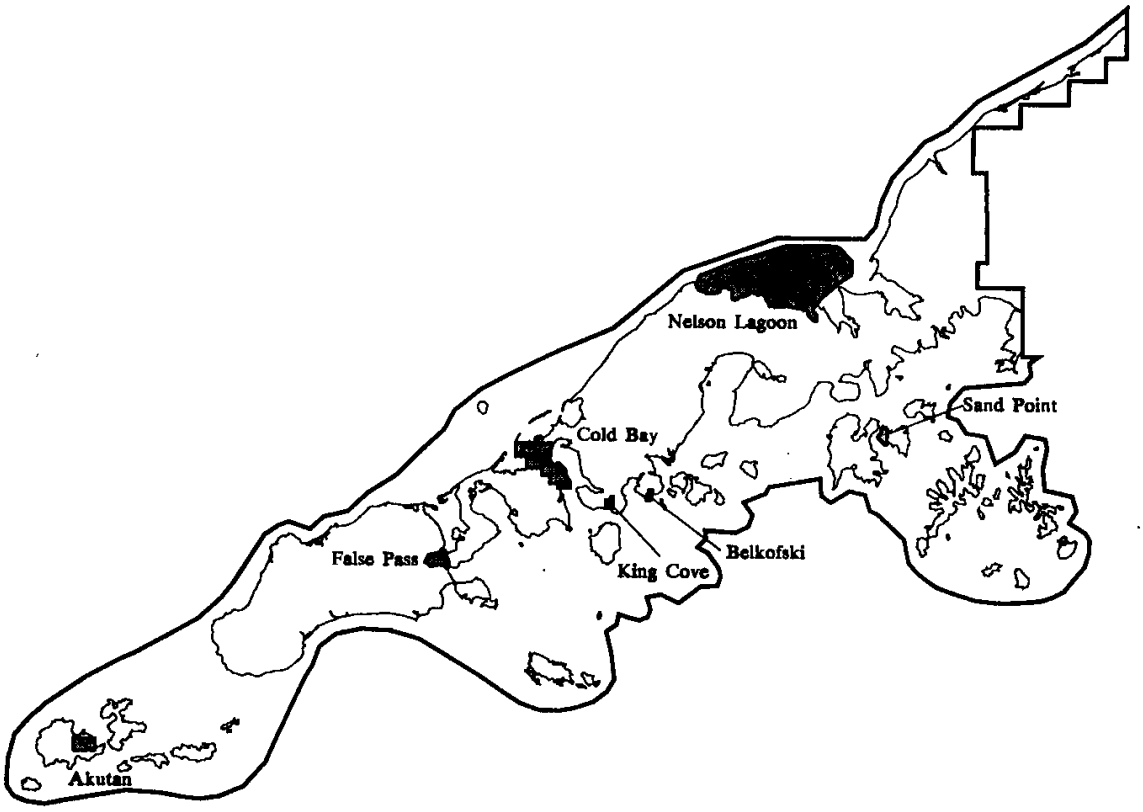


Figure 3-5 Aleutians East Borough

were included in the selected criteria. The criteria selected for use in the evaluation of alternatives included the following:

- Environmental sensitivity
- Land availability
- Groundwater/surface water conditions
- Health hazard
- Weather
- Topography
- Nuisance potential
- Cover material
- Local transportation availability
- Regional transportation availability
- Energy Costs
- Available equipment
- Growth potential
- Regulation changes

The reviewed options for each community are listed below with the recommended alternative is indicated in bold typeface.

Akutan

1. Repair existing incinerator, city waste only, ash and sludge barged to another landfill.
2. Compaction of waste and transfer to regional landfill, city waste only.

Option 1 was recommended as the preferred alternative because it had the lowest capital cost and present worth and was capable of meeting critical requirements.

Cold Bay

1. Construct a local landfill.
2. Construct a regional landfill.

Both options were found to be equally viable. The decision to develop a regional facility will be based on the current or future need or desire for a regional facility, partly determined by the operation constraints of the other communities.

False Pass

1. Construct a new local landfill.
2. Transfer station and haul to a regional landfill.

The long-range cost of the two options are about equal, but option 2 is recommended because of lower initial capital costs and less environmental impacts.

King Cove

1. Renovate existing landfill, use burn box for volume reduction
2. Close existing landfill, compact and transfer to regional landfill.

The renovation of the existing landfill was found to be the least costly option and it should be possible to meet all major requirements.

Nelson Lagoon

1. Construct a new landfill.
2. Incinerate and landfill locally.
3. Incinerate and transfer to a regional landfill.

Incineration coupled with transport of the ash and residue to a regional landfill was recommended as the most feasible alternative. Operation of a landfill locally was estimated to be very expensive and difficult to manage.

Sand Point

1. Renovate existing landfill and bale waste.
2. Build new landfill, use baler to compact.
3. Construct new transfer station with compactor and transfer to a regional facility.

It was recommended that the baler facility option sited at a new landfill location be selected for further implementation.

In summary, it was recommended that the borough maintain up to three landfills for the six communities. One or more of the landfills would be designated as a regional landfill and waste from the three communities with landfills would be barged to the regional landfill.

Summary and Conclusions

Each of the reports described in this Section found that some form of solid waste regionalization would be beneficial to the communities studied. Both economical and environmental benefits were cited. In most regions, it was found that the continued operation of a small landfill in each community was not the most economical or environmentally sound option and that regionalization of solid waste management was the preferred option.

REGION.DOC

CHAPTER 4
REGIONAL SOLID WASTE DISTRICTS

Requirement to Form Solid Waste Regions

Section 4006(a) of the Resource Conservation and Recovery Act (RCRA) requires states to define solid waste management regions for purposes of encouraging and facilitating the development of regional planning for solid waste management.

