

Conditions, Risks, and Contributing Factors of Solid Waste Management in Alaska Native Villages: A Discussion with Case Study

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INTRODUCTION

In Yr 2000-2001, the Central Council of Tlingit and Haida Indian Tribes' (CCTHITA) carried out a Statewide project that for the first time produced an in-depth portrait of Solid Waste Management (SWM) conditions and practices in Native Villages. Central to this work was a health risk study that identified for the first time significant associations between ill health symptoms and a variety of SWM exposure routes, as well as a substantial negative link between residents' subsistence practices and their concern over SWM conditions. This paper provides a brief summary of these conditions, their contributory factors, and how the factors manifested themselves in a case study.

METHODOLOGY OF CCTHITA STUDY

The process of developing the information involved 2 main components.

Comprehensive SWM Village Survey

An 11-page self-report survey was sent out to each of the 229 federally-recognized Tribes in Alaska. A relational database (ACCESS) was used for data compilation⁴. To increase participation, incentive prizes were used. Out of the final tally of 101 Village surveys, about half were submitted via post or conference table drop-off, and half were completed via phone interviews. Final geographic location and infrastructure characteristics approximately paralleled the population of Villages as a whole.

Quasi-Experimental Process Evaluation And Health Impact Study

Field work at four self-identifying "Demonstration Villages" involved assessing the SWM situation through waste characterization, site assessment, soil, water, and vegetation sampling, and house-to-house surveys on health and SWD practices. Historically, it has been difficult to identify quantitative physical health risks posed specifically to Native Villages because the population size of most communities is too small for statistically significant results. To circumvent this problem, our study design evaluated increases in health symptoms associated with a number of surrogate exposure factors such as dump visits, and home distance from the dump (Gilbreath 2000). Based on a literature review of studies on the health effects from open dump sites, our household surveys included questions on a number of ill health symptoms related to general immune functioning (e.g. headache, nausea, eye irritation, etc.), in addition to SWM exposure indicators, and subsistence practices. A total of 295 households were interviewed, representing greater than a 95 percent data collection rate for the

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⁴ Through an EPA National Environmental Information Exchange Grant this database will be updated and placed on-line with SWM information and tutorials specifically developed for Native Villages.

approximately 1,200 Village residents, the data was analyzed via Egret 2000 software, assuming a logistic regression model with beta-binomial random effects to account for the high number of shared households and close-knit community structure. Study adjustments included age, sex, race economic status, household size, tobacco use, Village, water hookup, and environmental concern.

RESULTS: A PORTRAIT OF A RURAL ALASKA SWM

Less than 5% of Native Villages have permitted sanitary landfills meeting even Class 3 criteria⁵, and the rest use what is termed an “open dump” (see Figure 1a-b for two examples). Virtually every material generated in, or brought to, the Villages, including hazardous wastes⁶, ends up in these typically unlined, uncontrolled, unfenced, and/or untrenched open disposal areas. Operationally, only about 60% of Villages have access to heavy equipment to consolidate and compact wastes– a critical need in maintaining a dump. But even at those Villages, the dump goes largely unmanaged because only 32% of Villages can afford even a part-time operator or SWM manager. Due to lack of staff and/or lack of soil, a mere 6% of Villages apply cover material to their dumpsite. Thus, at 25% of dumps, residents have difficulty even accessing a place to discard their wastes, and at 55% of dumps, it is necessary to walk on top of other garbage to find an unloading spot. The number of people directly exposed to wastes is higher than that-- with the typical absence of hardware or supply stores, dumpsites are used by some residents in about half of the Villages as salvage areas. In at least 30% of the Villages, contact with wastes includes potential contact with honeybucket waste (i.e. raw human wastes). At these villages honeybucket wastes are discarded at or adjacent to the site, or solid wastes are discarded at the honeybucket disposal site, creating a second solid waste site.



Figure 1a-b. Poor access is a primary factor in site risks. Lack of summer dump access due to mucky tundra resulted in the river dump on the right (easily accessed by boats).

