A Guide to Closing Solid Waste Disposal Sites in Alaska Villages

Central Council of Tlingit and Haida Indian Tribes of Alaska

July 2001

Cover by:

Renee Avugiak

April 14, 2001

Wiinga ciqiiciviim assilliqevkat-
uanga tua-i-wa meq assirruteu-
kalud cali-llu neqet tuquvrkarr-
lukii wiinga umyuaqua coom
elini ketuggcie ciqiciput
tuqungaytharrtukut.

What it says in english:

The dump makes me fell very
bad because it pollutes the
fish we eat. I hope that
someday the dump will get
fixed so we dont have to
die if the fish die.

Inside illustrations by:

Students of Chefornak Middle School, 2000-2001.

A Guide to Closing Waste Disposal Sites in Alaska Villages

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Dear Reader:

In 2000, the Central Council of Tlingit and Haida Indian Tribes of Alaska (CCTHITA) launched a Cooperative Long-Term Solid Waste Management (SWM) and Facility Improvement project funded by the Bureau of Indian Affairs. Through a four-village demonstration project and a statewide tribal SWM study, the purpose of the project was to develop cost information and logistical considerations needed by Alaska tribes to address their Solid Waste needs. This document, "A Guide to Closing Solid Waste Disposal Sites in Alaska Villages," is one product of our efforts over the past year. Its purpose is to be used as a guide for Alaska Native Villages and communities who are working towards sustainable Solid Waste Management practices.

CCTHITA would like to take this opportunity to thank the numerous people and organizations that contributed to our Solid Waste Project. Our greatest appreciation goes out to our consulting team from Zender Environmental Engineering Services: Lynn Zender, Simone Sebalo, Susan Gilbreath and Amy Larsen. This project would not have been possible without their dedication to the issues and hard work. We would also like to express our gratitude to the four demonstration villages that participated in our project: The Native Village of Chefornak, The Native Village of Selawik, Rampart Village Council and Yakutat Tlingit Tribe.

We thank the Bureau of Indian Affairs for funding this project, and Kristin Holzinger from the BIA Alaska Region for her support. We'd like to thank Joe Sarcone (EPA) and Ed Emswiler (ADEC) for their guidance throughout our efforts in addressing Solid Waste Management on a statewide level. Numerous other personnel from various state, federal and inter-tribal agencies also provided helpful feedback, including: Roland Shanks and Kurt Eilo from Alaska Inter-Tribal Council; Nancy Sonafrank (ADEC), Diane Sam (ADEC), Shawn Sorenson (SEARHC), Mark McCloud (USAF), Kurt Egelhofer (VSW), Roger Burleigh (VSW), and several staff engineers from ANTHC.

In addition to the four demonstration villages, many City and Tribal Council staff from villages throughout Alaska were gracious enough to describe their experiences with closing their community dump sites, which in turn provided much of this Guide's practical information. These wonderful people include Lottie Wolf (Mentasta), Grant Lawson (Skagway), Tom Graham (Kotzebue) as well as consultants Jim Vogel (Bristol Engineering), Greg Magee (Montgomery Watson) and Foothill Engineering.

Finally, we'd like to thank all of the Alaskan Tribes who participated and turned in Solid Waste Surveys for our statewide SWM database, and all the members of the Alaska Solid Waste Workgroup for their efforts in addressing SWM issues.

Gunalcheesh Haawa,

Edward K. Thomas
President

Table of Contents

Good Information Summaries

First Steps

Planning

Health Impacts

Environmental Impacts

Good Information Summaries
(continued)

Actions To Take At Your Dump Now

Estimating Site Closure Costs

Funding

Out in the Field Closing a Site

Chapter 1: How to Use This Guide

This guide was written for the people who make or carry out environmental decisions in native villages. As we all know, there is no such thing as a typical native village— our physical situation, number of people, culture, and how our communities work, are different. And there is a big difference in the experience level of the people who deal with our waste management issues.

We tried to write this guide so that **people with only a little experience can understand what they need to know** to close a site. If you think you fit that description, then **you can stick to reading just the bolded text and the stories and notes that are highlighted in boxes.** Also **look at what we call in this guide "Figures"**— they contain a lot of information in a pretty easy to understand way. When you need technical assistance, we tell you.

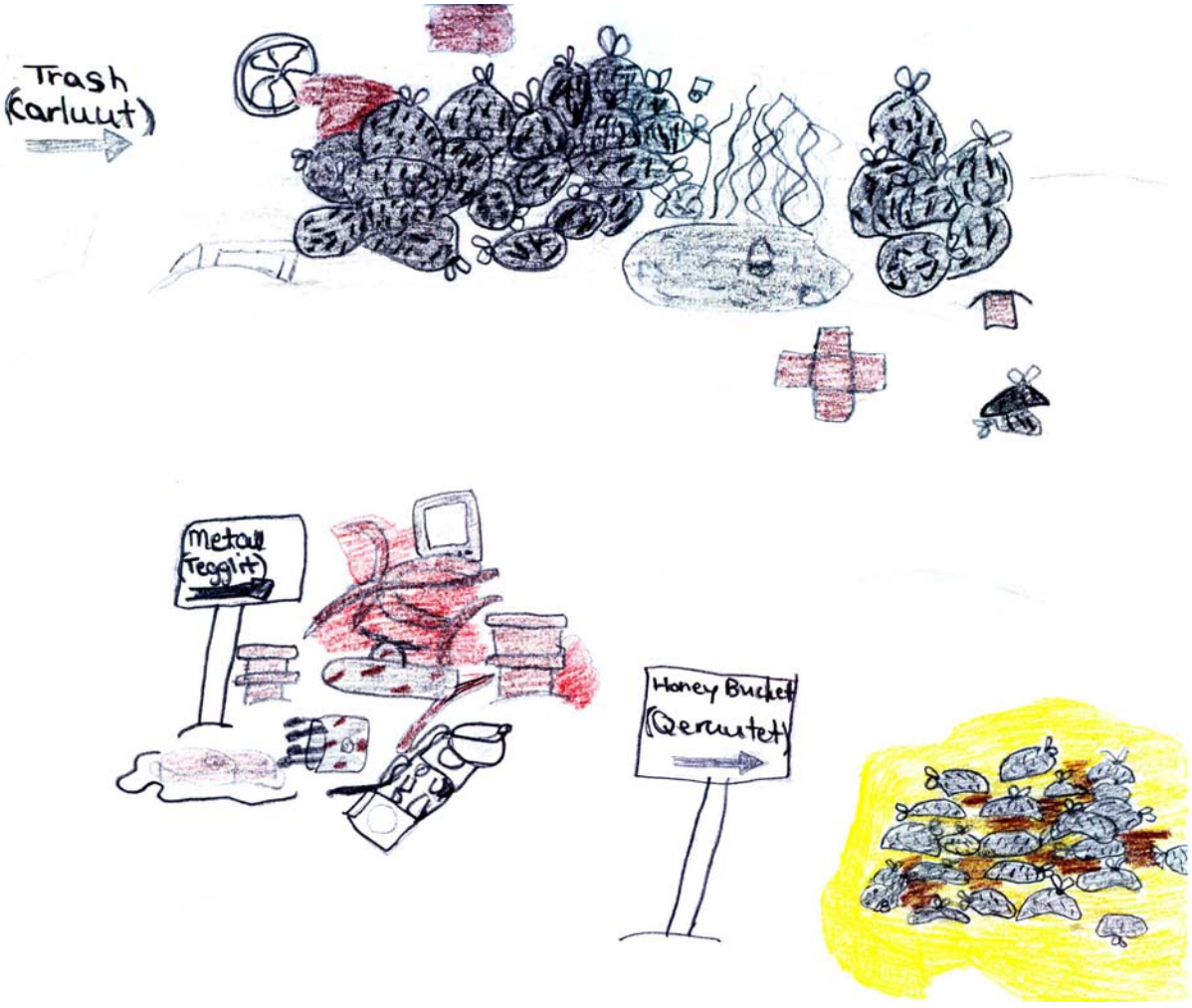
We also wanted to provide extra details for the people who have more technical experience, and need less assistance from agencies or consultants. Because this guide gathers a lot of information together in one place, this guide will be used by federal and state agency personnel as well. So **some of the text**— especially the health, environmental, and cost estimation sections-- **might be difficult to understand** without training.

There are a lot of Tables that put all the information you need on a single page. **Most of the Tables in this guide are more complex than the "Figures".** Tables are meant to be handy reference guides—they are packed full. This means that you shouldn't expect to understand everything on there right at first. **To use the Tables, you need to take some time to think about what the information is telling you.** Keep referring back to the Tables when you need to remember how to do something, or what you should be thinking about.

Even though this guide was written in a particular order, you can read whatever Chapter you want to, without reading the previous Chapters. But **Chapter 2 is a good place to start if you are new to the site closure business.** It is short and simple and should clear up a lot of questions.

Finally, please keep in mind that some contact names listed in this guide might change by the time you use them-- but the phone numbers should be good still.

We hope this guide is useful to you. Please call us up or come by our office in Juneau and let us know how you like it— we'll buy the coffee.



Unaciqiiciuik assiituq taugaam iliini carilaraput. waten ayuqsarkuunritug taugaam yaquaqaanirciquq. Iliini pageskuutteniu qusenglartukut.

This dump is bad, but sometimes we clean it up. It's not supposed to be like this, but it will get more further. Sometimes if we check it we get sick.

Chapter 2 Where Do We Start?

Closing our dump sites is a big issue for native communities. Half of the 100 villages we've heard from say they need to close their dumpsites and 29 percent of them listed site closure as one of their top waste management concerns. Closing your site involves a lot of choices, a lot of paperwork, and a lot of thinking about what in your community gets affected when you make decisions about managing your wastes. This Chapter eases you into the different issues of site closure and where in the manual you can go to find out more.

1. WHY CLOSE OUR SITE?

A picture is worth a thousand words. Figure 2-1 shows before and after shots of Beaver's recently closed dump.

Figure 2-1 "Before" and "After" views of Beaver's closed dump

2. DO WE NEED TO CLOSE OUR SITE?

First things first. Because site closure is a major project to carry out, be certain that you want to close your site. Figure 2-2 lists some questions you need to ask. Deciding whether your site poses health and environmental risks is difficult. Reading Chapter 3 will help answer it.

Chapter 3 also lists some different ways to avoid or reduce health and environmental risks without closing the dump site. One thing is for certain in this world. It is almost always easier to get a little money than a lot. You may be surprised about the things you can do to improve your site with no money, or a just a little of it. *If you can take away the health and environmental concerns of your community without closing your dump, it will probably be your best option for now.*

3. WHAT EXACTLY ARE WE GETTING OURSELVES INTO IF WE DECIDE TO CLOSE OUR DUMP?

Get ready for a big headache! But unless something is done about it, the concerns that your dump is causing won't go away. And they often get much worse. A temporary headache now is better than our lands and people being sick for years! Figure 2-3 shows the stages of closing a site, and lists the chapters of this manual where you can go for more help. You can check whether you are ready to start the site closure process by looking at Figure 2-4. There are a few main points to remember.

4. COMMUNITY INVOLVEMENT

The first thing is that you've got to get your community involved-- like with any big decision that affects everyone's lives. The more discussions held the better. And community leaders need to lead, or get involved in, these discussions if that is how decisions are traditionally made. Getting the community interested in waste disposal usually makes people more careful about how they discard their wastes. The ideas that come out of these big discussions usually work because people know what works in their community. Also, people are more committed to making their own ideas work. And it can be easier to get funding with community support. **A successful site closure starts with the community deciding they want the site closed**.

Unless you have someone really experienced in waste management, it is a good idea to get input from a favorite agency or organization, or a consultant. They can provide you a list of the different methods that are possible and considerations you need to know. They can also help you define the technical "story" of your waste disposal situation and calculate costs. But they don't know your community, and often they especially don't know our native communities. You need to help them define the details and come up with creative changes so that their list of methods will work. And your community needs to decide what is best by whatever decision making method it traditionally uses.

Figure 2-2 Should our site be closed?

Answer these questions:

Are there health risks you don't want?

There might be cheaper ways to reduce these risks without closing your site. Is starting a new disposal method the only way to get rid of these risks?

See Chapter 3!

Are there risks to your environment you don't want?

There might be cheaper ways to reduce these risks without closing your site. Is starting a new disposal method the only way to get rid of these risks?

See Chapter 3!

Are you running out of space?

Is there a cheaper disposal alternative?

Do you want to use the land for something else?

Does your community want the site closed?

Are you unable to maintain the dump site, but could maintain a new landfill or another disposal method?

Would it be too difficult or too costly to improve your site enough that it could be permitted?

If you answered yes to any of the above questions, your site should probably be closed.

Figure 2-3 What Am I Getting Myself Into?

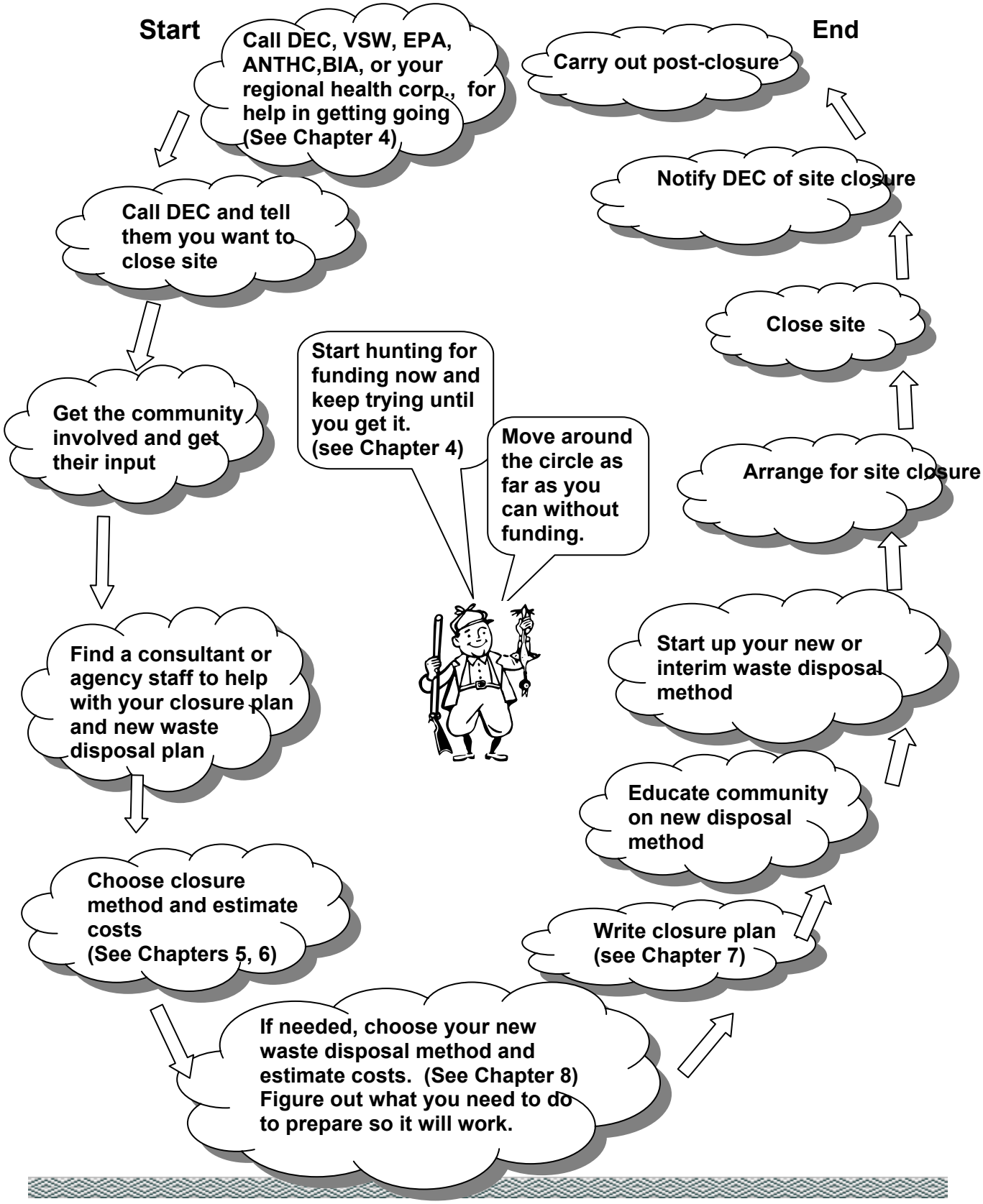
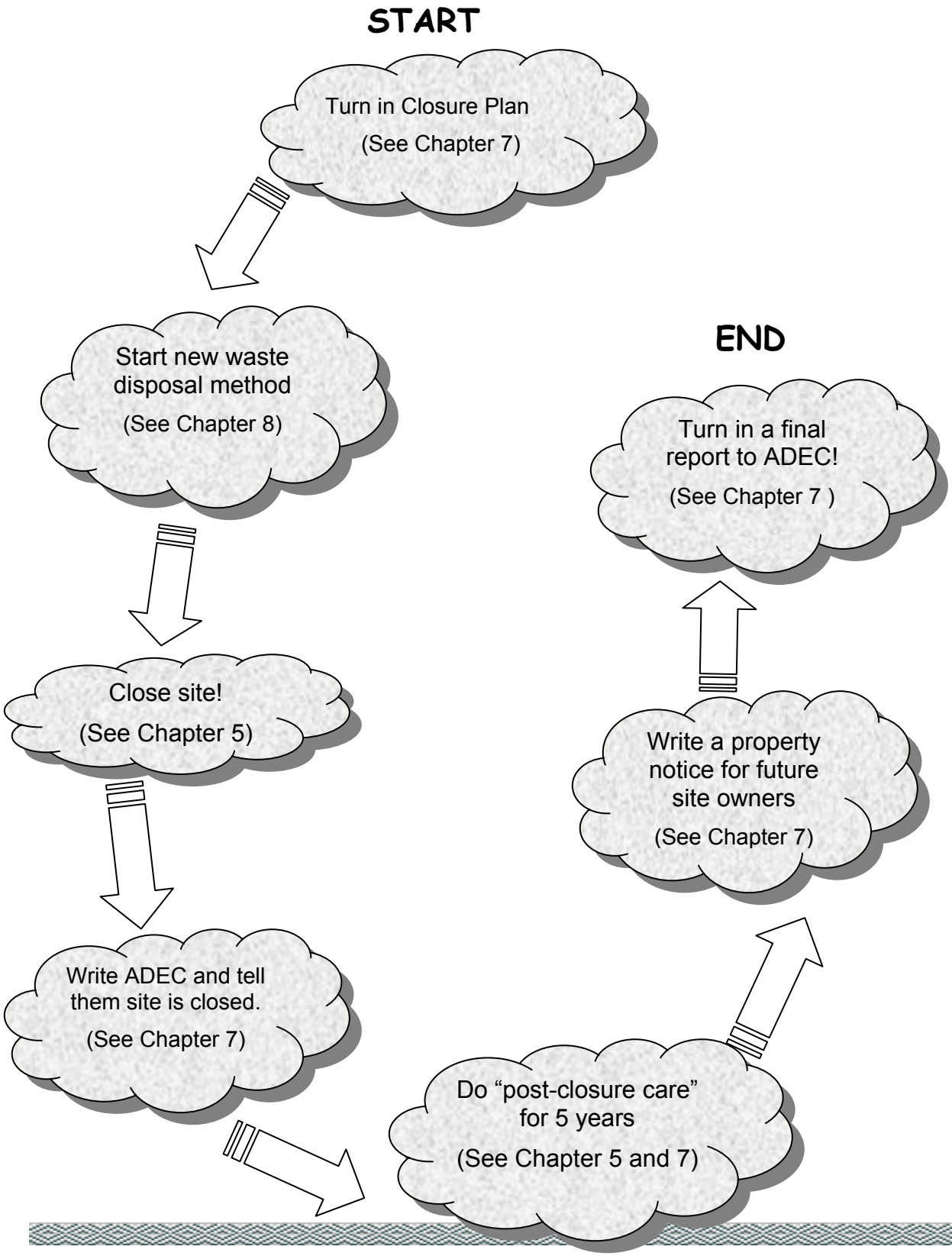


Figure 2-3 What are the milestones in closing a site?



5. ORGANIZATION

Too many of our village projects fail because of a simple thing like program organization! Going through all the site closure steps listed in Figure 2-2 is going to be a lot of trouble. So you definitely want to end up with something that works right! You need to **make sure that you (or your staff if you have one) have been given the official authority and time** to:

- Look for funding,
- Set up and facilitate meetings,
- Organize cooperative agreements and meetings with everyone who has a stake in site closure and the new disposal option,
- Review plans,
- Carry out community education, and
- Oversee new facility construction and site closure.

6. FUNDING

Besides being organized and having community support, the biggest thing we've found is to **start hunting for funding early and keep hunting until you've got something to bring home.** Look at Chapter 4 for help in finding funding.

7. PLANNING

Once you've got community support and program organization, you can't start planning too early either. Depending on your experience and resources, you might need funding to start comprehensive planning. But to get planning money, you'll need to plan a good outline for what you want to do. You have to plan to start planning! Something our villages keep missing when they don't plan right is figuring out **what will work with the existing community development plans and the goals the community has for the future**.

Keeping in mind how the site closure and new waste disposal facility will work with economic development, water and wastewater treatment, environmental and health goals, and subsistence activities is called integrated community planning. **If you can show that your planning is integrated, you are much more likely to end up with a successful site closure and new disposal facility, and you are more likely to get funding.** The primary factors you need to consider are listed in Table 2-1. Before you start planning, definitely take a look at **Table 7-3, it gives great suggestions on how to most effectively plan your site closure and new waste disposal method.**

Discuss integrated planning with your community and consultant (or agency/organization staff). Try identifying what specific concerns "crop up" with your community solid waste

Table 2-1

What to consider in an integrated SWM plan.

Category	Factors
Land use	**Is there an alternative use for the land that would be better for the community**? Have you made sure nothing else is already being planned for that land **(i.e. housing, water treatment pond, new airstrip, etc.)**?
Subsistence	**Will closing dump site in place affect subsistence?** You may need to add extra protective measures so that your community can feel subsistence downstream is safe-- or consider removing wastes instead. How will a new landfill affect subsistence? **Are the good berry or fishing grounds downstream of the proposed site?** Is there a possibility that dump runoff could get into nearby streams? You may need to **include in your plans a gated and staffed dump, and a hazardous waste storage facility**, to prevent hazardous wastes from being dumped**. Or you may need to include a big education component and a facility to backhaul batteries and burn used oil.** You may need to reconsider your SWM facility location, or consider a waste backhaul plan instead.
Water hookup	**Find out from VSW or ANTHC where any new water intake or wells will be, and where the new pipes will go**. You don't want your water pipes to go through or too near the dump. Make sure the water source they have scoped out will be sufficient for future needs. If not, **make sure that you don't locate your SWM facility in the only suitable place for a new water system**.
Wastewater treatment	Just like landfills, water treatment ponds require a large amount of flat land, pretty near the town, and away from the airport. If you are getting hooked up in the future – find out from VSW or ANTHC which sites are suitable for water treatment ponds. **The land left for a landfill may be limited.**
Economic development (general)	**Does your chosen site closure or disposal method conflict with future community projects?** If you want a new school or housing near the old landfill, you should consider closing your site by removing wastes. If you are thinking about a burnbox, make sure it will not be upwind of new development. **Is your new disposal method sized and designed right for future projects?** For example, if you are planning a new fish processing plant, where will fish wastes go so they don't attract bears and create odor? You could consider composting your fish and food wastes as part of your new disposal method. **Are you taking advantage of overlapping funding opportunities?** If you want port expansion and improvements, you should consider a waste transfer (i.e. backhaul) station at your port. You will end up with a new disposal option and a better port.

(continues on next page)

Table 2-1
What to consider in an integrated SWM plan (contd.)

Category	Factors
Tourism	**Tourists will add to your wastestream**. Make sure your disposal facility can be expanded or you have a plan to add recycling, reuse, incineration, composting, or other waste volume reduction method in place. **Tourism will be enhanced if they don't have to drive by or see a landfill** or other waste facility. Also, if you are thinking of a burnbox or incinerator, make sure that tourist activities or buildings are not located downwind.
Airport	The FAA requires all landfills and wastewater treatment facilities to be at least **5,000 ft (about 1 mile) from an airstrip**. If you have plans for jet airplanes to land in you community, the required distance is 10,000 ft. Will your airstrip be worked on in the future? **Take advantage of the fill** and other soil/rock material that is generally dug up for airport improvements. You can use it for covering your site for closure or for daily cover.
Construction projects	Does your waste plan include how you will deal with construction project wastes? Construction and demolition waste can overwhelm a small landfill, and generally much of it is not burnable. Make sure you **develop an ordinance charging projects for discarding wastes in the village, or requiring them to haul them out at project completion.**
Traffic	You want to **limit as much as possible the number of people and vehicles going through or just past the dump for other activities.** Make sure there is a convenient way for people to get to those activities besides going through the dump for a shortcut. **Also think about where you want the dump traffic to go in-town.** If you have a transfer station at the port, this will increase the amount of people going there with garbage. If possible, plan a route that avoids the busiest/more crowded boardwalks/roads**. To avoid waste scatter, develop an ordinance requiring people to cover wastes when going to the dump.**
Boardwalk to road system	**Are there plans for replacing the boardwalk**? How much gravel road is funded, where will it go, and how far out can it go? It would be really good to have a gravel road out to the dump instead of a boardwalk.
Children's recreation	**Do children ever play in or near the dump now?** Would the new SWM facility create an attractive playground for them, and do you include in your plan a way to avoid that? Especially in tundra villages, dumpsites can be attractive places to play because they offer a chance to get off the boardwalk in summer and interesting objects are found there. **You may need to include funding for a climb-proof fence.** Perhaps you can include a community education component that cleans up and paints old tires, and other useful wastes, and uses them to make a "recycle village" for kids to play in safely, away from the dump.

management (SWM) choices. Some good resources for planning are *Landfills in the Bush*, *Trash Management Guide*, and *Seven Generations*. See Chapter 4 for ordering information.

8. CONCLUSIONS

Hopefully, you have more ideas than you had when you started this chapter. Site closure is a big undertaking, but the benefit to your community and its future generations can be enormous. And luckily other villages have gone through the process. From what we know and hear, dealing with "red tape" from agencies, and sometimes from our Village and Traditional Councils, was the hardest part! But the people like you who learned and led along the way all survived (we think!). We feel they should give out medals or something. We can't do that, but if you visit us in our main office in Juneau, we'll buy the coffee and tell you some good fishing spots!

Jofina Arnaiak

(YUPIK)

Wiinga ciqicivim assilliqevkatuanga tuayima tanghilan. Kingan manggelr-ukumta asiryartuq. Yuut assiliartut epsalngluvkanateng.

(ENGLISH)

Sometimes I feel bad about the dump. Only if we had running water it would be better. I also would think that people would feel better, too.

Chapter 3: What are the Health and Environmental Considerations?

Running an open dump is the cheapest and easiest way to discard wastes in the short-run (but not in the long run!). So the main reasons why you might want to close your site aren't financial-- they're health and environmental. This Chapter looks at the health and environmental issues of open dumps. First, we talk about the problems that can occur, and then bring up some pretty inexpensive ways to address those problems.

A note about reading this Chapter!

This Chapter contains a lot of technical information that is explained using "Western science"—because we all know how much funding agencies and regulatory people like seeing numbers! If you are in a hurry, or are new to this way of thinking, the important information is bolded or contained in boxes and Figures. You can save the details for later-- or for someone else to chew on.

1. HEALTH IMPACTS OF OPEN DUMPS

Helped by a team of experts, Central Council of Tlingit and Haida Indian Tribes (CCTHITA) carried out a comprehensive health survey in the summer of 2000. Our purpose was to document health effects of unpermitted open dumps. Residents were questioned about symptoms of poor health, personal characteristics, and solid waste disposal practices.

The villages were chosen to represent four distinct regions of Alaska; the Northwest (NANA DOWL Region), the Yukon Delta (Calista Region), the Yukon Interior (Doyon Region), and the Southeast (Sea Alaska Region). Although each was off the road system, they were very different from each other and each had a unique solid waste disposal situation. Yet, the health expert was able to scientifically document the following conclusions for all villages:

- The health and environmental risks that people perceive with solid waste disposal substantially impact their subsistence practices.
- Slight but **significant increases in risks for symptoms of poor health** were found in:
  - ✓ People who visit the dumpsite frequently,
  - ✓ People who burn their trash close to their homes, and
  - ✓ People who are troubled by smoke or odors from the dumpsite (i.e. generally people living near the dump and those who are more sensitive).
- Residents have a high level of concern regarding negative health effects that open dumpsites might cause.

Open Dumps and Subsistence

One of the health impacts that you can consider is how your dump affects subsistence practices in your community. Tables 3-1a and 3-1b show the number of people in the four demonstration villages whose subsistence diets were affected by the risks they believed to be associated with their dumpsites. These people either changed the composition of their subsistence diets, or ate less subsistence foods. You probably already know that our traditional diets have been found to be very important in maintaining native health. In fact, we found that **in honeybucket villages, people who ate mostly subsistence foods instead of store-bought foods were *15 times less likely* to experience diarrhea** (see box below). **Whether your community's traditional subsistence lifestyle is being affected by the dumpsite may be as important to your community's health, as whether or not there is significant contamination at your site.**

A word about "risk"

You should know that **proving that something *causes* a health symptom is almost impossible when using Western science.** You can only say that, number-wise, people who share a certain risk factor tend to develop a certain health symptom more often. That is, they develop it more often than people who don't share this factor-- and it is not due to chance. There is an "association" between the risk factor and the health symptom, but we don't know for certain that the risk factor *caused* the health symptom—which would be a "cause and effect" relationship. For example, a study might find that people who don't exercise are at risk for coughing more than people who do exercise. But in that study, all the people who didn't exercise also smoked. So it might be the smoking, and not the lack of exercise, that caused the coughing. For our open dump study results told here – the health expert used numbers to rule out smoking, gender, tobacco use, income level, or alcohol use as being the cause of health symptoms. But there may have been other factors she didn't know about.

For the demonstration villages, the subsistence activities of the villages depending most on subsistence foods were more impacted than the subsistence activities of villages that consume less subsistence foods. This means that if your village depends highly on subsistence foods, you should consider ways to reduce people's fears of dumpsite contamination. If you don't close your site, increasing site management should decrease the perceived and actual risks associated with subsistence activities. See Table 3-7 for suggestions. Also, read more details about risks to subsistence in the Environmental Impacts Section.

Possible Contaminants in Your Water and Soil

Table A-1 in Appendix A lists contaminants found in the water and soil near the open dumps of the demonstration villages. The last column in the Table lists possible health consequences that can result from ingestion, inhalation, or contact with these chemicals at high enough levels. **Arsenic, barium, chromium, lead, and diesel contaminants appear to**

be common at open dumps in Alaska. Much of the chromium, lead, and diesel is likely from batteries, and used oil leaking from scrapped snowmachines and other vehicles.

Table 3-1a
Percent of residents relying on a subsistence diet in four Alaska villages.

Subsistence diet reliance	Northwest village	YK Delta village	Yukon Interior	Southeast village	Combined (1,225 people)
Less than half the time	17	8	32	29	19.9
Half the time	24	20	42	44	29.0
More than half the time	58	72	26	27	51.1

Table 3-1b
Percent of residents in four Alaska villages whose subsistence activities are impacted by environmental concerns.

Impact on subsistence	Northwest village	YK Delta village	Yukon Interior	Southeast village	Combined (1,225 people)
No impact	28	21	47	51	36
Some impact	56	29	32	29	39
Much impact	15	46	21	20	25

Although **it is almost certain that some contaminants have leached into soil and water around or beneath any unlined dump,** it is important to know that **not all of the contaminants in Table A-1 may be present.** On the other hand, you may have additional contaminants that are not listed below. Read more about soil and water contamination in the Environmental Impacts Section of this Chapter.