The regulations require the Governor or designated representative to identify solid waste regions after consultation with regional and areawide planning agencies, water quality and solid waste management planning agencies, cities, and counties and other appropriate units of general purpose local government. For unknown reasons, the state of Alaska never defined solid waste management regions in Alaska.

Each solid waste management region was supposed to form a designated authority to manage solid waste. Each regional solid waste authority was to operate under the guidance of the state solid waste management plan and regulatory framework.

Regional authorities were to be designated for all areas of the state where municipal solid waste is generated. Title 40 Code of Federal Regulations (CFR) 255.30(a) requires that in the event that no local or regional agency is held responsible for disposal for a region, a State agency should be identified and held accountable for the operation of the solid waste system. For unknown reasons, the state of Alaska has not designated a solid waste management utility to manage waste in the unorganized borough.

Alaskan Communities and Solid Waste Disposal

Existing solid waste districts consist of solid waste management authorities developed by cities, boroughs, and villages. In some areas, private companies have assumed control over solid waste without local government oversight or assistance.

Governmental bodies in Alaska consist of cities, boroughs, and native village councils. In addition, there are some communities that lack any organized form of government. In 1995, there were 16 boroughs and 145 incorporated cities in Alaska, of which 47 cities were within boroughs and the remaining 98 cities were outside of organized boroughs. Not included in the above numbers is the city of Metlakatla, which was organized as a city under federal law. Eight of the boroughs have designated solid waste powers. Most of the other boroughs also exercise solid waste authority despite the lack of designated powers. A large percentage of the cities in Alaska have designated solid waste powers and also own or operate solid waste utilities.

The Department of Community and Regional Affairs (DCRA) community database lists 330 communities (cities, villages, and other population centers) in Alaska. The U.S. Census Bureau identified 327 communities (>25 people) in 1991. About 216 of these communities have a dump or landfill. Only 10 communities have what could be considered to be a sanitary landfill and the rest could be considered to be open dumps that poses a threat to human health or the

environment to some extent. About 114 communities transport their waste to another disposal facility and do not have a dump or landfill.

According to 1991 census figures, about 40 percent of the state population lives in Anchorage, 30 percent in other urban places (>2,500 persons), and 30 percent in rural places (<2,500 persons). About 52 percent of the waste generated in the state is deposited in the Anchorage Regional Landfill. The eight largest landfills in Alaska manage 86 percent of the waste and about 208 small rural landfills manage about 14 percent of the waste. The percentage of waste by community is illustrated in Figure 4-1.

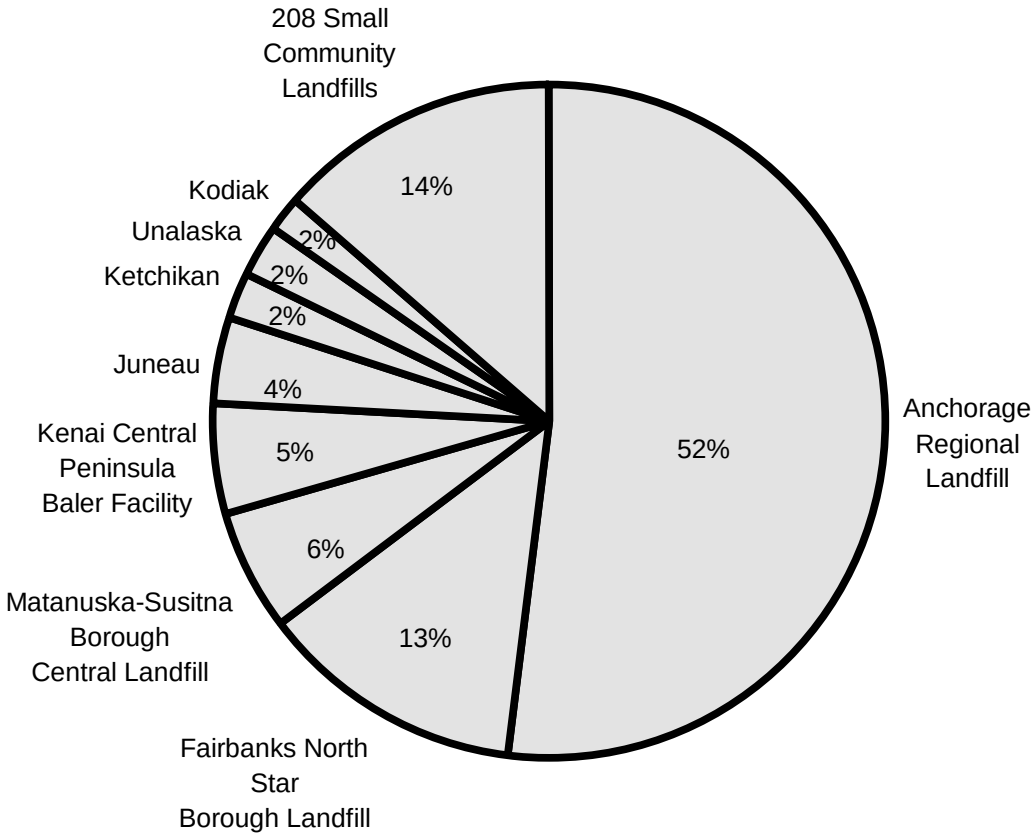


Figure 4-1 Percentage of Solid Waste By Community

Criteria For Solid Waste Regions in Alaska

Criteria for the establishment of solid waste regions was published in 40 CFR 255.10. The Alaska Chapter of SWANA has modified these criteria to conform with Alaska conditions. The recommended criteria for the establishment of solid waste regions in Alaska are as follows:

- Geographical areas that have a history of cooperating to solve problems in environmental or other related matters should be considered;
- Regions encompassing existing regional, including borough-wide systems or institutions, including those of the private sector, should be considered. Changes in their boundaries may be needed for economic viability or other reasons in keeping with appropriate waste management plans;
- Boundary selection that would require the creation of new agencies should be considered only where necessary. The relationship among established agencies should be considered. Where institutional gaps or inadequacies are found, regions should be identified keeping in mind which agencies would be able to fill those needs;
- The size and location of regions should permit resource recovery and conservation in accordance with the objectives of Alaska waste reduction and recycling laws such as Alaska Statute 46.06.021;
- A region's size and configuration should be considered, weighing transportation costs against economies of scale;
- Left-over regions having inadequate resources or volumes of waste should be avoided;
- Location should be considered relative to available transportation and markets for recovered resources;
- The volume of waste within a region will influence the technology choices for recover and disposal determine economies of scale, and affect marketability of resources recovered. A region should include sufficient volume of waste to support the goals and objectives of proper waste management, including recycling and energy recovery goals;
- Waste type should be considered since it also affects management options. Industrial or hazardous waste streams may warrant special consideration or special boundaries;
- The effect of geologic and hydrologic conditions, such as soil suitability, land availability, natural barriers such as rivers and mountain ranges, the quantity and availability of water resources, and the susceptibility of groundwater to contamination should be considered. Aquifer protection in accordance with Alaska water quality management plans and policies could influence boundary selection;
- Coordination with ongoing planning for other purposes may be an influence in selecting boundaries;
- To the extent possible, conterminous planning regions should be encouraged, and larger regions should be multiples of whole smaller regions.

Development of Solid Waste Regions

Regionalization Questionnaire

The Alaska Chapter of SWANA prepared a questionnaire to find out what communities felt about solid waste regionalization and requested communities outside of any regional district to propose an appropriate region for solid waste management. A copy of the regionalization criteria was also included with the questionnaire. A copy of the questionnaire is included in Appendix A. The questionnaire was sent to 79 communities and 26 responded, yielding a 33 percent return rate. The questionnaires were sent to communities most likely to respond, such as SWANA members and communities with a recognized form of government. Questionnaires were not sent to unorganized communities that lack a designated individual with authority to represent the community.

The communities without solid waste regionalization were asked if they thought regionalization could benefit their community. Six communities thought it could and 8 communities thought it wouldn't.

Communities were asked to identify what areas and communities adjacent to them that they thought would make a suitable solid waste region. Two communities identified their native corporation region and seven identified nearby communities.

Communities without solid waste control were asked to identify who they thought would make a suitable solid waste authority for local solid waste management. Three communities thought their city should control solid waste management. One community identified their borough. Two communities identified their local native corporation and one community identified the Alaska Chapter of SWANA.

When asked if their community had ever implemented regionalization for recyclables or hazardous waste, seven communities answered yes and 14 answered no.

When asked if they thought regionalization of solid waste could reduce solid waste management costs, ten answered yes, seven said no, and four didn't know.

State Input Into Region Formation

The Alaska Chapter of SWANA contacted the Alaska Department of Community and Regional Affairs and the Alaska Boundary Commission for recommendations on the formation of solid waste regions. The agency and commission recommended that existing boroughs be considered as solid waste regions because the criteria for establishing a borough correlates well with the criteria for solid waste regions. For the unorganized borough, the use of census areas may be a practical starting point for identifying solid waste regions.

Existing and Proposed Regional Solid Waste Regions

The state of Alaska can be divided into regions based on the solid waste regionalization criteria. Boroughs, by default, can be considered to be solid waste regions. Areas outside of boroughs can be grouped by communities that meet the regionalization criteria.

The U.S. Census Bureau has identified communities in Alaska and grouped them into census regions. A communities outside of an organized city or borough are classified as a census

designated places (CDP). To be recognized as a CDP, a place must have a sense of community and 25 or more resident persons. CDPs in the unorganized borough are grouped together into census regions. Figure 4-2 shows the state of Alaska divided into boroughs and census areas. For regional planning purposes, it is recommended that communities within a census region consider the feasibility of forming a regional solid waste district.

Communities should not limit regionalization to within their region. For example, the Denali Borough may want to form a regional agreement with the Matanuska-Susitna Borough since waste generated along the Denali Highway in the Matanuska-Susitna Borough must be transported through the Denali Borough on its way to the Central Landfill. It makes economical sense to haul waste to the closest permitted landfill, but regional agreements are necessary for this to occur. Likewise, communities in Southeast Alaska already share household hazardous waste collection facilities and may plan to expand trans-regional agreements. Agreements between boroughs will be necessary for combined shipment of waste to a regional facility.

Regionalization can extend beyond the state of Alaska. Some communities are shipping their waste, recyclables, and household hazardous waste to regional facilities in Washington and Oregon.

Solid waste regions do not need to remain fixed. Regions may be expanded or redrawn depending on changes in population or other conditions.