Visiting the dump is fraught with risks-- in the last five years, dump site accidents have occurred in 20% of villages, and bears have had to be shot at 34%. Most remarkably, people who visited their dump were 2 to 3.7 times more likely to experience faintness, fever, vomiting, stomach pain, ear and eye irritation, headache, and numbness. Residents did not need to visit the dump to be at increased risk. People living closer than one mile to their dump were 19 times more likely to have eye irritation and 3 to 4 times

⁵ Alaska is the only State with a RCRA exemption for its smaller landfills, termed “Class 3”. Most notably Class 3 landfills typically do not require a liner, monitoring, or daily cover.

⁶ Less than 21% of Villages have hazardous waste or hazardous materials storage programs.

more likely to have headaches and/or faintness. Yet, a full 72% of dumps are within about one mile of homes, and at least 30% are *within one-quarter mile*.

About 57% of Villages are in imminent need of a new dumpsite because they are running out of space. In an attempt to reduce waste volume and visual blight, dump fires are set, or unseparated wastes are burned in metal containers (i.e. “burn boxes”), in about 74% of Villages. Assumedly partly as a result, over 61% of residents are regularly “bothered by” dump odors and/or smoke during the course of everyday activities. Study results indicated that being bothered by smoke is not just an aesthetic issue, but a serious health concern. For a proxy measure of exposure to waste-generated smoke we examined residents’ waste burning habits at home. To avoid visiting the dump, residents in at least 66% of Villages burn waste just outside their home. These residents were 5 to 17 times more likely to feel faint, and almost 5 to 10 times more likely to develop numbness, with the risks increasing the more often people burned. Home burners were almost 30 times more likely than other residents to have developed rashes, and were at significantly increased risk for a variety of other symptoms, including fever, sore throat and cough.

Water quality concerns emanating from Village SWM were also identified. Fifty-six percent of dumps are seasonally flooded, and 34 % of dumps are within about ¼ mile of a drinking water source. At 22% of dumps, an oil sheen is visible on standing water. To this date, little water quality testing has been carried out, but the math together with the content and circumstances of the dumps seems to belie a high contamination potential relative to that typically faced in many other U.S. communities.

Of perhaps greatest overall importance is the link found between subsistence activities and SWM concerns. Some 80% of residents relied on subsistence food for the majority, or virtually all, of their diet. But 64% had changed their subsistence practices due to concern over dump site contamination. Regardless of the basis of concern, it is well-documented that subsistence is vital to both Native physical and societal well-being. Thus quality-of-life in Native Villages is being significantly impacted by SWM conditions. See Zender and Sebalo (2001a, b) for a more complete summary of results.

PROBLEM CONSIDERATIONS

Issues in addressing SWM in Native Villages include, but are not limited to:

Funding for New Facilities and Facility Closure

Few funding sources exist for Village landfill construction. The State’s Village Safe Water (VSW) shares State and federal funding with Alaska Native Tribal Health Consortium for design and construction of Village landfills, and for closure of old sites. But the funding amount is small compared to the need. Only two SWM projects were funded in YR 2002, for \$1.9 million. The primary reason is that water and wastewater projects are given priority in the State ranking system. While water hookup is certainly the priority, it is clear that open dumps can present a substantial health risk, and in some cases, addressing a Village’s SWM situation might reduce health risks more than upgrading a water system. Note, given the relatively pristine setting of most Villages, it is the open dumps that might present the greatest threat to Village water sources (excluding honeybucket sites, which as noted above are linked with SWM anyway).

Because most of these Village communities are considered Tribes by the federal government, they are eligible for federal funds reserved for Tribes. But these funds are also inadequate. In FY 2002, for the over 550 federally-recognized Tribes nationwide,

just \$2.2 million federal dollars targeted cleanup, closure, and construction of Tribal SWM projects⁷. Note to construct a new facility in a rural Village that meets State regulations, a price tag of \$1 million to \$2 million dollars is attached (SWANA 1999).