Not a lot of water and soil sampling has been carried out at village dumps. It's not possible to give ranges of the level of contamination you might have. **Figure 3-1 lists some factors that increase the likelihood of significant contamination.** If your dump meets

Figure 3-1 Should We Worry About Water and Soil Contamination at Our Dump?

If any of these things happen:

People drink water from downstream of dump

People fish or gather berries near dump

People live near dump

Kids play near dump

Important plants or animals are near the dump

And you can check 2 or more of these factors:

- ⬭ No liner or no continuous shallow permafrost under dump
- ⬭ Dump is near surface water (less than 500 ft)
- ⬭ Dump is less than 1,500 ft from drinking water
- ⬭ Water flows from dump into surface water
- ⬭ High ground water table (less than 15 ft)
- ⬭ Soil under dump is sandy or gravelly (easy to pour water through)
- ⬭ No wetlands between dump and area of concern

***And* you can check 1 or more of these factors:**

- ⬭ Honeybuckets are always or sometimes disposed at or next to dump
- ⬭ Hazardous chemicals, like ethylene glycol, are dumped there
- ⬭ Used oil is often dumped there
- ⬭ A lot of snowmachines, used appliances, or machinery are dumped there without being drained and rinsed
- ⬭ Batteries are, or were, dumped there regularly
- ⬭ There is not much checking of what people dump

You Need to Worry About Water and Soil Contamination!

See Table 3-5 for actions you can take and "Seven Generations" for more information on risk assessment (for a copy of Seven Gen., call Bill Stokes, ADEC Compliance Assistance Office, 269- 7580)

many of these factors, you should seriously consider either improving your dump site, or closing it as soon as possible.

Something to watch for!

Contaminants in the water increase a lot during and just after big rain events and flooding – especially the first of the season. After a big rainstorm, lead was found at 5,000 ppb in water just downstream of a village dump on the Yukon River. That level is 1,000 times higher than what is considered safe to drink! **Do you have people who like to drink their water from traditional untreated sources, and these sources are downstream of your dump?** Make certain that they don't take the water after big rain or flooding events. You can test your water during these times for heavy metals, like lead and mercury, for about $150. If you have reason to be concerned, you may be able to get ANTHC or another agency to fund the sampling. Water sampling can also be covered under IGAP monies. Your water operator, if you have one, may be able to help you as well. They are trained in sample taking and testing. If you decide to test your water, please send your test results to us. That way we can build up our information and let other tribes know of the risks their own dumps might be presenting.

Burning Wastes

Burning of typical household solid wastes, particularly plastics (e.g. plastic bags), can be hazardous to health. The smoke commonly contains dioxins, carbon monoxide, nitrous oxide, and carbon dioxide. These agents have been associated with respiratory complaints, dizziness, and headaches in the short-term, and cancer and heart disease in the long-term.

Recycle your batteries!

It's easy and can cost you nothing! The biggest thing you can do to reduce contamination potential is to get your batteries out of the dump. See Chapter 8.

Burnboxes or dump fires are set often, in 65 percent of the villages responding to our solid waste management (SWM) survey. Over one-half of the villages have dumpsites or burnboxes located closer than one-half mile from town, and smoke blows towards homes in 36 percent of these villages. Table 3-3 shows the number of residents taking part in the CCTHITA health study that were bothered by dump site odors – primarily smoke.

If you can easily smell the smoke from your dumpsite, landfill, or burnbox from any of the community homes-- and the smoke is dark at the source, **stop burning, move your burnbox, or take plastics and hazardous wastes out** *of the "to-be-burned" waste pile.* **People living closer to their dump were** *19 times* ***more likely*** **to have eye irritation, and**

3 to 4 times **more likely to have headaches or faintness**, than people who live over a mile from the dump. **People who were bothered by dump odors** (generally people who live near the dump or who are more sensitive) **were** over 6 times **more likely to experience faintness, and** over 5 times **more likely to have ear irritation** than other people. They had increased risks for many other health symptoms as well (see Appendix B). If you can't stop burning because you don't have enough dump space, or animals are too much of a nuisance, you need to close your site and choose a different location or disposal method.

Table 3-3
Percent of residents concerned about dumpsite odors in four Alaska villages.

Concern About Dumpsite Odors	Northwest	YK Delta	Yukon Interior	Southeast[a]	Combined (1,225 people)
No concerns	30	37	80	48	39.1
Some concerns	41	49	10	32	39.2
Many concerns	29	13	10	20	21.5
Dump distance to homes[a]	2,200 ft	1,800 ft	1 1/2 mile	1 mile	

[a] Estimated distance from dump of about one-half of the homes. Note each dump was burned with different frequency. See Chapter 8 to figure out how far a burnbox should be located from your community's homes.

If your dump or burnbox isn't close and upwind of homes, and you can keep out wastes that shouldn't be burned, *controlled* burning might be a good option. Burning can keep animals away and reduce the volume of wastes. If you maintain and use a burnbox correctly, the smoke can be much less toxic than smoke from an open burn. Using burnboxes instead of open burning reduces the risk of uncontrolled fires, and is much better for keeping animals away. See Chapter 8 for more about burnboxes and proper siting information.

Figure 3-2 Rusting and leaking oil drums.

Home Barrel Burning Because three of the dumps were not burned while the health expert was there, it was not possible to evaluate the increased health risks of open dump burning. But she could document the risk of home barrel burning. She found that people put themselves and their community at high risk while home barrel-, or home fire-, burning. It is not certain why, but **people who burned their own trash were** almost 30 times **more likely than other people to have developed rashes. They were** 5 to 17 times **more likely to feel faint, and** almost 5 to 10 times **more likely to develop numbness,** depending on how often they burned. Other symptoms that were found to be significantly higher include fever, sore throat, and cough.

You should know that if your dump is near homes, and it gets burned, these same types of risks are likely to be present if smoke or its odor is very noticeable in the village, and you do not separate out plastics and/or hazardous wastes. People can be less concerned about separating their trash if they're burning at home. They want to get rid of it so they don't need to haul it, or they want to burn as much as possible to keep their fires going. About 65 percent of the villages that responded to our SWM survey have households that use burn barrels. And burning at home means people are exposed to a greater concentration of hazardous constituents from the smoke. **If you discourage or control burning at your dump, make sure people don't burn their garbage at home instead.** It could create a bigger health problem than before.

Smoke on the Water – A Do-It-Yourself Study

Do you get your drinking water from a creek or river or do people store their water in open rain barrels? Does dark smoke from the dump or burnbox float over the water at least some of the time? The smoke could contaminate your drinking water when the ash particles settle. Although no studies have been carried out, people living near the dump in one village stated that the rainwater they store in open barrels tastes very different after a dump burn. The ash particles in dark smoke can contain toxic contaminants. So it makes sense that these particles can pollute the water when they settle.

Conduct a study on your own!

1. Right after, or during, burns ask people if their water tastes different from the day before the dump burn. But don't tell them why you are asking, and don't mention the dump burning. Just say you are conducting a taste test for a grant you are writing, or come up with your own excuse. Ask them something like, "Does the water taste different than two days ago?" Do this for three burns.
2. When the dump hasn't been burned for a while, ask them the same question at least once, and preferably 3 times. Again, don't mention why you are asking.
3. Look at the responses of people drinking water you think might be contaminated. Was there at least one person that noticed a definite difference in taste after all three burns? Did they find also *no* difference in taste when the dump *wasn't* burned? Then smoke from your dumpsite or burnbox might be contaminating the water. If most of these people found a definite difference in taste when the dump burned, and no difference when it didn't, the water is almost certainly contaminated.

Do you burn wastes?

There are some really important actions you can take to reduce your community's health risks from burning wastes:

- ✓ Use a burnbox or, if you can afford it, an incinerator
- ✓ If you use a burnbox, operate it so that it burns hot
- ✓ Burn only on days when the smoke goes away from the village
- ✓ Discourage or prohibit people, especially small children and the elderly, from going to the dump when wastes are burning.
- ✓ Limit burning to papers, cardboard, wood, and food wastes, especially if you don't have an incinerator or burnbox
- ✓ Don't burn hazardous wastes no matter what!
- ✓ Maintenance! With burnboxes, keep ashes from piling up and vents clear. Rust-proof the structure and look for and fix any structural damage.

Infectious Disease

One of the primary health risks of dumps is spreading diseases. Solid waste management affects whether disease can be transmitted in a lot of ways.

Honeybuckets If honeybuckets are still used in your community, you probably already know you're dealing with higher health risks than communities with completed tank haul or pipe systems. The health expert found that **people who used honeybuckets were** 6.5 times **more likely to have diarrhea than people with a water system**. Disease-causing organisms, like hepatitis viruses, can live in the honeybucket wastes. These organisms can be transmitted to other people if contact occurs. Skin rashes can also happen as a result of contact with contaminated water. The main ways contact can occur through solid waste management are:

- ✓ People with honeybuckets or slopbuckets throwing out their bags or emptying buckets at the dump
- ✓ Human wastes being tracked over to the dump site from a nearby honeybucket disposal site
- ✓ People discarding their garbage at the honeybucket site instead of the dump site
- ✓ Household pets allowed into the dump site or honeybucket site, or
- ✓ People drinking from, or swimming in, untreated water that is contaminated with dump runoff.

Community Education Alert!

Even when people know they shouldn't burn plastic, they may still be burning it unintentionally. We found in the health surveys that most people didn't realize the thin plastic shopping bags they were burning were considered plastic wastes.

Clinic Wastes Contact with disease organisms can occur also by accidentally touching unburned clinic wastes. Most of our village clinics now send their used needles to a hub city for proper disposal. But other clinic wastes, like gauze, bandages, and Kleenex can be infectious. Discarding them at the dumpsite makes transmitting diseases possible (but not certain) when people touch them. So it is very important to separate out these wastes and burn them each day.

Household Pets Household pets can transfer diseases from one person to another if your dump site, honeybucket disposal site, or sewage treatment pond, is unfenced. Make sure that pets cannot get into these places.

Concerned about your water?

You can test your river for "Fecal coliform" or "E. coli". The presence of these bacteria can indicate that the water is contaminated with disease organisms. If you have a water treatment operator, they can help test the water with their equipment. Otherwise, you can use a sterile container from your clinic and send the sample to a laboratory (about $30). Call the lab for help in taking and sending the samples. One lab to try is Analytical Lab, Anchorage, 258-2155. Try testing your water a couple of times. The likeliest time for high contamination is during and just after big rain events and dump flooding, like Breakup.

Insects Insects, like everybody's favorite – mosquitoes- can also transfer disease organisms from wastes to humans. If you can – burn or compost (and tarp-cover) food wastes to help reduce insects, and if you can't, covering wastes with soil, woodchips, sawdust, tire chips, tarps, or other material will help a lot. Grade and fill-in the dump area so that there are no standing pools for insects to breed. Keep the area where people are allowed to dump their wastes as small as possible.

Animals Sick foxes can carry rabies. They don't eat, but they follow the healthy foxes to the dumps. It doesn't happen often, but they may infect a household pet. Fencing your dump is the best strategy to keep foxes and many rodents out. Keep a buffer zone free of trash between the fence and wastes.

Maintaining a fence if you have bears can be a nightmare! There may be no perfect solution. Some communities have been pretty successful with electric fences – but the voltage must be very high, and the fence can be difficult and expensive to maintain in

harsh weather or with an unpredictable electric output. Other communities have improved their bear problem by discarding all fish wastes in a separate secluded area, away from the dump. The household trash (excluding the plastics!) can be stored and burned in a burnbox. Villages are reporting that burnboxes can be an effective way to keep bears from the garbage. The City and Borough of Yakutat noticed a big reduction in dump bears after they cleared a buffer zone around their dump and confined the place where people dumped wastes (the "active face") to a very small area.

Getting Elders Involved

Dealing with mosquitoes and bears and where to place the fish wastes are ecology problems. When it comes to ecology, we all know there is no one like our elders for good knowledge. If you haven't already, perhaps try asking your community elders about the SWM problem you are trying to solve – they may be able to figure out the best solution!

Dump Scavenging, Waste Hauling, and Increased Health Risks

Not surprisingly, **the more someone visits the dump, the greater their health risk was found to be.** For example, they are between 4 to over 9 times more likely to feel faint, have vomiting, stomach pain, or headaches (see Appendix B). They are more likely to come into contact with disease pathogens. They are more likely to breathe toxic fumes from hazardous wastes. They, especially children, are more likely to burn themselves with battery acid that has leaked onto wastes, or into puddles. And they are more likely to have accidents. So cutting down on how often and how long people are at the dump can be a really effective way to reduce dump health risks.

Your village dump may be in such a bad state of repair and have so many health hazards that the best thing you can do is to keep people away from the dump. This means starting a collection program if you can afford it, or restricting dump open hours and enforcing anti-scavenging ordinances if you can't afford a collection program. A big problem is that our village dumps can be the most interesting place to play for our children, especially for tundra communities where the dumps might be on the only high ground. Keeping children out needs to be a major priority.

Site Accidents

Having an open dump often means that you are risking an accident happening. Accidents are especially likely if you don't manage your site much, or monitor what people are discarding, and how they are discarding it. In our survey, 16 percent of the responding tribes reported having at least one dump-related accident in the past 5 years. ABout one-half of the accidents were related to fire. In one instance, a child burned his foot during open burning of the dump.

Some accidents appear to be from carelessness. People don't realize how dangerous a dump can be. In one village, a man let a fire get out of control while burning a rabid dog. He is "lucky to be alive" because the fire spread to some nearby empty propane containers. One person walking through a dump stepped on a board with a rusty nail and had to get a tetanus shot immediately. Several snow machine accidents and blown-out tires have also been reported.

Figure 3-3a
Uncontrolled burning can be dangerous to dump visitors

Selawik Household Waste Collection Program

The Village of Selawik started a subsidized collection program. Visiting their dump presented great health risks to residents because honeybucket wastes were mixed in with regular wastes. During the summer, there was no way for people to turn around their Hondas without driving off the boardwalk and into scattered wastes. The dump edge kept moving closer to town. Another big problem was people setting the dump on fire. The dump is close to town and the toxic smoke could be smelled for a couple of days.

The village decided the solution was to start a mandatory collection program for all honeybucket and solid wastes. That way, people wouldn't need to go to the dump, and fires wouldn't be set. Also, with just the dump operator going to the dump, the honeybucket wastes could be dumped in a single spot and garbage could be placed back within the original dump borders. The operator is paid a good wage and provided with protective gear. The residents are happy with their collection program. The village hopes to phase in collection fees over the next 3 years, so the program will be self-supporting. Collection of aluminum cans for recycling will help subsidize part of the costs.

Summary of Health Risks

Does this seem like a lot of information? Tables 3-4 and 3-5 contain a brief summary of how diseases can be transmitted, and illnesses or injuries can occur, through solid waste management channels. Look at the Top Ten List and Table 3-7 in the last Section of this Chapter for suggestions on reducing risks. You can use the relative risks that are listed in Tables 3-4 and 3-5 to decide which problem to focus on. If, like most villages, you only have a couple of environmental staff (or like many villages, you are the only one!), it is best to tackle one or two problems at a time. Remember too, just because a risk is listed as being relatively high, it does not mean that it is happening (although it might be). It means there is a fairly good chance that it will happen if things aren't changed.

If you want some real numbers to use for education in your community, or to apply for grants to help reduce your health risks, look at Appendix B. The results of the health survey are shown in a pretty understandable format. The amounts by which people increase their risk of illness with different waste disposal factors are listed.

Figure 3-3a Hazardous wastes should be covered and stored off the ground. **Showing a funding agency that you have to store your oil and antifreeze drums on the school playground could be a good way to receive funding for a hazardous waste storage shed.**

Table 3-4
Potential solid waste management pathways for spread of infectious disease in Alaska villages.

Source	Typical relative risk[a]	Pathway
Honeybucket disposal- *humans tracking through wastes*	**High** Depending on degree of separation of solid wastes and honeybucket disposal areas, frequency of visits, and O & M procedures	Residents can track through wastes and get on shoes or clothing. Touching mouth, nose, other cavity, or open sores after touching shoes or clothing can spread disease. If hands are washed in shared basin, disease may spread. Disease organisms can be tracked onto floor, where children or pets play and contamination occurs by wiping nose, sticking hands in mouth, etc.
Honeybucket disposal- *direct contact*	**Very high** If wastes are dropped into open disposal pond	Emptying bucket contents can splash sewage water directly onto clothing or into mouth, nose, other cavity, or open sores.
Honeybucket disposal- *pet tracking*	**Medium-high** Depends on degree of interaction with pets, especially children's interaction	If they have access to dump, pets can track through or ingest/inhale wastes. Once at home, interaction with pets can spread disease if hands are not washed after.
Honeybucket disposal- *swimming in or drinking from untreated, contaminated water sources*	**Medium-** swimming **Highest** - purposeful and regular drinking Depends on degree of contamination. Rashes, respiratory, ear, and cut infections can occur with swimming also.	If water floods through dump it can carry disease organisms into nearby rivers, lakes. The first flush through dump at breakup probably carries the highest risk. Accidental ingestion, transmission through sores, eyes or nose of organisms can occur. If the water has to travel through ground to get to river or lake, it is unlikely that disease organisms survive. Flow through wetland can lessen risk also.
Rabid foxes	**Very low**- humans **Medium**- unleashed dogs	Dumps attract foxes that may carry rabies. Foxes can bite pets or humans and infect them. Rabid dogs might then bite humans. Still, there hasn't been a case of human rabies in Alaskan villages for many years.
Clinic wastes	**Low** Assumes residents do not intensively scavenge through wastes	Residents can come into contact with infected gauze, bandages, or needles when dumping or scavenging at dump.
Insect vectors	**Unknown** Probably medium-low, will vary dramatically with species and disease	Insects can land on, or feed on, honeybucket wastes, clinic wastes, or contaminated food leftovers. They can transmit disease organisms by landing on humans (especially directly on or near mouth, nose, open sores). They may also transmit disease through bites.
Birds	**Low** Depends on number of birds and frequency of visits to rooftops or playgrounds	Birds may also land on or feed on wastes contaminated with disease organisms. They may land on roofs that have rain catchment systems, and disease organisms may contaminate water via their droppings or contaminated feet. They may also spread disease if children touch contaminated droppings and then touch their mouths or noses.

[a] Relative chance of occurring, assuming necessary conditions are present.

Table 3-5
Solid waste management health risks, other than infectious disease risks, in Alaska villages.

Source	Typical relative risk[a]	Pathway
Open burning- *Injury due to flare-ups*	**Medium high** Depends how close resident s must get to drop off wastes	Build-up of gases in smoldering dump can shoot up flames without warning for several days after a burn. Several injuries have been reported, including children.
Open burning- *Illness or rash due to smoke inhalation, skin contact*	**High** Depends on frequency of dump visits, distance from dump to town, frequency of burns	Frequent and regular contact with smoke is associated with increased risk of respiratory diseases, coughing, throat irritation, faintness, and rashes (especially for sensitive persons). Open burning is a problem because the smoke is generally more toxic and duration of burn is longer. Separation of hazardous wastes produces less toxic smoke, but it is difficult to control for this.
Burnbox burning- *Illness or rash due to smoke inhalation, skin contact*	**Medium** Depends on frequency of visits, distance from burnbox to town, O & M, frequency of burns	See above. Burning wastes in a burnbox generally presents a lower health risk than open burning due to less toxic smoke (from higher burn temperatures and greater control of what is burned) and a shorter burn period, so less smoke exposure.
Home barrel burning- *Illness due to smoke inhalation, skin contact*	**Medium to Very high-** outside of home **Med. high to Highest**-inside home or steam bath	See above. Burning wastes at home can be less risky than open burning due to greatest control of what is burned. If smoke is fully vented up chimney/pipe, risk is much less, but rest of community may be subject to increased risks due to smoke proximity. Burning of non-coated paper, cardboard, and wood is acceptable, but respiratory disease is still a risk. Burning of unseparated wastes in poorly vented homes likely presents serious short- and long-term health risks.
Waste dumping	**Low** Assumes decent access, relative ease of waste drop-off, and no dump smoke	Residents can slip on slimy boardwalks or trip on potholes, wastes. Blind corners or narrow access roads can cause vehicle collisions.
Scavenging/ playing at dumpsite	Medium to High Depends on frequency of visits, and whether stepping directly on wastes.	Injury from stepping/falling on nails and other sharp objects has been reported several times and can cause serious infections. Burns from leaking battery acid have been reported. Contact/inhalation with toxic fumes can occur stepping through rusting hazardous waste drums. Snowmachining around dump area is risky due to buried objects such as scrap metal.
Bears	**Low** Depends on degree of human caution exercised	Bears that are used to dumps may become assertive, but generally are not aggressive. Near-misses are reported when humans don't maintain a respectful distance, or surprise a bear. A man was killed by a dump bear near Hyder-- it was assumed he was sleeping in the bear's path. A Yakutat waste-hauler has been chased-- possibly because he must drop wastes off near the fish pit.

[a] Relative chance of occurring, assuming necessary conditions are present.

2. ENVIRONMENTAL IMPACTS OF OPEN DUMPS

While the health expert in the CCTHITA-funded study was looking at the village's health an ecology expert looked at the land's health. The study was limited, but they found several things important for your community to understand.

Here is the short list of the most important environmental considerations:

- **Dumps affect the type and number of plants** in the area
- Having **wetlands around your dump are a good thing**! Keep them there!
- **Dumps disturb the permafrost.** Environmental changes can result that expand the disturbed area, and increase the chance of contamination in downstream areas.
- **Heavy rain and flooding can temporarily release lots of dump contaminants** into water.

Impact on Plant Community

An open dump can impact the surrounding and downstream plant communities in a couple of ways. You know how one area of land can have lots of different types of plants, and another area just a few? Scientists call this plant "diversity", and they use it as one way to see whether a site has been disturbed. The ecology expert looked at the area around the dumps, and an area away from the dumps, called a "reference site", that was similar in the lay of the land and water flow patterns. If the dump wasn't having any impact on the land, the reference site and the dump area should have contained pretty similar plants.

Plant diversity and richness The Yukon Interior dump in our study was small, well-designed and maintained, with a good single access road. The surrounding plant community was not very different from the non-dump reference area. But at the Northwest and Southeast dumps, which were less-well managed and designed, the dump areas had lower plant diversity than they should have. At the YK Delta dump, which was also not well-managed, the plant diversity was actually higher than the untouched reference site, but the increase was due partly to weedy plants, such as petasites, fireweed, grass and sourdock. Also, there was only a small number of each type of plant. Usually in the sub-arctic tundra of the YK Delta there is a high number of each plant present.

At each of the Northwest, Southeast, and YK Delta dumps – the three less well managed and/or designed dumps-- the species "richness", a measure of how many of each plant there are, was lower than at the untouched reference sites. This means that **just a few**

plants would tend to dominate less-well managed dumps, and other types of plants would be harder to find.

Mosses Out of any plant, mosses were most impacted at the less-well managed dumps, and there was less of them there than at the reference sites. **Sphagnum moss covered about one-third less area** than at the reference sites (28 and 31 percent for the Northwest and YK Delta tundra dumps and 35 percent for the Southeast dump).

The ***destruction of moss is a big concern in tundra areas***. Moss serves as a primary insulator of permafrost, and the invasive plants that might take its place are not good insulators. Moss also retains high amounts of water, an important function in tundra, because readily available water for the surrounding ecosystem is generally scarce. Without insulation, permafrost can be altered, leading to dramatic changes in plant communities, water level, and thaw depth. Read about this process more under the Impact on Tundra Section below. The presence of moss in the forests of the Southeast is important to maintaining soil pH and the balanced understory of plants typical for these forests.

Dead Vegetation Another impact is **that a much higher amount of dead plants can be found near dumps.** It is clear that much of the dead vegetation is a result of trampling by foot, vehicle, or bears (in the case of the Southeast). Not surprisingly, the Northwest and Southeast dumps, **the two dumps with the greatest number of access trails, had by far the highest amount of dead vegetation**. An average of 43 to 63 percent of the land surrounding these dumps was covered by dead plants! The YK Delta and Yukon Interior dumps, both with a single access trail, had just a very small amount of dead vegetation. Additionally, the Northwest dump, **by far the least consolidated and the most poorly managed, had the highest amount of dead vegetation**, partly due to garbage covering the plants and blocking sunlight.

It couldn't be determined whether the dead vegetation results also from dump contaminants and/or slight changes in hydrology, topography, or soil conditions caused by the dump's presence. Significant contamination with some compounds can certainly kill plants or stunt growth. The Northwest and Southeast dumps, with the greatest percentage of dead vegetation, are much larger than the other two dumps, so assumedly the potential for soil-- and thus plant— contamination is greater. In terms of dump-caused changes in ecology, it is known that tundra plants are highly sensitive to small land slope and water level changes. Such changes might occur during dump site compaction, grading, berming, or erosion. Additionally, loss of moss in tundra and non-tundra environments may make soil pH (the acid content) increase outside of a plant's tolerance zone.

Impact on Tundra

The disturbance of tundra is a primary environmental concern for tundra open dumps. A healthy tundra ecosystem capable of supporting its plants and animals depends on a vegetation layer to insulate the underlying permafrost from heat in the summer and cold in the winter.

The tundra insulative layer can be degraded, and the permafrost impacted, by the following processes:

- Loss of moss, as well as other less-insulative plants, due to dump traffic and other processes not yet understood
- Replacement of moss by invasive plants that are poor insulators
- Compaction of tundra from dump traffic and overlying wastes
- Tearing up of tundra from vehicle traffic

Additionally, **open dumps may melt permafrost directly** by:

- Liquid waste dumping, particularly propylene and ethylene glycol (antifreeze), sewage wastes (honeybucket and sewage sludge), and oil.
- Large quantities of food wastes piled together with a ready carbon source, such as paper. The breakdown process produces heat.
- Ground fires

What can happen when permafrost gets disturbed? If you live on tundra you likely know already. Here is how scientists explain it in case you need to write about it in your grant proposal, or to educate community members. There are three potential impacts:

(1) **Ice mound and expansion of impacted area** First, the permafrost might actually thicken and form a "lens" of ice-- an ice mound. What happens is that the ice goes through a freeze-thaw cycle each year. The ice thaws in summer, and during winter the ice forms again, but with more water to make a larger mound. During the freeze events, soil is often brought to the surface. **The upheaved mixture of soil and ice,** called a "frost heave", then **piles on top of the protective vegetative area, killing the plants and thus increasing the size of the impacted area.** Frost heaves can be very disruptive to roads and bridges, as well as dump facilities.

(2) **Thaw bulb and development of an expanding pond** A second possibility is that damaging the vegetative layer could melt the permafrost and a thaw bulb could form. Where ice is melted, water is left in its place. This can lead to the development of a pond that can continue to increase in size each year. What happens is that during summer the on-shore winds force the melted water to the sides of the pond. The **warm water melts away more permafrost yielding a slightly larger pond each year.** The development of a pond would dramatically the type of plants found in the area.

Instead of arctic/coastal tundra plants, freshwater marsh type plants like pendant grass would take hold.

(3) **Quagmire of expanding peat mud** Another possibility is that the permafrost melts, but no pond forms. The ground gets too full of water and plants can't grow. A muddy swamp, or "quagmire" of very **saturated peat is left that is impossible to walk on or more move over without getting stuck.** These types of areas take a very long time to recover. If you live on tundra you probably have first-hand experience getting stuck in this stuff.

Wetland Mitigation

An important factor in how much contamination your dump might cause to the surrounding soil and water is the presence of wetlands. Wetland plants and soil take up pollutants like heavy metals, filter out disease organisms, and detoxify certain chemicals. Having wetlands between your dump and what you are concerned about is a very big help. **If you are looking into developing an area**, **make sure you do not physically disturb any wetlands** located between your dump and waters or land that you are concerned about.

Want some numbers?

In one village, the dump leachate and runoff from the adjacent honeybucket site flowed through wetlands before reaching the river from which residents fish. Going through 250 meters of wetlands, water sample counts of fecal bacteria went from too high to count (over 10,000) down to only 70 per 100 ml, what scientists would call a two-orders of magnitude decrease). Diesel in the water went from 170 ppm to non-detectable. In another village in the Southeast, lead went from 130 parts per billion in the water to 10 ppb about 1 mile downstream.

Hydrology

Something important that you should be aware of is that wetland or permafrost destruction changes the hydrology around and downstream of the dump. Thawing of permafrost may allow water to flow to areas it couldn't before. This may be okay or it could have very serious consequences. **Changes in permafrost and water flow may link the dump runoff directly or indirectly to your river,** or other areas that you use for subsistence. If a link to your river is created or the path shortened, the potential for contamination is greatly heightened. You need to look into this factor if you notice the land shapes or plant types around or downstream of your dump changing. And make sure this possibility is evaluated when community development plans are made (be especially careful locating water treatment ponds which can create thaw bulbs in permafrost).

Contaminant Release

Here is another good environmental process to know: **If left alone, wetland soil can keep metals, like lead and mercury, from getting into your water.** Soil in wetland areas locks heavy metals away by binding them fast with other compounds. But if this soil gets exposed to oxygen in water or air, the heavy metals are released. So one worry is that a new water flow path (on or under the surface) will release these heavy metals. The more oxygen the water has, the better its ability to release heavy metals. Turbulent water from rain, and rushing water from Breakup or a creek or river, breaking past and through contaminated soil should be avoided because of heavy metal release. **Digging up wetlands and exposing the soil to air will also result in release of contaminants.** If you are re-working or closing your dump, be aware of this process. Timing your heavy equipment work well after Breakup should be planned if possible. Another good remedy is to channel water to ponds first, before it flows into the river. The time in the still ponds will allow contaminants to resettle and the heavy metals can bind up again.

Subsistence Impacts

Not a lot of data exists on the impact of dumps on wildlife or subsistence plants. We know that chemicals can accumulate in our animals, and high levels of some contaminants, like mercury have been found in some parts of marine animals. And heavy metals like cadmium, lead, and mercury are found in soil, and sometimes in water, at open dumps. As Table 3-1 showed, subsistence contamination from dumps concerns a lot of us.

Soil Contamination You should know that **the contamination of soil from dumps does not appear to occur too far outside of the dump.** In one sampling study performed, soil contamination of heavy metals did not extend past about 500 yards. Many contaminants are trapped by soil, especially heavy metals. Since most wildlife tend to stay away from areas of human activity, and therefore, stay away from the dump, **it is likely that wildlife is not affected significantly by dump soil contamination.**

Water contamination Because water flows over long distances, it is more difficult to say how wildlife might be impacted from dump water contamination. In the villages studied, the level of contamination in the water from the compounds listed in Table 3-1 was quite low, and likely of little to negligible concern to fish and wildlife. **If the waters that you are concerned about are relatively far from the dump, or are not directly connected to the dump** except through several hundred yards of wetland or subsurface flow through soil, **the fish and wildlife are almost certainly okay to consume**.

However, open dumps can cause heavy contamination of water in the wrong circumstances. **If a creek flows right through or past your dump, without any wetland mitigation, contaminant levels near the dump may be substantial enough to impact fish populations.** Anecdotal evidence suggests that heavily polluted dump water can degrade fishing streams and spawning beds. High organic loading can deplete oxygen and also cause

creek populations to decline or change in species type. Also, the jump in contaminant levels during flooding events should be considered when conducting subsistence activities.

First Flush We mentioned the "first flush" effect of rain and flooding in the Health Section. The first big rain event of the season or flooding from Breakup flushes out lots of contaminants that had settled on creek and river bottoms, been trapped by plant filtration, or locked up with soil. During this time some water sources that mix with dump runoff may be very polluted. If honeybucket wastes are mixed in with solid wastes or you have a honeybucket dumpsite, and the river water is mixed in with honeybucket runoff, it may be unsafe to wade in the river while conducting subsistence activities. Even without accidental ingestion, skin contact with water highly polluted with bacteria can cause rashes, and delay the healing of sores.

