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Managing Minnesota's Solid Waste

THOMAS MEERSMAN

The Ironwood sanitary landfill near Spring Valley in southeastern Minnesota has been out of the headlines for nearly seven years now. Through the 1970s it was a busy enterprise, but became infamous in 1980 when state pollution control officials discovered that Ironwood's owners had accepted nearly 1400 barrels of hazardous wastes (much of it illegal and some of it leaking) from the Advance Transformer Company of Boscobel, Wisconsin. The resulting lawsuits, state ordered public hearing, soil and groundwater studies, cleanup, media attention, and sustained public concern caused Ironwood's owners to surrender their permit shortly before the Minnesota Pollution Control Agency (MPCA) officially revoked it in July of 1982.

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Compared with subsequent discoveries, Ironwood was not a major hazardous waste problem, but it became a lightning rod in its time. Ironwood was one of the first Minnesota sites (in addition to the former Reilly Tar property in St. Louis Park) to be tagged as a "toxic dump" shortly after a national audience had watched the emotional saga of New York's Love Canal and its community evacuation in 1978 and 1979.

Today, Ironwood is one of a growing number of defunct landfills in Minnesota. It has been covered with a clay cap, and numerous wells continue the monotonous chore of pumping contaminated groundwater and piping it to a storage lagoon for treatment and release. The cleanup has cost millions of dollars and will probably continue for several more years. It is the legacy of a technology that was once thought to hold much promise, but has failed by nearly everyone's evaluation to have "solved" the garbage problem.

Garbage is an enormous issue now in Minnesota. After a decade of concern about hazardous wastes with exotic

names, attention has shifted to things familiar: the plastic milk containers, used batteries, aluminum platters and pizza boxes crammed by the thousands into trash bags every day; the broken television sets, bags of grass clippings and piles of newspapers that are lugged to dumpsters and dropped by the ton at landfills.

Every man, woman and child in Minnesota generates an average of 2000 pounds of trash per year. The total accumulates at a rate that would fill a typical 1200-square-foot home every two and one-half minutes (1). We are running out of space to dispose of this rubbish. We have learned that landfills are not sanitary, and that past disposal fees have been vastly underpriced—a far cry from the true costs of measures required to protect the environment. What has been out of sight can no longer remain out of mind. Elected officials at all levels of government are struggling to determine what to do next, and their decisions are committing millions of taxpayers' dollars and are defining how we manage garbage and even change our thinking about it in the decades to come.

History

Landfills as we know them today have not always been with us. Before 1969 they were called "open dumps," and Minnesota had 1200-1500 of them scattered around the state. They were simply places to discard refuse, and to occasionally burn some of it. "There was basically a dump in every township in the state," remembers Dale Wikre, a geologist for Barr Engineering Company and former solid and hazardous waste division director for the MPCA. It was a way of life, says Wikre, for people to burn trash in their own backyard 55-gallon drums, and to take the ash and other debris every so often to the dump on the edge of town.

In the late 1960s, policymakers and citizens involved in the inchoate national environmental movement began to realize that open dumps were not healthy, safe or aesthetically pleasing. In Minnesota and elsewhere, legislators began to suspect that the open dumps, often located in "marginal" land near swamps, wetlands and sinkholes, might be fouling the waters. And the odors, rodents and uncontrolled fires at the dumps had been nuisances for long enough.

State lawmakers gave solid waste authority to the MPCA in 1969, and a year later designated counties as having the prime responsibility for managing solid wastes in their districts. Some of the MPCA's early administrators, including Wikre, attempted to cajole or threaten the counties to close the miscellaneous township dumps and to centralize trash disposal in something called a "sanitary landfill." Under the new system, people would have to pay someone to haul their garbage away, often to a location at some distance. "There was tremendous opposition to closing the dumps in rural areas," says Wikre. "It was pretty much the agency against everyone."

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Over the years the towns and counties acquiesced, and by 1976 many of the smaller dumps had closed (2). With its new authority, the MPCA began to issue permits to sanitary landfills. Some of them, like Ironwood, began operating in the early 1970s.

