

IX. SOLID WASTE DISPOSAL ALTERNATIVES

There are few alternatives available to the community because of the airport separation problem, the proximity of the National Park, and the general lack of land available within the community available for a solid waste disposal site. Three alternatives are presented in this study:

Alternative A: New Solid Waste Site Located North of Gustavus Near the End of the Main Road.

Alternative B: Upgrade the Existing Disposal Site Located Within Gustavus.

Alternative C: Tranship Solid Waste to Juneau and Disposal at the Juneau Landfill.

Although incineration is not presented as an alternative, it can be combined with any of the three options presented above as a means of reducing waste volume. Another possibility for reducing waste volume is the use of a mechanical baler. These options are presented as Additive Alternatives 1 and 2.

Alternative A -- New Solid Waste Site Located North of Gustavus Near the End of the Main Road

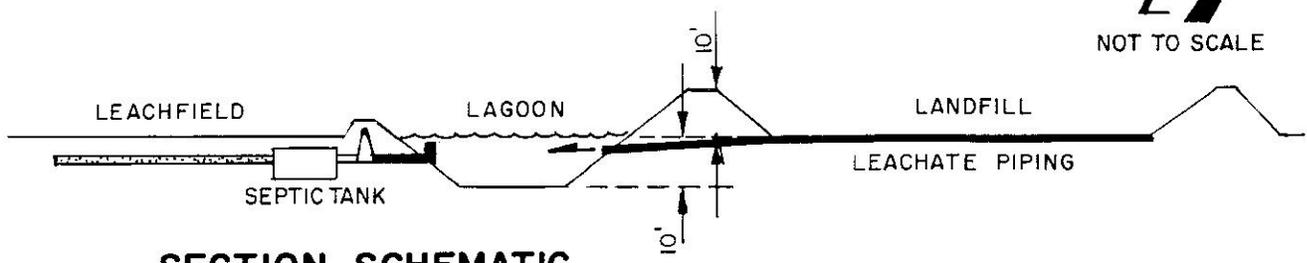
The only available land outside of the 10,000-foot airport separation radius is located north of Gustavus in the vicinity of an old transmitter and abandoned tower (see Figure 3). The land is currently owned by Cook Inlet Region, Inc. (CIRI); CIRI is a Native Corporation and has expressed a willingness to sell this

land. This site is advantageous because: (1) it is convenient to Gustavus and Bartlett Cove; (2) road access is adjacent to the site; (3) it is not located near private land; and (4) site conditions, such as soils and the water table, appear to be suitable. Site conditions will need to be determined during a site investigation that will be scheduled when approval is obtained from CIRI. It is anticipated that ten acres of land will be required for a solid waste disposal site with a 50-year life.