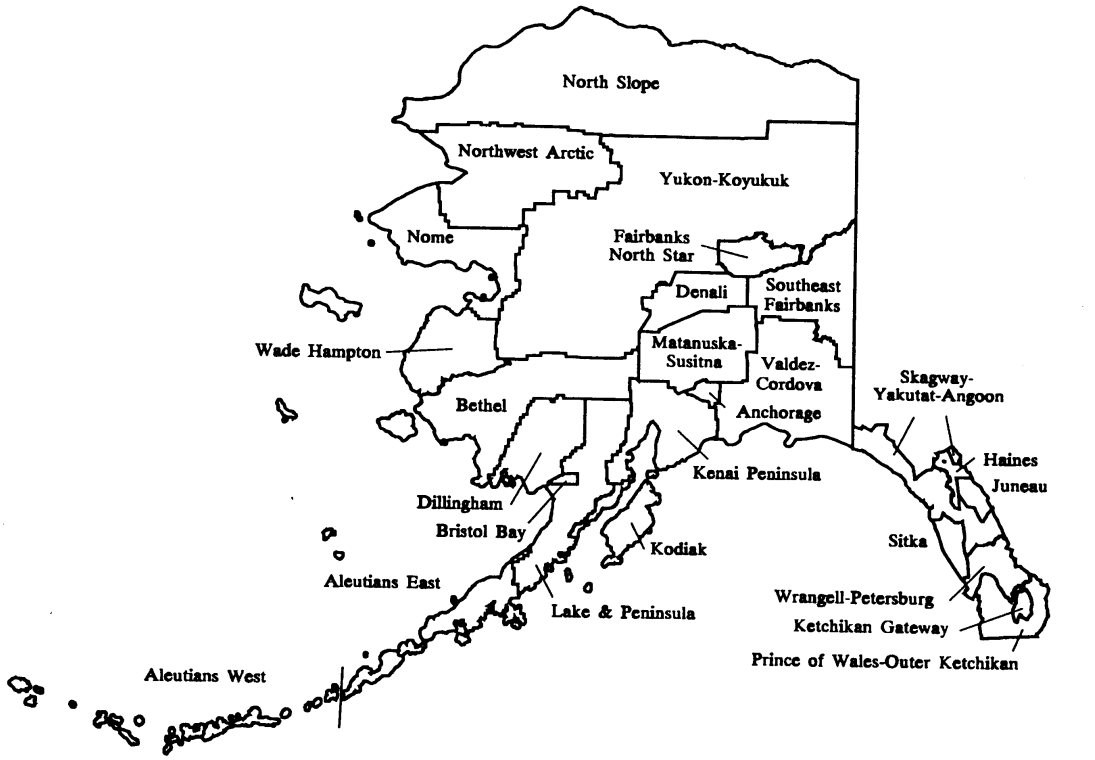


Figure 4-2 Alaska Boroughs and Census Areas

CHAPTER 5
ECONOMICS CONSIDERATIONS OF REGIONALIZATION

Introduction

The relatively high cost of small landfills is often a major factor in the decision to form regional agreements to share facilities. In many situations, regionalization can result in cost savings; however, a full review of system costs and options is recommended before implementing a regional plan.

The total cost of a solid waste management system can be broken down into the following areas:

- Administration
- Collection
- Processing
- Disposal

Administrative functions include activities such as planning, funding, financing, accounting, equipment purchase, personnel management, public information, inspections, and enforcement. These costs usually comprise about 10 percent of the entire system costs and range from 5 to 20 percent.

Collection involves the storage, pickup, and transportation of waste from the source to the final processing and disposal facility. The maintenance and operation of collection equipment and maintenance of storage facilities is usually included under collection costs. This is often the most expensive component of waste management and ranges from 20 to 80 percent of the total system costs.

Processing include activities such as sorting, hazardous waste screening, recycling, baling, incineration, composting, and other activities that make the waste more manageable or suitable for disposal or recycling. Processing costs are highly variable depending the methods used. The processing costs for a typical landfill operation with nominal recycling is usually around 10 percent of the full system costs, but can range from 5 to 40 percent of costs.

Disposal is the final component of a waste management system and usually involves the operation and maintenance of a landfill. Disposal costs include the purchase of land for disposal, design and construction of a landfill, disposal of waste in the landfill, purchase and maintenance of equipment and cover material, final closure, monitoring, and post-closure care and monitoring. Disposal costs are usually about 20 to 40 percent of the total waste management costs. Figure 5-1 shows a typical distribution of solid waste management costs for a local city landfill where residential and commercial waste collection is provided. The actual distribution of costs will vary between communities depending on site specific conditions. Regionalization usually causes a shift in system costs. For example, shipping municipal waste to another landfill will increase collection and shipping costs but will reduce local landfill operation and maintenance costs.

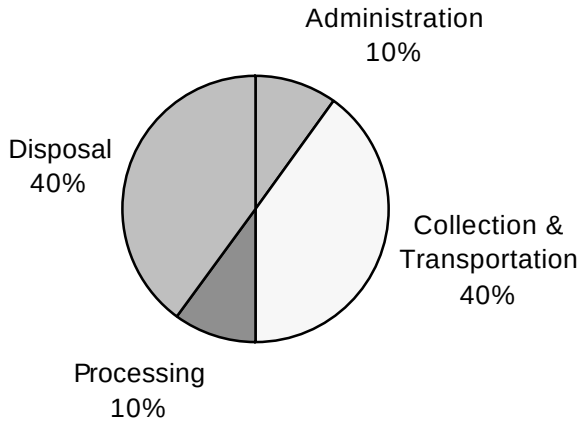


Figure 5-1. Typical distribution of solid waste management costs

Administrative Costs

Solid waste system administrative costs are not always apparent and may be combined with other community costs. For example, a public works director administers a variety of community facilities and services, but the portion of time spent on solid waste management usually is not separated from other duties. Likewise, a local enforcement officer may take action to resolve a litter or sanitation problem, but these efforts are usually not accounted to the solid waste system.