“Sanitary” Landfills

“What a sanitary landfill was supposed to be was managing the wastes so you buried them in a safe way,” says current MPCA ground water and solid waste division director Rodney Massey. “What it turned out to be, in retrospect, was expanding some of the town or county dumps and covering them up once a day or once a week, instead of finding good sites and trying to have the natural conditions help mitigate the problem. It was a combination of a technical and political compromise to close as many of the old dumps as we could.”

In the mid-1970s, Massey and others began to realize that the new landfills might not be very sanitary; they were a means to store trash, but not to dispose of it safely. Officials tested groundwater near a few landfills, and discovered traces of solvents and other chemicals. “We found that the rainfall that comes down leaches through the landfill almost like a drip coffeemaker,” explains Massey. “What you get looks a lot like drip coffee too, only it smells a little worse.” Massey and others had suspected that landfills located in sandy terrain might be leaking, but were startled when tests showed that many of the chemicals could move through natural barriers as well. “The organic fraction is not held up by any soil structure at all,” says Massey. “It moves as fast through clay as it does through sand.”

By mid 1977, MPCA officials switched from issuing open-ended solid waste permits to five-year renewable permits that required owners and operators to conduct hydrogeologic studies of their property and to monitor the quality of groundwater beneath their landfills. In the meantime, state legislators in 1978 formed a joint solid and hazardous waste committee, a group that was to spend the next two and one-half years developing, discussing, and writing Minnesota’s landmark Waste Management Act of 1980. It became the state’s comprehensive master plan for solid and hazardous waste management, and changed the direction for the 1980s and beyond.

The Landfill Crisis

After officials found pollution problems, first with open dumps and later with sanitary landfills, the number of places to dispose of garbage began to decline precipitously. Of the nearly 150 landfills issued operating permits by the MPCA since 1969, about one-third of them have closed, and many others are expected to do so within the next five years (3). In the seven county Twin Cities area, six of 14 landfills have closed during the past decade, and only three of the remaining eight sites have any significant space for more trash (4).

Some landfill owners simply ran out of room. Others found it unprofitable or at least not as profitable to comply with stricter government regulations. Still others could not find and pay for environmental liability insurance, or provide financial assurances that they could properly close the facilities and maintain long term care and monitoring (5). In addition to the added economic pressures and business risks, those who wanted to build new landfills or expand old ones have also encountered more public complaints about potential environmental damage, health risks and property

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devaluation. The result—only eight new landfills have opened in Minnesota since 1980, none of them in the metropolitan area (6).

At the same time the number of landfills has shrunk, two other aspects of solid waste management have been more fully documented. Nearly all current and former landfills that have been tested have leaked chemicals into the ground water, and Minnesotans are generating more garbage each year. Metropolitan Council solid waste planner John Rafferty says that waste generation far exceeds population growth, at least in the Twin Cities area, and has done so for more than a decade. While the metropolitan population increases at the rate of about 1.1 percent per year, says Rafferty, its solid waste generation continues at a 3.3 percent annual climb—a growth rate that has remained fairly constant during the past 20 years.

The result of these increasing pressures has become a crisis in the strictest definition of the word. Solid waste management is at a turning point. The clock is ticking, and county officials are making choices that will affect their communities for the next 20 to 30 years.

Legislation

The concern about solid waste was addressed squarely by legislators through the Minnesota Waste Management Act of 1980. At the time of passage, the law was perceived primarily as a response to Minnesota’s need for *hazardous* waste disposal (7). The act authorized formation of the Waste Management Board, which began a lengthy search for a hazardous waste disposal site that has changed much over the years, and still has not concluded (8).

A less noticed section of the 1980 act involved *solid* waste, primarily mixed municipal garbage. Legislators realized that landfills were probably the least desirable method of handling trash, so they established priorities for future planning and projects. First of all, the law reads, counties should try to reduce the amount of waste generated. They should also separate and recover materials and energy from waste, reduce their “indiscriminate dependence” on disposal, and coordinate their efforts among political subdivisions. In other words, landfills became the lowest priority: A necessary evil, but to be used only as a last resort, and only as one of several integrated strategies for managing solid wastes.