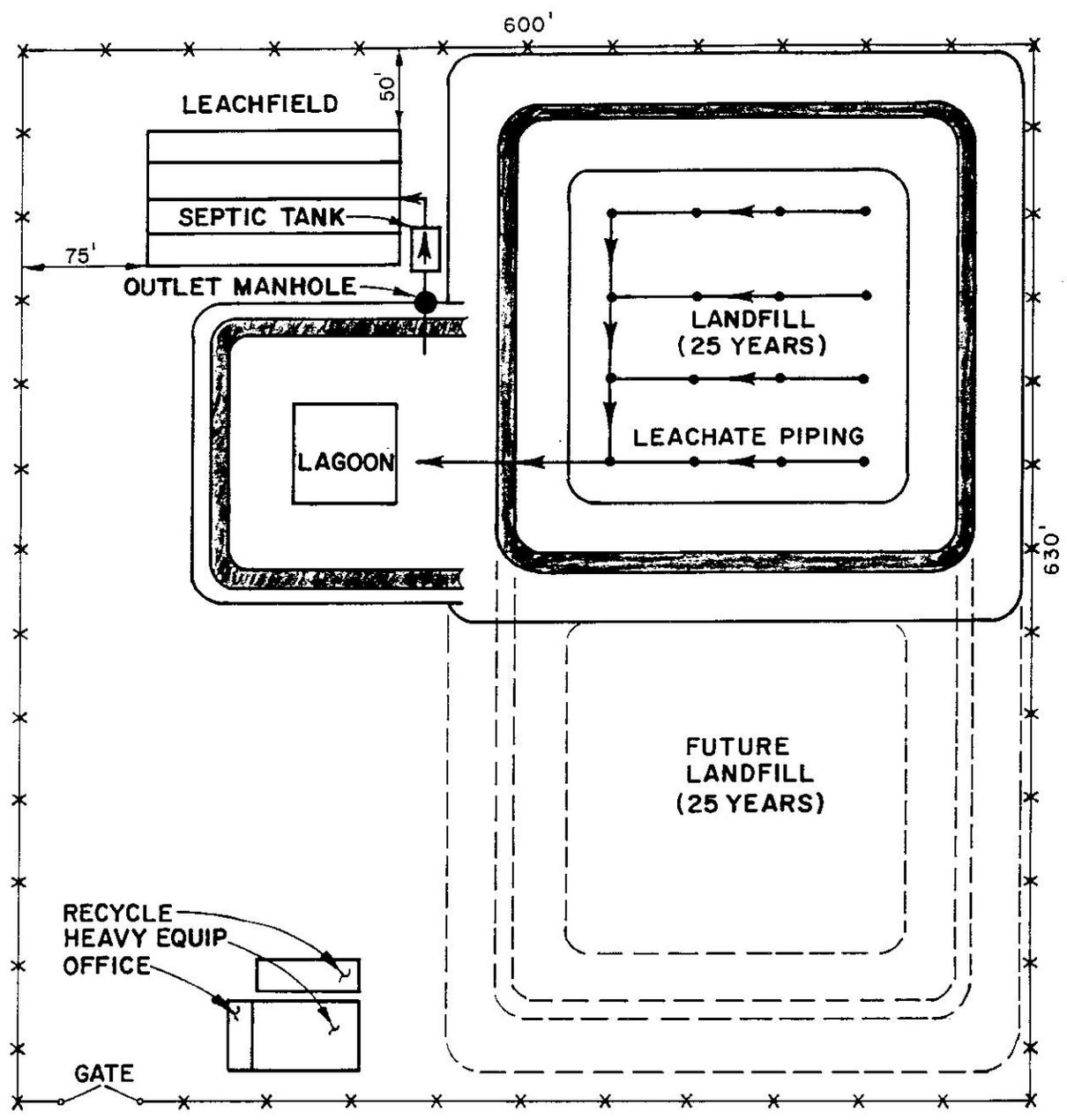
The proposed layout of the site is shown in Figure 4. The active solid waste disposal site consists of a lined and diked area 200 ft. x 200 ft. x 10 ft. high. A perforated four-inch polyethylene drain will be installed at the bottom of the diked area to collect leachate, as shown in Figure 5. This piping system will discharge to a lined lagoon with a surface area of 120-feet by 120-feet and a depth of 10-feet. The lagoon will also be used as a septic sludge disposal site by the community. The purpose of the lagoon is two-fold: (1) to promote the separation of solids (which settle to the bottom of the lagoon) from liquids (which overflow into a septic tank and discharge to an adjacent leachfield); and (2) to promote aerobic decomposition of the liquid portion of the wastewater. The liquid wastewater that overflows from the lagoon enters a leachfield where it percolates into the soil. Percolation through the soil causes purification of the wastewater by ion exchange, filtration, absorption, complexing, and biodegradation.