Operation and Maintenance

At the FY 2002 Alaska Native Health Board (ANHB) Summit Meeting, State, federal, and local Native Village sanitation experts concluded that lack of O & M money and support is the primary logistical obstacle to successful Village sanitation programs. Several small demonstration projects, including the CCTHITA project as well as the FY 2001-02 Alaska Inter-Tribal Council SWM Project, and the continuing multi-year ANHB SWM projects, have strongly indicated that O & M money can be extremely effective in addressing Native Village SWM. Proper O & M could be expected to reduce dump site risks by keeping residents away from waste contact and smoke/vapor inhalation, and keeping hazardous wastes out of the site. Conversely, lack of O & M, can be expected to present increased health risks. Yet, State and federal solid waste funding generally does not allow expenditures for O & M-- only for capital purchases. And as alluded to above, Village financial resources are generally inadequate to cover all or part of O & M costs.

Cost of Waste Management Alternatives

If most open dumps are in seemingly hydrologically unsound locations, too close to airstrips⁸ and/or homes, and present significant health risks, why are dump sites in the Villages at all? One prime reason is that SWM alternatives present substantially higher O & M costs than landfills. The CCTHITA Project included SWM feasibility plans for the four Villages, generating comparative waste disposal costs. Except for the Southeast Villages, waste transport costs are very high. A roadless Village in the YK Delta or Kotzebue region could expect to pay \$1,000/ton to barge and haul wastes to the Anchorage landfill, and another \$100/ton for disposal. Assuming a low-end average waste generation of 4 lb/p-d, and 1.5 f.t.e., “backhaul” would cost about \$325 monthly per 4-person household, excluding capital construction of the transfer/storage facility and financial obligations for the storage site closure⁹. Note these same households pay \$100 to \$180 monthly for water hookup. The O & M costs for a Clean Air Act-compliant incinerator with a mono-fill are substantially lower than for backhaul, but costly nonetheless. For an exceptionally large rural Village of 800 people, a monthly household cost of about \$75 was calculated.

Note, the CCTHITA work revealed that the more complex O & M requirements for the incineration, baling, and backhaul options result in a high fixed cost ratio – around 80 percent. Thus, for the majority of Villages under 500 people, economies-of-scale raise the cost of these options drastically. For a 200-person Village, the monthly household cost for an incinerator would be \$255. Operating a Class 3 landfill at a basic service level would cost the same household about \$45 monthly.

Institutional Interaction

Another major problem identified at the ANHB Summit is the cultural divide

⁷ Federal Interagency Tribal Open Dump Cleanup Project FY 2002 outlay to total of 27 Tribes.

⁸ CCTHITA SWM database results, see also case study text in this paper for elaboration.

⁹ Backhaul requires a baler /transfer facility and, for most Villages, winter waste storage or a mini-landfill because barges land in summer only. Running a heavy-duty baler requires regular O & M, fuel, supplies, and at least 0.75 f.t.e. staff over that needed for a self-haul landfill. See also Sebalo and Zender (2002).

between Native Villages and the State and federal agencies who serve them. A wealth of socio-, economic-, political-, and cultural- Literature identifies “Western” society thought, and thus its organization, structure, and rules, as being more specific, linear, and hierarchical. These attributes both spring up from, and contribute to, the way Western society functions and to what the society strives. Likewise, the same Literature fields document indigenous culture modes of thought and operation as generally more diffuse (i.e. contextual), nonlinear, and consensual, with a lifestyle that best fits their situation and values. Where this contrast in world view exists, the issues emanating from it that can affect a Tribal SWM program are numerous and complex (Zender 1999). While a methodical documentation of the issues as applied specifically to Alaska Native Villages has not been formally carried out, Alaska Native cultures generally share the same broad Tribal culture characteristics, and the same issues for generally the same reasons are mentioned often by Native and non-Native audiences at Alaska Native SWM conference sessions¹⁰, as well as noted by the primary author of this paper in a wide range of Native Village SWM situations. The examples described below are intended to provide the reader with a sense of the broadness, tone, and complexity of these socio-cultural related issues. For a comprehensive discussion, and detailed references for the socio-cultural theories employed here, please see Zender (1999).