Berries Because dump soil picks up contaminants, plants near the dump will take up some of these contaminants. Plant uptake is a helpful process because it helps clean up dump contamination. You should be aware that picking berries for consumption near the dump is probably not a good idea. Many fruit plants concentrate their nutrients (and contaminants) in their seeds and fruits. To be safe, make sure residents know to go at least 30 yards upstream or uphill of the dump, or 400 yards downstream or downhill of the dump. **Eating a small handful of berries closer to the dump should be fine, but it should not be a habit without testing the area first.**

General Rule A general rule is that **if fish are just passing through contaminated water, or animals only occasionally drink it, the fish and animals are almost certainly okay to consume.** If fish have been living in highly contaminated water for several weeks, it may be better to fish elsewhere for a while. For example, fishing in a pond right at the dump should be heavily discouraged. If plants are flooded by dump runoff infrequently, they should be okay as well. Even in warmer temperatures between 68° to 86°, bacteria and viruses do not survive in agricultural crops watered with processed wastewater (or fertilized with sewage sludge), over 60 days. And they usually survive less than 15 days. So **if you are concerned about consuming berries that might have taken up honeybucket or sewage treatment water, wait 60 days after plant exposure and you should be completely safe.** If you think the berry plants may be regularly exposed to a significant level of bacterial contamination, boiling berries for jams at least 25 minutes also will kill bacteria.

What to look for

Remember we are only talking about fish or animals living in highly contaminated water continuously or eating plants in heavily contaminated soils continuously. Heavily contaminated water or soil will often look or smell different from other areas. **Make sure your community's subsistence practices do not change unless they have to. Test areas that you are worried about.** Please send the results to us, ANTHC, EPA, or DEC so that we can all share dump risk information.

Nutrient loss To be complete, we should mention that open dumps could have an indirect impact on subsistence by changing the plant community type around the dump. One way to look at plants is in two broad types of categories – invasive plants, and non-invasive plants. Invasive plants are better adapted to disturbed areas—like the access trails and interior of open dumps. And the nutrition value of these kinds of plants can be of poor quality compared to non-invasive plants that establish themselves over long periods of time. For example, the Northwest dump studied had highly disturbed land due to numerous access trails, and lower nutritive grass replaced the higher nutritive sedge. So **the presence and/or health of wildlife living around the dump may be impacted.** Of course, since it is only disturbed areas that this problem might occur, the easy solution is to limit dump traffic to a single route.

Bears

Speaking of nutrition, the health of bears is definitely impacted by open dumps. The presence of bears was noted as a problem in over half of tribes responding to a statewide survey. **Bears who depend on garbage for their food tend to live 10 to 15 years less than non-dump bears.** Of course, the other health hazard for bears is that they are often killed at dumps. Two-thirds of the tribes with bear problems stated that at least one bear had been killed at their dump in the last five years. Village residents tell stories of bears being killed often for easy sport and not for safety or subsistence reasons. At one Yukon dump, an out-of-towner cut off the paws (to sell in China) and left the body. Keeping bears away from the dump not only protects your community, it prevents this type of killing and wastefulness.

Figure 3-4 Brown bears at a Southeast dump site.

Summary of Environmental Impacts

If you made it through this whole section, you should be congratulated. It's like taking a whole college course on ecology in one sitting! A handy summary of what you just read is provided for you in Table 3-6. Remember too, if you have questions about environmental processes at the dump, call your agency staff person and they should be able to set you in the right direction for information. Another good idea is to call the University of Alaska Cooperative Extension Service at the College of Rural Alaska (474-2631). The purpose of College Extensions is to reach out to the community and help them with real-life problems. While they may not have specific information about dump contamination, they know a lot about the types of ecological processes and factors that can make contamination worse or better. They may be able to put you in touch with the perfect person for your question.

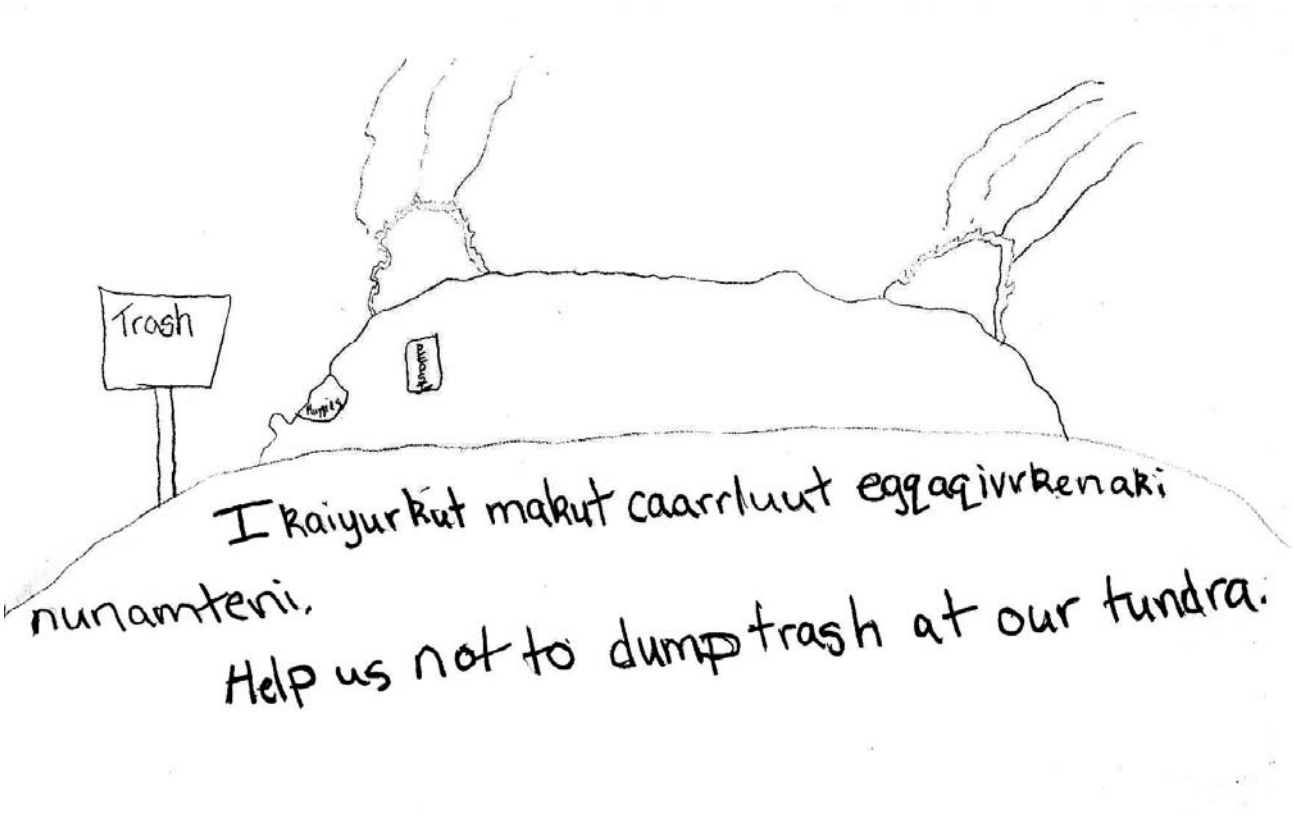


Table 3-6
Environmental risks related to open dumps in Alaska villages.

Source	Typical relative risk[a]	What it does
Soil contamination in immediate dump vicinity	**Very high** But decreases rapidly away from dump	Dumping batteries, used oil, ethylene glycol, paints, or other hazardous wastes contaminates soil and may impact plant community or make berries unsafe to eat.
Water contamination in immediate dump vicinity	**High –** water flow through dump will be contaminated to at least some level	Runoff to dump ponds may make water acidic, causing acid burns and impacting plant health, continued uptake of contaminated water may affect animal health.
Soil contamination away from dump	**Low-** except in case of direct water flow to area of sediment settling	May impact plant and animal communities over long-term.
Water contamination away from dump	**Very low to high –** depends on level of dilution and initial contamination, and much greater risk if water flows directly from dump and not through wetland or subsurface soil.	May impact plant and animal communities over long-term. A high bacterial count may make use of water in subsistence activates unsafe.
Plant diversity loss-	**High-** in immediate dump vicinity **Low** – other areas depending on water flow	Makes plant community more susceptible to changes, may change type of animal species in area. May impact berry gathering practices. May decrease nutritive value of area to wildlife. Loss of moss affects permafrost.
Tundra degradation	**Very high** If more than one access route, unmaintained access, or unconsolidated wastes	Impacts plant community directly. Kills moss and other plants, changes plant types. May set in place ever-increasing area of impact due to permafrost changes. May create new hydrology, and link water sources of concern to dump.
Contamination of animals	**Very low**- unless animals live continuously in immediate vicinity of poorly managed dump	Accumulation of dump contaminants in animal organs may make sustained eating of these animals a health risk.
Contamination of berries	**Low** – except immediate dump vicinity	Berries in immediate dump vicinity may accumulate contaminants.
Bear health jeopardized	**High**	A diet of garbage dramatically reduces a bear's lifespan. Killing bears for easy sport may also result
Contaminated air from burning	**Very high** – during smoke period, less toxic with burnboxes	Continuous dump burning may deprive oxygen to plants exposed to heavy smoke. Health risks to humans discussed in health section. Smoke turns rain into acid rain and can impact plant health in that way.

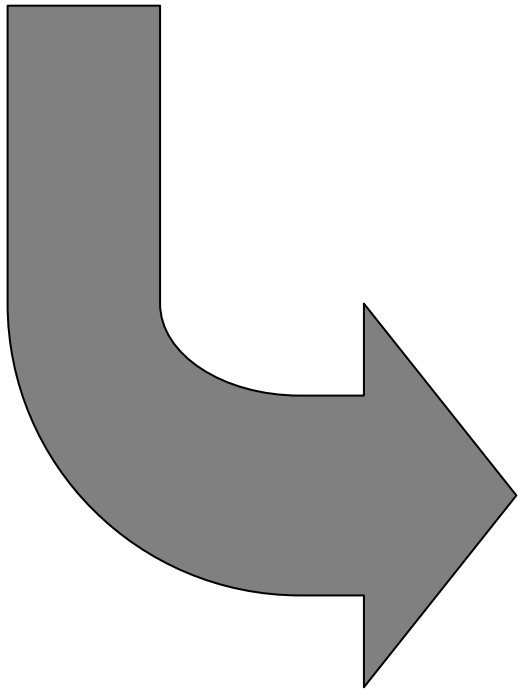
3. FIXING HEALTH AND ENVIRONMENTAL PROBLEMS

You may be reeling from thinking about how many health and environmental risks your dump might have. And we all know getting funding for big things like closing a dump and starting a new one can be a long time in coming. The good news is that there are lots of ways to reduce the risks of your dump. In fact, **you may be able to reduce your risks enough that you won't need to close your dump at all**.

Table 3-7 lists problems talked about in this Chapter, and ways to solve or reduce them. The methods listed are all no-cost to medium-cost options, so you should be able to afford at least some of them. The medium-cost options (about $5,000 to $30,000) may take a bit of creative funding. Check out especially the ANHB Solid Waste Demonstration Grants (see Chapter 4). Also many agencies have discretionary funding at the end of year for these types of simple and effective improvements. You just need to make it clear what the money is for and how much it will reduce your risks.

The problems listed first are some of the most risky to community health, so try to give them priority. Also, if you read Table 3-7, you'll see some of the same solutions mentioned for different problems. If you can swing them, those solutions will be the most effective efforts to carry out, because they will solve more than one problem.

Here is the top ten list of risk-reducing choices:



TOP TEN WAYS TO REDUCE YOUR SOLID WASTE DISPOSAL RISKS

Education

Changes people's risky behavior like scavenging, burning plastics, dumping batteries, drinking untreated water downstream of dump (without testing), and dumping honeybucket wastes at dump, or solid wastes at honeybucket site.

Waste (And Honeybucket) Collection Program

Keeps people out of dump, prevents random fire setting and battery disposal, helps with waste consolidation, waste area separation, stops honeybuckets from being dumped at dumpsite, and garbage being dumped at honeybucket site.

Better Access

Reduces tundra degradation, promotes waste consolidation and waste area separation, reduces people/waste contact

Separate Waste Area

Stops scavenging, promotes waste reuse (and volume reduction), stores wastes for future recycling.

Burnbox or Incinerator

Reduces disease organisms, reduces volume, reduces disease vectors, detracts bears, stops uncontrolled fires. *Burn wastes only in well-designed and maintained burnbox, and downwind of village.*

Frequent Cover

Reduces disease organism contact, reduces volume, reduces disease vectors, detracts bears. Alternative cover materials include tarp(s), wood chips, rock, shredded or weighted plastic, crushed glass, old clothing, textiles, rugs, etc.

Stop Smoke Inhalation

Reduces respiratory symptoms and reduces potential for rashes, cancer and respiratory diseases. Switch to good, maintained burnbox, burn wastes only downwind of homes, prevent people from entering dump during burn days or when smoky, ban home barrel burning of non-paper/food wastes.

Battery Recycling

Greatly reduces toxicity of leachate, stops risk of acid burns to children visiting dump. Contact Frank at Anchorage Battery, 276-5251 or Joe Sarcone at EPA, 271-1316.

Know Your Risks

Safeguards community health, prevents subsistence activities from being altered unless necessary. Test suspected water that is used without treatment (e.g. drinking from traditional source, swimming, wading). Test during or just after big rains and flooding for maximum contamination, and test at other times for minimum contamination. Until you are certain it is safe, you may need to stop village use of this water during or just after big rains and flooding. Test for heavy metals and E. coli or Fecal coliform. Ask your water operator or EPA for help for free or low-cost testing.

Ban Or Separate Plastics

Reduces smoke toxicity and reduces windblown wastes, litter. Villages in the Yukon River Inter-Tribal Watershed Council have banned Styrofoam and plastic. Contact: Andrea Bongen, 563-9334.

Table 3-7
No-cost to medium-cost ways to reduce risks of solid waste disposal in Alaska villages.

Problem	Type of solution	Ways to reduce the risks associated with it
Honeybucket wastes mixed with regular garbage disposal	**Education**	Ask people why they dump their honeybucket wastes at dump site, or garbage at honeybucket site, and see if you can address that. Explain how these practices increase community health risks.
	Designated area	If people continue to dump honeybuckets at dump site, then mark off an area for them to dump at. Try to berm the area. If possible, mark a low area of the dump that is not prone to flooding.
	Make access clear	Make sure that people can dump their garbage without having to walk onto wastes. Keep access and turnaround clear. Build movable platform to dump wastes from.
	Collect wastes	Set up a mandatory honeybucket collection system and/or mandatory garbage collection to keep people away from disposal sites;
	Fencing & staffing	Fence disposal sites to keep pets out, or confine pets. Restrict dump open hours to times when it can be staffed.
People scavenging through dumpsite	**Education**	Let people know how high the risk of injury and illness is when they walk through and on top of wastes. If kids play there, work with the schools to educate them on the dangers. Get funding for creating an interesting place for them to play.
	Separate area	Make and maintain a separate area for reusable items. If you have a spare building, make that a reuse center to bring materials that will get ruined if they stay outside.
	Fencing & staffing	Fence off the area and restrict dump open hours to times when it can be staffed.
Swimming in or drinking from contaminated water	**Education**	Tell/show people that using untreated water that is mixed with dump runoff may make them sick or give them rashes.
	Test water	Test water to see if it is okay to drink or swim in.
	Restrict use	Try to keep people from swimming/wading/ or drinking water during and just after big rain events or flooding (e.g. Breakup)
	Site remediation	Start better dump management practices, like separating out wastes, picking out batteries. Take off all snow before melting. If heavy equipment is available – try to redesign slope of dump so water goes around, not through dump. Erect berms to redirect surface water.
Decreased subsistence activity	**Education**	Let people know that all studies have shown it is much healthier for them to continue subsistence diets.
	Sample Testing	Test waters or soils in areas where people are concerned. IGAP funds can cover this, or you may be able to get funding from other agencies. Call someone like Bill Stokes, Compliance Assistance, ADEC, 269- 7580, or Joe Sarcone, Rural Sanitation Coord., EPA, 271-1316, to figure out what to test, how to do it, and how to interpret results. Make sure you send them or us a copy of results so that the information can be used to help other tribes in similar situations.

Continues on next page

Table 3-7 (contd.)
No cost to medium-cost ways to reduce risks of solid waste disposal in Alaska villages.

Problem	Type of solution	Ways to reduce the risks associated with it
Smoke and fires from open burning	**Designated burner**	Have a designated person who is the only one allowed to set dump on fire. Set fires only on non-windy days and/or when wind is away from village.
	Education	Tell/show people how dangerous smoke and flare-ups can be. Get them to stop lighting fires on their own, and ask the designated person instead. Post signs in-town say when the burn days are, and to stay away for 2 days.
	Separating wastes	Get people to separate out their plastics. If open burning is the only option for now, consider banning plastic bags at the stores[a].
	Burnbox	Consider using a burnbox instead.
	Collection program	Mandatory collection program so people don't set dump on fire and so hazardous wastes can be better separated out.
	Protect boardwalk	Make boardwalk at dump fire-proof or fire-resistant, or secure funding for insulated gravel platform, so that good access is kept.
	Cover wastes	If possible, compact and cover wastes often instead of burning. Look for alternative cover material such as a tarp(s), wood chips, rock, shredded or weighted plastic, crushed glass.
Smoke from burnbox	**Separating wastes**	Get people to separate out their plastics. Consider banning plastic bags at the stores. Staff burnbox or do random visits and help people see what wastes they should be separating out..
	Restrict burning	Burn only on non-windy days and/or when wind is away from village.
	Maintain	Maintain burnbox for high draft, hot fire, and quick burn.
	Relocation	If impossible to keep smoke away from village, relocate burnbox.
Smoke from home barrel burning	**Education**	Tell/show people how risky it is to breathe smoke from fires with plastics, used oil, or hazardous household product wastes.
	Ordinance	Ban household burning within village limits or confine it to certain days and allow only paper, food, and wood wastes to be burned.
	Burnbox	Find out if people would burn at home less if there were a burnbox. If so, get a burnbox and place it in a good, downwind location.
Out-of-town business and government agency dumping	**Ordinance**	Write an ordinance making it illegal for businesses to dump their wastes. Require backhaul. Or if you want the revenue, require them to pay for disposal. These businesses save a lot by not paying for waste disposal. But our villages end up paying in the end! Note it is illegal for federal agencies to dump at unpermitted dumps.
	Call ADEC	Take action against businesses that have dumped hazardous wastes and refuse to clean them up, or continue to dump other types of wastes against village wishes. First, write an official letter. Then try calling ADEC Spills and Prevention, 451-2121.

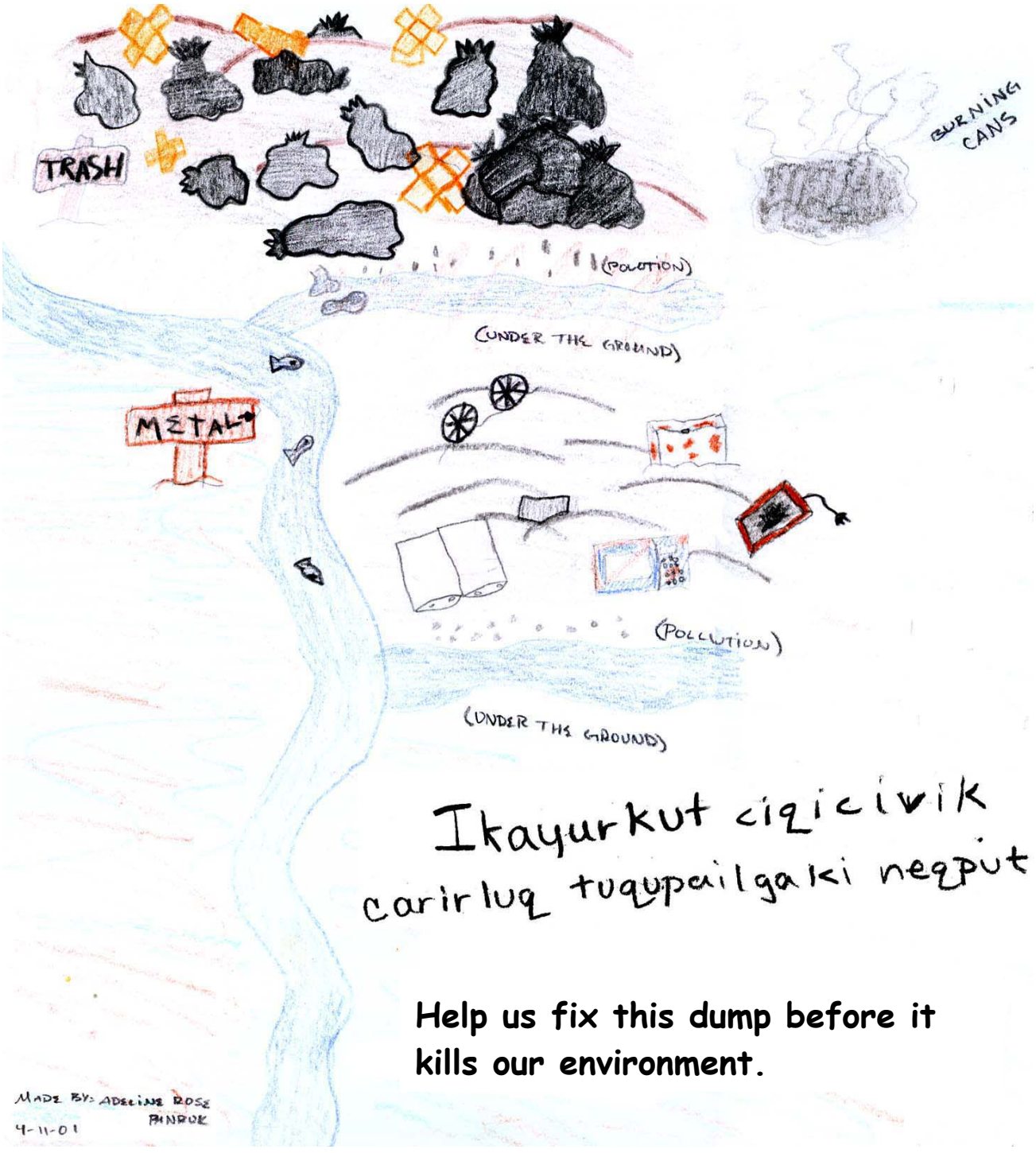
Table 3-7 (contd.)
No cost to medium-cost ways to reduce risks of solid waste disposal in Alaska villages.

Problem	Type of solution	Ways to reduce the risks associated with it
Clinic waste dumping	**Make plan**	Work with clinic to set up a strict plan of burning *all* clinic medical wastes daily.
Dump expanding/ people littering	**Education**	Explain how unconsolidated trash creates higher risks (people are exposed more and tundra and wetlands are destroyed).
	Better access	Find out why people are doing this – if it's because they don't like going to the place they should be dumping, make a better access (funding for small site improvements may be available from ANTHC).
	Collection program	Start a mandatory waste collection program so all wastes can be placed correctly by waste collector.
	Recycle	Start a recycling program to reduce volume of wastes. See Chapter 8 and Appendix C.
	Bale	Bale wastes to keep dump neat
	Clean up	Try paying community groups to clean up litter, or make it part of a school program to award "points" to students.
	Ban plastics	Ban plastic bags from your village. Because they are light-weight and don't degrade, plastic bags contribute highly to unsightliness.
	Burnbox	Purchase a good burnbox, or construct one yourself using a good design and materials.
Tundra destroyed	**Education**	Let people know about the degradation process they are producing. Mark off the area of "bad" tundra around the dump and let people see how the area increases over time.
	Consolidate waste area	Practice waste consolidation measures – start a collection program, or pay someone to consolidate wastes 1 or 2 days per week. Bale, compact and/or trench wastes if possible. Burn paper wastes. When ground is frozen, bring out or rent heavy equipment to work over landfill (ask project managers of village construction projects to borrow theirs)– at least once just after summer, and once before summer.
	Improve access	Improve and maintain a single access route to the dump, making it by far the most convenient path to take. Make boardwalk at the dump fire-resistant or fire proof so it doesn't burn away. Try for funding to make an insulated gravel platform at dump.
	Erect barriers	Erect barriers so people only go to dump along a single route and only to the "active face" – the small part of the dump where people should be bringing their wastes currently.
	Backhaul antifreeze	Make certain that antifreeze (ethylene or propylene glycol) is not dumped – make sure that construction, housing, electrical, fuel projects and businesses backhaul or recycle their antifreeze.

Continues on next page

Table 3-7 (contd.)
No cost to medium-cost ways to reduce risks of solid waste disposal in Alaska villages.

Problem	Type of solution	Ways to reduce the risks associated with it
Foxes, rodents	**Fencing**	Erect fencing.
	Control dogs	Restrict dogs from entering dump.
Birds, insects	**Cover wastes**	If possible, compact and cover wastes. Look for alternative cover such as a tarp(s), wood chips, rock, shredded or weighted plastic, crushed glass. Reduce water ponding to reduce insect breeding.
	Burnbox	Purchase/construct a well-designed burnbox. Burn food wastes.
	Compost	Start a covered worm compost operation like the Village of Iguigig, or compost food wastes in an area away from dump and houses. Call Can-O-Worms 1(888) , 422-2129.
Plant life changed	**Education**	Show people the difference in plant diversity and abundance at dump and away from dump.
	Consolidate	Reduce impacted area by consolidating wastes.
	Barricade	Block off area and revegetate.
	Test water	If area is not at dump, but downstream, test water to make certain it is not too contaminated for fish, wildlife, and human use.
	Stop runoff	See runoff and flooding suggestions.
Leachate from dump	**Prevent formation**	Prevent water from passing through. See runoff and flooding suggestions.
	Recycle - reduce toxicity	Prevent hazardous wastes from entering dump. Start recycling batteries immediately. Find out if used oil is dumped. Ensure machinery and vehicles are drained of oil and fluids before dumping. Make certain antifreeze is backhauled, recycled, or treated.
Odor from dump	**Move fish**	Bring fish wastes to another area. Burn/compost food wastes.
	Quick burn	Burn or bury dead animals immediately.
	Check odor	If odor is not from food/animal waste, make certain its not a chemical.
Bears	**Separate**	Separate fish wastes and discard away from dump and human traffic.
	Grind	If available, use grinder for fish wastes and compost with wood, paper, etc. Call Jeff Benson, Metlakatla Compost Project, 886-4200.
	Compost	Compost food wastes – you may need to store compost barrels inside a building.
	Accept bears	Accept bears presence. Most dominant bears tend to avoid human traffic. Get people to visit dump only at certain hours so that bears may avoid them.
	Buffer zone	Maintain a clear buffer zone free of trees, heavy brush, and wastes so that bears do not emerge next to humans unawares.
	Burnbox	Use a burnbox.



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Help us fix this dump before it kills our environment.

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Chapter 4: Show Me the Money and Get Me Some Help!

Now that you've figured out you want to close your site, can you afford it? To figure out how much money you might need, go to Chapter 6, which talks about costs. Here we talk about whom you can go to for money and technical help, and how you go about getting it.

WHAT HAVE OTHER VILLAGES DONE?

Table 4-1 lists villages that have already gone through the process of closing their site. Their contact information is provided so you can ask them questions about how they got their sites closed. Table 4-2 includes some other villages that are planning to close but have not yet finished. Both tables include funding sources, so if you are interested in getting funding from a particular agency, it may help to contact that village and see how they did it. You'll find more information about their closures in Chapters 5 and 6. As you can see, their funding came from many different places.

WHAT ABOUT OTHER DUMP USERS?

One thing you should check is whether an agency owns the land underneath the dump, and whether any agencies or organizations used the dump. These groups may be willing to pay for part or all of the closure cost. If they are a federal agency, they may be required to pay part of the costs because it is illegal for them to dump wastes at landfills not in compliance with federal solid waste regulations (RCRA 42 U.S.C. 6964).

WHAT CAN I GET FROM THE AGENCIES?

You can get a lot of help from the different agencies and organizations. Even if they can't get you money right away, they can help you get on the right track to funding in the future. They can also be of enormous help ***(free-of-charge!)*** in getting your closure plan together, and deciding between different waste disposal methods. Agencies are also a source for getting good publications on Solid waste management (SWM) and community planning, and SWM education. The main agencies to ask for help are listed in Table 4-3.

Order these documents now! (most are free— if not, ask for a machine copy)

Seven Generations, ADEC, 269-7580

Community Planning Toolbox, Governor's Council of Rural Sanitation, 761-7700

***Landfills in the Bush*,** Associations of Village Council Presidents, 543-3521

Trash Management Guide, Alaska Health Project, 276-2864

Decisionmaker's Guide to SWM, EPA, 1 800 424-9346. Ask them to send a publications list of free SWM documents.

Solid Solutions in Rural Alaska, EPA Tribal Program, 271-6323

Down with Dumps (Video), Parts 1 and 2 target rural Alaska villages, ADEC Solid Waste Office, 269-7653

Table 4-1
Contact and Funding Information for Village Dump Site Closures.

Village	Year closed	Closure design	Funded by	Contact
Mentasta	1998	Chemtrack Consultants	BIA	Lottie Wolf, Mentasta Lake, 291-2319
Eagle	1994	City of Eagle	BLM	Jerry Nelson, Mayor of Eagle, 547-2282
Nenana	1997	City of Nenana	City of Nenana	Robert Knight City of Nenana, 832-5441
Galena	1998	U.S. Airforce	ADOT	USAF
Cape Lisburne	2000	USAF	USAF	USAF
Oliktok	1996/97	PMC/Frontec	USAF	Gary Brell, USAF 552-2150, gary.brell@elmendorf.af.mil
Kaktovik	1998	USAF	USAF	Gary Brell, USAF 552-2150, gary.brell@elmendorf.af.mil
Cantwell	1998	VSW	VSW	Doug Poage, VSW, 269-7612
Anderson	2000	VSW	VSW	Doug Poage, VSW, 269-7612
Unalaska	1998	City	ADEC, city	Dept of Public Works, 581-1260
Golovin	1998	Montgomery Watson	*information unavailable*	Montgomery Watson, 248-8883
Sag River	1990	ADOT	ADOT	Environmental Section, 451-5291
Stirling	1989	*information unavailable*	Kenai Borough	Lanie Hughes, Kenai Borough 262-9667
Circle	*information unavailable*	*information unavailable*	*information unavailable*	Bill Miller, 773-2822
Chignik Lake	1996	Arctic Slope Consulting	ADOT	John Lind, Chignik Village, 845-2228
Togiak	2000	Bristol Bay Engineering.	VSW (ADEC & ANTHC)	Jim Vogel, Bristol Engineering, 563 0013
Allakaket	2000	ANTHC	ANTHC	Don Antrobus, Engineer, ANTHC, 729-3550
Beaver	1997	VSW	VSW	Roger Burleigh, 269-7606
Skagway	2000	Mont. Watson	*information unavailable*	Grant Lawson, Public Works 983-2449
Newtok	2000	Village	State	Stanley Tom, Tribal admin, 237-2314
Noorvik	2000	Village	BIA	Fred Smith, General Manager, Elsie Sampson, IGAP, 636-2144

Table 4-2
Contact information for some villages with site closures currently in process and/or funded for future closure.