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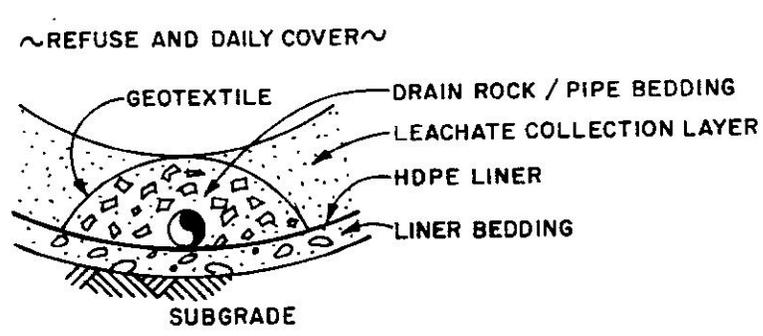
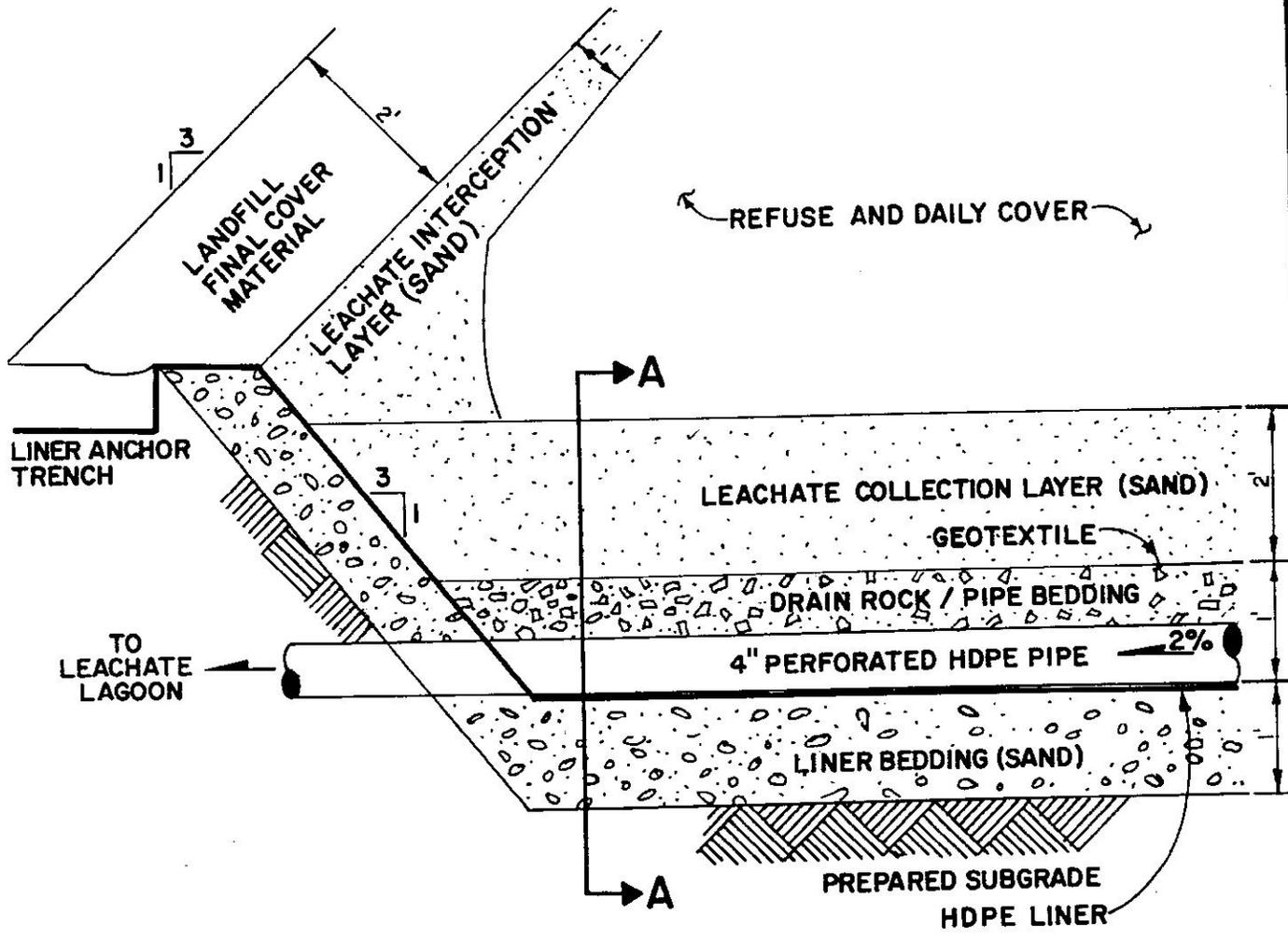


SECTION SCHEMATIC



PLAN

Figure 4
PROPOSED SOLID WASTE LANDFILL



SECTION A-A

Figure 5
TYPICAL LANDFILL SECTION

In addition to the solid waste disposal area, lagoon and leachfield, the site will include a recycling center. The entire 10-acre site will be surrounded by an electrified cyclone fence topped with barbed wire to prevent animals from entering.

Management of the solid waste site will be the responsibility of the Gustavus community, which must form a non-profit corporation to own the land on which the solid waste disposal site is located. Access to the site will be controlled by a lockable gate. The actual deposition of solid waste will be strictly controlled to a specific cell in the landfill that will be compacted and covered with earth on a monthly basis in winter and on a weekly basis in summer. Monitoring wells will be located down-gradient from the leachfield to insure that the groundwater does not become contaminated.

After 25 years it is anticipated that the solid waste disposal site will be filled to capacity. The 25-year life can be extended with an effective solid waste reduction and recycling program. The solid waste disposal site must be closed and capped with a final layer of at least 2-feet of earth fill. A second disposal site will then be developed adjacent to the first site, identical in area and depth. The second disposal site will allow for an additional 25 years of solid waste disposal at the 10-acre site.

Estimated capital and operation and maintenance (O&M) costs are presented in Table III and Table IV on the following pages. The capital cost of constructing a permitted landfill is high because the land must be purchased, a liner must be installed because of the high permeability of the underlying soil, a leachate collection system must be installed, and a fence must be built around the entire site. The operation and maintenance costs are not unreasonable for a community the size of Gustavus.