Communication Between Agencies and Villages

Different ways of speaking and thinking can lead to miscommunication (e.g. Gudykunst et al. 1988). For example, Native cultures can be more reserved in opinions and expressions than western-oriented cultures, especially with strangers or “outsiders” (Curtis, S. 1992). In these cases, agency personnel could then get the mistaken view that a Village is less concerned about its solid waste situation than it actually is.

Appreciation By Agencies For Village Modes Of Operating. Many Villages are consensus-driven and can be more time-independent in their decision making procedures than non-Native communities. Time is seen more as contextual rather than as the progressive series of “artificial pulses” that is perceived by Western society (Hall 1983). Over the long-term, a culture’s perception and use of time generally coincides with its optimal functioning. Thus, in working with Villages on SWM planning, grant tasks, and decision-making, the difference in time perception could lead agencies to expect shorter timelines than might be needed for a successful Village project. Time might be a practical consideration as well. People tend to perceive according to what they experience. The convenient logistics offered by the urban experience of most agencies could support a (flawed) perception that similar logistics are found in the Alaska Bush.

Appreciation By Village Staff For The Strictures Imposed On Agencies. Conversely, for Village staff, it may be difficult to appreciate or understand completely the stringency of rules and deadlines that agency personnel must abide by.

Schism Between Village Mode Of Operation and Agency Policies. For example, Village life is subsistence season-based – in the CETHITA study about 80 percent of residents depended on subsistence for most of their diet. Native Villages are also heavily community-oriented. If an elder passes away, the entire Village may need to “shut down” for a week to properly observe the event. Yet, in this time, or within the time needed to hunt and gather for the winter, a number of applications or reports may be due with strict deadlines set by urban-dwelling lawmakers and regulators.

¹⁰ For example, Alaska Forum on the Environment Rural SWM sessions YR 2000 – 2003.

Another issue is the structure of the State and federal grant applications, the main avenue for Villages to secure SWM funding. Many Native cultures have strong oral-history traditions, with an associated mode of traditional knowledge transfer that is demonstration based. Because, perhaps *a priori*, our government agencies tend to follow the traditional Weberian model of bureaucracy, grant applications tend to be written by people who transfer knowledge by instruction, not demonstration. Thus, in some Village Environmental Departments, staff who are highly competent according to how their society has been functioning well under extreme conditions for tens of thousands of years may be at a disadvantage when filling out a grant application according to instructions or priority award criteria. For some staff, an even greater barrier exists because they must write applications and reports in their second language (English).

Then there are the SWM regulations themselves. Effective “enforcement” depends on addressing the individual’s or group’s perception of what is in their individual, or group’s, best interest, and their perception of what justice is (Gudykunst et al. 1988). Thus, it can be expected that regulations for Native Village SWM would be more effective if they were developed in a way that coincided with Native communities’ views of SWM (as they relate to environment, health, and community responsibility)¹¹. Regardless of the question of jurisdictional authority, it is suggested that there may be room for modifying the Alaska State regulations to more effectively communicate to Villages (or perhaps any other community) their intent and associated criteria.

HOW GENERAL ISSUES MANIFEST SPECIFICALLY: THE NATIVE VILLAGE OF SELAWIK AS CASE STUDY

The Native Village of Selawik was a participating Village in the CCTHITA health study. Their waste site is a sprawling open dump without safe access, ¼ mile from town, that scored 3 out of 100 during a YR 2002 DEC inspection. Selawik has been attempting for the past several years to construct a permitted landfill so that they can close their dump. In addition to the significantly better environmental protection of a landfill that meets Class 3 criteria, the proposed new site offers three critical improvements: (1) the new facility would be located further from town, (2) the predominant wind would not blow into town, reducing health hazards from smoke inhalation, and (3) the drainage would flow to the River well below the drinking water intake (instead of just above it).