Village	Population	Funding source	Contact
Klawock	750	City of Klawock, Denali Commission	Roger Brown, 755-2265
False Pass	73	City of False Pass (partial)	Tammy Shellikoff, 548-2227
Noorvik	634	BIA (partial)	Fred Smith, 636-2144
Kaltag	251	*Information unavailable*	William Soloman, Jr. 534-2329
Adak Island (Class I)	106	*Information unavailable*	ADAK Refuse Corp, 592-4506
Dillingham	2,400	*Information unavailable*	Public Works, 842-5211
Chenega Bay	69	Economic Development Administration	Jim Vogel, Bristol Engineering, 563-0013
Emmonak	804	VSW, ANTHC	Jim Vogel, Bristol Engineering, 563-0013
Metlakatla	1,375	Interagency Open Dump Project, Environmental Justice Grant	Environmental Director, 886-4200
Iguigig	62	Interagency Open Dump Project	Igiugig, 533-3260
Deering	155	Interagency Open Dump Project	Deering Administrator, 363- 2138
Mountain Village	757	Interagency Open Dump Project	Mountain Village Environmental Director, 591-2930

Table 4-3
Agencies and organizations offering SWM assistance to rural Alaska Villages.

Agency/ Organization	What they do	Who to contact
Bureau of Indian Affairs (BIA)	BIA's role is to protect tribal lands and resources and generally serve out the trust responsibility accorded tribes by the federal government. Their role in SWM in through protecting tribe's environment. BIA has discretionary funding for a variety of SWM activities, including site closure and road building. They may provide technical assistance or equipment as well.	Kristin Holzinger, Environment Program, 1(800) 645-8397, #9
Dept. of Environmental Conservation (DEC)	The Solid Waste Program under DEC's Environmental Health Division and DEC's Compliance Assistance Office are excellent resources for technical assistance. ADEC is the state regulatory and enforcement agency. They set the rules for constructing, maintaining, and closing SWM facilities, including dumps. They approve closure plans, and permit new landfills. Though limited, ADEC funds some site closure projects through discretionary funds. To get funding through ADEC, you must have a plan that meets regulations. ADEC can stop VSW projects from being funded, and their non-support of a project may stop other agencies from funding it. So it is good to at least touch bases with them. DEC also runs a remote maintenance program through the Division of Facility Operation and Construction that gets people out to your village for hands-on advice and emergency assistance.	Bill Stokes, Compliance Assistance Office, 269- 7580 Ed Emswiler (Juneau, 465-5353) Diane Sam (Fairbanks., 451-2174), Leslie Simmons, (Anch., 269-7590)
Environmental Protection Agency (EPA)	EPA is another good place to go for some advice and funding. EPA is the federal regulatory and enforcement agency, but they would only enforce in villages where an extreme danger to community health and environment exists and it is not being addressed. EPA can assist villages by providing: 1) examples of solutions that have been implemented by other villages; 2) technical support over the phone or in the village (or direct people to some one who can provide them with such assistance); 3) information regarding existing funding opportunities including contacts, applications, and review and comment of funding proposals; 4) assistance with solid waste management planning electronically or on site; and, 5) tips for public education activities. EPA funds other agencies and organizations to handle SWM grants, but typically has some discretionary funds and SWM demonstration grants.	Joe Sarcone, Rural Sanitation Coordinator, 271-1316

(Continues on next page)

Table 4-3 (contd.)
Agencies and organizations offering solid waste management assistance to rural Alaska villages.

Agency/ Organization	What they do	Who to contact
Village Safe Water (VSW)	VSW is a program for rural villages in DEC's Division of Facility Operation and Construction. They have no regulatory or mandated assistance role. VSW is a granting agency that provides technical assistance only to villages who have successfully applied for and received a VSW grant. Usually a community gets a grant to study the SWM situation first. Then VSW assists in identifying the problem and how to solve it. To get a grant or low interest loan for solid waste, the village needs to prioritize the project very high on their list, and the project must fit in with community long-term goals. Grant awards are considered in conjunction with ANTHC project awards. If you don't receive a grant, VSW can provide some technical assistance, but has no discretionary funding. The Division of Facility Operation is also a good place to go for training manuals and training information.	Kurt Egelhofer (269-7601) or Ken Collison (465-5137).
Alaska Native Tribal Health Consortium (ANTHC), **Regional Health Corps**.	ANTHC has no regulatory role, but is mandated to assist if possible. ANTHC employs several engineers that can assist in planning, designing, and building solid waste facilities. ANTHC relies on state and federal funding, and works with Regional Health Corporations to prioritize projects. Solid waste projects are often 'tagged on' to water and sewer projects with higher priority, rather than treated as 'stand alone' projects. However, this is changing slightly. Your regional health corporation is closely associated with ANTHC, but can offer separate assistance in landfill permitting, funding, research, on-site surveys, operation and maintenance planning and implementation, training, and any additional technical assistance that a community requests.	Regional Health Corp engineer, or ANTHC engineer, for your village. If you don't know who that is, call Steve Forthun, ANTHC, at 1 (800) 560-8637 #3504
USDA Rural Development (USDA, USFS)	Rural Development is dedicated to social and economic sustainability of rural villages. Technical assistance and funding is primarily handled through grants and low-interest loans. Staff might be able to assist you in locating appropriate funding, technical and planning materials, information, or contacts. If you are a community near a national forest, additional resources are available through the USFS.	Call your regional Rural Dev. Office, or the statewide office at 761-7705
Alaska Native Health Board (ANHB, RASC)	Alaska Native Health Board is an advocacy organization for native health. It does not provide technical assistance, but does award community grants for SWM projects. ANHB staff serves on advisory boards and task forces where native health issues are of concern. It also oversees and organizes the Rural Alaska Sanitation Coalition (RASC), comprised of interested agencies and village reps. RASC is set up to dispense sanitary health information, and review and formulate policy on issues of interest.	Elizabeth LeBlanc, 526-6006

OK, SO WHAT GRANTS ARE OUT THERE?

Take a look at Table 4-4 for the different funding sources that are available to villages and tribes. A couple of the programs require the tribe to apply. If it is the municipality (the city) who runs SWM in your community, the tribe can apply and a cooperative agreement or transfer of funds generally can be worked out. Some communities have leveraged funds from both the city and tribe to work together on their SWM problems.

What is discretionary funding?

Discretionary funding means that the agency staff has the power to fund whatever project it wants (as long as it has something to do with the agency's mission). They can decide how much money to give, and when to give it. Discretionary funding is a great source of potential funding for you because it is so flexible. You should apply as early in the fiscal year as possible, because the funds may be given out quickly. But another trick is to call all the agencies at the end of the year. If they have money left, they often need to, or want to, spend it. Try modifying your project for the amount of money they have left, and the type of project they are looking for. Usually, good straightforward projects, or projects already partially funded have the best chance. And try to get to know the agency staff so they know how reliable you are!

What is "Matching" and "In-Kind" funding?

Matching funding means that you need to come up with the same amount of funding as you are awarded, or a certain given percentage of what you are rewarded. If the award is $5,000 and the percentage is 100%, you need to come up with $5,000). Often, matching funds can be all or partially made up by 'in-kind" funding. In-kind funding is what the dollar amount of your village's effort is worth. So if you make $400 per week and will be spending one week helping out, or overseeing, the project, that is $400 of in-kind funding. If your village has equipment it will be using, often you can use the O & M or rental costs as in-kind funding.

Table 4-4
Solid waste management funding available to rural Alaska villages and tribes.

Agency/ Organization	What kind of grant?	Deadlines and who to call
Tribal SWM Interagency Workgroup	**Tribal Open Dump Cleanup Project.** Must be a tribe. Can fund site closure, SWM plans, new waste facility construction, post-closure care.	Call BIA, ANTHC, or EPA. Optional November pre-proposal, final proposal due in February.
Central Council of Tlingit and Haida Indian Tribes of Alaska	**Solid Waste Improvement Project**. Has awarded soft money grants to villages (in any region). Emphasis on reducing health or environmental risks. Short application. Year-by-year funding status.	Deadline and amount available varies each year, typically late Spring. Cathy Needham, CCTHITA 1(800) 344-1432, x 7187
Environmental Protection Agency (EPA)	**Discretionary funding** through the Office of Solid Waste, and **Solid Waste Demonstration Projec**t awards which can be multi-year, with no cap. EPA funds most of their grants through other agencies and organizations.	No deadlines. Apply early. Joe Sarcone, Rural Sanitation Coordinator, (907) 271-1316
Village Safe Water (VSW)	**VSW Capital Improvement Project Program (CIP)–** also known as **Alaska Village Grants Program**: Large grants available (no cap) for planning and implementation of site closure and new waste disposal facility funding. There is a strict priority ranking procedure performed by ANTHC and VSW. You must have a community plan first that looks at how waste disposal fits into your long-term community goals, such as economic development and water and wastewater treatment. Apply as soon as possible. You will be placed on a list and move up each year.	Applications mailed to each village in early August. Completed applications are due back the first week in October. Apply early. Ken Collison, VSW Program Manager, 465-5137, ken_collison@envircon.state.ak.us or Kurt Egelhofer, VSW Engineer III, 269-7601 kurt_egelhofer@envircon.state.ak.us
Alaska Native Tribal Health Consortium (ANTHC)	**Discretionary funding** for training-related expenses. Large facility construction and site closure grants are awarded through VSW CIP (see above). To get funded for SWM, your community must place a high priority the project.	No deadline. Apply early. Contact your Regional Health Corp., or Steve Forthun, Program manager, ANTHC, 1 (800) 560-8637
Alaska Native Health Board (ANHB)	**Alaska Solid Waste Demonstration Grant** Awards of $2,000 to $10,000 for village-based, local SWM projects. Project type is flexible as long as it helps improve SWM conditions or improves the capacity of the village to plan and make good SWM decisions. Applications are scored and must strictly conform to instructions. An average of 15 villages are funded each year. *Funding availability may change next year.*	Deadline is in February. Strict but simple application guidelines. ANHB is very helpful in sharing previous applications and awards, and gives advice on applying. Elizabeth LeBlanc, Grant program manager, 562-6006

(continues on next page)

Table 4-4
Solid waste management funding available to rural Alaska villages and tribes (contd.)

Agency/ Organization	What kind of grant?	Deadlines and who to call.
Bureau of Indian Affairs (BIA)	**Discretionary funding** available. Past funding has included site closures, transfer station construction, SWM training, recycling equipment. Tribe (not city) should apply.	No deadline. Apply early. Call Kristin Holzinger, Environmental programs, 1(800) 645-8397, #9
USDA Rural Development	**Water & Wastes Program Grants:** Money for site closure possible if plan for new disposal method is included. Must do environmental review and cost analysis. Method chosen should be least costly method that *protects the environment well*. So transfer station or waste removal for closing sites may be funded. Equipment or O & M expenses not allowed. No cap on grant amount – $100,000 typical. **Direct Loan Program**: Very low interest loans payable over 40 year period. Can include equipment purchase. Can include 1st year operating expense. No cap. **Guaranteed Loan**: Helps secure bank loans by guaranteeing loan. No cap. **Technical Assistance and Training Program**: For evaluating dump impact on water resources, providing training for active dump site maintenance, training communities to reduce wastes (including recycling), assistance or training in developing site closure plans. No cap	For Technical Assistance grants apply between Oct.1 – Dec. 31. No deadline for other programs, but apply early. Need Application form for all programs. Statewide Office: 761-7705, www.rurdev.usda.gov
Rural Community Action Program (RuralCAP)	**RAVEN EPA Americorps**. Funds a SWM community education/action position for 1-year ($1,200 per month). Past Americorps staff have started recycling programs, cleaned up villages, conducted wastestream or environmental assessments. Recruits must be from applying village. The community applies and finds an individual for the position by the deadline time. Regional health corp. assists in selection, so be sure to touch bases with them for better chance.	November deadline. Include community letters of support. Position starts in January Laura Pegar or Raina Swanson, Americorps Manager, 279-2511
Department of Community and Economic (DCED)	**Rural Development Assistance Mini-Grant Program** Partnership between the U.S. Forest Service Economic Action Program and DCED (formerly DCRA). Matching funds to stimulate improvements on long-term economic and social well-being of rural residents. Village can donate "in-kind". Nineteen villages received grants in 1999. Averages $8,000.	Steve Bush, USFS, 271-2519, sbush@fs.fed.us
Dept. of Environmental Conservation (DEC)	Some **discretionary funding.**	No deadlines. Contact local office. See Table 4-2.
Federal Interagency	**Federal Environmental Justice Demonstration Project**.	Danny Gogal, Env. Jus. Office, EPA, gogal.danny@epa.gov, (202) 564-2576

LESSONS LEARNED BY ALREADY-FUNDED VILLAGES

Keep trying. The village of Mentasta successfully applied for a grant from the BIA. Their biggest advice is KEEP TRYING! It may take three or four years of applying for all the different grants before you get anything. But each time you apply, you are getting your name written down at the agencies, and they'll remember you next time. The different agencies talk with one another too. Sooner or later everyone will be talking about you, and you'll get your money.

Keep calling. Quoting one agency employee, "The SQUEAKY WHEEL GETS THE GREASE". This means that when agencies don't have enough money or time for everyone, they are often more likely to help those communities that keep contacting them for help. You also let them know you are dedicated and reliable which helps with getting discretionary funding.

Talk with your community. Granting agencies tend to favor those villages who have the full support of the community. See if you can get letters of support from local community groups, like the school board. Consider forming a community group to look at ways to improve your SWM situation. Get them to write a letter of support, or apply for community environmental education grants.

Talk with other villages. You may be able to find out really useful ways to stretch your money, or get funding from a different source. Also, agencies tend to favor projects where two or more villages cooperate with each other. Is there some way you can work with neighboring villages on your SWM goals?

Talk with local governments. Agencies also tend to favor projects where different governments and citizen groups cooperate. Is there some way you can work with your city, tribal corporation, and/or borough?

Consider small steps. You may not be able to fund your planning, site closure, and set-up of a new waste disposal system all at once. It is often much easier to get smaller grants, so don't ignore them. For example, Noorvik received $20,000 from the BIA to do some interim site cleanup and risk reduction steps. Additionally, agencies often have discretionary money at the end of year they can spend how they like. A simple, straightforward, and small project such as carrying out a waste assessment, sampling for soil and water contamination, constructing a burnbox, or setting up a used oil burner may have a good chance of being funded. Finally, agencies often tend to fund villages that are receiving grants from several different groups. They believe if lots of people are contributing to a single project, there is more likelihood it will be successful. Several small grants from different agencies may bring in a much larger grant.

Smile for the Camera! Some villages have received funding by publicizing how bad their site is. If you don't get agency folks out to your village, they may not realize just how bad

your situation is. After waiting too long for funding to relocate their badly eroding beach dump, the village of Newtok made a videotape of their dump and sent it to some State agency folks. The state folks were real surprised at the condition—and Newtok received $70,000 to move their dump.

The same goes for federal agency folks in Washington DC. They are used to dealing with sanitary facilities on reservations in the lower-48 and the open dump situation in Indian Country there has gotten a lot better. The Village of Selawik convinced some Washington folks who were attending a conference in Kotzebue to visit the Selawik dump site. And boy, were those folks surprised at what Selawik residents had to deal with!

So get out that camera, or borrow a video camera from an agency or native advocacy group—pictures can tell a story that words can't.

Integrate your planning and funding. Figure out if there are ways to fund part of your SWM project with money from non-SWM grants. For example, you might be able to build a road to the landfill by including it in a construction project. Through another construction project, you might be able also to buy or rent heavy equipment for closing your site or operating your new landfill. Or you may be able to use the heavy equipment you get through SWM money and reduce your funding request for a construction project. Look at what you new disposal method does for your village infrastructure, too. For example, building a transfer station for shipping out wastes can improve your port facilities. **Look at Table 2-1 and Table 7-3 for more suggestions on effective planning and funding.**

Chapter 5: How to Close a Site

There are two main ways to close a solid waste disposal site. You can leave the wastes where they are, or you can pick up them up. This Chapter talks about both methods, and how to apply them. The next Chapter (Chapter 6) talks about the costs for each method and how to decide which one to use.

1. SITE CLOSURE IN-PLACE

Leaving the wastes at the site and covering them up is called an "in-place closure". **For Class 3 landfills or open dumps, the "cover" is usually made up of local soil, but it doesn't need to be.** Whatever the cover is made of, it is placed there to do the following things:

- Keep wastes from blowing around, or getting scattered
- Keep people and animals from scavenging
- Keep odor down
- Keep fire danger down
- Stop people from using the site
- Reduce rain and snow melt going through wastes

For all except the last thing, just about any kind of cover will do. But a cover that greatly reduces the amount of water that reaches the wastes requires some basic features. So ADEC has written regulations to help protect your ground and surface waters from too much leachate.

Leachate

Any water that comes into contact with the wastes will be contaminated. And of course, any water that goes in, has to come out. So by reducing the incoming water, the amount of "bad" outgoing water, called "leachate", will be small, and your environment will be much better protected.

ADEC Final Cover Regulations

You can get a copy of ADEC regulations by calling your ADEC person (see Table 4-2). **Generally, the cheapest way to close your site in-place and meet regulations is to use the following cover:**

- 18 inches (or more) of any kind of soil
- 6 inches of "topsoil"
- Native plant seeds for revegetation

And that's it! The hard part comes in placing this cover on the right way. The "paperwork" that ADEC requires when you close your site is described in Chapter 7. The physical steps for closing a site are listed in Figure 5-1.

Increasing Environmental Protection

You don't have to use the cover described above. In fact, **you may choose to use a different, more protective cover** if your landfill fits in any of the situations below:

- Continuous permafrost area
- Close to important waterway
- Close to important subsistence area
- Very high winds
- Site gets flooded at Break-up
- Burrowing animals are present
- Available soil is sandy/gravelly and water goes through quickly
- Hazardous materials are at site, but are not retrievable
- Community is uneasy about contents of landfill

If you're unsure about the need for more protective cover, talk to your favorite agency technical assistant. Remember you can use the other closure option of removing your wastes, as well.

The number of ways you can improve your site cover is endless. The basic thing you are trying to do is *minimize erosion by water and wind, and minimize the water going through the covered wastes*. You can accomplish this by:

Adding a Protective Thaw Barrier

For landfills on permafrost, you want to keep the wastes frozen. So a good idea is to add another 2 to 3 feet of soil to the cover. You would still top the whole landfill off with 6 inches of topsoil. But this way, the summer thaw depth shouldn't reach the wastes. *With temperatures in the Arctic projected to get warmer in the future, an extra insulation layer makes a lot of sense, and is very well advised.*

Using A Thicker Infiltration Layer

You can always make your soil cover thicker. A thicker cover provides more protection from erosion, roots, and animals, and water is less likely to reach the wastes.

Using A Less Permeable Soil

If you're using gravel or sand for your cover, you'd have to make it really thick to prevent water from reaching the wastes. Another option is to use soil with lots of clay in it. For not letting water through, silty soil is not as good as clay soil, but better than sand and gravel. Buying a good type of soil will be pretty expensive, but if you have reason to worry about contamination from your landfill, buying may be worthwhile. Also you won't have to mess up any of your land to excavate soil.

Adding Another Cover Layer(s)

There are other ways to cover your site. Specially-made tarp covers of thick plastic or fabric, called geo-synthetic membranes or liners, can be installed in-between the topsoil and soil infiltration layers, or within the infiltration layer. Using these "tarps" can reduce or eliminate the need for the 18 in of soil. Because these covers don't allow water in, they are a good idea for areas with heavy rain, like the Southeast. While not quite as ideal, any source of plastic will work. The village of Gustavus separates out plastic bags from its wastestream and lines its landfill with them. *Your community could start saving plastic bags and left-over tarps to greatly improve the landfill cover.*

Adding A Drainage Layer

It is difficult to keep water and/or snow off the landfill! Water is bound to find its way past the topsoil layer. Besides removing excess snow, one way to stop this water from reaching the wastes is to add a layer of gravel, or other porous material-- like crushed glass, underneath the topsoil layer. As long as this new drainage layer is graded, and allows water through it more easily than the soil underneath, water will tend to flow across this layer and out the sides of the landfill. Drainage canals that collect this run-through water would carry the water away from the landfill. A well-planned drainage system is especially important for Southeast communities.

Adding a Slurry Wall

If your landfill is often located in standing water or it gets flooded at Breakup regularly, you might be required by ADEC to take extra steps in designing the right kind of closure. Engineering a site cover that will last in water is complex. One option is to build a slurry

wall. You'll need to get someone to design it for you, but it is just a wall that surrounds the wastes, and goes down into the ground. The wall keeps the water that is touching the wastes from running out and mixing with the non-contaminated water outside the wall. It is called a slurry wall because it is often made by pouring wet concrete into a mold that extends from above the water surface to below the ground.

Dewatering Wastes

Another way to deal with wastes that are in standing water is to remove the water. A highly adsorbent material, like clay, gypsum, or carbon is added to soak up the water, and left there. The wastes can then be capped as is. If possible, excess water is first pumped out, but must be treated before being released to the environment. If you think you might have leaky hazardous waste drums, you can also employ a "high tech" process that encases the drums, or other wastes, using heat and synthetic bonding materials.

A Note on Permafrost Landfills

Closing a waste site over permafrost is a tricky business because you don't want to melt the permafrost (see Chapter 3 for reasons!). ADEC regulations describe a class of landfill called a "Permafrost Landfill". If you had an officially designated Permafrost Landfill, you would need to install ground thermometers (called thermistors) to measure the temperature around the wastes. If waste thawing took place, you would need to refreeze the wastes. For Class 1 and Class 2 Landfills, these regulations for Permafrost Landfills are still easier to meet than for non-Permafrost Landfills (mostly because they don't require a liner). But for Class 3 landfills (villages under about 1,000 people), these regulations are stricter than the basic Class 3 regulations everyone else has to meet.

Its confusing, but in practice, **ADEC allows Class 3 villages in permafrost areas to choose to be treated as a non-"Permafrost Landfill" to meet state regulations on landfill permitting, operating, and closing.** But you still have to make sure the permafrost underlying your landfill does not degrade and cause meltwater to accumulate or the cover to settle differentially and cause cracks. And to better protect your community, you may still want to meet the stricter Permafrost Landfill regulations. **If your landfill is over permafrost,** the best thing to do is **call ADEC, or an ecological or permafrost engineer, and talk about ways you can prevent permafrost melt and thus protect your surrounding environmental resources.** Also go back up and look at where we talk about adding extra cover to keep wastes frozen. Generally (but not in all cases!), if you do this, and you are careful about not allowing liquids in your dump site, and you don't disturb the cover, you will be okay.

What Equipment and How Many People Should We Use?

Specialized heavy equipment can be used for each step in the covering process. But **often, you can get by with the equipment you have on hand.** For example, some communities grade their cover with a village-owned dozer, frontloader, or backhoe, instead of renting a grader. You might use a pickup truck instead of a dump truck for hauling. Using specialized equipment can be quicker and might be needed in some cases, but it can cost more money. How do you decide? **The best choice depends on:**

- How much money you have to spend
- What equipment is available locally
- How complex your closure plan is (do you need a particular slope steepness, drainage canals, waste dewatering?)
- How to prepare the site adequately (i.e. clearing, grubbing, excavating)
- How much soil you need to haul and how many trips must be made
- Whether your site is small enough to manually seed
- Whether you plan on separating out and recycling some wastes.

The best plan is to plan your closure first, and then figure out whether your own equipment can do the job in a reasonable amount of time. Remember, **renting is more costly *per day*, but sometimes site closure with rented equipment can be much quicker, so the total cost can be lower.** Look at Table 5-1 for what types of equipment other villages have used in their site closures. Remember, you can find the contact information for these villages in Table 4-1.

The number of people you will need depends mostly on how quick you want to get done, and how much manual labor you'll need. Sites with lots of scattered wastes require more people. Waste separation for recycling requires extra people as well. For small sites, you will need at least one equipment operator and 1 or 2 laborers. **Look at Table 5-1 to see how many people other villages have used.**

How Important is the Final Shape of the Covered Landfill?

Very important! **Make sure that the final shape looks somewhat like a dome.** Even though it is easier for dozer operators to grade a flat top – that is not what you want! In most cases you want the top to slope down by about a 5 percent grade so water drains off, and puddles don't form. The side slopes of the landfill should never be more than a 3 to 1 steepness (for every 3 ft up, go 1 ft over).

Figure 5-1. Operational steps in closing a Class 3 landfill.

Consolidate the Wastes

Pick up scattered wastes around the edge of site and bring to "low spots" within central site cover area. Separate out recyclables and any hazardous wastes. Use heavy equipment to chain-drag or lift, and then crush, any non-recyclable metal wastes, and to doze or lift any large piles of wastes to central area.

↓

Clear and Grub

Clear the ground around the consolidated wastes to make a buffer zone of at least 10 feet. Take out any obstacles like stumps, leftover wastes, brush, and trees. Also where possible, clear obstacles within the cover area. Vegetation that takes root or burrowing animals can cause the cover to cave in later on.

↓

Compact Wastes, Fill Holes, and Grade

Compact wastes to about a two feet depth by running over with heavy equipment at least 4 times. Cover wastes with a couple of inches of fill, and use the fill to plug surface holes and depressions. Cut fill out on-site or use other suitable material (e.g. leftover asphalt, crushed glass). Grade this working surface to a 2% to 4% slope away from the landfill. Ensure any excavations made for fill do not drain to landfill.

↓

Place Cover, Compact, and Grade

Lay soil cover material in consecutive layers of a half-foot deep at a time. Use a minimum of 18 in of soil, or an alternative cover type of any thickness that will serve the same purpose. Compact each layer with several passes of equipment. Fill any holes. Grade final cover to a slope consistent with natural contours of surrounding land as much as possible, but between 2% to 15% with drainage away from landfill. Note compaction on top of tundra will result in tundra depression of about 1 to 2 ft. Do not allow over 2ft sink.

↓

Revegetate, Control Erosion

Apply the upper topsoil layer so that it is at least 6 in thick, and will sustain native plant growth. Fertilize, then seed and water the cover manually, use a hydroseeder, or install a seeded fabric mat. Carry out other erosion control measures as needed, such as constructing wind berms or drain paths. Go over the site once more with a dozer. The tractor marks will help growth.

↓

Fencing, Signs, Markers, etc.

Put up a fence to keep people from dumping, and kids from playing, there. If you can't afford a fence, mark the boundaries with permanent markers or survey monuments. Place a sign(s) at access points that tells people the landfill is closed, and that it is unsafe to enter.

↓

Post-Closure Care

Carefully look at the closed landfill at least once per year for 5 years. Fill in any depressions, holes, or cracks and construct runoff channels if needed. Shore up any eroded sections. Pull out any bushes, trees, or other long-rooted plants that are taking root. Check for signs of environmental contamination.

Table 5-1
Types of heavy equipment, number of people used, and time required to close village sites.

Village	**Site size (acres)**	**Description of closure and time period needed**	**Composition of cover**	**Equipment used**	**People and Time (excluding design and administration)**
Mentasta	2	Simple closure. Consolidated and covered.	2 ft of city-owned gravel topped with 1 ft of local soil, seeded with native grasses.	City-owned small backhoe and Cat tractor, rented dump truck	5 laborers, 3 operators. Took 10 days.
Eagle	1 1/2	Dumpsite is over a 50 ft cliff. City directed simple closure.	2 ft of local soil, no seeding	One dumptruck, one Cat	2 operators. Took 2 days.
Galena	26	Site regularly flooded. Air Force oversaw in-depth closure. Drums, cars, batteries, miscellaneous recyclables were separated and shipped out.	18 in of soil, plus 6 in of topsoil, used a heavy biodegradable seeded mat to establish vegetation.	Crawler/hydraulic excavator, ¾ ton pickup truck, grader, compaction roller, frontloader, two 3-axle 20 ton trucks, two backhoes, water truck, car crusher	4- 6 operators, 6 – 10 laborers, 2 –4 field supervisors, 2 project managers, plus administration. Took 3 months.
Galena (alternate dump)	3 1/2	Consolidated debris to a low spot of about 1 acre. Buried trenches were left intact. Site regularly flooded.	Local 18 in of soil, plus 6 in of topsoil, hydro-seeded 2 acres. Chose grasses to repel birds due to airstrip proximity.	Cat D-8, Case 580 backhoe, pickup truck, D8 dozer, compactor, hydromulcher	2 laborers, 1 surveyor/foreman, 2 –4 operators. Took 3 weeks.
Cape Lisburne	1	Closed old portion of active landfill. Mostly left-over ash and metals from incinerator.	18 in of local gravel, 6 in top soil, heavy seeded mat	unknown	unknown
Allakaket	67	Relocated salvage items to new landfill, burned cardboard and wood. Consolidated and compacted.	2,200 yd^3 of gravel for about 18 in of cover, 6 in of topsoil, revegetation with grass seeding.	City-owned tracked bulldozer/backhoe, dumptruck	Labor unknown. Took 4 weeks.
Noorvik	634	Interim cleanup, separated plastics and haz wastes, consolidated, with wind fence.	None— site still active until completion of new landfill in 2001 or 2002.	Rented equipment	Unknown.

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Table 5-1 (contd.)
Types of heavy equipment, number of people used, and time required to close village sites.

Village	**Site size (acres)**	**Description of closure and time period needed**	**Composition of cover**	**Equipment used**	**People and Time (excluding design and administration)**
Oliktok	1	Mostly ash, construction debris, cover graded to 7%, drainage dikes built around landfill.	2 ft of stockpiled gravel purchased previously from Kaktovik, plus seeding	D8 Cat,10K loader, grader	1 operator, 1 laborer. Took just 40 hours.
Kaktovik	2	Mostly ash, construction debris. Opened up whole landfill, including trenches, by rough grading, then covered.	2 ft of gravel hauled in from quarry, plus seeding	Three 12 yd^3 dumptrucks, 966 frontloader, D8 Cat, D14 grader	2 –3 operators, 1 foreman, 4 – 6 laborers. Took 7 days.
Beaver	1/2	Mixed municipal wastes. Dump was on a slough. Picked up trash, consolidated, then burned, covered, and seeded.	2 ft earth, seeding	One backhoe	1 operator, 7 laborers. Took one month, on and off
Togiak (planned)	2	Municipal wastes. Clean the beach of vehicles and debris, move wastes to new landfill, then close/cover site	Local soil from gravel borrow site	D-6 Dozer, 966 Loader, 2 Dumptrucks, Flatbed, JD 450 Grader	2 laborers, 3 operators, 1 superintendent. 4 weeks projected
Skagway	1 1/2	Municipal wastes. Skagway chose to use the **additional protective measure of a liner** due to high rainfall. They also included a **gas venting system**.	From top: 6 in topsoil, 1.5 ft of river pit borrow, high density polyolefin liner sandwiched between protective geo-fabric, 6 in of sand	D-3 Dozer, 926 Loader	3 operators. Also Church group picked up scattered wastes over 5 - 10 acre area for $30,000.
Newtok	1/4	Municipal wastes. Dump was moved 220 ft due to beach erosion. Cleanup into supersacks.	None – still active	All manual labor, as no equipment and high erosion.	20 – 22 people. Took 2 ½ weeks

Natural Contouring

Pay attention to the natural contours of your land and the environmental factors associated with it. Get your landfill and cover design to match that as much as possible, while still keeping within minimum and maximum slope steepness. As we all know, **the land is shaped the way it is, because that is the way it works (i.e. it is most stable) in our environments.** For example, if your wind blows most of the time from the north, you want to align your landfill so that the length is going north-south (not east-west), and place extra cover on the windward side. **You want your closed landfill to blend into the natural landscape in the future.** So – keeping in mind that shapes other than rectangles can be more time-consuming and costly – **sit down with elders** and maybe other people in your community **and figure out what shape would look right.** The shape that elders settle on will probably be the most stable, and so have the greatest cover integrity. Having your community involved in the closure design will get people to be more involved in maintaining the cover, and they will be proud of the way they chose to close it.

Lessons Learned!

Getting in a good enough cover that is placed right is a really difficult problem in Alaska. **Covers get eroded easily when not placed well.** Snowmelt and rain can then get into the wastes and bring their contaminants down into the ground water, or out the landfill sides. Also, wastes can start sticking out of the landfill, creating an attractive safety hazard for your kids. Want your cover to really last? By looking at the history of 18 covered sites throughout Alaska, the United States Air Force learned many valuable lessons that are listed in Table 5-2.