TABLE III -- ALTERNATIVE A CAPITAL COSTS

NEW SOLID WASTE SITE LOCATED NORTH OF GUSTAVUS
NEAR THE END OF THE MAIN ROAD

<u>ITEM</u>	<u>UNITS</u>	<u>UNIT COST</u>	<u>TOTAL</u>
Land Purchase	10 Acres	\$ 7,000	\$ 70,000
Mobilization	Lump Sum	10,000	10,000
Clear and Grub	7 Acres	2,000	14,000
Landfill Dirt Work	12,500 cu.yd.	5.00	62,500
Lagoon Excavation	3,500 cu.yd.	9.00	31,500
H.D.P.E. Pipe, 4"	900 ft.	10.00	9,000
Drain Rock	150 cu.yd.	20.00	3,000
Liner Bedding, Sand	1,700 cu.yd.	10.00	17,000
H.D.P.E. Liner	8,125 sq.yd.	6.50	53,000
Leachfield	1,000 ft.	11.50	11,500
Septic Tank	Lump Sum	5,000	5,000
Fencing	3,100 ft.	20.00	62,000
Monitoring Wells	Lump Sum	2,000	2,000
Demobilization	Lump Sum	10,000	10,000
Close Existing Dump	Lump Sum	23,000	23,000
Septic Pumper Trailer (Inc. Frt.)	Lump Sum	25,000	<u>25,000</u>
Subtotal			\$408,500
Engineering (10%)			40,750
Contingency (10%)			<u>40,750</u>
Total			<u>\$490,000</u>

TABLE IV -- ALTERNATIVE A OPERATION AND MAINTENANCE COSTS

NEW SOLID WASTE SITE LOCATED NORTH OF GUSTAVUS
NEAR THE END OF THE MAIN ROAD

<u>ITEM</u>	<u>NO. UNITS</u>	<u>UNIT COST</u>	<u>TOTAL COST</u>
WINTER (OCTOBER - APRIL; 7 MONTHS)			
Operator	16 hr./mo.	\$ 19/hr.	\$ 2,130
Cover Material (Monthly)	12 yd./mo.	\$ 10/yd.	840
Heavy Equipment Operating Cost	8 hr./mo.	\$ 50/hr.	2,800
Snow Plowing	8 hr./mo.	\$ 35/hr.	1,960
SUMMER (MAY - SEPTEMBER; 5 MONTHS)			
Operator	40 hr./mo.	\$ 19/hr.	\$ 3,800
Cover Material (Weekly)	24 yd./mo.	\$ 10/yd.	1,200
Heavy Equipment Operating Cost	16 hr./mo.	\$ 50/hr.	4,000
ALL YEAR			
Monitoring			\$ 4,000
Tools and Materials			<u>2,000</u>
Total Estimated Yearly Cost			\$ 22,730
Monthly Cost (Bartlett Cove)			\$ 475
Monthly Cost (Gustavus)			\$ 1,420
Monthly Cost per House (60 Houses)			\$ 24.00
Cost per 100 Pounds Disposed			\$ 5.80

SEPTIC TANK PUMPING COSTS (TANKS SHOULD BE PUMPED EVERY TWO YEARS)

Pumping and Hauling **\$ 250.00**

**Alternative B -- Upgrade the Existing Site Located
within Gustavus**

The only land available within Gustavus, other than the CIRI land discussed in Alternative A, is a parcel of State land where the existing dump is located. This site is within the 10,000-foot airport separation radius but outside of the 5,000-foot radius for piston-powered aircraft. Furthermore, FAA may allow the permitting of this site because it is more than 10,000-feet from the active runway utilized by jet-powered aircraft. The advantages of this site include: (1) it is convenient and centrally located; (2) site conditions are favorable; and (3) it has been historically used as a solid waste disposal site. The disadvantages are: (1) the community of Gustavus will be required to take ownership of the land and consequently the liability of whatever has been deposited in the dump in the past; (2) the site may be contaminated with hazardous waste generated as a result of activities related to construction of the airstrip; (3) the site is near private land and groundwater contamination is a potential problem; and (4) the site is adjacent to the Good River and the community's small boat haul-out area.

Regardless of whether this site is selected as the long term solid waste disposal site for Gustavus, a site investigation should be conducted. A site investigation includes a determination of the quantity, type and distribution of waste

deposited at the dump, groundwater quality tests, and the development of a plan to close-out the site and develop it for other uses, such as recreation. Depending on the findings of the site investigation, it may be required to remove hazardous wastes (if they exist) and to otherwise take remedial actions to insure that the site is safe for future activities. Initial water quality tests were conducted by Village Safe Water, as discussed on page 12 of this study.

If the community decides to take over the ownership and operational responsibilities for the existing solid waste disposal site, a more-detailed analysis will be conducted. A landfill similar to Alternative A is envisioned, although only one cell will be developed initially, five acres in size. Capital costs are presented in Table V. Operation and maintenance costs are identical to Alternative A.