In addition to spelling out the priorities, the 1980 act and annual amendments to it have guided counties and municipalities and encouraged them to change their old habits. Counties may no longer build new landfills, for instance, unless they have filed certificates of need and prove that they have no feasible and prudent alternatives to burial, such as incineration, recycling, and composting. Legislators have also banned landfill disposal of waste tires (1984), used oil and lead acid batteries (1987), and yard wastes (1988) (9). “We are becoming much more sophisticated in the way we look at the waste stream,” says the Metro Council’s Rafferty. “Instead of looking at it as a large amorphous mass, we are

starting to selectively look at individual components more carefully."

Perhaps the most difficult amendment to the 1980 act for Twin Cities counties was the so called "metro restriction on disposal," passed in 1985:

"After January 1, 1990, waste disposal facilities located in the metropolitan area may not accept mixed municipal solid waste for disposal unless the waste has been transferred to the disposal facility from a resource recovery facility identified by the (metropolitan) council."

The message was clear: As of 1990, metro counties could no longer dump raw garbage into landfills unless it had been processed in some manner. These became the marching orders for Twin Cities officials, and the handwriting on the wall for the rest of the state: Solid waste management would change drastically in the coming decade.

County Response

Counties have responded to the legislation and to the landfill crisis in several ways. Some have formed alliances to manage their solid wastes (Figure 1); others have decided to go it alone. Some have chosen to build state-of-the-art incinerators; others have selected a "low tech" strategy of large-scale composting and mandatory recycling. Still other counties (usually those with several more years' worth of landfill capacity) are waiting and watching their counterparts across the state.

Some of the quickest action has occurred in the seven county metro area in response to the 1990 deadline imposed by the legislature. Washington and Ramsey counties formed a joint agreement to sell their trash to Northern States Power Company (NSP), which separates ferrous metals, unsafe materials and non-burnables mechanically at a processing plant, and shreds the remainder to be used as a fuel in the utility's Red Wing power plant and its Wilmarth plant in Mankato. In 1989, five other counties will begin sending portions of their trash to a different NSP garbage processing facility in Elk River, just northwest of the Twin Cities, and the chopped up combustibles will be burned at the nearby United Power Association plant (10).

Hennepin County has contracted with a subsidiary of the Blount Corporation of Montgomery, Alabama, to build and operate a \$140 million waste-to-energy plant on the fringe of downtown Minneapolis (11). Unlike the NSP facilities, the Hennepin County burner would not include the intermediate step of a garbage processor, but would incinerate nearly all of the 1000 tons of garbage sent to it each day (12). In this technology, commonly called "mass-burn" plants, only the largest wastes such as appliances and automobile parts are separated and removed by cranes before the rest of the trash is loaded into the incinerator (13).

In part because of its location near the densely populated downtown area, and in part because of concerns about costs and potential environmental and health effects (especially the emission of dioxins and lead into the atmosphere), some citizens' groups and Minneapolis city council members have opposed the Hennepin County project, and are trying to persuade county commissioners to abandon it. If the incinerator construction proceeds without interruption, it will be virtually complete by the fall of 1989, and ready for commercial operations in early 1990 (14).

In addition to large-scale incineration, metro counties have significantly stepped up their efforts at recycling (Figure 2).

Several counties and municipalities have initiated programs to collect yard wastes and compost them. Others have organized waste education programs, and have established dropoff centers for household hazardous wastes—the paints, cleaners, insecticides, wood preservatives, and other chemicals that are among the more serious pollutants when they accumulate in landfills. Still other organizations, including colleges, government departments, nonprofit groups, and clubs have initiated or expanded internal recycling programs.

The Metropolitan Council set a goal of recycling 16 percent of the waste stream by 1990, and is offering Twin Cities' counties and communities various financial and technical assistance to help reach that goal. Although the objective is not likely to be achieved quite that early, counties are moving forward with the support of many individuals and organizations.