You can also learn from other villages. Out of 97 villages that answered our solid waste management (SWM) survey, **35 villages had erosion, contamination, or other problems with their old sites.** Table 5-3 lists some villages and the problems they experienced. You may be able to **visit these villages or talk with someone there to learn if there is a way to avoid their problems**.

Equipment Size The Village of Mentasta recommends making sure your equipment is large enough so that you can finish your job more quickly. They used their own small-capacity equipment, which they found took a long time and was frustrating. If the wastes at your site are pretty scattered, equipment can be too big for the job as well. Check your site to figure out whether the wastes are mostly piled together (big equipment is best), or scattered and/or difficult to get to (small equipment and manual labor is best).

Site Plan and Pre-Grading The Village of Kaktovik recommends making sure you have a good plan of what you're doing before you start. They also recommend pre-grading the site, so that you can get an exact idea of how much cover you'll need to haul in.

Beach Erosion and Liner Material The Village of Newtok had major problems with erosion because their old site was located on the beach, with a strong Southwest wind. Once exposed by the erosion, the two-inch thick blue Styrofoam liner sheets used by the Army Corps to close the site disintegrated into small pieces. Styrofoam will not contaminate water or soil, but the lightweight pieces blew all over the tundra, creating an ugly landscape. Newtok had to relocate their dumpsite using all manual labor. They recommend making sure that your site will not be subject to heavy erosion by either relocating it first or erecting strong wind barriers. If you suspect erosion will be a problem, do not use Styrofoam as a liner. Geotextile or thick plastic tarps made for the purpose would be better.

Table 5-2
Lessons Learned in Making a Soil Cover Last[a].

Common Problem	Avoiding the Problem!
Debris sticking out through cover	Compact the wastes well, fill in all holes before placing the final cover. Pay special attention to large metal wastes that might stick through
Site flooded	Make sure to dig ditches around your site especially if you get a lot of rain or snow. Remove snow each year before breakup.
Cover erosion of North Slope sites	Do not use fine beach sand as a top cover. It is not strong enough to withstand the weather. Place rock on top. If not available, consider alternative weighted cover, such as glass wastes, over the sand. Use wind barriers. Consider using a thicker cover or weighted synthetic tarp cover.
Eroded trenches cutting through site	Make sure the landfill is in a dome shape. Be careful grading the cover to make sure it is smooth and at a slope that is not too shallow or too steep.
Vegetation doesn't take	Before planting, call up the Alaska Plant Materials Center at 745-4469 and follow their advice carefully. Make sure you have good quality topsoil. Track the cap with a dozer to leave small pockets of water for the plants. If you're in an area that has especially extreme weather, like the North Slope, you may need to use pre-seeded vegetation mats. Contact Polar Supply Company, Anchorage, 563-5000.

[a] See Draft Report of Preliminary Site Inspections for Closed Solid Waste Landfills at Various Remote Air Force Installations in Alaska, Foothill Engineering.

Table 5-3
Reported problems at closed dumpsites for selected villages.

Village	Regional Corporation	Erosion problems	Suspected contamination	Other reported problems
Chistochina	Ahtna, Inc	√	√	Windblown, water contamination, predators.
Atqasuk	Arctic Slope	√	√	Buried landing mats and barrels.
Stebbins	Bering Straits	√	√	May contain chemicals from National Guard.
Wales	Bering Straits	√	--	--
White Mountain	Bering Straits	√	--	--
Chignik Lagoon	Bristol Bay	√	--	--
Togiak	Bristol Bay	--	--	Older dumpsite has no monitor assessment to it.
Kokhanok	Bristol Bay	--	√	--
South Naknek	Bristol Bay	--	√	--
Platinum	Calista	√	--	--
Tuntutuliak	Calista	--	--	People still dump during the spring through fall.
Napaskiak	Calista	--	√	Unrestricted dumping.
Lower Kalskag	Calista	√	√	In a slough running into the river.
Aniak	Calista	√	√	--
Tununak	Calista	--	√	--
Kipnuk	Calista	√	√	Trash seen on top of closed dumpsites.
Goodnews Bay	Calista	--	√	Homes are built on top or near one.
Atmautluak	Calista	√	√	--

(continues on next page)

Table 5-3
Reported problems at closed dumpsites for selected villages.

Village	Regional Corporation	Erosion problems	Suspected contamination	Other reported problems
Kotlik Tribal Council	Calista	√	√	Overflowing, floods, erosion problem. Trash is starting to show.
Tuluksak	Calista	--	--	Dumpsite too close to airfield.
Bill Moore's Slough	Calista	√	√	They have not been properly filled with dirt.
Port Graham	Chugach	√	√	--
Eyak	Chugach	--	√	--
Knik	Cook Inlet	√	√	--
Manley Hot Springs	Doyon	--	√	--
Takotna	Doyon	√	√	--
Fort Yukon	Doyon	√	√	--
Ruby	Doyon	--	--	Transformers with PCB's may be buried at the old dumpsite near the washeteria.
Ouzinkie	Koniag	√	√	Rusty water runoff into ocean.
Karluk	Koniag	√	√	--
Noatak	NANA	√	--	--
Selawik	NANA	√	√	Old dump on the river, trash floats on the water.
Chilkoot	Sealaska	--	√	--
Craig	Sealaska	--	√	--
Kasaan	Sealaska	--	√	--

Burning Wastes First

To reduce the amount of wastes to be covered, it is always a good idea to **separate out wood and cardboard wastes for burning before closing**. While the practice is **associated with many risks**, **some villages have found it useful to burn the rest of their wastes** before closing. The advantages are:

- Less volume, so quicker closure and less labor and equipment costs
- Less cover material needed, so less expensive
- Some hazardous chemicals will be released to air, so toxicity potential for soil and water contamination is reduced
- Disease organisms and honeybucket wastes are eliminated with thorough burn, reducing hazard to site workers
- Organic wastes are mostly removed, so methane gas buildup should be negligible.

The disadvantages are:

- Unless plastics and hazardous wastes have been separated out, the smoke will be toxic and unhealthy for community to breathe (see Chapter 3)
- Risk of uncontrolled fire
- Settling of smoke particulates can contaminate surrounding area
- Unburned plastic does not contaminate water, soil, or air, but smoke from burned plastic emits toxic chemicals
- Available carbon is greatly increased with charred ground, and runoff into streams may deplete stream oxygen levels, affecting stream plant and animal life
- If fire spreads to vegetated area with scattered waste at the edge of dump, loss of plants may result in increased erosion later on, affecting runoff patterns and cover integrity.

Under the state Solid Waste regulations, controlled open burning of most wastes is allowed for Class 3 landfills. It is confusing, but under the Air Quality regulations, open burning of anything but paper or untreated wood is illegal! The solid waste folks at ADEC recognize that small villages may not be able to afford an incinerator. And they know that controlled waste burning can sometimes be the best management method for the situation in our villages. So they are working out how to address this issue. They want to make sure their regulations still protect community health and environment. On the other hand, they want the regulations practical enough so that if we want to meet them, we can.

You have to make the decision that is right for your community. If you decide to burn all your unburned wastes first, **be sure to use controlled burning**. In practice, ADEC considers this to mean burning in a burnbox or in a shallow ground depression away from any active areas of the dump; the smoke should not be black; and uncontained waste burning should be watched the whole time. Also use the precautions listed in Figure 5-2.

Figure 5-2 Steps to take if you want to burn wastes at your dump before closing!

(1) Burn on days when the wind is blowing at moderate speed away from the community.

(2) Prohibit residents from going to the dump during the smoky period.

(3) Don't start cleanup activities until several days after the burn, to avoid worker injury from flare-ups.

(4) Be prepared to pass out face masks to residents if the smoke starts blowing to the village. If the fire can't be put out, surgical masks from the clinic offer at least some protection. Elders and people with respiratory conditions should stay indoors.

(5) Tell residents who rely on traditional water sources located in the smoke area to fill up before the burn, and not to go back for about a week after.

(6) Staff the dump during the burn to ensure no one goes there, and to ensure the fire does not spread. Protect this worker with a high quality face mask fitted with filter cartridges (about $15 to $30, e.g., Eagle Enterprises in Anchorage, 562-2331).

(7) If you have vegetated area around the main dump area, you need to protect it. Plants there help filter out contaminants and prevent erosion. Try berming or wetting the area if possible.

(8) Wear protective gear and sturdy boots and look for and remove all hazardous wastes that you see before burning – especially batteries – the likelihood of lead and other heavy metal contamination from batteries will increase if left on ground and burned.

(9) If you have access to water hoses, do not flush the area with water after the burn, runoff will be heavily contaminated. Light wetting to settle ash is useful, if possible. If not flooded out, many contaminants, such as a large portion of heavy metal, will eventually bind to soil, and stay out of the water.

(10) Take care that you do not endanger nesting waterfowl in the area. If a stream nearby is important for spawning, take extra care to avoid creating any erosion or runoff.

(11) Ask your ADEC or ANTHC representative for help in deciding if you are uncertain whether burning is a good idea for your situation.

2. CLOSING A SITE BY REMOVING WASTES

The other way of closing a site is to gather up all of the wastes and dispose of them somewhere else.

- Typically, this means shipping the wastes in containers to a large, well-run landfill.
- A second option is to ship the wastes to a certified "clean-air" incinerator.
- If you are building a new permitted landfill, a third option is to place the wastes there.
- If you are getting a well-put-together burnbox, a fourth option is to burn the wastes, ship out or bury the ash, and ship out the metal wastes, tires, and hazardous wastes.

Burning first can reduce your total costs a lot because a good burn can reduce the weight of site wastes by about 80 percent, and perhaps more. The biggest problem with using a burnbox to burn wastes is that you need to be very careful about pre-sorting and taking out hazardous wastes. Also, you will be burning continuously for many days, and probably weeks. Even smoke that is not toxic can be hazardous to health with heavy and prolonged exposure. Take precautions, look back at Figure 5-1 and follow the recommendations that are applicable.

There are two stages to removing wastes-- arranging for waste removal, and the waste removal itself.

Arranging for Waste Removal

You, your consultant, or agency staff person, need to **make arrangements with the manager of the facility you want to bring your wastes to**. Table 5-4 lists the contact information for several Alaska and Washington Landfills. You'll need to have ready a good volume and weight estimate of how much waste you'll be sending, measured in cubic yards of compacted waste. You should know the landfill you want to ship to may not want to accept your wastes. This possibility is why it may be best to work with an agency staff person while making arrangements. They may be able to help you convince the landfill manager. If not, you'll need to choose another landfill.

Also, you'll need to **arrange with a shipping company(s) to transport your wastes**. Table 5-4 lists some shipping companies and some requirements. Again, if they haven't dealt with solid wastes before, the shipping company may be reluctant to ship wastes. However, if you take the time to explain you will not be shipping hazardous wastes, and the wastes will be contained, most companies will agree to ship your wastes.

If you're not going to contract outside labor, and you don't have anyone certified to deal with hazardous waste, you'll need to **get someone "HAZMAT or HAZWOPER certified"**. The other option is to arrange for a certified person (such as an agency staff person) to be there during waste removal. See Table 5-4 for information on certification.

Table 5-4 Steps to arrange for waste removal.

1. Call Landfill Manager			
Name	**Contact**	**Important Information**	**Costs**
Anchorage	Joel Grunwaldt, 343-6262	Must get permission from the Solid Waste Director first.	$90/ton. Disposal fee is double what residents pay.
Fairbanks	Bob Jorden, 459- 1482	If you're outside the borough, or will bring more than 25 tons *per month*, you have to fill out a form and get permission from the Mayor and Solid Waste Manager.	Outside borough or dumping more than 25 tons/month: $100/ton. If you're inside the borough and dumping less than 25 tons: $50/ton.
Rabanco	Chris Ballestrino, (206) 332-7711	Rabanco generally quotes for disposal inclusive of shipping. Call and get estimate.	Southern Alaska cost including shipping, disposal, containers: $61/ton (Ketchikan) to $350/ton (Dillingham)
2. Arrange for Shipping Wastes			
Northland Services	1 (800) 426-3113	You need to know how many tons of waste you are shipping. Rates vary depending on where you are shipping to and from. A minimum weight charge of 10 tons applies for small villages,16 tons for hub cities.	Regional village to Kotzebue: about $870/ton Regional village to Bethel: about $640/ton Regional village to Dillingham: about $662/ton Dillingham to Anch about $196/ton
Boyer Alaska Barge Lines	225-2093	Rabanco handles shipping and disposal together.	Southeast village to Seattle: about $65 to $90/ton, including disposal.
Bowhead Transportation Inc .	1 (800) 347-0049	Containers must be returned within 48 hours cleaned.	Barrow to Anchorage: about $895/ton
Samson Tug and Barge	1 (800) 331-3522		Aleut to Anchorage: about $159/ton
3. Get HAZMAT/HAZWOPER Certified			
DEC Division of Spill Prevention and Response	Bob Dreyer, 269-7688,or Cathy Gitkov, 465-5237	Generally, private companies give state-certified training.	Southeast: "Our Uncle's House", 463-7375 SWANA, Alaska 552-7753

Figuring out how long it will take to remove your wastes

With a four person crew, you can figure on picking up about 65 yd^3 of wastes per day. If the site is well compacted, and you are using mostly heavy equipment to collect wastes, you can pick up about 120 yd^3 per day. If you are using mostly manual labor, figure on about 20 to 30 yd^3 per day. You should know how much you have in your landfill. If you don't yet, you or your consultant will need to figure that out. There is a BIA manual called Assessment of Open Dumping on Indian Lands that details how to calculate your site volume and area (call the Portland Area BIA Office or contact the author at www.zender-engr.net for a copy). With the waste amount, you can figure out how long it will take you to clean up, and whether you'll need a bigger crew to finish before Freezeup (or before Breakup in tundra areas where otherwise you can't operate the equipment without getting stuck or destroying tundra).

Physically Removing the Wastes

Once you've got the shipping and disposal arranged, the waste collection is pretty easy:

Collect Wastes

Collecting wastes is a straightforward business. Unless your wastes are all very scattered and easy to lift by hand, you'll need at least a small loader or backhoe (for trenched wastes). For most sites, you'll need laborers too, to pick up scattered wastes, and help with attaching drag chains to scrap metal and appliances. You'll need also to allow time to bring the wastes to the waste containers, and then the containers to the port, airstrip, or transfer station/landfill.

One thing you'll want to consider is what wastes you can separate out and recycle easily. As long as you're shipping the wastes out, you might as well get paid for it! Even if you don't make money recycling, you can end up saving money because you don't have to pay for the disposal. And many barge companies ship recyclables free-of-charge, so you save there. It is pretty easy to separate out scrap metal, vehicles, and appliances. Sometimes, there are other wastes that can be picked out easily. You might want to look for big piles of unspoiled cardboard from village stores. You can also separate out wastes for reusing or burning, like scrap wood. And you should definitely try to pick out all the vehicle batteries, and any hazardous wastes, without compromising worker safety.

When you're looking for a contractor, see what they are willing to do for recycling. Some firms have big magnets for picking out metal. Others have big motorized screens that shake back and forth and separate the dirt out. This kind of machine (called a "trommel") may be worth renting if there is a lot of mixed-in dirt. Dirt is pretty heavy, and will cost a lot to ship out. But remember separating wastes requires more labor, and labor costs. **Be sure it costs you less to separate out recyclables, reusables, or dirt**

than the amount of money saved. See Chapter 8 for battery and other waste recycling information.

Ship Wastes

Usually, site wastes are placed in shipping containers. Unless you're on the road system, you've got two choices. You can leave the containers at the port or airstrip, and bring the wastes there, or you can have the containers at the site, directly fill them, and then haul them back to the port or airstrip. Which way is best depends on the type of containers used, suitable space at the site, and what type of contract you sign. If your dump is close to the barge port, shipping costs may include retrieving the containers.

Clean Up the Area

Include in your plans some time and money for getting the site back to its original appearance. Heavy equipment and traffic tears up the ground. In tundra areas, the ruts created can gradually sink in and expand (see Chapter 3). It may be worthwhile to fill in depressions and hydroseed the site. As a minimum you should try to **control erosion until the vegetation regenerates**. This might mean placing wind barriers and/or laying down mulch or fabric mats to keep the soil in place. If you have a chipper, you can chip scrap wood, and lay down wood chips.

Contaminated Soil

If any soil at the site looks heavily contaminated (for example with oil), it should be removed as well, or treated on-site. If you've got a large amount of contaminated soil, removing it may be too costly, or it may not be accepted at a landfill. You can leave the soil there, put up a temporary fence, and "treat" it. Treating soil is usually done by spreading it out, turning it, and exposing it to air over time. There are other simple ways as well, and ADEC personnel can help you decide which method is best.

Village Contacts

Closing a site by removing the wastes hasn't been done much in Alaska. It hasn't been done much in the Northern Territories or Northern Scandinavia either, so no real good role model exists for isolated cold region dump sites. The Metlakatla Indian Community is cleaning up several of their sites by removing and shipping out hazardous waste drums and scrap metals, and relocating some wastes to a new location. Their funding was under a demonstration grant so that all of their cleanup plans and costs are available to the public (contact Jeff Benson, 886-4200). Several tribes in the lower–48 have closed their sites by removing wastes, such as the Yakama Nation of Confederated Band and Tribes in Washington, the Shoshone-Bannock Tribe at Fort Hall Reservation in Idaho, the Omaha Tribe in Nebraska, and most recently, the Santa Rosa Rancheria in California (Bruce LaRue, 559-925-2918).

3. RE-USING YOUR LAND

One of the good things about closing your site by shipping out wastes is that you can reuse your land right away and for any purpose. If you decide to cover your wastes instead, you may still be able to reuse your land. During the first five years though, you may only use the land for activities that won't disturb the cover. If cover is disturbed, you will need to make immediate repairs. After five years have passed, any disturbance of the cover is still not recommended, but some disturbance is acceptable.

Buildings on or near the landfill should not be constructed for at least five years. Anyway, you may not want to construct buildings or make use of the site for any high human activity. Methane, an explosive and toxic gas, can build up under the site cover and migrate into new buildings or surface soil pockets. Some folks in the lower 48 have had their backyards explode because their houses were on top of old garbage dumps! For bigger sites, it is a good idea to wait at least 10 years to minimize this possibility. Otherwise, you may bring in methane monitoring equipment and test for methane regularly.

Another problem with putting buildings on the site or using it for a community gathering area is the **ground can subside and erode**. As wastes deteriorate and settle, the ground over them can become full of holes and depressions. Most of the subsidence happens in the first 5 years, but it can still go on for another 10 or 20 years. Wastes can also poke out of the ground. That can create a dangerous situation for children, and a nightmare for building maintenance!

Some of the ways that communities are using their closed sites are listed in Table 5-5.

Table 5-5
Some ways to reuse your land after covering and closing dump site.

Village	Land Reuse
Mentasta	Haul-away garbage Dumpsters are located there
Nenana	A farmer might grow hay there
Kaktovik	Sewage sludge is spread out for treating there. Contact ADEC if you are interested in this use.
Stirling	Leasing the area for grazing.

4. HEALTH AND ENVIRONMENTAL CONSIDERATIONS

Always keep in mind how your activities affect the land, water, plants and animals around the site. Whether you are using local labor or outside labor, you should **make sure that you or someone you trust oversees how the site work is carried out**.

Look out for your workers' safety. Include in your funding request money for protective gear such as:

- ✓ Respirators
- ✓ Tyvek suits
- ✓ Steel-toed boots
- ✓ Ear plugs (if using heavy equipment)
- ✓ Eye protection
- ✓ Leather gloves and rubber liner gloves
- ✓ Hardhats
- ✓ Medical kit.

You can order this type of equipment through specialized catalog services. For example, try Eagle Enterprises, Anchorage, 562-2331.

To contract or not to contract

Many villages hire a contractor who will take responsibility for complying with DEC's closure regulations. A contractor can make sure the cover placement is done right, and they'll have to fix it if things go wrong. But you could save a lot of money if you don't hire out (see Chapter 6). Just make sure you have someone who knows exactly how to follow the site cover design specified in your Closure Plan, and work with your ADEC representative to meet regulations.

Environmental Protection Re-read the section on Environmental Impacts in Chapter 3 before starting site work. For example, you can specify a single road or path for heavy equipment to use around the site. That way, the least amount of land is disturbed. If you have nesting waterfowl or animals around the site, you can wait until the young are weaned before disturbing the area. Also, you can mark areas with stakes or fencing that you want equipment and traffic to avoid. If your site gets flooded during breakup, wait several weeks for the first flush of contaminants to get incorporated back into soil before beginning cleanup operations.

If you are using a contractor, make sure that they are taking the steps needed to protect the environment. While contractors may be very good at grading and covering

the site to specifications, they may not be very good at protecting the surrounding land and water—unless your village requires it. If you think you have a complicated closure or your site is in a sensitive area, **consider hiring an ecologist** that will let you know what to look out for, map the best equipment access area, and design an environmental recovery plan. Include money for hiring in your funding request.

Wiinga Nayumiralriaruunga. Assiilliqua ciqiciuviim ayuuqellranek. Kitugcecugyaaqaqa maantellriit yugnun. Tepsaqlluni-llu. Taugaam kitugceskatgu tepsariingaituq cali cagcimaangaituq. Kitugceskatgu quyaaciquukut.

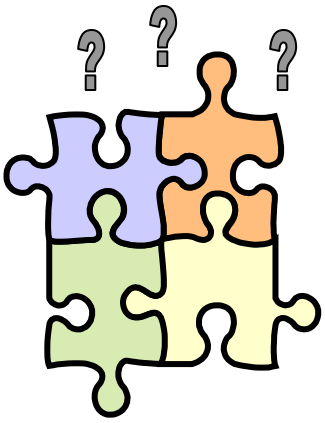
Here is how it means:

I am Stephanie Tirchick, I feel really bad about the dump we have in Chefornak. If people in Chefornak fixed it, it wouldn't stink but it stinks because they never fixed it. When they fix the dump it wouldn't be messy. If they fix it I would feel really happy.

Chapter 6: How Do I Choose the Closure Method?

(Cost and Non-Cost Factors)

Like most things in life, each site closure method has a good side and a bad side. This Chapter talks about the information you'll need to decide which method is best for you. Mainly, there are two things to consider: money factors and non-money factors. Both are very important to look at. You can find a really cheap way of closing your site, but you might be putting your community at risk. On the other hand, you can figure out a way to close your site with all kinds of fancy gizmos, and you may never get funded due to cost.



A note on estimating closure costs!

Rest assured if you're not used to working with lots of numbers, estimating a site closure cost will be confusing. You'll need to devote several hours to get a good estimate. If you're not able to follow the examples with a pencil and paper, try skimming the text and Tables to get a rough idea of the costs you'll be dealing with. Calculating an accurate cost is something that engineers train for a long time to do— so don't hesitate to get an agency technical person, consultant, or local math whiz to help out.

1. CONSIDERATIONS OTHER THAN COST

Table 6-1 lists the main issues you might want to consider when deciding how to close your site. Many of these considerations are described in Chapter 5. Remember, if you want to do an in-place closure, but you think you need better environmental protection, you can always choose a safer (but probably more costly) cover design.

Stand Up for your Community!

When native villages get funded, it is commonly at a basic environmental protection level. But your particular village may be still threatened at this level. Your subsistence activities may be changed too, due to an inadequate closure or community perceptions of an inadequate closure. Under the federal Environmental Justice Statute, as native communities and tribes we have a right to ask for adequate funding to protect our environment, community health, and society well-being. Make sure you include monies for protective gear and a thorough job of separating out hazardous wastes before closure. If you need one of the more fancy covers described in the last Chapter— ask for it and include a detailed statement about why your community needs it.

Table 6-1
Comparison of site closure methods (excluding costs).

Factor	Cover Wastes In-Place	Waste Removal
Protection from future contamination	**Not as good.** Any hazardous wastes are left in-place and may contaminate water and/or soil.	**Best.** Source of contamination is removed.
Post-Closure care and monitoring	**Not as good.** ADEC requires future site care and may require water testing	**Best.** Likely will not be needed.
Ecological disturbance during closure	**Probably worse.** If soil is collected locally, there will be a greater disturbance area.	**Probably better.**
Ecological disturbance after closure	**Not as good.** You can make it better by including a good plan for restoring the disturbed areas.	**Better.** The natural outline of the land is restored, so water, soil, and vegetation can proceed normally.
Land use potential	**Not as good.** Will need to wait for at least 5 years for most uses, and use may be limited then due to subsidence concerns	**Good.** Should be able to use land right away.
Health concerns	**Not as good.** Landfill mounds become attractive to children as play areas, particularly in flat tundra areas. Contamination potential persists.	**Good.** There should not be any health problems for site traffic.
Aesthetic	**Not as good.** Landfill mounds may not revegetate well. Fencing will be present. Deep-rooted plants and trees cannot be allowed to grow at site.	**Good.** Area should return to normal.

Continues on next page

Table 6-1
Comparison of site closure methods (continued).

Factor	In-Place	Waste Removal
Worker safety during site closure	**Better.** Not as much waste contact. However, hazardous waste drums may rupture during compaction.	**Not as good.** There is a slightly greater risk to laborers when handling wastes.
Liability risks during closure	**Better.** Keeping your wastes means much less chance of getting sued by outside parties. Under federal rules, you can still get sued by people in your community if the closure is done badly.	**Not as good.** You need to be careful that any hazardous wastes mixed in by mistake don't cause a problem in shipping and disposal.
Contamination during closure	**Unclear.** Hazardous waste drums may rupture during compaction. Disturbance of sediment may release contaminants.	**Unclear.** Weathered/fragile hazardous waste containers may rupture during pickup. Disturbance of sediment may release contaminants.
Liability risks after closure	**Not as good.** Risk of future contamination or problems from poor closure	**Better.** Once disposed in alternative permitted landfill, it is very unlikely you will be liable for problems there.
Taking care of own wastes?	**Best**	**Not as good.** But many people believe that bringing wastes to a good, safe landfill is more responsible than leaving wastes in-place.
Local jobs	**Unclear.**	**Unclear.**

2. HOW MUCH WILL IT COST TO COVER UP OUR WASTES?

Table 6-2 lists several villages that have already closed their sites by in-place closure. Try finding the village in a geographic area most similar to yours. Then multiply your site area by the cost per square yard given in the 5th column. That cost is your first real rough estimate of how much money you'll need to spend. However the cost given for these villages is very site specific. Some villages didn't carry out a closure study first. Others had their own equipment. Most villages placed topsoil layer on top and seeded it, but a few did not.

A breakdown of village site closure costs is given in Table 6-3. Table 6-3 can be used with Table 5-1 in Chapter 5 to give you a much better estimate of how much money you'll need to raise. Table 5-1 describes how each village closed their site. If you see a village that closed a site in a way similar to how you want to close your site, you can use that village's costs.

Table 6-2
Approximate cost of closing sites by covering wastes for several villages.

Village	Population	Site Size (acres)	Total Cost[a] ($)	Cost per sq. yd.	Comments
Mentasta	130	2	**$46,800**	4.65	Gravel cover stockpiled, so no cost. Local labor, mostly own equipment.
Eagle	220	1.5	**$1,767**	0.22	No hydroseed, no manual labor, no design
Galena	675	26	**$2,861,100**	21.88	Hauled drums, cars etc. away, intensive design and field work.
Galena ("wet pit")	675	3.6	**$26,010**	1.44	Local labor, excludes design.
Cape Lisburne	--	1.2	**$540,000**	93.10	---
Kaktovik	259	1.75	**$520,200**	58.41	---
Cantwell	166	0.5	**$41,616**	16.51	On road system
Anderson	517	20 (highly scattered)	**$90,000**	1.07	Local labor, own equipment, fertilizer but no seeds, on road system.
Unalaska	4,283	5.1	**$1,050,000**	42.00	---
Golovin	144	17	**$307,958**	3.57	---
Allakaket	170	0.7	**$68,000**	20.10	Free cover material
Newtok	284	*1/4*	**$70,000**	63.00	*Site relocation only.*
Togiak	809	2	**$175,000**	17.50	Projected cost assumes free gravel borrow, else cost/yd^2 = 19.34.
Skagway	862	1.5	**$77,661**	10.71	Includes liner, but not design, administration, or contingencies.
Noorvik	634	2-2.5	**$20,000**	2.10-2.40	*Interim cleanup only.*

[a] Adjusted to approximate Year 2000 costs

Table 6-3 Cost per square yard of dumpsite to be closed (costs do not include post-closure unless noted).

Village	Site Size (acres)	Labor ($/yd^2)	Equipment ($/yd^2)	Admin. ($/yd^2)	Borrow ($/yd^2)	Seed ($/yd^2)	Engineering & design ($/yd^2)	Additional expenses ($/yd^2)
Mentasta	2 ac.	1.58 local	0.60[a]	1.35	0.0 stockpiled	0.18	0.70	Fencing not included.
Galena	26	2.58 outside, w/b 1.50 for local	2.15	0.16	6 local borrow	0.91	1.21	Add 40% for "bush factor"
Galena	3.6	1.37 all local labor	3.26	u/a	6	0.91	u/a	Post-closure: 1.29 for outside labor, 0.57 for local
Cape Lisburne	1.2	7.42 outside labor, includes housing	8.91	2.45	7.45 local gravel	4.32	4.91	General preparation: 44.18 contingency: 19.63,drainage ditch : 0.85, signs: 2.61
Kaktovik	1.75	2.06 all local	6.21	1.47	19.33	5.8	2.94	General preparation: 11.82 contingency: 11.82
Cantwell	0.5	3.93 non-local	3.44	VSW	2.48	1.24	4.13[b]	Contingency: 1.24
Unalaska	5.2	u/a	u/a	u/a	u/a	12	u/a	----
Golovin	17	2.97	2.47	0.66	10.53	7.50 fabric	1.32	General: 1.83, signs: 0.43 contingency: 5.30, post-care: $4,100
Togiak	2.1	u/a	u/a	u/a	1.25	u/a	u/a	----
Skagway	1.1	1.36 local	0.83 own equip.	u/a	6.33	0.05	u/a	Liner = 4.41, gas vent = 0.60
Allakaket	0.7	local	shared	ANTHC	free	u/a	u/a	
Newtok	1/4	6.20	none	none	none	none	none	Boat rental= approx. $8,000

u/a = unavailable, [a] used their own equipment, except for 1 dumptruck. [b] includes survey, record, assess, segregate & dispose hazardous wastes

Using Tables 6-3, 5-2, and 6-2 to Estimate Closure Costs

Example: If you are on the road system and see from Tables 5-2 and 6-2 that you want to close your site the way Mentasta closed its site, you could use the different cost breakdowns in the first row of Table 6-3. Suppose instead of local labor, you wanted to use outside labor and you needed to rent all your equipment. Instead of using Mentasta's labor and equipment costs, you could use the costs listed for Cantwell (also on the road system). We'll look at post-care in the next example, but for now, you can use Galena's post-closure cost for local labor (last column of Table 6-3) of $\$0.57/yd^2$.

If your site is 2 acres, using the costs listed in Table 6-3, you could estimate your total closure cost as:

Convert 2 acres into sq. yd.: $4{,}833\ yd^2/ac \times 2\ ac = 9{,}667\ yd^2$

Labor (Cantwell): $\$3.93 \times 9{,}667\ yd^2 = \$37{,}987$

Equipment (Cantwell): $\$3.44 \times 9{,}667 = \$33{,}251$

Administration (Mentasta)= $\$1.35 \times 9{,}667 = \$13{,}050$

Soil borrow (Mentasta) = $\$0 \times 9{,}667 = \$0$

Seeding (Mentasta) = $\$0.18 \times 9{,}667 = \$1{,}740$

Engineering (Mentasta) = $\$0.70 \times 9{,}667 = \$6{,}767$

Post-closure (Galena) = $\$0.57 \times 9{,}667 = \$5{,}510$

Total without contingencies or fencing = $98,305

The Mentasta closure cost listed in Table 5-1 did not include fencing. You probably want fencing, which is about $20 per linear foot (8 ft high), $1,100 for a gate, plus $10 per foot for barging. If your site is about 215 ft by 400 ft, fencing would be:

(215 ft +215 ft +400 ft + 400 ft) x ($20 +$10) + $1,100 = $38,000

If you are on the road system, a 20% contingency would probably be enough. So the total estimated cost for site closure would be:

($98,305 +$38,000) + ($98,305 +$38,000) x 20% = **$163,566**

Another way to get a good quick estimate is to use Figure 6-1. This Figure shows the range of costs (per square yard area) for closing a village dump site in Alaska. The costs are broken down into the main categories. **What if you don't know anything yet about how you will close your site?** You can use the average cost for each category. The upside-down triangles mark the *average* cost of labor, equipment, engineering, etc. The quickest way to get a cost estimate is to follow the page down along the triangles. Choose *either* the local labor or outside labor cost. See the box below.