TABLE V -- ALTERNATIVE B CAPITAL COSTS

UPGRADE THE EXISTING SITE LOCATED WITHIN GUSTAVUS

<u>ITEM</u>	<u>UNITS</u>	<u>UNIT COST</u>	<u>TOTAL</u>
Mobilization	Lump Sum	\$10,000	\$10,000
Landfill Dirt Work	12,500 cu.yd.	5.00	62,500
Lagoon Excavation	3,500 cu.yd.	9.00	31,500
H.D.P.E. Pipe, 4"	900 ft.	10.00	9,000
Drain Rock	150 cu.yd.	20.00	3,000
Liner Bedding, Sand	1,700 cu.yd.	10.00	17,000
H.D.P.E. Liner	8,125 sq.yd.	6.50	53,000
Leachfield	1,000 ft.	11.50	11,500
Septic Tank	Lump Sum	5,000	5,000
Fencing	1,900 ft.	20.00	38,000
Monitoring Wells	Lump Sum	4,000	4,000
Site Investigation	Lump Sum	50,000	50,000
Demobilization	Lump Sum	10,000	<u>10,000</u>
Subtotal			\$304,500
Engineering (10%)			30,250
Contingency (10%)			<u>30,250</u>
Total			<u>\$365,000</u>

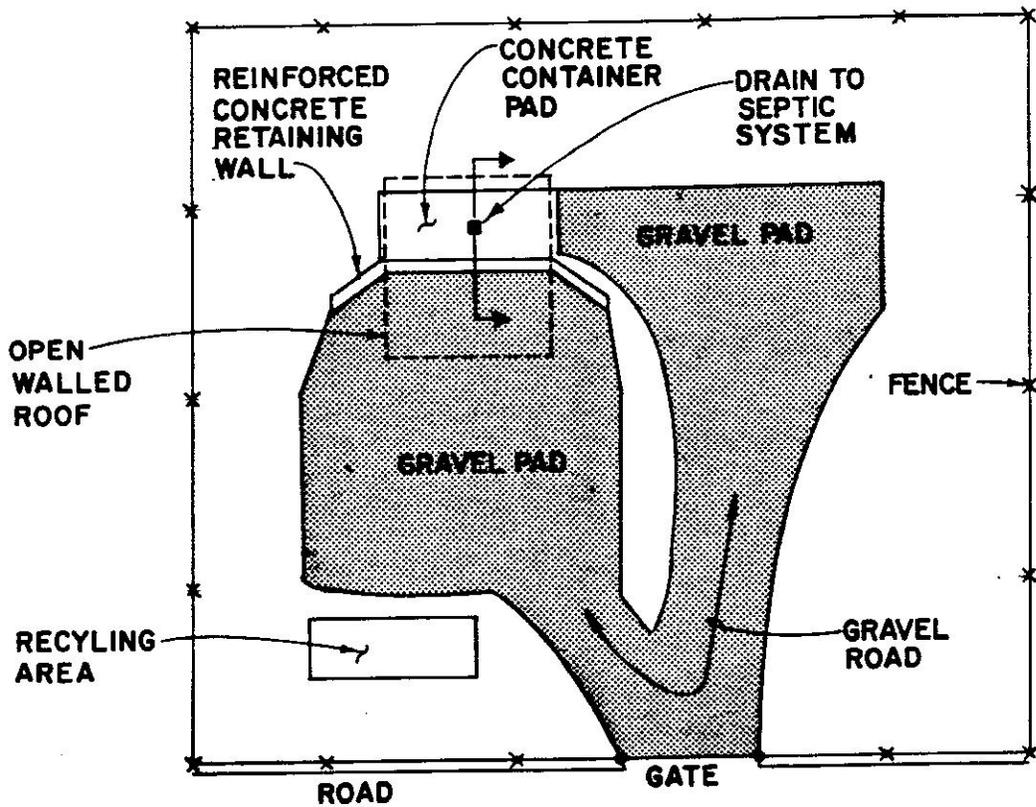
Alternative C -- Tranship Solid Waste to Juneau and Disposal at Juneau Landfill

Hauling solid waste to Juneau is a very expensive alternative from an operational standpoint. The main problem is that there is no regularly scheduled barge service between Juneau and Gustavus, and transporting the waste to Juneau will be expensive. Another problem is that the solid waste must be transferred to a permitted landfill or burned in an incinerator at Juneau, and this adds additional operating costs.

A transfer station will be needed at Gustavus for collection and temporary storage of solid waste. The transfer station will probably be located at the existing waste disposal site. The transfer station will be designed to provide weather protection for a container, which will be recessed below a concrete platform to provide easy access to the top of the container, as shown in Figure 6. The containers will be of heavy duty construction with special steel covers that provide a simple bear-proof access hatch for household garbage and a winch-operated access lid for bulky waste. Drainage from the container will be collected and routed to a septic system and drainfield for treatment and disposal. The transfer station will be surrounded by a fence to discourage unauthorized entry.