Under a regional approach, a solid waste administrative body may be developed to oversee solid waste functions for a group of communities. These administrative bodies are usually called regional or district solid waste boards or authorities and usually consist of professional staff capable of running the solid waste system. Appropriate staff for a regional solid waste authority may consist of engineers, accountants, attorneys, or other informed citizens. Some regional districts prefer to have a representative from each community on the board to protect special interests.

Costs for solid waste administration are usually included in collection or disposal fees. Under a regional system, each community usually pays their proportion of administration fees based on the quantity of waste and solid waste services required.

Collection and Transportation Costs

Costs for collecting and transporting waste can vary substantially for communities. Many small communities have no collection system, and each family and business is responsible for transporting their waste to the disposal facility. Other communities provide dumpster or curb

side collection of solid waste. Collection fees charged by a hauling company usually include both the collection and disposal costs in the fee.

Under a regional system, a community may decide to ship their waste to another location for final disposal. Shipping waste out of a community makes particular sense if the costs of maintaining a landfill are higher than shipping the waste to another facility. In some instances, a community may lack suitable property for a landfill or may not want the environmental risk of a waste site near their community.

Shipping costs vary depending on the location, frequency, and quantity of waste to be shipped. Typical shipping costs in 1995 dollars are presented in Table 5-1. Information for this table was obtained from various shipping companies. Shipping costs may be reduced by a community by pre-processing waste to reduce the volume or weight of waste for shipment. For example, incineration can reduce the weight and volume of waste by as much as 85 percent. Also, baling can reduce the volume of waste and will allow more material to fit into a shipping container. This factor is particularly important in situations whereby shipping costs are charged by the number of containers. Regular and repeated shipments are usually less expensive than one-time shipments of materials. It is usually possible to negotiate lower rates for long-term, regular service. It is also possible to enter into a long-term contract to fix or control shipping costs. There is usually sufficient competition to switch shippers if one company attempts to raise the rates above reasonable costs. The Alaska Public Utilities Commission regulates waste collection and hauling costs of large collection companies and may provide additional price protection for some communities.

Table 5-1
Typical Shipping Costs in Alaska

To - From	Shipping Method	Dollars per Ton
Anchorage to Seattle	Container ship	120
Bethel to Anchorage	Airplane	550
Nome to Anchorage	Airplane	650
St. Paul to Anchorage	Airplane	1,660
Barrow to Anchorage	Airplane	1,800
Ketchikan to Seattle	Barge	75
Juneau to Seattle	Barge	100
Prince William Sound to Seattle	Barge	120
Kodiak to Seattle	Container ship	120

Processing Costs

The least expensive method of handling waste is to simply bulldoze it into a landfill. All other activities, such as recycling, baling, or incineration will be more expensive. Recycling costs vary depending on the amount and types of waste recycled. It is generally recommended that only items with market value be recycled or the facility may end up landfilling the material or recycling costs may substantially exceed and cost savings. Waste screening is required at all landfills and should be considered to be a normal component of every waste management program.

Although waste processing can be expensive, it may reduce overall system costs. For example, baling or incinerating waste can reduce the volume of waste and will extend the life of the landfill. Saving landfill space saves landfill construction costs. Also, volume and weight reduction is highly recommended if waste is shipped a long distance because shipping costs can be reduced. The costs and benefits of each processing method should be considered before implementing a waste processing system.

Landfill Cost Formula

The cost of building and operating a sanitary landfill have increased in recent years. In 1991, the U.S. Environmental Protection Agency (USEPA) issued new municipal solid waste landfill regulations under Subtitle D of the Resource Conservation and Recovery Act (RCRA). Alaska solid waste regulations were revised on January 28, 1996 in order to conform with the federal standards. Subtitle D establishes criteria for landfill siting, design, operation, groundwater monitoring, closure, post-closure, and financial assurance. Some small remote landfills may be exempt from the design and groundwater monitoring requirements, but most of the other standards still apply and all landfills must be designed and operated in a manner that minimizes health or environmental threats.

A formula was developed by Henry Friedman to estimate the cost of constructing and operating a sanitary landfill in Alaska. Actual cost figures and estimates were taken from a wide variety of sanitary landfill facilities across Alaska and form the basis for the formula. The derivation of the formula is described as follows.

Landfill design and construction costs in Alaska are typically around $350,000 per acre. Table 5-2 lists the source of this cost estimate.

Landfill closure and 30 years of post-closure costs were also estimated for rural Alaska. Cost estimates from various firms ranged from $100,000 to $700,000 per acre. For estimating purposes, the lower figure was chosen, but environmental problems could easily be in the higher end of the cost range. This cost estimate is based on the design and operation of a sanitary landfill; therefore, post-closure remediation costs are expected to be low. Remediation costs for open dumps can be expected to be closer to the high range estimate. The total landfill design, construction, and post-closure cost is therefore $450,000 per acre.

Table 5-2 Typical Sanitary Landfill Design and Construction Costs in Alaska	
Cost per Acre	**Source of Information**
$418,083	Dames & Moore/R.W. Beck - 1994 Fairbanks Solid Waste Management Study
$336,428	CH2M HILL - 1992 Unalaska Tipping Fee Analysis
$344,707	Montgomery Watson - 1992 Prince of Wales Solid Waste Study
$369,565	CH2M HILL - 1995 Anchorage Regional Landfill - Actual Costs

It is estimated that an acre of land can hold about 12,000 tons of solid waste if the center of a rectangular site has waste piled to a depth of 30 feet with 3 horizontal to 1 vertical side slopes. It was assumed that the waste would be compacted to a density of 1,000 pounds per cubic yard and about 20 percent of the volume would be cover material.

The life of the landfill is dependent on the number of people generating waste. The average waste generation rate is about 6 pounds per person per day, which equals about one ton per year per person. Therefore, the population is equal to the number of tons of waste produced each year. The life of a landfill is determined by dividing the waste capacity of the site by the annual in-place waste generation rate.