The general issues of funding, O & M, and culture, described in this paper can manifest themselves as a variety of specific obstacles to Village SWM improvement. Not all of the obstacles described below manifest in each Village situation, but most Villages, including the Village of Selawik, face several at once:

1. Funding for Capital Projects, Not O & M, Can Increase Health Risks and Costs.

Like most Village dumps, the Selawik dump would not be in the hazardous condition it is in had money been available for heavy equipment, fencing, and regular O & M, including either a part-time dump operator or a mandatory house-to-house waste collection program. But that amount of money (in the neighborhood of \$150,000 for capital costs and \$30,000 to \$35,000 per year in O & M, assuming the Village could subsidize half of it) is not available. With an original grant from CCTHITA, Selawik was

¹¹ For example, on one reservation in the Lower-48, county “No Dumping” signs served no better purpose than target practice. The Tribe replaced them with “Respect Your Land” signs and the dumping stopped.

able to begin a summer household collection program that reduced resident contact with the dump, and thus assumedly significantly reduced resident health risks. However, those funds have run out and attempts to fund the program with fees have so far failed. As with most isolated Native Villages, most of Selawik's residents struggle economically.

Were the State and federal government to make O & M money available, not only would the health and environmental risks posed to its citizens be reduced substantially, they could save money and provide year-round employment in the Villages. In the case of Selawik, a new landfill facility with a "burnbox" unit will cost about \$1.5 million dollars, plus an additional \$1.5 million dollars for the road. Spread out over the 20-year life of the facility, amortized, with a return rate of 5 percent, about \$244,000 per year would be needed for construction. The minimum O & M costs (including staff position, equipment upkeep, and operation) are only about \$60,000 per year, or about \$70,000 per year including the purchase of dozer and fencing. If that \$70,000 per year had been subsidized in the first place, the capital costs for a new facility could have been avoided. At the very least, construction could have been put off several years into the future, resulting in a savings of over \$170,000 (\$244,000 minus \$70,000) per interim year.

2. Costs To Properly Close Open Dumps Are Higher Than Would Be Required For Well-Maintained Disposal Facilities.

Once a new facility is built, proper O & M must be carried out not only to prevent health and environmental risks, but to ensure that the new facility can last the designed lifetime, and so that its closure costs do not skyrocket. In Selawik's case, the lack of a fence and facility staffing has resulted in a sprawling 26-acre dump that will require a high level of technical expertise to close without adversely affecting the sensitive tundra. The result is that closure is expected to cost from \$1 to \$2.5 million dollars more than a typical closure for a permitted landfill (Zender and Sebalo 2001b).

3. Lack Of Effective Communication Between The Agencies And Villages.

In 1998, NANA/DOWL Engineers completed a design for a new landfill. Lack of construction funding, absence of an SWM plan, and changes in Tribal and City leadership delayed an application for the Class 3 Landfill permit from DEC until late Spring 2001. During the time the permit was being reviewed, a SWM plan was compiled through a CCTHITA grant. DEC permit review comments came out in Fall 2001, and the permit application was rejected on a number of grounds. Many of the comments are addressed with the SWM Plan that was drafted after DEC comments were formulated. The one main sticking point is that DEC saw the basic landfill design as fatally flawed because it called for tundra excavation. Had DEC and Selawik been in regular contact, DEC's non-acceptance policy on excavated tundra landfills would have been revealed. Instead, tens of thousands of dollars plus a number of donated consultant hours were wasted in compiling a permit application that had no chance of being approved. After many months of deciding their course of action, the Selawik Council decided to amend the design for an area "supersack landfill", and resubmitted the draft permit. In the meantime, DEC changed its SWM rules and accordingly returned with additional requests for data, as well as the newly instituted Plan reviewing and Permit fees.

4. Discrepancy In Agency Policy With That Of What May Be Best For Community.

One of the DEC regulations requires Alaska Department of Transportation (DOT)

to sign off on proposed new landfill construction (as the delegated FAA authority). A 5,000 ft distance between airstrips and dumpsites is stipulated or a waiver is needed, to minimize the aviation hazard that birds can pose. In the case of turbo jets, a 10,000 ft distance is required. DOT has classified the Selawik airstrip as a jet airstrip, although only small planes fly in. Unlike the existing site, the proposed site is greater than 5,000 ft, being about ½ mile further from the airstrip. While it is still less than 10,000 ft it is logistically and environmentally the only feasible site to use. Until a new site is constructed, Selawik residents have no choice but to use the existing site, which in addition to being closer to the airstrip, presents a substantially greater public health and aviation risk than projected for the new landfill. Yet, apprised of these circumstances, DOT withheld their formal approval for several years, presenting a lose/lose situation. Fortunately, in the last six months DOT has committed to building a landfill road, and the waiver stalemate is projected to be resolved.