The average total cost with contingencies for closing village disposal sites in-place is:

$38.08/ yd^2 (using local labor)

or $42.71/$yd^2$ (using outside labor)

For example, if your site is 90 feet by 90 feet:

Convert ft to yd:

90 ft ÷ 3 = 30 yd

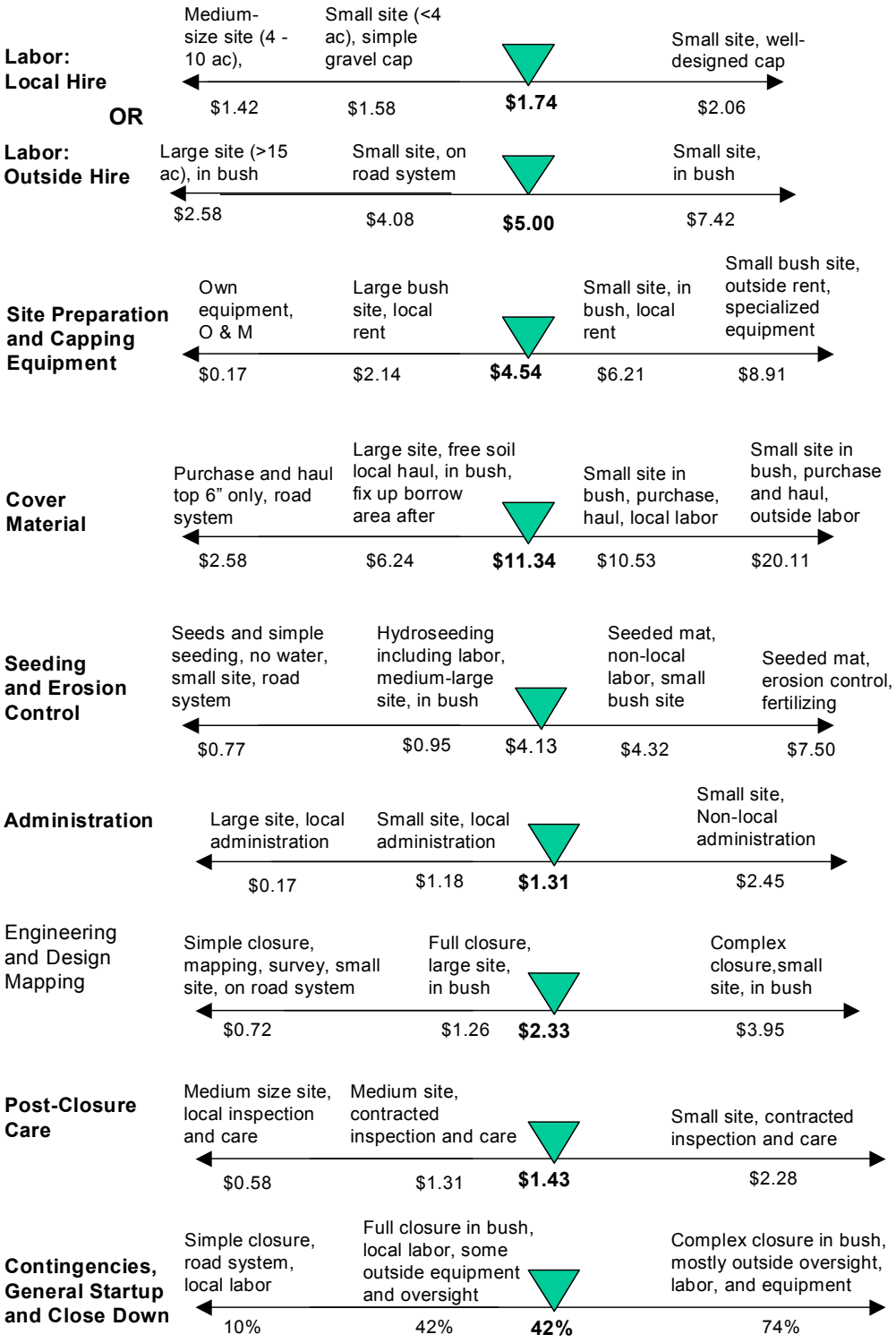
Site area = 30 yd X 30 yd = 900 yd^2

Estimated site closure cost = 900 x 38.08 = $34,272

If you're out on the Arctic Slope, your price likely will be higher. If your site is on the road system, your price likely will be much lower, unless you have a really complicated closure, or are installing extra protection features.

The *best* way to use Figure 6-1 is to look at each category separately and estimate where your village will fit in the range of costs given. It sounds a bit complicated, but it is really just using your common sense, and then choosing a cost. The result won't be exact, but it should be a better estimate. Be careful with your estimates when you're unsure. Choose a cost that is a bit higher than you think it might be, so the funding you ask for will be enough. Also, like all construction projects, you'll be adding a contingency at the end. That covers you in case your cost estimate is too low.

Figure 6-1 Range of Costs per yd^2 for Closing Sites In-Place



Estimating the Cost of Closing A Site In-Place Using Figure 6-1

Example: Suppose you had a small site of about 2 acres. You have your own borrow, but will need to buy topsoil. After conferring with your community and Tribal Council, you decide to cover the wastes with a simple cover of 18 in of borrow and 6 inches of topsoil. Because you have a lot of wind erosion at the site, you'll use a seeded fabric mat, instead of hydroseeding. You want to save money, so will use local labor and your own backhoe. You'll need to rent a dumptruck to haul the soil.

A good estimate of your costs would be:

Labor costs: Your chosen cover is more involved than a cap comprised of simply gravel, but it is not a complex cover design. So you could choose the average labor cost of $1.74/yd^2. But you know your local labor is pricey compared with other villages, so you might want to estimate about $2/yd^2.

Site Prep and Equipment: You'll be using your own backhoe, but still need to rent something. There's nothing special about your site, and it is not in a field of big rocks and bushes (requiring more costly site preparation). Figure 5-1 shows a cost of $6.14/yd^2 for small sites with all the equipment rented. A cost of $0.17/yd^2 is for villages that use their own equipment. So you can guess that your cost might be about halfway between – or $3.16/yd^2.

Cover material: You have to buy some of your soil, but not all of it. According to Figure 6-1, the cost for a small bush site buying all of the cover would be $10.53/yd^2. A large site with all free soil is $6.24/yd. Since large sites cost less per area, and the soil is all free, a cost of halfway in-between, $6.24 and $10.53, or $8.38, might be too low. So you might guess that your site would cost halfway between $8.38 and $10.53. That means an estimate of $9.45/yd^2.

Seeding and Erosion Control: The cost for a seeded mat at a small site with non-local labor is $4.32/yd^2. So the cost using local labor should be a bit less. Even if you don't know anything about seeded mats, you could assume an estimate of anywhere between $2/yd^2 to $4/yd^2 would be reasonable. To be sure you estimate enough to cover the true cost, you might want to estimate about $3.50/yd^2.

Cost Estimation Example Using Figure 6-1 (continued).

Administration Your project will be locally administered, so a cost of $1.18/yd^2 is appropriate.

Engineering Design and Mapping Your closure is fairly straightforward so it will cost less than a complex small site closure. Because you have a small site, the cost per square yard will be more than for a large site in the bush. So you can figure your cost will be between $1.26/yd^2 and $3.95/yd^2. You know the average is $2.33/yd^2. As a small bush site, it is always a good idea to go over the average, unless there is an obvious reason not to. So you might estimate about $3.00/yd^2 .

Post-Closure You would prefer having someone else deal with the site after it is closed. and have them write the final report. That way even if you're gone by then, you know the proper maintenance will be carried out, and the 5-year closure report compiled and sent to ADEC. So you would estimate about $2.28/yd^2.

Contingencies You have a typical mix of local labor and outside equipment, project management, and engineering. Your closure is not too complex. An average contingency of 42%, including mobilization and demobilization (getting prepared and shutting down), is appropriate.

Your total cost without contingencies would be:

9,667 yd^2 x ($2.00 +$3.16 + $9.45 + $3.50 + $1.18 + $3.00 + $2.28)/yd^2

= 9,667 yd^2 x ($24.57)/yd^2

= $237,518

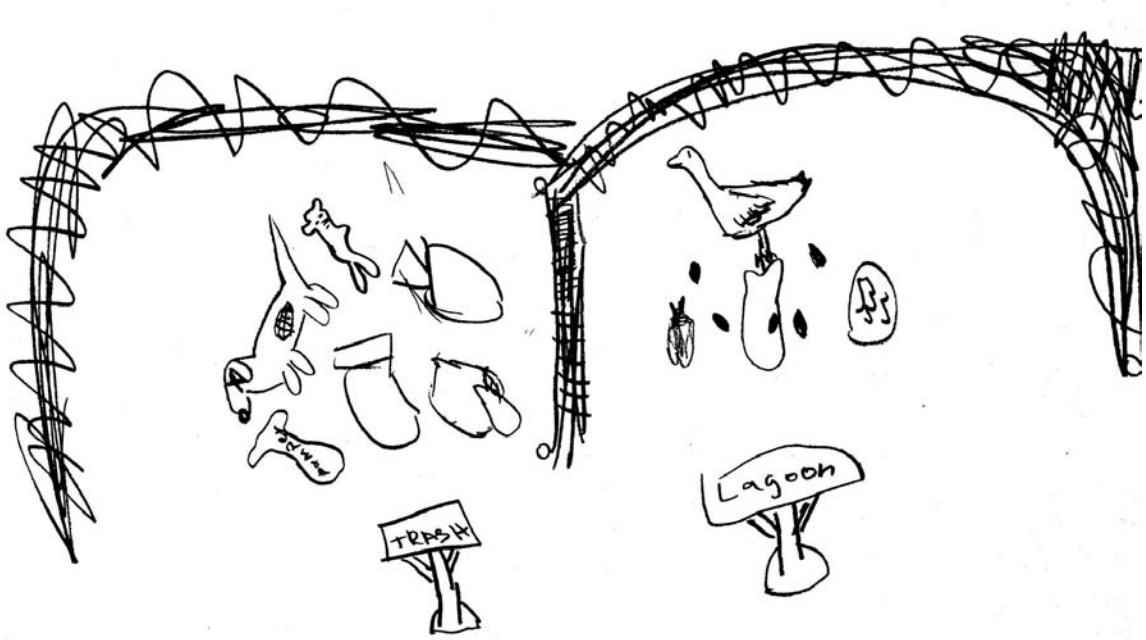
Adding in the cost for starting up and shutting down, plus contingencies, the final estimated cost would be:

$237,518 + (237,518 x 42%) = **$337,276**

3. HOW MUCH WILL IT COST IF WE WANT TO REMOVE OUR WASTES?

For some reason, the option of removing all the site wastes has not been used by Alaskan villages yet. But as described in Table 6-1, issues like future land use, contamination of nearby water and soil, safety, aesthetic appearance, tightening landfill regulations, and increasing Arctic permafrost melt make a compelling case for waste removal as an important, perhaps even preferable option for some villages.

Table 6-4 lists unit costs to determine how much you will spend if you choose to close your site by removing all, or part of, your wastes. An example is included after the Table. Because it lists specific costs for equipment, labor, and other factors, Table 6-4 may also be helpful in improving your total cost estimate for site closure.



Ikayaw kut kituqqluku yuillquq. Kuiik assii-utnguq. Yaut cigiiciagaten maani kuigqaacuay aami ekartelartuq kuall kuigmi tagluni,

Help us clean our environment. The river is polluting. When they dump something the pollution goes to the stream

Table 6-4
Estimated unit costs and labor needs for closing village dumpsites by removing wastes.

Item	Unit value (Year 2001)	Comments, Source
LABOR		
Foreman/operator	43.00/hr	Includes fringe. Local wage is typically lower. Cost Works[a]
Heavy equipment operator	$40.97/hr	Includes fringe. Local wage is typically lower. Cost Works[a]
Laborer	$30.85/hr	Includes fringe. Local wage is typically lower. Cost Works[a]
Engineering, project management	$50 - $150/hr	If working with agency (i.e. VSW, ANTHC) may be free-of-charge. See also General Project Requirements.
EQUIPMENT RENTAL/PURCHASE		*Note below that lower costs may apply for long-term rentals:*
Small frontloader	$365.26/day	1.5 C.Y. track. Cost Works[a]
Large frontloader	$465.85/day	2.5 C.Y. wheel. Cost Works[a]
Small backhoe	$378.58/day	0.5 C.Y. wheel. Cost Works[a]
Large backhoe	$583.75/day	1.0 C.Y., track. Cost Works[a]
Flatbed	$158/day	1 axle, 1.5 ton rating. Cost Works[a]
Dozer	$316/day	75 h.p. Cost Works[a]
EQUIPMENT OPERATION		
Small capacity	$14.74/hr	ENR/CCI #7155
Large capacity	$33.31/hr	ENR/CCI #5435
WASTE COLLECTION		
Typical waste volume removed each day from site	65 yd^3/d[b] ($120\ yd^3/d$ for well-consolidated wastes, 10 -30 yd^3 for highly scattered wastes)	Four person crew (1 operator, 3 laborers). Adjust collection rate proportionately for different size crew (assuming adequate equipment).

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Table 6-4 (continued)
Estimated unit costs and labor needs for closing village dumpsites by removing wastes.

Item	Unit value (Year 2001)	Comments, Source
WASTE HAULING		
Dump truck rental	$750 - $1,350/ week	5 – 12 yd^3 capacity. Regional quote.
One 20 to 30 yd3 container	$110/month Anchorage, plus haul fee $5/day ($75 min.) Fairbanks, plus haul	Regional waste company quotes. Excludes shipping costs. They deliver/pickup on road system for $130, plus mileage fee.
Mileage fee for road hauling	$1.33/mi over 20 mi	Cost Works (A licensed cost software program)
Flying wastes	$600/ton, Kotz. or Bethel to Anch.	Northern Air Cargo (baled or wrapped)
Barging wastes	NANA Region: $870/ton Calista Region: $640/ton YK Delta to Anch: $1,087/ton Arctic Slope: $895/ton Bristol Bay: $700/ton Dillingham to Anch: $196/ton Southeast to Rabanco: $61 - $90/ton Southeast to Juneau: $161/ton Aleut to Anch: $311/ton Yukon Riv. (Ruby) to Nenana: $490/ton	To convert waste volume to weight assume about 600 - 650 lb/yd3 using heavy equipment to tamp down wastes into shipping containers. 750 – 1,000 lb/yd3 for compactor containers or baled wastes. *Note; quotes given are for regional village to nearest hub city, unless otherwise stated. Southeast includes disposal via Ribanco Corp.* ***Minimum weight charge applied – typically for about 10 tons.*** *Rates should be used for rough estimation only. Call barge company for current specific rates.*
SHIPPING		
Heavy equipment barge-in	Excluding Southeast: $4,000 to $6,300 inc. handling & fuel surcharge, depending on capacity. Southeast from Juneau: $700 – $1,200	Company quotes.
Supersacks	$20/bag, shipping 100 ct= $500	Company quotes, see Ch. 8 for info.

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Table 6-4 (continued)
Estimated unit costs and labor needs for closing village dumpsites by removing wastes.

Item	Unit value (Year 2001)	Comments, Source
OUTSIDE CREW		
Transportation	Approx. $1,000 per worker per roundtrip.	Charter plane on village leg may be more cost effective.
Barge-in trailer housing (Inc. kitchen, bathroom)	1 bd trailer: $32,000 purchase or $990/month rental (18 month min.), $8,000 shipping 2 bd trailer (2- 6 persons): $50,000 purchase, $12,000 shipping 6 person trailer: $135,000 with shipping	Company quotes. For example, contact e.g. Travco Industrial Housing, 1 (888) 387-2826. VSW quote.
Per diem	Rates vary . See website for hub cities. Note there are no restaurants or motels in most small villages.	www.dtic.mil/perdiem/opdrform.html
CONTINGENCIES		
Overall Project contingency	15% - 20%	Includes over-budgets for engineering, design, construction, mobilization and demobilization
"Bush" contingency	10 - 20%	Additional to overall project contingency. Typical contingency for sites listed in this manual.
GENERAL PROJECT REQUIREMENTS (Alternative calculations based on percentage)		
Mobilization/ Demobilization	10% - 30% larger sites 30% - 50% smaller sites	Includes getting equipment, trailer housing, crew over and back. Includes trailer housing rental or purchase. Depends on relative amount of outside labor, services, and equipment needed.
Administration	2.5%	Typical for closures in this manual
Engineering design/ support/project management	5%	Typical for closures in this manual.

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Table 6-4 (contd.)
Estimated unit costs and labor needs for closing village dumpsites by removing wastes.

Item	Unit value (Year 2001)	Comments, Source
DISPOSAL		
Scrap metal recycling	You receive- Steel and Iron: $20/ton Tin: $5/ton	Seattle market rates Mar 2001. Fluctuates with markets, assumes good quality, well separated, no compressors
Mixed wastes	You pay- Fairbanks: $50/ton inside borough, $100/ton outside Anchorage: $45/ton inside borough, $90/ton outside Eastern Washington (Rabanco): Rates vary	For quantities larger than 5 ton, always arrange for mixed waste disposal beforehand
Refrigerators/freezers	You pay- $20 - $30	Typical charge for freon bleeding
All other white goods	You pay- $0 - $20	Recycle as metal scrap to avoid fee
Tires	You pay- $2 - $5	Typical fee, note tires might be prohibited.
SITE CLEANUP/EROSION CONTROL		
Fill in holes, place mulch or soil, regrade where necessary	0.5 ac/day	4 person crew
Hydroseeding	0.5 ac/day application/prep rate at approx. $5,500/ac	Contact Alaska Plant Materials Center at 745-4469 for correct seed mix and tech. support.

Determining Waste Removal Costs with Table 6-4

Example: Suppose you are in Western Alaska and have a dumpsite located near an important fish camp, or at the place you want to build your new school. Just to be safe, you decide to ship out all the wastes. Have you been out of school for awhile and/or aren't used to working with numbers or waste measurements (its tricky!)? Then get a good estimate of the volume of waste at the site by working with agency personnel, or other people who have done this kind of thing before. Let's say your wastes are generally dumped pretty close together, with some scattered wastes around the edge of the dump. If piled all together, but not compacted, they would take up about 650 yd^3. Using Table 6-4, a good estimate for the total closure cost would be:

Labor: 1 foreman/operator at $43/hr, 3 laborers at $30.85/hr.

650 yd^3 of wastes at 65 yd^3 waste collection per day = 10 days or 80 hrs of labor

You also will need to have people going over the site in advance to pull out batteries, flag hazardous wastes, etc. For 1 acre site, assume about 2 days, or 16 hrs.

Labor costs = (96 hr) x $43/hr + (80 hr x $30.85/hr) x 3 operators = **$13,013**

(You are using local labor and will not need trailer housing or crew transportation.)

Equipment: You have no heavy equipment and there are no projects going on that you can borrow from. You decide to rent a small capacity frontloader from the nearest hub city.

Rental: ($368/day x 10 days work) + ($368 X 4 days shipping time) = $5,152

Operation: (11.20/hr x 80hr) = $896

Shipping: approximate $5,000 one way, or $10,000 roundtrip

Total equipment costs: $5,152 + 896 $10,000 = $16,048

Containers: You have about 650 yd3 of loosely consolidated wastes at your site. The weight of those wastes would be about:

650 yd^3 x 225 lb/yd^3 = 146,250 lb= 73 tons of wastes

Containers hold 600 to 650 lb waste per yd^3. Assume 625 lb per yd^3. So the volume of containers must be about:

227,500 lb /650 = 234 yd^3, or twelve 20 yd^3 containers

Container rental: 12 containers at $110/month for one month = $1,320

Container shipping: Containers weigh about 500 lb. At about $700/ton:

12 containers x 500 lb x ($700 per 2,000 lb) = $2,100

Container cost = $1,320 + $2,100 = $3,420

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Determining Waste Removal Costs with Table 6-4 (contd.)

Waste shipping: Assume $700/ton for shipping wastes.

$700/ton x 73 tons of waste = $51,500

Waste disposal: You've contacted the Anchorage landfill manager and he okays you for a $100/ton disposal fee.

73 tons of wastes X $100/ton = $7,300

Site cleanup and erosion control: Let's say your site is about 1 acre.

Cleanup/hydroseeding at 0.5 ac/day = 2 days.

Hydroseeding = $5,500 per acre for 1 acre = $5,500.

Labor = operator + 3 laborers = $43/hr + (30.85/hr x 3) = $135/hr = $1084/day

$1,084 x 2 days = $2,168

Total cleanup = $5,500 + $2,168 = $7,668

Miscellaneous:

Get someone hazmat certified: $1,500

Protective gear: $500

Total excluding engineering/support/project management, and administration:

$13,013 + $16,048 + $3,420+ $51,500+ $7,300 + $7,668 + $1,500+$500 = $100,949

Total with Engineering = 5%, and Administration = 2.5%:

$100,949 x 1.075= $108,520

Contingencies: project contingency of 15%, plus 10% "bush contingency":

Total Site Closure Cost with Contingencies = $135,650

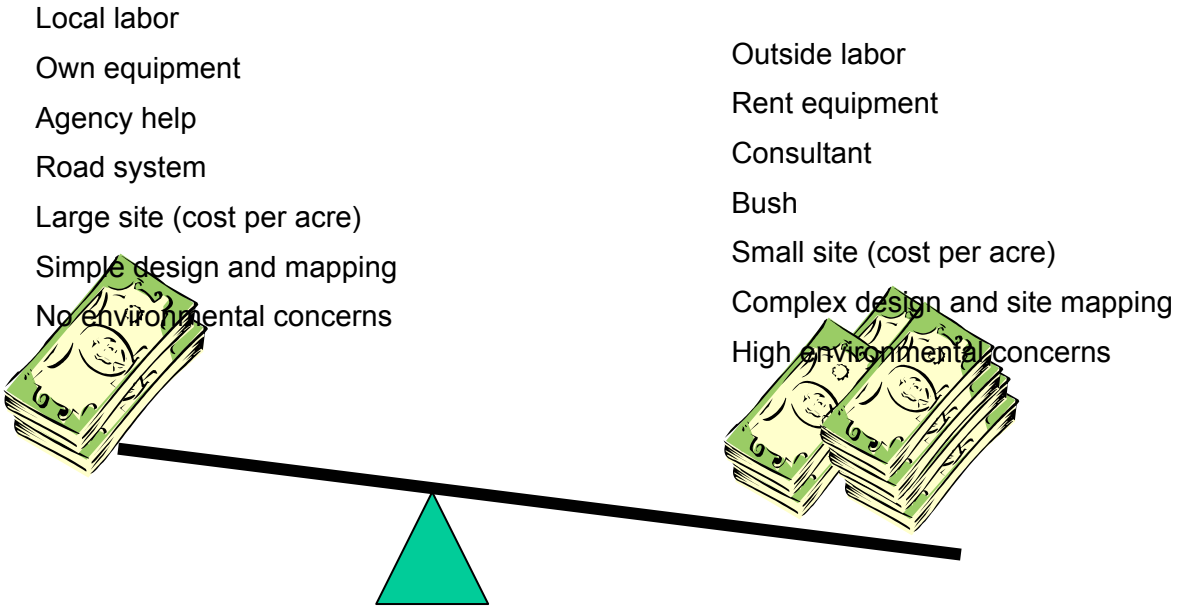
Equipment Consideration

Note! If you had your own equipment, and simply needed to pay for it's operation, the total cost in the above example would be only; **$115,289**. You would save over $20,000! Because renting and barging equipment is so expensive, you should always consider purchasing equipment instead, especially good quality used equipment. You can come out ahead if you will need the equipment anyway for a new landfill or transfer station. You may be able also to rent out the equipment to future projects that come into town. But be sure to include money to build a simple shed to house the equipment—or it will break down quickly in Alaska's harsh weather.

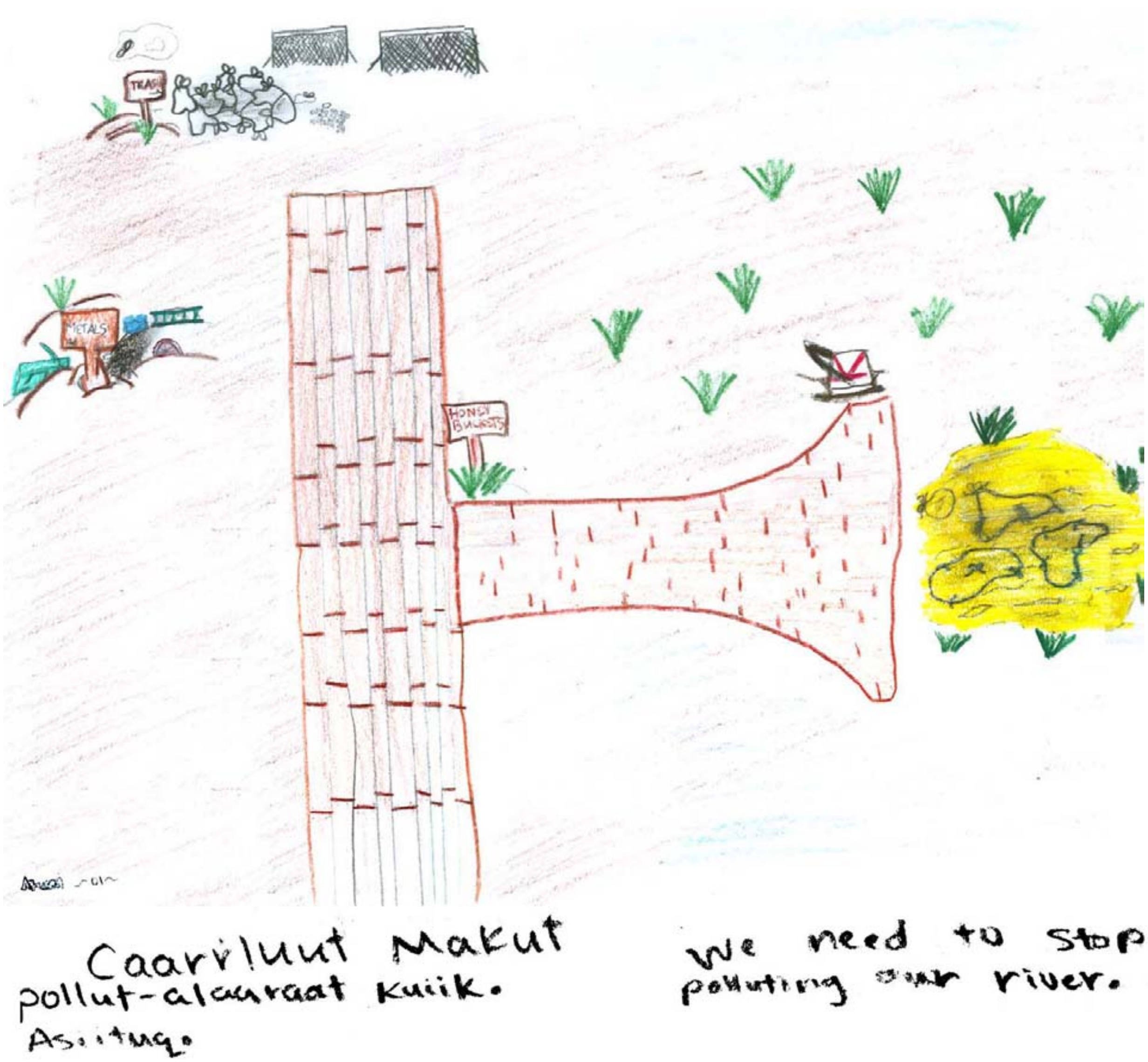
4. SUMMARY OF CLOSURE CONSIDERATIONS

In general, many of the factors affecting the level of costs for closing sites by covering wastes are critical in determining the level of costs for removing wastes. Figure 6-2 summarizes these main cost factors.

Figure 6-2 Biggest Cost Factors in Dump Site Closure



Remember, when all is said and done, it is your community that is affected by how your dump is closed. So the site closure method is your choice. You will make the best choice for your community as long as you consider all of the potential impacts mentioned in this Chapter and Chapter 3. Also, site closure often involves an outside agency, definitely impacts future land use and development, and might impact subsistence. So don't forget that **your tribal authority and responsibility, government organization, and community culture can be affected with this type of big decision.** If you want your solid waste disposal plans to fit in with community planning, be sure to look at Table 2-1 in Chapter 2, and Table 7-3 in Chapter 7.



Chapter 7: What Paperwork Do We Need to Do?

To close your site officially, you'll need to turn in to ADEC what is called a "Closure Plan". Turn in your closure plan before you even start to close your site, and the sooner, the better. That way, if anything is found wrong with it, you'll get help in fixing it before its too late. Regardless of being an ADEC regulation, a closure plan is a really good idea anyway. It helps you get prepared and organized. You can use it for getting contractor bids. And in the future, it can be used to show someone that you closed the site the right way. That can help avoid any liability claims.

1. HOW TO WRITE YOUR CLOSURE PLAN

The information you are required to include in an official Closure Plan for a Class III permitted landfill (or an unpermitted site serving less than about 2,000 people), is given in Figure 7-1. For an example of a basic closure plan, call ADEC or see the Appendix in *Landfills in the Bush* (call 543-3521 for a copy).

Additional Information

You may *want* to include some additional technical information. You might need to hire an engineer or geologist, but you can benefit a lot because:

- You can be more certain that your closure plan will be adequate to protect your environment and health.
- You may be more likely to receive funding if you can show how well thought out your plan is.
- If you want to take additional protective measures like those described in Chapter 4, you may be able to get a higher amount of funding by showing why you need the extra work.
- You can get a more accurate cost estimate.
- You'll know better what your landfill will look like, and how big an area will be impacted by excavating soil/gravel borrow.
- You can hold the contractor to a specific plan, and also have a more straightforward bidding process.
- ADEC is more likely to approve a detailed plan.

Additional information to consider is described in Figure 7-2. Talk to your favorite agency staff person. They can help you figure out what is best to include in your plan. Before you start planning, **look at Table 7-3, it gives great suggestions on how to most effectively plan your site closure and new waste disposal method.**

Figure 7-1. What Do We Include in a Site Closure Plan?

Describe The Closure Method

If you are closing by covering wastes, talk about what makes up your final cover (e.g. 18 inches gravel, 6 inches topsoil with seeding). Include as much information as you can about the type of soil, how you are going to compact the site, how you are seeding the site, and how steep the final site slope is. If you are closing by removing wastes, talk about how much waste you will be picking up, how it will be contained, and which barge or plane service you are using.

For either method, include how you will deal with any hazardous wastes. Take site pictures before closing, and describe the amount and type of wastes. Include a time schedule for when the site will be closed.

↓

Describe The Final Appearance Of The Site

Talk about how big an area the closed site is, where the permanent site markers are, where the signs are, and what they say. Describe anything else that might be important.

↓

Describe The Future Use Of The Site Area

Talk about what you think the site will be used for in the immediate and long-term future.