Containers will be a standardized 40-cubic-yard size (30 ft. long by 8 ft. wide by 7 ft. high), which will hold an estimated 30,000

TRANSFER STATION PLAN



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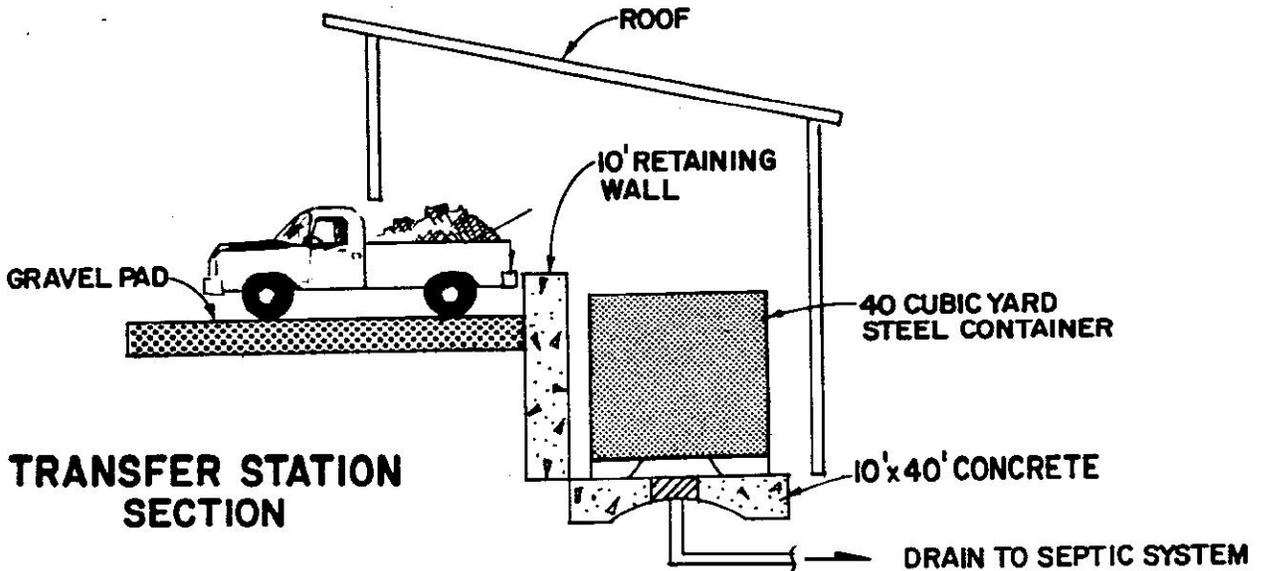


Figure 6
TRANSFER STATION

pounds of solid waste. A dedicated roll on/roll off truck will be needed to transfer the containers to the dock and back. Two containers will be needed to service Gustavus, one at the transfer station and one for transit purposes between Gustavus and Juneau. One voyage per month will be required during winter months (October through April) and two trips per month will be necessary during the summer (May through September).

Barge service to Gustavus is provided by Alaska Outport Transportation Association, a cooperative that serves ten of the smaller communities on the panhandle, but the barge does not stop at Juneau. It may be possible to use a landing craft or a small barge to haul solid waste from Gustavus, but the operating cost is high, especially if no other freight is hauled to share the cost of the voyage. Gumption Freight currently charges \$1,600 per round trip, but a long-term contract could reduce this cost somewhat.

Estimated capital and operating costs are summarized in Tables VI and VII.

TABLE VI -- ALTERNATIVE C CAPITAL COSTS

TRANSHIP SOLID WASTE TO JUNEAU AND DISPOSAL AT JUNEAU LANDFILL

<u>ITEM</u>	<u>UNITS</u>	<u>UNIT COST</u>	<u>TOTAL</u>
Transfer Station	Lump Sum	\$124,000	\$124,000
Containers	2 each	15,000	30,000
Transfer Truck	1 each	100,000	<u>100,000</u>
Subtotal			\$254,000
Engineering and Contingency (10%)			<u>26,000</u>
Total			<u>\$280,000</u>

TABLE VII -- ALTERNATIVE C OPERATION AND MAINTENANCE COSTS
TRANSHIP SOLID WASTE TO JUNEAU AND DISPOSAL AT JUNEAU LANDFILL

<u>ITEM</u>	<u>NO. UNITS</u>	<u>UNIT COST</u>	<u>TOTAL COST</u>
WINTER (OCTOBER - APRIL; 7 MONTHS)			
Operator	8 hr./mo.	\$ 19/hr.	\$ 1,064
Truck Cost Operating Cost	8 hr./mo.	\$ 10/hr.	560
Barge Service	7 Voyages	\$ 1,600	11,200
Disposal Cost Channel Sanitation	7 Containers	\$ 2,000	14,000
SUMMER (MAY - SEPTEMBER; 5 MONTHS)			
Operator	16 hr./mo.	\$ 19/hr.	\$ 1,520
Truck Cost Operating Cost	16 hr./mo.	\$ 10/hr.	800
Barge Service	10 Voyages	\$ 1,600	16,000
Disposal Cost Channel Sanitation	10 Containers	\$ 2,000	<u>20,000</u>
Total Estimated Yearly Cost			\$ 65,144
Monthly Cost (Gustavus)			\$ 4,070
Monthly Cost (Bartlett Cove)			\$ 1,360
Monthly Cost per House (60 Houses)			\$ 68.00