5. The Need To Work With Multiple Smaller Grants That May Have Mismatched Timelines And Funding Criteria.

Constructing a permitted new landfill in the Bush and closing the existing one can cost \$1 to \$5 million dollars, depending on the circumstances. If the Village is not fortunate enough to be selected for facility construction under the VSW and ANTHC program, they generally must search for a bundle of smaller matching grants to make up the cost. For example, they might find funding to conduct a SWM plan, but not a design, or find funding for the road, but not the facility.

To be successful, the separate funding pieces must come together according to a certain time sequence. But dealing with a number of grants and agencies with different stipulations and timelines is extremely time-consuming. By the time a Village is ready to begin construction, the award money could be lost, or the SWM plan may be obsolete, requiring the Village to begin again.

Selawik is in the process of patching together different funding sources and has initiated a working relationship with a number of different agencies including: DEC, Maniilaq Association (a Tribal Regional Health Corporation), CCTHITA, Bureau of Indian Affairs (BIA), U.S. Environmental Protection Agency (EPA), DOT, and consultants NANA/DOWL Engineers and Zender Environmental.

A new landfill design was initially completed in 1998. At that time, DEC policy for excavated landfills was not set, so that had the Village had the wherewithal to embark on the permitting process at the time, it is reasonably likely that the permit would have been approved. Regardless, in FY2001-2002, the Selawik Environmental Program received \$250,000 from the federal Interagency Tribal Open Dump Clean Up Project (TOC). The money was earmarked for closing the existing dump site because it was assumed that funds would become available to construct a new facility within the next year. The Village decided to await the FY2001 Fall completion of their SWM plan, so that funds would be spent as effectively as possible. Consequently, to reduce the health risks that residents would be subjected to for at least another year the Village redrafted the TOC budget to focus on improving the dump rather than closing it.

But after redrafting a plan for the money, the \$200,000 State Community Development Block Grant that Selawik was awarded to begin landfill construction was pulled because too much time had elapsed from the award date. The money was pulled even though Selawik was progressing forward in systematic fashion to ensure that the money would be used in the most effective manner. Loss of this award necessitated

Selawik to redraft once again its use of the TOC award.

But amending their TOC once more had the unfortunate effect, seen in hindsight, of dissuading the TOC Committee of awarding Selawik the highly competitive grant for the FY 2002-2003 period. This setback necessitated another TOC budget amendment, leaving the Village once again to address the existing site health risks essentially with a “band-aid” approach of consolidating the front edge of the dump away from houses as much as possible. Note it is a band-aid approach for a number of reasons, but one prime reason is that Selawik is a boardwalk tundra village. Their dozer (bought with TOC monies) can only access their existing site during Freezeup (which unfortunately is the same time when wastes are covered with snow). But Selawik is a large enough community that going for 6 months without waste consolidation and compaction results in any progress towards site cleanup being lost over the summer months.

The result of the above narrative is that instead of having \$700,000 to spend on landfill construction (i.e. the two TOC awards plus the CDBG funds), the Village has nothing. Of course, even if Selawik had been awarded the TOC, and been able to retain the CDBG, they would need to find \$700,000 to \$800,000 more to complete construction.

6. Funding Can Lag Several Years Into The Future, Even Though The Issue They Are Intended to Address Can Change Substantially by the Time Funds Become Available.