↓

Provide Technical Drawings Or Maps Of The Area And Planned Cover

Include the final boundaries of the site, and any relevant features like access points, fencing, sign locations, bodies of water. If you are taking borrow from a local area, include the borrow source area on the map. Cross sectional drawings are particularly helpful to show the planned slopes and grading of the cover.

↓

Provide Total Cost Estimates For Closure And Post-Closure

Include a final budget that is broken down into categories such as labor, equipment, administration, cover materials, design, and contingency costs.

↓

Describe How You'll Limit Permafrost Melt

For *unlined sites located on permafrost*, talk about how you'll monitor the site for signs of permafrost degradation (e.g. thermistors, visual inspection, or other). Talk about what actions you would take to prevent contamination if the thaw damage became serious.

Figure 7-2 Optional Topics to Include in your Closure Plan

Topographic Map Of Area With Current And Final Elevation of Site Surface

A "topo map" shows the contours of the land and how the covered landfill will fit. If you don't have a topo map, you'll need a surveyor to measure the different rises and drops in your landscape. This map will allow you to make calculations for exactly how much soil cover you'll need.

Description Of Environmental Impact

Talk about how closing the site will impact the environment. For example, are you doing something to prevent erosion? Will removing borrow from your source area affect subsistence practices, or cause sediment to enter valued streams because of future erosion? Will you be careful not to disturb nesting areas with your heavy equipment?

Surface Water Management

Talk about what you are going to do to prevent rain and snow-melt from getting into the landfill (e.g. snow scraping, careful grading, drainage canals, dewatering processes, where runoff water goes).

Properties Of The Cover

Talk about the "permeability" of the soil or other cover material you're using. You can test for it specifically, or often you can find out a good general number by talking to a geologist (try U.S. Geological Survey, Anchorage, 786-7111).

Post-Closure Program

Talk about what you will do to make sure the cover stays in good repair. Include any plans for visual inspections, sampling, or routine maintenance.

Table 7-3
Factors in planning for site closure and a new waste disposal facility.

Factor	Specific concern	Example
Sustainability Can you sustain the plan financially and logistically?	Operation of facility	Funding and staff to support a collection program?
	Maintenance of closed site and/or new waste facility	Staff and funds to do post-closure care of site?
	Future logistics	Is there enough land for accumulation of wastes?
"Double duty": Can you save by sharing between projects?	Waste facility/equipment used for something else	Barge transfer station/storage used for transfer/storage of other goods
	Other facility/equipment used for solid waste	Heavy equipment in town used for site closure
	Pooled funding	Solid waste planning funded by community development planning money, or vice versa?
Rules Are there regulations that affect your closure or new disposal method choice?	Airstrip	Need to site new facility over 5,000 ft away. May need to upgrade site closure if site is closer than 5,000 ft.
	Air quality	Will burning wastes meet air quality rules?
	Water quality	Will closing in-place or new landfill produce leachate that does not meet environmental regulations?
	Logistics	Does barge/plane have rules on carrying wastes?
Land use	Land has planned use already.	Landfill land needed for wastewater pond?
	Land use affects other activities.	Will locating landfill in wetland that treats wastewater reduce wastewater treatment?
Development barriers	Choice of closure and disposal method affects future development?	Is housing going to go up near closed site or waste facility? Where will the community expand?
	Development restrictions for land over closed site.	If you close site in place, will you be able to use land the way you want in 15 or 20 years?
	Jet aircraft landing restrictions.	Is waste facility more than 10,000 ft from airstrip?
Health and Environmental	Chosen options affect health goals.	If you open burn or use a burnbox, (i.e. not an incinerator), will smoke affect community members? Are traditional water sources safe?
	Chosen options affect environmental concerns.	Will tundra disturbance from new landfill be acceptable? Will landfill location affect fisheries/tundra/wetland restoration?
Subsistence	Chosen options impact subsistence activities.	Is landfill up-gradient from fish camps, or in path of caribou migration? Are potential access points away from nesting and berry picking areas?
Tourism	Logistics	Will new facility be able to support tourist wastes?
	Appeal	Will closed in-place site be acceptably aesthetic for tourists? Is new facility out-of-sight and odor-free?

2. WHAT AM I REQUIRED TO DO BESIDES SUBMIT THE CLOSURE PLAN?

If you remember Figure 2-3, you know there are a couple of other things you need to do besides a closure plan:

1. After you've closed your site, **remember to write ADEC** and tell them you've closed it. You don't need to say or use anything fancy. Just let them know it is one less thing for them to worry about! You should do this within 90 days of closing your site. It is a good idea to include some pictures of the closed site, too. They like collecting them.

2. For the next five years, **remember to do your post-closure inspections** (and monitoring if it is needed)! Take a look again at Chapter 4 for details.

3. Sometime before the five years is up, **make official the fact that the site was used as a landfill.** This requirement is just so that if somebody buys or rents the property in the future, they will know there used to be a landfill there. If the site has a property deed, you use that. If it doesn't have a deed attached to it, then find some kind of piece of paper or record that makes sense. If you can't find something, start your own official record. **Write out the following** on the "deed":

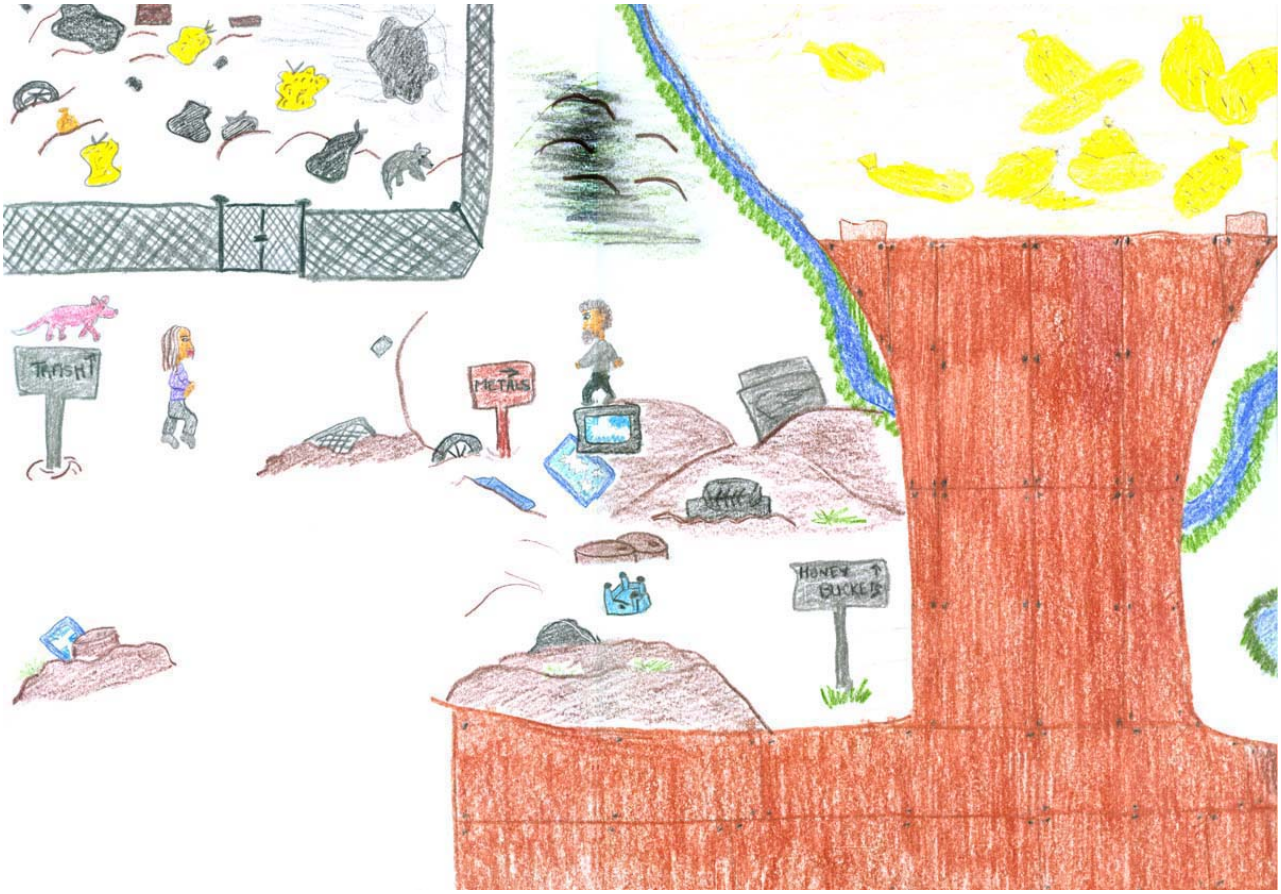
   - The site was used as a Class III landfill (or open dump).
   - The site may not be suitable for some uses.
   - Maintenance and repairs to the property might be necessary to prevent pollution problems
   - Any activity that results in damage to the final cover of the property must be corrected to control potential pollution problems.

   Make two copies. Keep one for yourself and send one with site pictures to ADEC. You can use the ADEC form that is provided in Appendix D.

4. Finally, the last thing you need to do is to **send ADEC a small "report" after the five years is up.** All you've got to do is include some pictures of the site, and talk about any problems that came up with the site or site cover. Look again at Chapter 4 (under Post-Closure) for what kind of problems might come up. For example, if you started seeing cracks in the third year and you filled them in, talk about that. Did you need to re-seed? Include that as well. Note if you're one of the few that had to keep sampling their water during the 5 years of post-closure, you'll need to include all your sample results, as well.

3. WHAT WILL HAPPEN IF WE DON'T MEET ADEC REGULATIONS?

The people at ADEC are Alaskans, and they understand that conditions in Alaska's rural villages are difficult, and logistics often cannot work out. **If you want to meet regulations, but are having trouble doing that, call up your ADEC representative and talk with them about it.** Their policy is to work with villages in reducing their health and environmental risks as much as practical-- and to avoid any enforcement measures. Let them know you are trying hard given your circumstances. You will be a lot better off because you'll leave them a good impression of your community. A good impression can come in handy in the future when seeking funds for other projects.



Wiinga Ciiskuciryugua, assiiliqlartua ciqicivíim avatii ayuqeltra. Cimiryugvaqaput tamamta tua-i-wa cagglan.

- My name is Dana Jimmy. I feel uncomfortable about the dump site by the way it looks. We want to change the dump because the trash is going all over the village and the tundra.

Chapter 8: Choosing Your New Waste Disposal Method

Well, like we promised, most of this manual has to do with closing your dumpsite, and not figuring out what to do about a disposal alternative. But unless you've already got one, you need to first choose-- then start, a new disposal method before you close your site. So this Chapter will help guide you and your community through that decision making process.

1. WHAT KINDS OF DISPOSAL ALTERNATIVES ARE OUT THERE?

You've got several options to think about:

- Using a burnbox, or incinerator if affordable, and landfilling or shipping out ash residue and non-burnable wastes
- Using a transfer station in place of a landfill, constructing a salvage yard and materials reuse shed, and hauling out all wastes that are not reusable
- Using a transfer station for some wastes, and landfilling, burning, or storing other wastes for economic or logistical reasons.
- Constructing a Class III landfill (or Class II for larger villages) with appropriate extra protection features if needed
- Using any of the above options with a strong recycling and reuse program

Table 8-1 lists some villages and what their waste management methods are. If you see a village that may be similar to yours and are interested in what they are doing, try contacting or looking for them at the next tribal conference or workshop. ADEC or EPA personnel should be able to give you more information, or get you in touch with the right person also.

Are you having trouble finding funding, getting your plan started, or getting a permit?

Start up as many of the site improvements described in Chapter 3 as you can:

- You'll reduce your health and environmental risks a lot
- You'll be more able to convince funding agencies that your SWM plan will be successful, and
- Your community will be more ready to support a new alternative when it gets funded.

Table 8-1
Solid waste disposal methods reported by some Alaska villages.

Village	Region	Disposal Method	2001 Contact
Afognak	Koniag, Inc	Burn box, Home barrel burning, Compost pile	Alisha DeGuzman, 486-6357, alisha@afognak.com
Akutan	Aleut Corp	Incinerator, Recycle program	Alice Tcheripanoff, 698-2300, atcheripanoff@yahoo.com
Allakaket	Doyon, Limited	Dump, Burn box, Home barrel burning, Honey bucket disposal	Eliza Ned, 968-2237 allakaket@smtp.ak.bia.gov
Atmautluak	Calista Corp	Dump, Waste hauled, Home barrel burning, Recycle program, Hazardous waste program, Honey bucket disposal, Lead-Acid batteries recycle	Edward Nicholai, 553-5335
Atqasuk	Arctic Slope	Dump, Waste hauled, Supersacks, Honey bucket disposal	Joseph Akpik, 633-2575, jkakpik@hotmail.com
Chalkyitsik	Doyon, Limited	Dump, Home barrel burning	Michael Joseph, 848-8118, mike_me_happy@hotmail.com
Chenega	Chugach Natives, Inc	Dump, Burn box, Hazardous waste program, Used oil burner	Charles Robertson, 573-5132
Chilkat	Sealaska Corp	Dump, Waste hauled, Recycle program	Pat Warren, 767-5505, klukwan@whybear.com
Chignik Lagoon	Bristol Bay Native Corp	Dump, Incinerator, Burn box, Home barrel burning	Laura Stepanoff, 840-2281, civc101@aol.com
Chistochina	Ahtna, Inc	Waste hauled, Transfer station, Burn box, Home barrel burning, Recycle program	Joneal Hicks, EPA/NR Director, 822-3503, jhicks@tribalnet.org
Deering	NANA Regional Corp	Dump, Home barrel burning, Honey Bucket disposal	Ruth Ann Moto, 363-2138, ramoto@maniilaq.org
Elim	Bering Straits Native Corp	Dump, Burn box, Home barrel burning, Recycle program, Septic tank disposal at landfill, Used oil burner	Carol Nagaruk, IRA Cnsl, 890-3737, elmiracouncil@earthlink.net
Eyak	Chugach Natives, Inc	Dump, Recycle program, Hazardous waste program, Baler, Used oil burner	Kate Williams, Dir. of Env. Programs, 424-7738, kwilliams@tribalnet.org
Igiugig	Bristol Bay Native Corp	Dump, Waste hauled, Home barrel burning, Recycle program, Hazardous waste program, Open dump burning	Marie Nelson, 533-3260, lolympic@aol.com
Kasaan	Sealaska Corp	Waste hauled, Home barrel burning	Paula Peterson, 542-2230, kasaanira@hotmail.com
Kipnuk	Calista Corp	Dump, Waste hauled, Incinerate, Recycle, Transfer station	Tammy Dock, IGAP Coord, 896- 5515

Continues on next page

Table 8-1 Solid waste disposal methods reported by some Alaska villages (cont'd).

Village	Region	Disposal Method	2001 Contact
Knik	Cook Inlet Region Inc	Dump (Borough Landfill), Waste hauled, Hazardous waste program	Emily Houk, 373-7991, kniktribe@matnet.com
Kotlik Tribal Council	Calista Corp	Dump, Waste hauled, Recycle program, Honey bucket disposal, Hazardous waste disposal van/area	Victor Tonuchuk Sr, Environmental Director, 899-4651
Mentasta	Ahtna, Inc	Waste hauled, Transfer station, Recycle program	Charles David Jr, EPA/IGAP Coord, 291 2319, cdavid@tribalnet.org
Minto	Doyon, Limited	Dump, Home barrel burning, Sewage Lagoon	Ronnie Silas, 798-7399
Ouzinkie	Koniag, Inc	Dump, Recycle program, Honey bucket disposal	Daniel Ellanak, 680-2259, dellanak@hotmail.com
Pedro Bay	Bristol Bay Native Corp	Dump, Burn box, Home barrel burning, Recycle program, Hazardous waste program, Used oil burner	Ben Foss, Env Coord, 850-2225, pedrobayvc@aol.com
Ruby	Doyon, Limited	Dump, Home barrel burning, Honey bucket disposal, Hazardous waste program	Joe Wright, Env Tech, 468-4495, smokinjoeak@hotmail.com
Russian Mission	Calista Corp	Dump, Home barrel burning, Recycle program, Ship waste on barge	Darcy Kameroff, Tribal administrator, 584-5511
Selawik	NANA Regional Corp	Dump, Home barrel burning, Recycle program	Lorraine Ticket, EPA Coordinator, 484-2165
Shishmaref	Bering Straits Native Corp	Dump, Recycle program, Honey bucket disposal, Open dump burning	Jennifer Pootoogooluk, Env. Manager, 649-2212, jpootoogooluk@ak.net
Togiak	Bristol Bay	Dump, Burn box, Recycle program, Ship Batteries, Transfer station. Used oil burner	Peter Lockuk, 493-5821
Toksook Bay	Calista Corp	Dump, Home barrel burning, Recycle program, Honey bucket disposal, Hazardous waste program	Felix Lincln, Env. Coord, 427-7115
Tyonek	Cook Inlet Region Inc	Dump, Home barrel burning, Recycle program	Angela Sandstol, Tribal administrator, 583-2271, tyonek@aol.com
White Mountain	Bering Straits Native Corp	Dump, Waste hauled, Home barrel burning	Lucy Ione, Tribal Coord. 638-3651

Burnbox

What is it?

A burnbox is used by many villages. Either a self-constructed or purchased large metal container with good draft is used for burning trash.

Advantages

- Burnboxes are inexpensive
- No animal attraction if done right
- Reduces volume of burnable waste by about 90%
- Reduces weight of wastestream by about 80%
- Because ash and non-burnable trash is relatively non-toxic, you have a lot of flexibility in landfilling or reusing it.
- If you choose to ship ash out, it will be much cheaper than unburned trash, and you'll have less liability concerns

Disadvantages

- If not run right and at a high temperature, you'll get toxic smoke
- Need to have fairly predictable wind directions, and burnbox placed at least a mile downwind of homes, or 2-3 miles upwind
- Must separate out wastes causing explosions, black and/or toxic smoke, like aerosol or paint cans, batteries, lamps, rubber and tar products, tires, waste oil, liquid fuels, pressurized containers, large animals, large plastics.
- Needs regular (dirty) maintenance

Where to go

Call the ADEC or EPA rural sanitation coordinator (see Table 4-2) for tips on buying, installing and operating a good burnbox. If you want your burnbox to run well and not cause health problems, you *must* get advice first! Burnboxes are too easy to mess up otherwise! **Be sure also to look into buying an "incinerator".** If you can get the funding, retain a trained operator, and afford the upkeep, your community will be better protected. ADEC has just put out a very helpful publication dealing with incinerators and burnboxes, *Burning Garbage in Rural Alaska*. Contact: Ed Emswiler, 465-5353, ADEC Solid Waste.

Transfer Station

What is it?

A transfer station is a place to drop off and store wastes so they may be transferred to their final disposal site. Usually, it consists of 1 to 3 shipping containers, and a platform for easy unloading. Scales and gated fencing are often added. Some stations, like Unalakeet's, are inside of warehouses to store wastes over the winter. Road villages mostly haul out wastes by truck to a city landfill. Some villages use transfer stations for in-town "drop-offs" to keep people away from the landfill.

Advantages

- Cleaner and more pleasant than a landfill, and shipping facility can be used for other purposes
- If hauling wastes out, environmental risks are very low
- Health risks are greatly reduced because easier to keep animals and people away from wastes, and wastes are removed relatively quickly
- Don't need much space for it and no environmental restrictions in terms of locating it
- You can get rid of all wastes (hazardous should be separated still)

Disadvantages

- Can be expensive to construct. Maintenance is low, but hauling wastes might be expensive, depending on location and what type of contract you negotiate.
- If your port/airstrip is in-town, you'll need to have the station located there, or have a weekly truck haul from station through town, to the port. An in-town waste operation may be a nuisance.
- Must commit to a contract so dependent on outside factors. Can get a long-term, cheaper, stable contract or a short-term flexible contract.
- You need to be sure hazardous wastes are not thrown in, or you may be liable if an accident is caused.
- For some wastes, shipping might not make sense economically or logistically-- a small landfill, monofill, and/or incinerator (or burnbox) still might be needed. A salvage yard for scrap metal is generally recommended.

Where to go

Contact ANTHC and VSW for help in construction. If you plan to haul wastes to another city's landfill, contact their SWM manager. For non-road villages, contact your barge or plane service to develop a contract. See waste removal discussions in Chapters 5 and 6 for more considerations.

Landfill

What is it?

A permitted landfill is a well-run dump that is located away from environmentally sensitive areas, and designed so that drinking water is not negatively impacted. Health concerns are greatly reduced by controlling animals, birds, and insects through a variety of methods. Honeybuckets or wastewater is dumped or discharged in a separate area so that germs are minimized. Access is controlled so that people do not risk injury, or needlessly track germs from the landfill to their homes.

Advantages

- A landfill is a more familiar disposal method. As long as you don't open burn and do pretty steady maintenance, you won't come up against any emergency situations
- The community handles and takes responsibility for its own wastes
- You can get rid of all wastes (hazardous should be separated still)
- A well-run landfill is an ideal place to start up a recycling/reuse program.

Disadvantages

- Takes up a lot of land and future use will be restricted
- You really need to be careful about locating your landfill so that environmental damage is avoided. In reality, there are few places in village Alaska that are ideal for a landfill.
- To avoid health and environmental risks, it is likely that you will need to install extra protective features, like a liner and drainage system. This type of landfill can be quite costly.
- If you commit to a landfill for disposal of your wastes, it is much more difficult to change your mind than using a transfer station or burnbox, or other method. The largest portion of money is for capital outlay upfront (construction). You will also have to spend money on closure costs, once the landfill is opened, regardless of how long it is used.
- You must keep hazardous wastes out of the landfill. Staff must be dedicated to a well-ordered landfill, or you will have another open dump.

Where to go

Contact ANTHC and VSW for help in construction. Look to USDA Rural Development or the State's Municipal Capital Improvement Project for funding.

Supersacks

What is it?

Supersacks are large, heavy-duty plastic bags that can be used as permanent landfill stacking blocks or to temporarily store solid waste for barging or burning. These bags are reusable and can hold up to 5,000 pounds of dry or free flowing material. When empty, the bags fold down for shipping and when filled they form a free standing block that is 3 feet wide and 4.5 feet tall. There are different style bags to suit your needs, such as: full open top, discharge spout bottom and fill spout top.

Advantages

- The potential for soil and water contamination is greatly lessened. Backhauling trash-filled sacks reduces these risks even more.
- Wastes are contained, thus eliminating windblown trash, keeping the active landfill portion small, and reducing maintenance needs.
- Using supersacks reduces trash scavenging and litter scattering by animals and birds. Keeping wildlife, pets, and people away from wastes greatly reduces health risks.
- When filled, supersacks can be placed to form snow/wind barriers.
- Materials like aluminum, glass and plastic can be temporarily stored in supersacks until recycling is feasible.

Disadvantages

- Supersacks are a temporary solution because sunlight can eventually break down the bags, making them rip and tear easily. Double-bagging is recommended for landfilling
- Adds some cost and effort to landfill operation.
- Cannot use sacks for scrap metal, appliances, or hazardous wastes.

Where to go

You can purchase supersacks new or used.
New ($19 - $22 each): **Helios Containers Systems,** 251 Covington Dr., Bloomingdale, IL 60108, (800) 336 342, or **Advanced Supply,** 1275 Graphite Dr., Corona, CA 92881, (909) 520 9270.

Used ($13 - $15 each): **The Bag Connection,** 459 9th St., Dundee, OR 97115, (800) 622 2448.

Used bags are also available from reconditioned supply sources or from local sources such as highway/airport maintenance crews or water treatment facilities.

Recycling

What is it?

Recycling is collecting a material for processing so it can be used again. Smart waste use also includes reducing wastes like packaging, creating dump salvage areas, re-using wastes, and composting.

Advantages

- Extends life of disposal site by keeping valuable materials out and in-use.
- May bring in some money, and saves world energy and resources.
- Reduces litter and windblown wastes.
- Can reduce pollution and health risks, especially if you recycle batteries, used oil, antifreeze, or plastics (if they are now burned). Vehicle batteries contain lead and acid, which cause nerve damage and skin burns. Batteries in dumps deteriorate rapidly, and threaten water quality.
- Free, controlled heat can be produced by used oil burners.

Disadvantages

- Requires planning and cooperation in community. Different types of waste must be collected separately or sorted after collection.
- Recycling some materials is not cost-effective yet, especially if you are planning a landfill where space is not an issue. Except for batteries, antifreeze, used oil, and plastics (if burned), efforts spent on recycling the most common wastes will not reduce health or environmental risks, so efforts may be better spent on other SWM improvement projects. It takes time and effort to find a buyer (especially for plastics and glass) and arrange shipping.
- Hazardous materials, such as batteries and used oil, must be crated in a particular way to ensure safety. Some simple supplies are required.

Where to go

Aluminum Alaskans Litter Prevention and Recycling (ALPAR), 274-3266, Flying Cans Program flies village aluminum cans to a recycling center at no-cost, and you receive payment for cans.

Batteries Note protective gear should be worn when handled. Arrange through a willing barge or air carrier (like Northern Air Cargo, 1 800 478 3330) to ship to a battery recycling center in Anchorage, Fairbanks or Juneau. Ask the recyclers for help with packaging and labeling requirements, or call Joe Sarcone, EPA, 271-1316. A few battery recyclers are:

Battery Specialists of Alaska 1939 East 5th , Anchorage 99501 , 276-5251
ABS Alaskan 2130 Van Horn Rd, Fairbanks 99701, 452-2002
E&L Auto 10005 Crazy Horse Dr, Juneau, 789-2728

Used Oil Used oil from vehicles and power plants can be burned in a used oil burner. There are special regulations for collecting and burning used oil so it's a good idea to call your local ADEC office first. A few used oil burner vendors are:

NuEra Technologies PO Box 112332 Anchorage 99511 (800) 347 9575
Gleason Research , PO Box 771171, Eagle River 99577, 694-2299
Craig Taylor Equipment HC-34 Box 2133, Wasilla 99654 (800) 973 2603

See Appendix C for a full recycling guide, and Table 8-1 for some villages with recycling programs.

2. WHERE SHOULD WE LOCATE OUR NEW FACILITY?

Figuring out where you want to put your new disposal facility is a really important decision. You will need to hire a geohydrologist (or an engineering firm that has a geohydrologist) to help you figure out which locations don't connect to your drinking water supply through surface or subsurface water flow. They will also figure out which location is most appropriate in terms of the lay of the land, and distance to the water table or permafrost.

But you have your job cut out for you too! You need to get together with them and make sure that they consider what is important to your community. In particular, if there are people in your community who get their water from traditional water sources, and not city or PHS water, make sure they realize that. Also make sure they realize where your important fishing areas are. If you don't let them know about these issues, they will use cost as the deciding factor in picking out suitable locations.

Is Your New Location Right for Your Community?

- Is the site far enough from town so that odors or smoke are not a problem?
- Is the site far enough from any future development that might take place?
- Is the site far enough from an airport (must be at least 5,000 ft, and 10,000 ft for a jet runway)
- Is the site far enough from your town's water intake and traditional drinking water sources?
- Does the land need to be used for anything else (if so, could both projects work there)?
- Does the location make sense in terms of convenience, traffic for the most people possible?
- Would the location affect migration patterns of wildlife (e.g. caribou?)
- Would the community feel they needed to change subsistence practices?
- Is the location downstream of important fishing, berry gathering/hunting grounds as much as possible?
- Does the community support the new location?
- Will construction at the site or along the access road affect wildlife or important land?
- Have you considered using the old location? You won't be impacting unspoiled land. The old site land is already impacted (and probably contaminated), and an access way already exists.

How far is far enough? In our Health Survey we asked people if they were bothered by dump smells or smoke. Table 8-2 lists how many people were bothered, and what distance from their dump. Taking into account the usual wind direction, and other factors, it turned out that the more frequently wastes were burned, the longer the minimum distance was that people had to live to not be bothered by dump odors/smoke. Looking at the last row, even if you locate your facility 8,000 ft away, if you plan on burning wastes

frequently, you could still expect about 20 percent of residents to be bothered a lot. **You also need to think about how bad the smoke is.** The thing is, the second village (shown in the second row) only burned their wastes every few weeks. But when they burned, there was a lot of waste buildup, and the burn would last for a couple of days with heavy black smoke. So even though it didn't happen often, 70 percent of residents were bothered at least a little by the dump. **When you burn regularly, there is less smoke, the fire can be more controlled, and you can be more careful about what you're burning** because you can pick out big plastics and batteries.

These results are for uncontrolled, unseparated waste burning. While the results would probably be similar for burnboxes, it is likely they would be different for an EPA Regulation-compliant incinerator. If run properly, incinerators produce odors that are much less noticeable (more importantly, the emissions are generally not harmful).

Table 8-2
Percent of residents who were living at a given minimum distance from their village dump, or further, who were bothered by dump odors/smoke.

Wastes are burned[a]:	At a distance of:	Bothered somewhat	Bothered a lot
Never	2,500 ft	9%	4%
Every 2-3 weeks	3,000 ft	70%	19%
5-6 days per week	8,000 ft	16%	21%

[a] Generally, uncontained, unseparated wastes were burned in an uncontrolled manner.

3. RECYCLING PROGRAMS

No matter what you choose, it will be a good idea to start recycling, reusing, or composting at least some of your wastes. Table 8-3 shows the advantages that can be achieved by reducing the wastes that need to be discarded. Appendix C includes considerations and contact information for recycling or reusing a variety of wastes.

Worried about costs?

Aluminum can and battery recycling programs can be set up so they are free-of-charge. If you want an aluminum can program, Call ALPAR at 274-3266. Many villages have already arranged with local plane/barge companies to backhaul batteries for free. They have also arranged for the battery recycler or dealer to collect the crated batteries at the port or air terminal. You can find out which villages near you have programs, how they do it, and what you need to by calling Joe Sarcone at 271-1316 or Bill Stokes at 269- 7580.

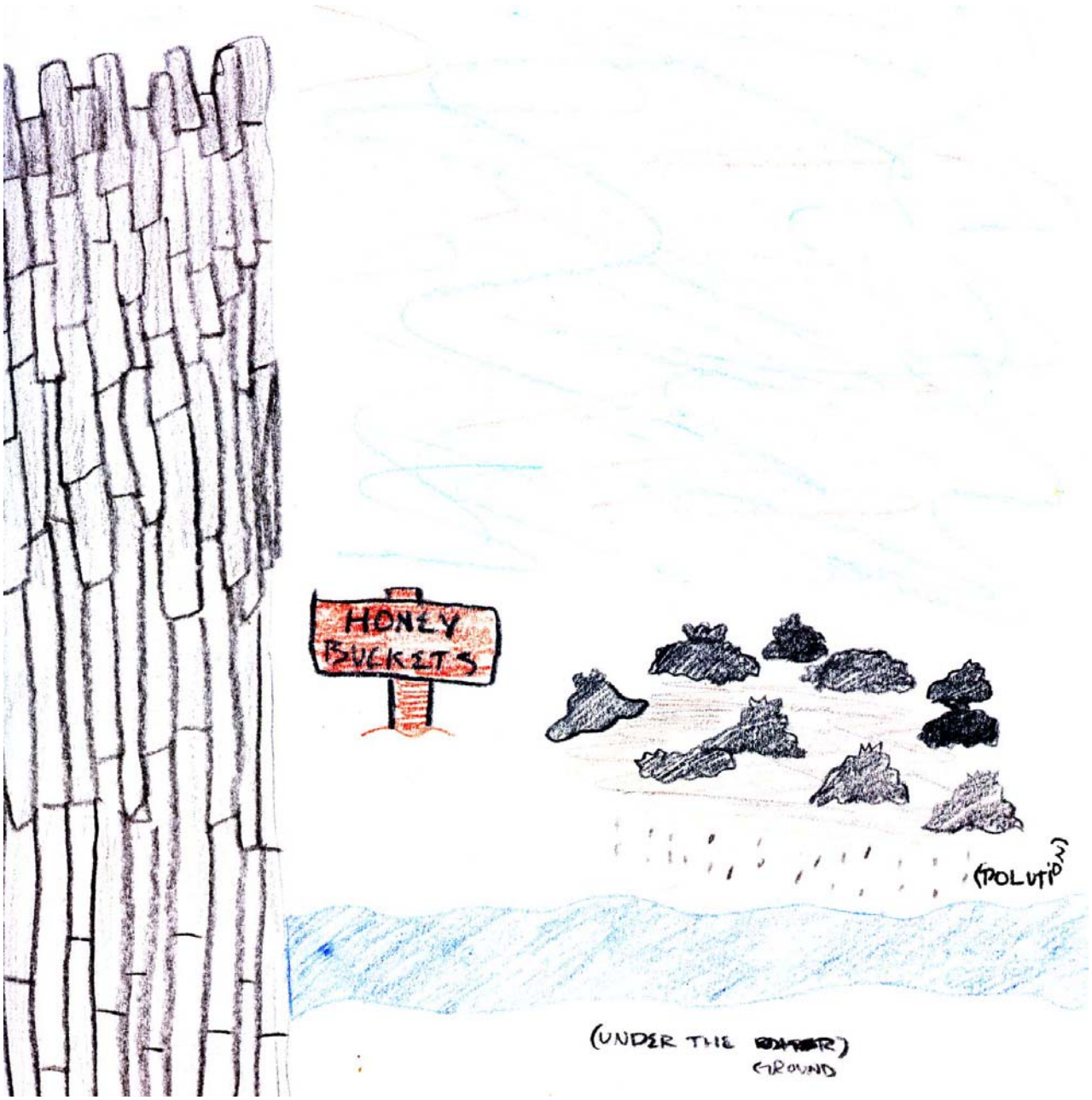
Table 8-3
Considerations in starting a program to recycle, reuse, or compost wastes.