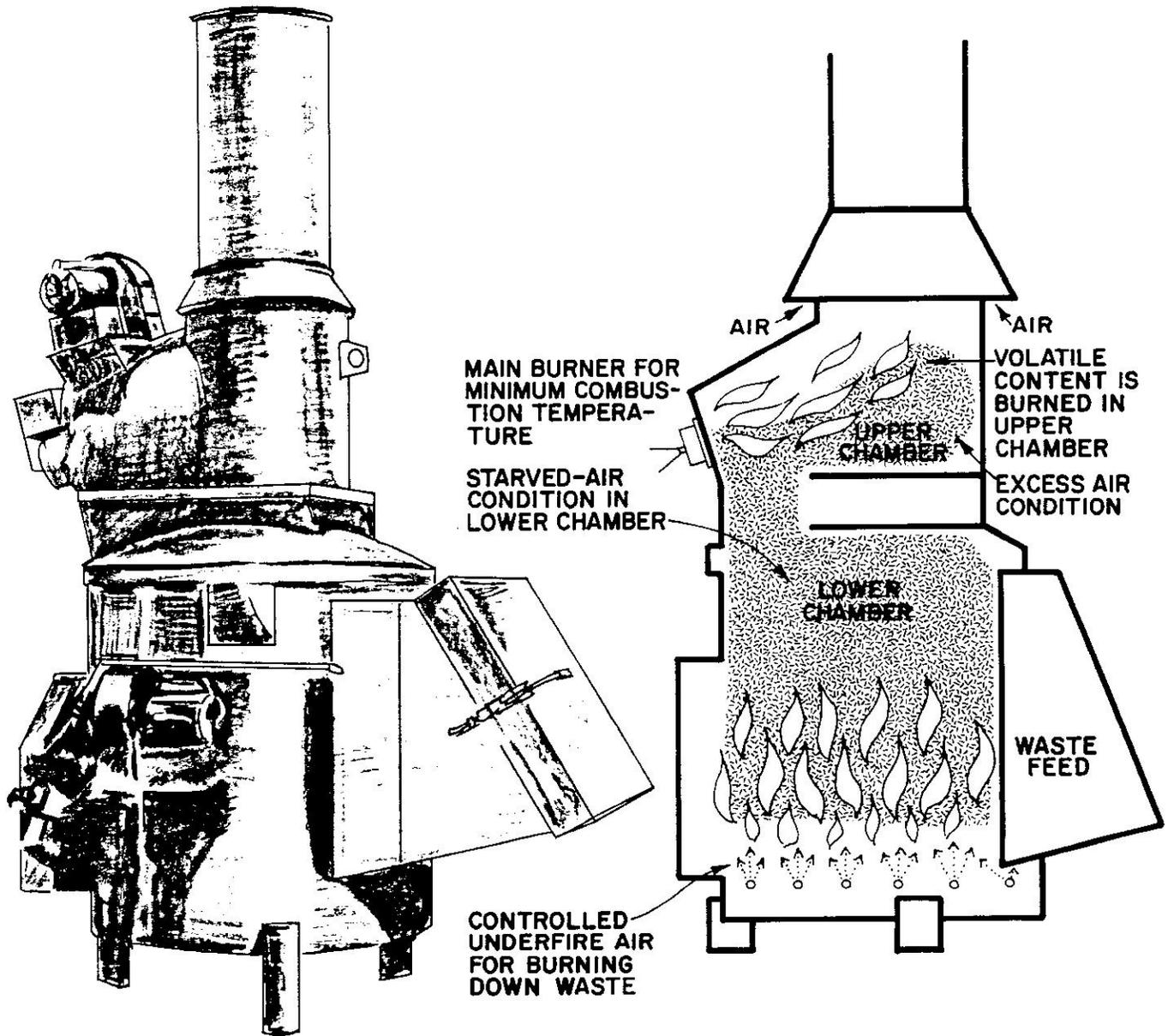
Operating costs are unreasonably high, nearly three times the cost of Alternative A. Cost estimates for hauling septic tank sludge to Juneau were not calculated because of the very high transportation and disposal costs.

Additive Alternative 1 -- Incineration

Incinerating solid waste is an effective means of reducing the volume of solid waste. For a small community such as Gustavus, incineration will be an intermittent, as opposed to continuous, operation. Solid waste will be stored in a large container and fed into the incinerator to insure high combustion temperature and complete burning, as shown in Figure 7. Solid waste will be burned monthly during the winter and weekly during the summer. Ash from the incinerator will be disposed of in a landfill either in Gustavus or in Juneau.