Typical landfill operating costs in Alaska are about $150,000 per year based on a review of numerous sanitary landfill facilities in Alaska. This factor applies to a wide variety of mid-range to small landfills.

From the above information, the following formula can be derived:

$$\frac{\$450{,}000 / acre + \left(\frac{(12{,}000\ tons / acre)(\$150{,}000 / yr)}{Population} \right)}{12{,}000\ tons / acre}$$

The results of the equation can be seen in Figure 5-2

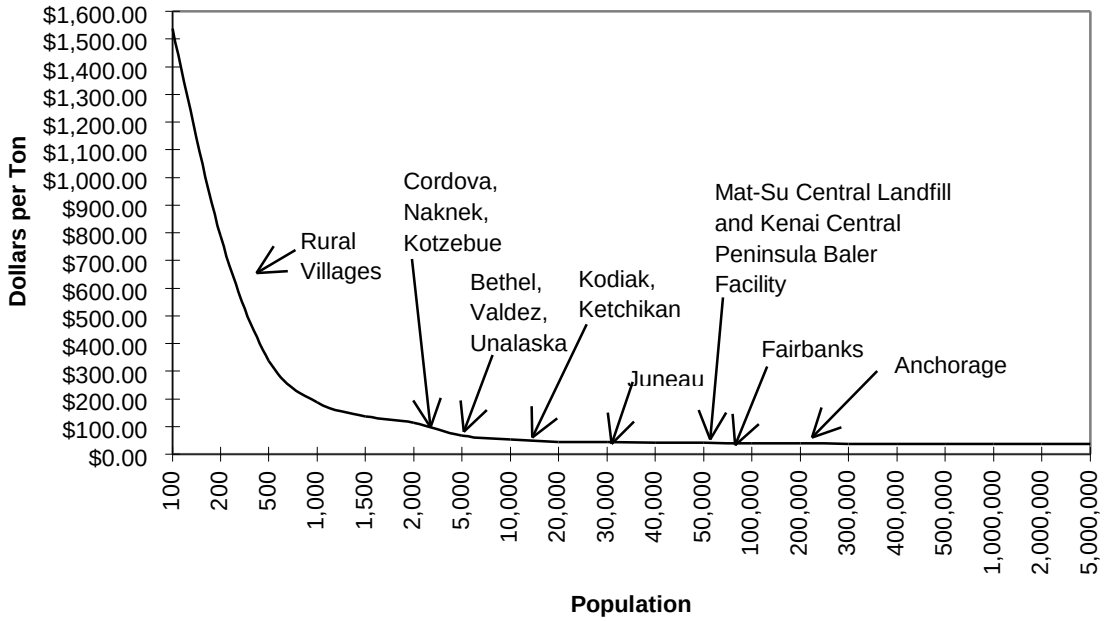


Figure 5-2. Disposal Costs vs Population Size

From the above figure it can be seen that disposal costs for the larger landfills in Alaska, such as Anchorage, Fairbanks, Matanuska-Susitna Borough, and Kenai Peninsula Borough, should be in the $38 to $43 per ton range, and mid-range landfills, such as Kodiak, Ketchikan, and Juneau, should be in the $43 to $53 per ton range, small cities such as Bethel, Unalaska, and Valdez, should be in the $53 to $68 per ton range, and small villages should be in the $340 to $1,500 per ton range.

A summary of appropriate disposal costs based on population size are presented in Table 5-3. It should be recognized that disposal costs are just part of the total system costs. Tipping fees at many landfills include other system costs in addition to disposal costs and therefore should be higher than the listed disposal costs.

It is apparent from this information that small landfills are not very economical and this may be one of the reasons why small communities often have an open dump rather than a sanitary landfill. Small communities should consider the feasibility of processing their waste and shipping it out to a more economical regional landfill. Some communities may decide to live with the problems and liability of an open dump rather than pay the required amount to upgrade their landfill operation to sanitary standards. Under the Land Disposal Program Flexibility Act of 1996, the governor of the State of Alaska has the authority to exempt landfills in native villages that dispose of less than 20 tons of municipal waste daily from any and all solid waste regulations and laws. The risks and potential liability costs should be carefully weighed against other options if the dump alternative is chosen. The risks associated with open dumps range anywhere from direct threats to human life to minor litter problems.

Table 5-3 Disposal Costs vs Population Size	
Population Range	**Disposal Cost Range ($/ton)**
100,000 to 500,000	39 to 38
10,000 to 100,000	53 to 39
5,000 to 10,000	68 to 53
2,000 to 5,000	112 to 68
1,000 to 2,000	187 to 112
500 to 1,000	340 to 187
100 to 500	1,500 to 340

Environmental consulting firms and insurance companies with landfill bonding experience can help determine landfill risk valuation.

The actual cost of building and operating a sanitary landfill is highly variable and depends on land costs, site conditions, availability of local materials for design components, labor costs, regulatory requirements, and other factors. The general landfill cost formula appears to correlate well with actual landfills cost estimates prepared for individual landfills in Alaska, but actual costs for a landfill may vary.

Comparison with other Utilities

The actual cost of other utilities, such as electricity, telecommunications, and fuel, were compared with the size of the community and a similar cost correlation to solid waste management was found to exist. The proportional higher cost for smaller communities is similar. This finding diminishes the argument that waste cannot be managed in a sanitary manner in small communities because the cost is too high. Methods have been found to deliver other utilities in small, rural communities despite higher costs. In many cases, actual costs are subsidized to make utility cost more affordable to small communities. For example, the Power Cost Equalization Program reduces the cost of electricity in rural communities. Perhaps similar programs could be developed to reduce solid waste management costs in rural communities.