Disposal method used	Recycling	Reusing	Composting
Burning	You need to separate out plastics and batteries before you burn anyway, so recycling logistics should be fairly easy. Note that, recycling materials other than aluminum, white paper, cardboard, toner cartridges, metal scrap, and batteries, may cost some money. Burning or reusing paper, and reusing or landfilling plastics may be best.	Hazardous wastes like paint, batteries, cleaners can be reused so won't need to discard them separately.	Won't help much as compostable wastes are burnable.
Transfer station/Hauling out	Hauling out wastes for recycling can be carried out in same facility with same procedures. Will reduce disposal volume and save money.	Can help to reduce volume of wastes and save money!	Can help to reduce volume of wood and food wastes and save money!
Landfilling	If your landfill is limited for space, recycling helps to extend life. Recycling batteries, used oil, and toner cartridges reduces potential contamination problems. Windblown wastes are reduced.	Can help to reduce volume of wastes and extend landfill life. Reusing hazardous wastes greatly reduces contamination problems. A separate salvage area creates a cleaner landfill, easier to maintain.	Composting fish wastes and food scraps away from landfill will detract disease vectors and keep bears out of the dump. Odors are reduced. Worms are raised (they compost wastes) and may be used for fishing bait.

3. SWM CHOICES AND VILLAGE AUTHORITY IMPACTS

The Alaska Native Health Board finished a study on new sanitation facilities in 2000. They found that introducing new facilities to villages results in many community changes, not just infrastructure. Social, economic, and cultural changes may place because you can end up changing the local government authority and responsibilities, management, operations, traditional practices and local market economy. **Just about every interaction between an outside agency and village has the potential to increase or decrease self-governance and leadership in your village.** Make sure your village evaluates what will happen and what they want to happen. If you know how you want your village authority and responsibilities to be affected, you can take action when developing plans, negotiating contracts, carrying out cooperative agreements. If you are unsure how your plans might affect your sovereignty or self-determination, ask your BIA representative, or call AI-TC.

A last guideline in choosing your new disposal method is to **make sure that it fits into your long-term community plan.** Not only will it help you in figuring out how your community will change in the ways just talked about, it will help you get funding as well. Some SWM grants require a community plan, and most are more likely to be awarded if the agency can be sure that your chosen disposal method is well-thought out. Go back and look at Table 2-1 for the different factors you should consider in your decision.



Appendix A

Table A-1 Contaminants found in water and/or soil near open dumps of four villages and possible health consequences.

Contaminant	Village[a]	Short-term consequences	Long-term consequences
Arsenic	C, N, D, S	Diarrhea, constipation, nausea, fatigue, numbness, abnormal heartbeat	Thickening of skin, "corns" on palms and soles, birth defects, cancer
Barium	C, N, D, S	Respiratory problems	Unknown
Chromium	C, N, D, S	Stomach pain/cramps, diarrhea, nasal irritation, respiratory problems	Nasal damage, lung damage, allergic reaction, birth defects, cancer
Lead	C, N, D, S	Stomach pain/cramps, constipation, nausea, vomiting	Organ damage, neurological damage, birth defects
Mercury	C, S	Lung damage, nausea, vomiting, diarrhea, increases in blood pressure/ heart rate, skin rashes, eye irritation	Permanently damage the brain, kidneys, birth defects
Methylene Chloride	C, N	Vision and hearing impairment, nausea, numbness, dizziness	Problems end when exposure stops
Acetone	C	Nose, throat, lung, eye irritation; headaches; dizziness; confusion; nausea; vomiting	Kidney, liver, nerve damage, birth defects
DDT	C	Slight effects with high ingestion	Reversible liver damage with high ingestion
Trichlorofluoro methane	C	Confusion, dizziness, respiratory problems, irregular heartbeat, eye irritation	Dermatitis, cardiac abnormalities
Toulene	C	Dizziness	Tiredness, weakness, memory loss, nausea, hearing loss, kidney problems, birth defects
4'Isopropyl-toluene	C	Unknown	Unknown
2-Butanone	C, N	Respiratory, skin and eye irritation, dangerous when mixed with other compounds	Unknown
Diesel Range Organics	C, N, D, S	Rash, eye irritation, diarrhea, cough, nausea, increased blood pressure, headache, numbness	Unknown

[a] C – Calista region, N- NANA region, D-Doyon region, S-Sealaska region

Mana Dump-aq assiryaaqluq
taugaam uqllartuq
cakneq tuai-wa yuut
uqllalrianeq atuuranek
atuulartut ciqiciuigmi
aggataaqata.

This dump is not that bad but it's littered where it's not to be, like at the tundra. That's why people use dirty clothing when they are going to dump the trash at the lagoon.

Appendix B: Health Survey Results

To look at the health impacts of open dumps on Alaska native people, CCTHITA carried out studies in four villages located in the Yukon Delta, Northwest, Yukon Interior, and Southeast. In each village, a local interpreter accompanied a health expert (an "epidemiologist"), and they went from house to house, talking with people. More than 95% or the households were reached. The total number of households interviewed was 295, representing 1,221 people.

What Solid Waste Disposal Factors Increase Our Health Risks?

Before going to the villages, the health expert researched several studies on people living near different solid waste sites around the world. Based on people's testimonies, she found they had increased chances for a weakened immune system, greater stress and fear about where they were living, and a higher chance at being affected by hazardous chemicals in the dumps.

In our study, there were four factors found that made a difference in how healthy people were:

- ✓ Visiting the dump
- ✓ Household distance to the dump
- ✓ Home barrel burning
- ✓ Bothered by smoke or odors from the dump

Remember, this doesn't mean that other waste disposal factors are not risky. It only means that we couldn't find anything with this study. For example, there was only one dump burned during the time we were interviewing. A lot more people may have said they had coughing, eye irritation and other symptoms if smoke were hanging in the air then.

Look at Table B-1 below. It lists different health symptoms in the first column, and the percent of people affected with those symptoms in the second column. The next four columns list the relative risks that people have if they meet that particular factor.

What is a relative risk?

A characteristic that a group of people shares, like smoking cigarettes, is looked at. Another group of people-- the "control group" – doesn't have that characteristic (i.e. they are not smokers). Both groups are asked questions about their health, like whether they cough. In our example, the relative risk for the group of smokers is how much more the smokers coughed than the non-smokers (e.g. if the relative risk is 3, smokers coughed three times more often than non-smokers). To be useful, the results have to be adjusted for other factors that might affect why people cough. So for example, the study would not include people who had a cold or fever.

Table B-1
Relative risk of symptoms related to waste disposal factors[a].

Symptom	% Affected	Live near dump	Dump smoke or odor concerns	Burns near home	Visits dump
Rash	7.2	-----	2.3	29.7	2.9
Faintness	3.6	4	6.3	see Table B-3	3.5
Fever	8.7	-----	1.7	2.3	2.0
Stomach pain	10.3	-----	2.2	-----	3.0
Vomiting	2.6	-----	1.6	-----	3.6
Diarrhea	5.2	-----	1.5	-----	-----
Ear irritation	4.4	-----	5.5	-----	2.1
Eye irritation	5.9	18.9	2.3	-----	3.7
Congestion	19.4	-----	1.8	-----	1.4
Sore throat	14.1	-----	1.8	2.0	1.6
Cough	18.4	-----	1.5	1.9	1.7
Headache	14.1	2.9	2.0	-----	3.0
Numbness	3.5	-----	2.6	see Table B-3	3.4

[a] Adjusted for age, smoke/tobacco, race, sex, and socio-economic status (where necessary).

How to read Table B-1 Lets look at the first row – which is the risk of getting a rash. Out of all the households interviewed, 7.2 percent of people had rashes in the last 10 days. That's a lot! In the third column, the "----" means that people living near the dump don't have any higher risk to get a rash than people not living near the dump. Look at the next column in the first row: It says that people who were concerned about the smoke and/or odors coming from the dump were on average 2.3 times more likely to get a rash than people who weren't concerned. The next column shows **that people who burned their garbage near their home were 29.7 times more likely to get a rash than people who didn't home burn!** Anyway, the next number says that people who visit the dump are 2.9 times more likely to get a rash than people who don't visit the dump.

Scientific details

If you will be using this information for funding or to share with scientists, you should know that to get what is considered a significant result by scientists, all the people were looked at together, and not as a separate village. And people were asked about the health symptoms they had in the previous 10 days only. That way, a person's memory isn't a problem. Also, the results were adjusted for things like age, smoking, tobacco use, race, and sex, and economic status, where necessary.

More Science Details --Confidence Intervals Scientists like lots of numbers. If you give them the numbers in Table B-1, they'll ask you how confident you are about the results. You can give them the numbers listed in Table B-2, below. For each factor, this Table tells you the range of what the relative risk *could* be. For example, for burning garbage near your home, you can say there is a 95% chance that people are at least 3.1 times more likely to get a rash, and they may be up to 283.1 times more likely to get a rash. The range of 3.1→ 283.1 is called the "95% confidence interval" for the relative risk of getting a rash if you home burn.

Table B-2

Range of relative risks of symptoms related to waste disposal factors (95% confidence intervals)[a].

Symptom	% Affected	Live near dump	Dump smoke/odor concerns	Burns near home	Visits dump
Rash	7.2	-----	1.2 → 4.3	3.1 → 283.1	1.8 → 4.6
Faintness	3.6	1.2 → 3.3	3.3→ 11.8	see Table B-3	1.3→ 9.4
Fever	8.7	-----	1.1 → 2.6	1.5 → 3.7	1.1→ 3.4
Stomach pain	10.3	-----	1.3 → 3.8	-----	2.0,→ 4.5
Vomiting	2.6	-----	1.1 → 3.3	-----	1.7→ 7.5
Diarrhea	5.2	-----	1.0 → 2.4	-----	-----
Ear irritation	4.4	-----	2.7 → 11.2	-----	1.3→ 3.4
Eye irritation	5.9	4.3→ 82.4	1.0 → 5.2	-----	2.1 → 6.7
Congestion	19.4	-----	1.2 → 2.7	-----	1.0 → 1.8
Sore throat	14.1	-----	1.2 → 2.7	1.2 →3.0	1.2 → 2.7
Cough	18.4	-----	1.0 → 2.0	1.2→ 2.9	1.3 → 2.2
Headache	14.1	1.2→ 7.0	1.3 → 3.1	-----	2.2→ 4.1
Numbness	3.5	-----	1.1 → 5.8	see Table B-3	1.9 → 6.2

Risk of Living Near the Dump

One thing you should know is that for the "distance to dump" factor, people who lived closer than 1,000 ft to the dump were compared with people who lived 5,000 ft or more. But 5,000 ft is still pretty close. Other studies have shown effects on people as far away as 5 or 10 miles. It's just that, like in most native villages, the households in the villages studied were all pretty near the dumps. So it is possible that one reason why distance to the dump didn't show increased risks for more health symptoms might be that all the homes are too close to the dump. Remember too, as described in Chapter 3, distance to the dump also affects whether people were bothered by dump smoke or odors.

More on Home Barrel Burning

How often people burned near their home affects what the relative risk is for having symptoms of faintness or numbness. Table B-3 lists the relative risk for home barrel burners depending on how often they burn. The low and high ends of the "95 % confidence interval" are included in the set of parentheses.

Table B-3
Increasing risk of faintness and numbness with more frequent household barrel burning (numbers in parentheses give 95% confidence interval).

Symptom	Burns once every couple of weeks	Burns weekly	Burns frequently (more than 1x per week)
Faintness	5.4 (1.0, 28.7)	13.2 (4.2, 40.9)	17.4 (6.4, 47.1)
Numbness	4.8 (1.6, 13.9)	5.2 (1.8, 15.0)	10.1 (4.9, 20.7)

Remember with home barrel burning, people in neighboring households likely have increased risk too. People who don't separate out their plastics or hazardous wastes, and burn garbage to start or maintain fires inside home stoves or steam baths probably have the highest risk because they get the greatest exposure!

Honeybucket Disposal and Subsistence

The CCTHITA study also had some interesting results having to do with honeybucket use and subsistence practices. To summarize, they are that:

- ✓ Using honeybuckets increases your risk for diarrhea (and complications that can result)
- ✓ Eating more subsistence foods decreases that risk
- ✓ Subsistence activities are substantially changed or reduced due to people' s concern about their dump

Experiencing diarrhea is the only health symptom looked at for which honeybuckets increases your risk. People who used honeybuckets were on average 6.4 times more likely to have had diarrhea in the past 10 days (the 95 percent confidence interval is between 2.8 and 15.0). In honeybucket villages, **people who ate subsistence foods more than half the time were 15.1 times less likely to get diarrhea than other people.** The 95 percent confidence interval for this risk is 3.0 to 76.3.

Eating a subsistence diet decreased people's risks for a number of other symptoms of poor health. The relative amount by which subsistence foods reduced health risks is given in Table B-4. The numbers given compare people who eat subsistence foods more than one-half the time to people who ate subsistence foods less than one-half the time.

See also Tables 3-1a and 3-1b in Chapter 3 of this manual for numbers on the impact of open dumps on subsistence activities.

Table B-4
Relative risk of residents eating a subsistence diet less than half of the time compared with residents eating subsistence foods more than half of the time for various health symptoms in four Alaska villages[a].

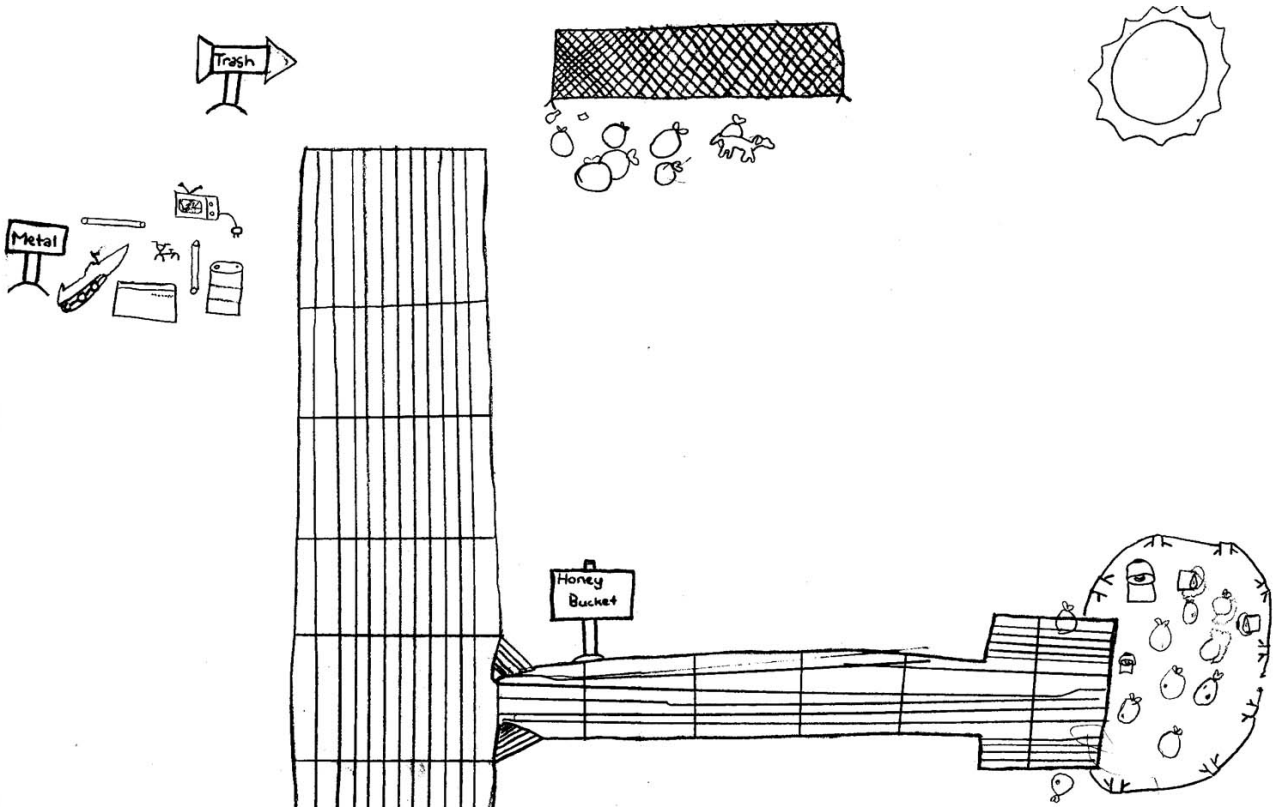
Symptom	Subsistence
rash	--
faintness	--
fever	2.3 (1.5, 3.7)
stomache pain	1.5 (1.0, 2.4)
vomiting	3.4 (1.3, 8.8)
diarrhea	Effect modified by honeybucket use (see text)
ear irritation	--
eye irritation	--
congestion	--
sore throat	--
cough	1.6 (1.1, 2.4)
headache	--
numbness	--

[a] Adjusted for age, smoke/tobacco, race, sex, and socio-economic status (where necessary).

In case someone asks you whether the CCTHITA health study "corrected" for certain conditions, Table B-7 lists some diseases and health-related symptoms looked at. The numbers given in this Appendix were also corrected for age, race, sex, and income level when necessary.

Table B-7
Prevalence of various health factors in four Alaska Villages

Condition	Prevalence (percent)
Cigarette Smoking	8.4
Passive Smoking	10.8
Chewing Tobacco	3.8
Diabetes	0.3
Asthma	1.5
Allergies	1.5



Appendix C – Recycling Information

Municipal Waste Guide

Waste Type	Primary Considerations	Alternatives to Land Disposal	Who To Contact
Food Waste  Food scraps, hide hair, fish wastes, solid and liquid fats.	Attracts animals & insects, creates odors & settles as decomposes, site cover may crack or subside, produces gases.	Compost to return nutrients to the soil. Use compost for gardening or dump site cover. Burn under controlled conditions.	Anchorage Composting Facility (907) 243 8577 USDA Cooperative composting info (907) 786 6300 Composting Council (440) 989 2748 Natural Gardens (907) 561 4938 Can-O-Worms 1 (888) 422 2129
Paper Mixed Paper Office Paper Other Paper Cardboard  Newspapers, magazines, envelopes, telephone directories, bags, and cardboard containers such as cereal/cracker boxes, 6-pack cartons, egg cartons.	Litter. Fuel source for uncontrolled fires. May release dioxins or metals from inks and coatings.	Separate clean and dry paper types and recycle. Shred for mulch, compost. Burn in compliance with Clean Air Act. Use untreated paper for home fires. Cardboard can be used for packing batteries Reduce junk mail by calling mailing lists and catalog 800 numbers.	Smurfit Stone Recycling, Anchorage (907) 562 2267 Northland Barge Services 1 (800) 426 3113 West Seattle Recycling (206) 935 4255 R.L. Polk 1 (800) 873 7655 - removal from mailing lists DuPont 1 (800) 448 9835 - recycle Fed Ex, UPS tyvek
Plastics  Plastic soda, water, milk & juice jugs, shampoo bottles, laundry/bleach bottles, six pack rings, packaging materials (Styrofoam peanuts), bags and wraps.	Litter problems. Burning creates toxic smoke. Not degradable.	Separate by type and recycle. Use alternatives to plastic containers and bags. Shred/chip for road bed, insulation, compost bulking agent. Use as fishnet floats (children can decorate with non-toxic paint), crochet plastic bags to rugs, balls, purses. Compact and landfill.	Mail Boxes Etc. accepts Styrofoam peanuts for reuse. For info on crocheting bags refer to ADEC's 'Solid Solutions.' Safeway, Carrs & PayLess Stores accept plastic bags. Alaska Materials Exchange (907) 269 7586 West Seattle Recyc. (206) 935 4255 - #1&2 soda jugs ITW Hi-Cone 1 (800) 965 7464 - mail six pack rings Mail clean formed Styrofoam to: FP Intl. (650) 364 1145, Packaging Store (907) 563 9876, Mail Cache (907) 563 3131
Textiles  Clothing items including footwear, fiber from apparel, lines (sheets and towels), carpets and rugs.	Carpets and rugs can harbor rodents. Burning polyester, plastic clothing and treated rugs can emit toxic fumes.	Reuse. Donate. Set up sheltered salvage area.	Salvation Army Anchorage (907) 562 5408 Big Brothers (907) 278 2621 pickup (907) 563 1997 Value Village (907) 337 6390 Alaska Materials Exchange (907) 269 7586
Leather & Rubber Miscellaneous rubber parts, leather covers, etc.	Minimal concerns.	Reuse. Set up salvage area.	Salvation Army Anchorage (907) 562 5408 Big Brothers (907) 278 2621 for pickup (907) 563 1997 Value Village (907) 337 6390
Furniture Couches, chairs, desks, beds, etc.	Furniture stored outdoors can attract rodents. Inhalation of rodent droppings can be a serious health risk.	Reuse. Set up sheltered salvage area. When retrieving furniture left outside, check for droppings using a mask.	Salvation Army Anchorage (907) 562 5408 Big Brothers (907) 278 2621 for pickup (907) 563 1997 Value Village (907) 337 6390 Alaska Materials Exchange (907) 269 7586
Glass  Glass containers such as beer and soft drink bottles, wine and liquor bottles, bottles and jars from food, cosmetics and other products.	Abrasion danger to site scavengers.	Crush for use in place of sand or gravel in concrete, road base, asphalt. Separate clear and colored glass, recycle. Use as landfill cover.	Anchorage Composting Facility (907) 243 8577 Smurfit Stone Recycling (907) 562 2267 Juneau Friends of Recycling (907) 780 4212
Metals Aluminum Tin Cans Scrap Metal  Aluminum containers and packaging such as food and beverage cans. Steel (bimetal and tin) food and beverage cans. Scrap metal, 55-gal drums, copper, brass.	Corrosion slowly releases metals. Improperly compacted metals can rupture site cover. Burning contaminates ash, little heat recovery or volume reduction is achieved.	Recycle. Alaskans Litter Prevention and Recycling (ALPAR) flies aluminum cans from villages to a recycling center free-of-charge. A check is issued for the value of the aluminum. Local barge/air lines may transport other metal types free-of-charge. Before land disposal ensure metal scrap is contaminant-free.	ALPAR Flying Cans Program (907) 274 3266 Smurfit Recycling Center (907) 562 2267 Juneau Friends of Recycling (907) 780 4212 Alaska Metal Recycling (907) 349 4833 Hilltop Recycling (907) 696 2246 West Seattle Recycling (206) 935 4255 Skagit River, WA 1 (800) 869 7097 Alaska Materials Exchange (907) 269 7586
Yard Wastes/ Wood  Grass clippings, leaves, weeds, brush and branches, tree stumps. Wood is composed of pallets, crates, barrels and furniture.	Shelters rodents, other animals. Some treated wood is hazardous waste.	Compost. Shred to mulch for land cover. Burn untreated wood under controlled conditions. Reuse wood.	Anchorage Composting Facility (907) 243 8577 USDA Cooperative (907) 786 6300 - composting info AAA Wood Recycling (907) 258 6100 Natural Gardens (907) 561 4938 Can-O-Worms 1 (888) 422 2129

Municipal Waste Guide

Waste Type	Primary Considerations	Alternatives to Landfilling	Who To Contact
Tires 	Tires from automobiles, trucks, ATV's, etc.	Tires retain water and create mosquito breeding grounds. Burning gives off a dense, toxic smoke and fire is difficult to put out.	Retread. Reuse for raised bed gardens, slope or road stabilization, bumpers, playground equipment. Shred or grind for use as mulch or fill. Do not burn. Wash thoroughly before using for any public contact activity.	Alaska Tire Recycling Inc. (907) 344 1668 Citizens for Recycling Solutions (907) 566 2405 Matt Miller (907) 272 3347 – innertube recycling
Batteries 	Batteries from cars, trucks, boats, sno-gos and motorcycles.	Batteries corrode, releasing heavy metals and acid into the environment. Lead can cause nerve damage in animals and people. Acid will burn eyes and skin. Burning batteries produces a poisonous gas.	Arrange with a barge line or air carrier to transport batteries to a recycling center in Anchorage or Seattle. Many packaging requirements vary. Fish tote cratings may be acceptable. Only lead/acid batteries are accepted.	Northern Air Cargo 1 (800) 478 3330 and Alaska Air (907) 543 3905 are 2 air carriers that can transport batteries. Battery Specialists of Alaska (907) 276 5251 Interstate Battery (907) 349 1577 ABS Alaskan (907) 452-2002 Jackovich Ind. & Const. Supply (907) 456 4900
Household hazardous wastes 	Paint, paint thinners, drain openers, weed killers, pesticides, herbicides, antifreeze gasoline, fuel additives, carburetor cleaners, turpentine, detergents, bleach, broken fluorescent light bulbs. bulbs.	Hazardous materials may react to cause fires, explosions and poisonous gases. Hazardous substances can seep into the ground and pollute drinking water.	Use up materials for their intended purpose. Separate from other garbage and don't landfill or burn. Shelter off-ground for community re-use or shipment. A material is hazardous if the label contains words such as flammable, corrosive, toxic, explosive, and/or volatile.	Alaska Materials Exchange (907) 269 7586 MOA Transfer Site (907) 343 6298 Alaska Energy Recovery (907) 258 1558 - antifreeze Haz. Waste 1 (800) 550 7272 Poison Control 1 (800) 478 3193 Alaska Pollution Control (907) 344 5036 Alaska Motor Doctor (907) 278 5428
Dirt, Ash, etc	Incinerator ash, miscellaneous dirt, dust from home projects.	Ash can be hazardous and should be tested.	Use as landfill or dumpsite cover. Use for road construction fill.	
Appliances  	*Large*: Ovens, microwaves, air conditioners, refrigerators, freezers, washers, dryers, water heaters. *Small:* Coffee makers, irons, food mixers, etc.	Bulky and difficult to compact and landfill. Minimal heat recovery from incineration. Freon is hazardous.	Set up salvage area. Ship and recycle as scrap metal. Freon must be removed by a qualified technician prior to compaction shipping or land disposal.	Alaska Materials Exchange (907) 269 7586 Alaska Metal Recycling (907) 349 4833 Anchor Appliance (907) 344 4555 - for freon removal: Mike's Refrigeration Systems (907) 780 4935
Electronic Goods 	"Brown goods." Computers, electronic parts, T.V.'s.	Contain heavy metals and hazardous chemicals.	Reuse. Donate. "Take apart & put together" school projects. Store above ground & cover.	Hewlett P. 1 (888) 485 1849, Sal. Army (907) 562 5408 Compaq 1 (800) 524 9859, GreenDisk 1 (800) 305 3475 Cartridge Conn. (907) 563 9326, HMR (415) 647 6071
Waste Oil 	Oil produced by generators, snow machines, outboards, cars, boats and other machines.	Used oil contains metals and toxic contaminants which can pollute the groundwater and surface water. Used oil is a potential fire danger.	Set up drop-off area for used oil. Burn in waste oil burner to produce heat for buildings.	Used Oil Burner Vendors: Gleason Research (907) 694 2299 NuEra Corporation (907) 345 6411 MRO Sales (907) 248 8808 Alaska Energy Recovery (907) 258 1558
Junk Vehicles 	Scrap or abandoned automobiles.	Bulky. Batteries, tires, fluids, etc can contaminate groundwater.	Repair. Sell for parts. Donate. Compact & ship for recycling as scrap metal. Remove batteries, fluids, and tires before crushing or storing on ground.	Alaska Metal Recycling (907) 349 4833 ABC Towing (907) 522 1456, Skagit River 1 (800) 869 7097 Scrap Ind. (907) 348 7802 Donate (707) 527 5864 West Seattle Recyclers (206) 935 4255 - for scrap metal
Medical Waste 	Any solid waste generated in the diagnosis or treatment of humans, or animals. Syringes, etc.	Potential to spread disease through direct contact, water, or animal scavengers.	Take to local clinic. Burn under controlled conditions. Implement strict collection/disposal protocol for Haz. wastes	SEARHC (907) 463 4008
Construction & demolition debris	Concrete, asphalt, wiring, drywall, piping.	Temptation to scavenge in landfill exposes people to health and safety hazards.	Reuse. Materials and exchange programs. Concrete and asphalt can be taken to quarries for recycling.	Alaska Materials Exchange (907) 269 7586

General contact numbers: **Supersacks** *Helios Containers*, 1(800) 336 3422, *The Bag Connection*, 1(800) 622 2448 **Baling Equip**. *Larry Fagnani* (907) 373 5337, **Shipping Companies** *Northern Air Cargo* 1(800) 478 3330, *Northland Barge Services* 1(800) 426 3113 **Incinerators** *Garness* (907) 562 2933, *Safety Waste Incineration* (907) 277 5767 **Paper Shredders** *General Business Systems* (907) 279 2275

References: T. Stocks, EPA, RurAL CAP, ADEC *Solid Solutions*, 1996; M. Drumm, AK Health Project, *Trash Management Guide*, 1992; *7 Generations; SWANA, Guide to Decision-Making in the Public Sector,*

Funded by Alaska Inter-Tribal Council, Central Council Tlingit and Haida Indian Tribes of Alaska & the Bureau of Indian Affairs. Developed by S. Sebalo and L. Zender, Zender Engineering, 2000. www.zender-engr.net

Appendix D – Form for Notifying ADEC of Completed Site Closure

Alaska Department of Environmental Conservation

NOTICE OF CLOSURE OF A CLASS III LANDFILL

Pursuant to 18 AAC 60.396, _____ hereby notices all potential purchasers or leaseholders of this property that the property located at : [legal

description] _____

_____

_____

_____

_____

and situated in the _____ Recording District(s) was used as a Class III Municipal Solid Waste Landfill (MSWLF, as defined in 18 AAC 60.300 and 18 AAC 60.990. Thus, this property may not be suitable for some uses; maintenance and repairs to the property might become necessary to prevent pollution problems at the site and any activity that results in damage to the final cover of the property must be corrected to control potential pollution problems.

Please return the original of this Notice to the address below.

_____ Date: _____

Printed Name and Title: _____

Mailing Address: _____

See 11 AAC 05.010(a)(14) for required fee. Print or type legibly in English; if necessary, attach and refer to attachments or exhibits (not larger than 8.5" x 14"). This form is intended to comply with the recording requirements of AS 40.17.030 and 11 AAC 06.040.