Selawik recently found out that some \$700,000 from DOT has been earmarked to upgrade the boardwalk access to the existing dump site, scheduled for construction in '05. However, the dump site will be closed as soon as the new landfill can be built, hopefully by YR 2005— and the boardwalk access is in need to be repaired now. It is unclear at this time whether the boardwalk money in YR 2005 can be used for other road projects within the Village. A frustrating problem is that BIA money may also be available for the same road projects at that time. Of course, if that BIA money becomes available, then the DOT money would not be needed. In the meantime, the Village’s priority is funding to construct the landfill. Unfortunately, DOT does not fund sanitation facility construction and the BIA Roads Program doesn’t either.

7. The Environmental Program Staff Of Villages Are Typically Over-Taxed.

The 1- to 2-person Village environmental staff must deal with all environmental issues, attend training, carry out planning, and keep abreast of State and federal environmental regulations. But these are the very people that are generally responsible for searching and applying for SWM assistance grants. Even with assistance from other Village staff, the task of applying for all of the grants that might be appropriate to use for SWM would be a full-time job. Add to that consideration the cultural divide issues discussed briefly above and it is almost certain that some promising grant opportunities will be lost each year, through lack of time or other resource/capacity-dependent factor. Dealing with the day-to-day operational management of a serious environmental and public health problem, while at the same time attempting to network and plan for its long-term solution, places a very large burden on Selawik’s staff of two. Because a steady source of money is not available to pay for a grantwriting position, and it is difficult to recruit an experienced writer to an isolated Village, Selawik needed to hire a consultant, an act that further drains the Program’s resources.

8. Villages must compete for scarce funding.

As one example of the scarcity of funding, Selawik applied for a federal

Hazardous Waste Program grant available to federally recognized Tribes. The problem is that only a handful of Tribes have a hazardous waste program and this was the first time that such a grant was offered. Not surprisingly, the need far exceeded the available funds of \$375,000, and Selawik's application, while highly ranked, was turned down. This circumstance also illustrates another problem – logistics and demographics. Native Village projects require a higher amount of funding than lower-48 Tribal projects due to logistics; there are a large number of Villages; and each Village has a relatively small population. Partly as a result, while Alaska Native Villages make up some 40 percent of federally recognized Tribes, in the past they have not received nearly that percentage in federal Tribal assistance money.

CONCLUSIONS

The Native Village SWM situation is serious, its underlying causes complex, and its solutions unclear. However, addressing the conditions and their contributory factors now is critical. Otherwise, Village SWM health and environmental risks are likely only to increase as harmful wastes and byproducts accumulate; the incidence of burning, disease vectors, and physical injuries multiply; and the potential for water and soil contamination increases.

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- Curtis, S. (1992) "Cultural relativism and risk-assessment strategies for federal projects," *Human Organization*, vol. 51-1.
- Gilbreath, S. (2000) Health effects associated with solid waste disposal in Alaskan Native Villages *Doctoral Proposal*, Graduate Group of Epidemiology, University of California, Davis.
- Gudykunst, W. and S. Ting-Toomey, with E. Chua (1988) *Culture and interpersonal communication*, Sage Pub, Newbury Park, CA.
- Hall, E. (1983) *The dance of life*, Doubleday, New York.
- SWANA (1999) Alaska Solid Waste Regionalization Report, *Alaska Chapter of the Solid Waste Association of North America*.
- Sebalo, S and L. Zender (2002) Baling Your Garbage: Baler information and Alaska Case Studies, *available for download at <http://www.zender-engr.net>*
- Zender, L. (1999) Solid Waste Management on Indian Reservations: Limitations of Conventional Solid Waste Management Engineering, *Doctoral Thesis*, Civil and Environmental Engineering, University of California, Davis.
- Zender, L. and S. Sebalo (2001a) Left Out in the Cold: Solid Waste Management and the Risks to Resident Health in Native Village Alaska, Results from Central Council of Tlingit and Haida Indian Tribes' Solid Waste Management (SWM) Survey and Village Health Study, *available for download at <http://www.zender-engr.net>*
- Zender, L. and S. Sebalo (2001b) In: A Guide to Closing Solid Waste Disposal Sites in Alaska Villages, Central Council of Tlingit and Haida Indian Tribes of Alaska, 3.1 – 3.30, B1, B6, <http://www.zender-engr.net> and <http://www.ccthita.org>