Tipping Fees

Tipping fees are the amount charged for the receipt of waste. Fees are usually charged on a per ton basis, but some facilities without a scale charge by the vehicle load or volume. Fees based on weight are preferred over fees for volume because the volume can change depending on the amount of compaction. Residential customers are usually charged by the vehicle rather than a weight basis for convenience purposes. The tipping fee is usually established to recover costs of solid waste administration, processing, and disposal and usually do not include collection fees. Disposal costs estimated by the cost formula should be increased by about 10 to 20 percent to

account for administrative and processing costs. A summary of tipping fees charged in Alaska are presented in Table 5-4.

Table 5-4
Tipping Fees in Alaska in 1996

Facility	Average Intake (tons/day)	Tipping Fee ($/ton)
Anchorage Regional Landfill	700	45
Fairbanks North Star Borough Landfill	220	40
Juneau Channel Landfill	50	140
Ketchikan	40	102
Mat-Su Central Landfill	100	45

The tipping fees established by various communities do not necessarily cover all solid waste system costs. For various reasons, a community may choose to subsidize the cost of solid waste management through other funds. For example, raising the fee higher than a neighboring community may result in waste flowing to the less expensive facility, thus depriving the higher priced facility of tipping fee revenue. Also, a community may feel that tipping fees based on full cost recovery may be unreasonably high and customers would object strongly to the high fee. In these cases, a community may choose to supplement the tipping fee revenue with funds from other sources to pay the full costs of the solid waste management system.

Summary

The full cost of managing solid waste consists of administrative, collection, processing, and disposal costs. These costs are proportionally higher for smaller communities, particularly for communities under 2,000. Regionalization can usually reduce overall costs, but each situation should be reviewed individually. Factors other than economics may be involved in the decision to regionalize. Regionalization of waste may result in better management of waste and less environmental harm to a community.

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CHAPTER 6

TRANSPORTATION

Introduction

Regionalization of solid waste management usually requires the transportation of waste from various sources to a processing and disposal facility some distance from the source of waste generation. The availability of a waste transport systems is therefore a key issue in regionalization.

The state of Alaska has spent millions of dollars developing transportation networks across the state. The main components of the state transportation system consist of the following:

- A marine highway system, docks, and port facilities;
- Airports and landing strips in most communities
- Several highway network systems connecting communities

In terms of waste management, the transportation system should be viewed as a two way street. In many cases, the transportation system that brings supplies to a community can be used to haul waste out. The use of existing transportation systems is often the least expensive method of transporting waste because the costs have already been paid for the transportation of materials to a community. The use of the same equipment to backhaul waste can often be obtained at a reduced cost.

Water Transport

Alaska State Ferry

The Alaska state ferry can be used to transport waste between communities they serve. In some instances this is already being done. For example, the majority of waste generated in Tenakee Springs is transported to Ketchikan or Juneau on the Alaska State Marine Highway. Some ferry officials indicated to ADEC that they do not want the ferry system to be used for hauling waste, but state and federal commerce laws prohibit the ADOT/PF from restricting the transport of waste. The Alaska state ferry is a suitable transport system for waste if properly containerized.

Barge and Container Shipping

There are numerous private barge and container shipping companies that serve coastal communities in Alaska. Most of the transport vessels haul more supplies to Alaska than on the return trip, leaving plenty of capacity to backhaul waste.

Container ships require more draft than barges and can be used at only deep water ports. Containers are usually of a standard international size so they can be stacked and transported through intermodal systems. The containers can be transfered to truck trailers for highway transport or rail cars.

The use of container shipment of waste in the Lower 48 is very common. Leakproof containers designed specifically for solid waste transport are often used. Containers used for food and other types of goods cannot be used for the transport of waste. Container shipment of waste is well developed in Washington and Oregon. Most of the waste generated on west coast cities is transported to regional landfills located in low-populated desert areas in eastern Washington and Oregon. Waste from Alaska could be added to this system at a relatively low cost because the infrastructure is already present. The quantity of waste generated in Alaska would constitute on a small fraction of the waste currently hauled.

Barge transport of waste is also a viable option, particularly communities without a deep water port facilities needed to accommodate container ships. Barges have been used to haul scrap metal and waste from Prudhoe Bay, Shemya, Bristol Bay Borough, southcentral and southeastern Alaskan communities.

Figure 6-1 lists the majority of water transport services available in Alaska. This figure was produced by *Marine Digest and Transportation News* and is reproduced herein by permission of the magazine. Shipping is limited to summer months in areas north of the Alaska Peninsula. Communities are advised to contact the listed transport companies for more detailed information.

Air Transport

There are about 600 published airports and more than 3,000 airstrips in Alaska, according to the Alaska Office of the Federal Aviation Administration (FAA). Most of the airports are owned and operated by the State of Alaska and certified by the FAA. Many of the smaller airstrips are private and are not maintained on a regular basis.

During the 1970s, the Alaska Department of Transportation and Public Facilities (ADOT/PF) began building airport runways in most Alaskan villages and the state continues to upgrade and increase the number of airports in rural Alaska. Air transport has improved access to many small communities and has also resulted in an increase of solid waste. Dump problems began to develop in many rural communities shortly after the airports were built.

Air transport is heavily subsidized by the federal government. Very few communities pay the full cost of maintaining or operating their airports. Also, the federal and state government subsidizes the cost of mail delivery and other shipments to rural areas in Alaska. These subsidizes have contributed to the distribution of materials from industrialized society to remote communities.