Capital costs of the incinerator alternative are presented in Table VIII. Costs include the incinerator, spark arrestor, weatherization package, temperature controls, and an automatic feed system. The capital cost of the incinerator includes the cost for two units, which will be necessary 20 years from now if Gustavus continues to grow and if the community accepts solid waste from Glacier Bay National Park. For the first ten years of operation, one incinerator unit is all that is required to meet the solid waste disposal needs of the community.

Operating costs of the incinerator option are presented in Table IX. As the table shows, the operating costs are high as compared to the landfill alternatives; however, it must be pointed out that if recycling is successful, the amount of solid



(NOT TO SCALE)

Figure 7
INCINERATOR

waste that must be incinerated can be cut at least in half. The operating costs are also calculated for the anticipated population 20 years from now; therefore, the initial operating costs will be lower because the present population generates significantly less trash.

There are several advantages that an incinerator offers. Since the solid waste is burned at a high temperature, the risks of polluting the groundwater with organic chemicals leaching from the landfill are eliminated. Since the incinerator will be burning less than 1,000 pounds-per-hour, it will not require an ADEC permit to operate; the incinerator must meet smoke opacity regulations, which state that the smoke must have an opacity less than 20 percent. Finally, an incinerator will greatly reduce or eliminate any odor problems that a solid waste site typically generate.

The primary disadvantage of an incinerator is that it is expensive to operate. It will be necessary for the community to hire and retain a trained operator with the skills required. An incinerator is also a mechanical piece of equipment that occasionally breaks down and requires repairs.

The community rejected this alternative during a public meeting because of health concerns over smoke emissions from the incinerator.

TABLE VIII -- ADDITIVE ALTERNATIVE 1 CAPITAL COSTS
INCINERATION

<u>ITEM</u>	<u>UNITS</u>	<u>UNIT COST</u>	<u>TOTAL</u>
Incinerator CA-400P	2 each	\$ 36,100	\$ 72,200
Spark Arrestor	2 each	650	1,300
Weatherization Pkg.	2 each	550	1,100
Temp. Control	2 each	2,700	5,400
Hydraulic Feed	2 each	25,000	50,000
BOB-CAT 943	1 each	45,000	45,000
Freight and Misc.	Lump Sum	15,000	15,000
Power Extension	0.6 miles	50,000	<u>30,000</u>
Subtotal			\$220,000
Engineering and Contingency (10%)			<u>22,000</u>
Total			<u>\$242,000</u>

TABLE IX -- ADDITIVE ALTERNATIVE 1 OPERATION AND
 MAINTENANCE COSTS

INCINERATION

<u>ITEM</u>	<u>NO. UNITS</u>	<u>UNIT COST</u>	<u>TOTAL COST</u>
Operator	16 hr./wk.	\$ 19/hr.	\$ 15,808
Electricity	72 KWHR/wk.	\$.50/KWHR	1,872
Fuel Consumption	230 gal./wk.	\$1.21/gal	<u>14,472</u>
Total Estimated Yearly Cost			\$ 32,152
Monthly Cost (Gustavus)			\$ 2,010
Monthly Cost (Bartlett Cove)			\$ 670
Monthly Cost per House (60 Houses)			\$ 33.50

Note: Operation Costs do not include ash disposal costs.



Additive Alternative 2 -- Mechanical Baling

Baling solid waste is a method of mechanically compacting the waste to reduce the volume for disposal. Typical municipal solid waste ranges in density from 150 to 300 lb./cu.yd., and garbage trucks can compact the waste to about 500 lb./cu.yd. Solid waste in a landfill can be compacted with heavy equipment to about 1,000 lb./cu.yd.; a baler is capable of consolidating the waste further, with the density ranging from 1,200 to 1,500 lb./cu.yd.

The advantage of using a baler in conjunction with solid waste management depends on the disposal alternative chosen. If solid waste is buried in a landfill located in Gustavus, the life of the landfill can be increased from 25 to 50 percent depending on operating conditions and how often the solid waste is baled. If the waste is transported to Juneau, baling will reduce the transportation cost because more waste can be loaded onto the landing craft for each voyage.

The primary disadvantage of mechanical balers is that they are very expensive, on the order of \$200,000. Operating costs are also relatively high because baling solid waste is labor intensive and balers require maintenance. Given the relatively small quantity of solid waste that requires disposal in Gustavus, and considering the remoteness of the community if the baling equipment requires repairs, mechanical baling is not considered

practical for Gustavus. If tourist activity associated with Glacier Bay National Park increases significantly, a baler may be practical for reducing the volume of solid waste during the summer.