To a large extent, air transport has been viewed as a one-way transport mode, and has been viewed as too expensive to haul waste materials out of remote communities. Air cargo shipment of solid waste, however, is possible and in many cases more economical than attempting to construct and manage a sanitary landfill in many small communities. This situation is particularly true in communities that lack suitable land for a waste disposal.

Air transport costs for solid waste can be significantly reduced by processing the waste before shipment. Incineration can reduce the weight and volume of municipal waste by as much as 80 percent. Baling can also reduce the volume of waste. Containerization of waste is usually

required before shipment. Most of the air cargo companies can supply suitable containers for shipping a variety of materials.

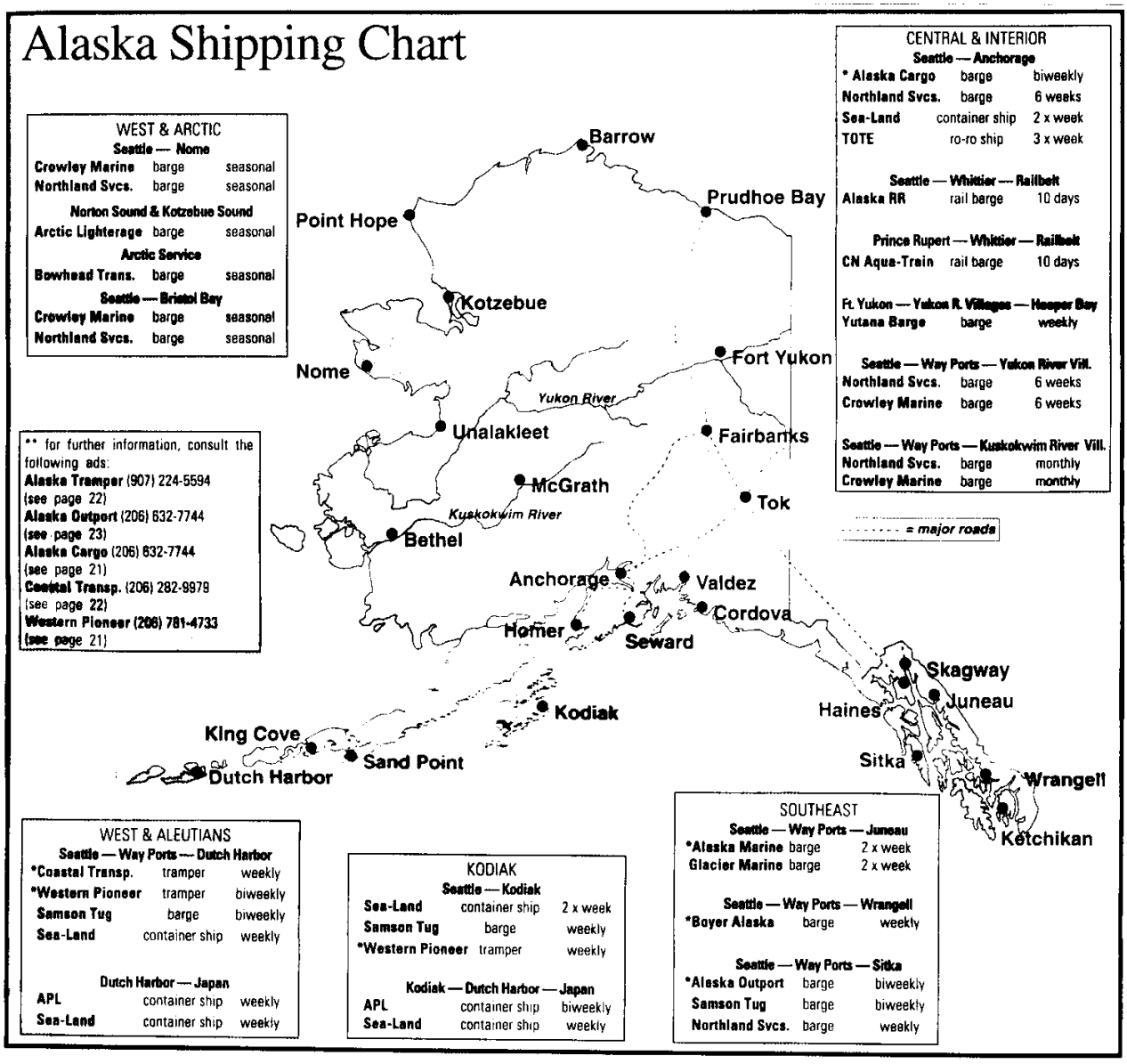

Figure 6-1 Alaska Shipping Chart

Highway Transport

There are about 12,000 miles of paved highway in Alaska and several highway networks. The highway system has been used extensively for regional transport of waste in Alaska. All of the large boroughs along the interior highway system use transfer stations and truck haul systems to transport waste from rural areas to regional landfills. The regional transport of waste along other highways in Alaska is also common.

Transfer stations can be established to replace small dumps. There are many types of transfer trailers and vehicles designed for hauling waste. The size and type of container depends on the waste generation rate and frequency of transport. Intermodal containers are also available and allow waste to be transported on a variety of systems, such as container ship, rail, and highway.

Summary

The transportation infrastructure in Alaska is well developed and can be used to transport waste to regional facilities. The same transport method that is used to transport materials to a community should be considered for use to transport waste out of small communities that have difficulty operating a sanitary landfill in an economical and environmentally sound manner. Waste processing is usually performed before shipping, such as incineration or baling, to reduce the volume and weight of the waste. There are usually specific waste containerization requirements of each mode of transport. The transportation system continues to be improved in Alaska and provides a means for shipping materials in and out of isolated communities.

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