Incineration

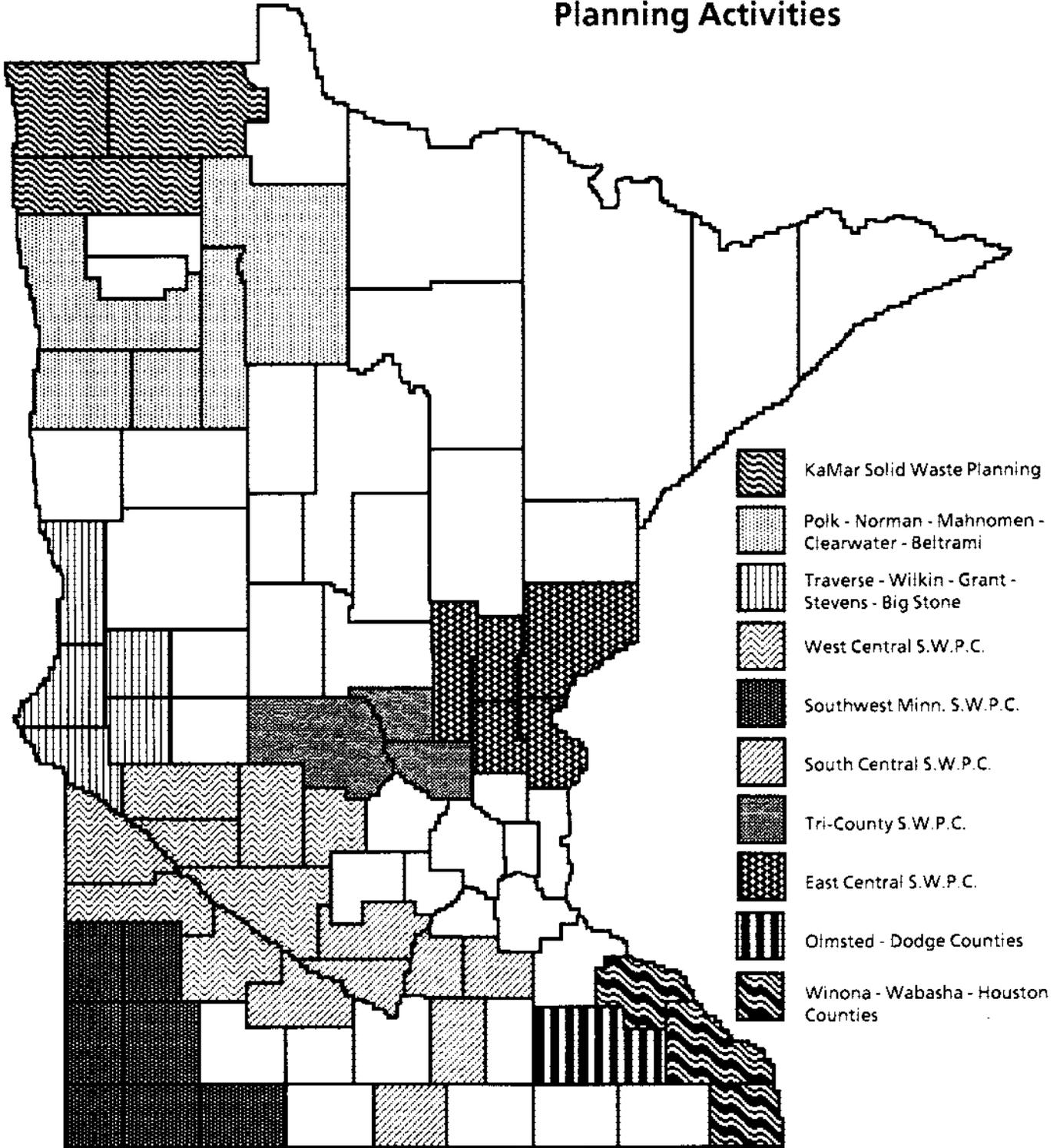
Recycling, composting, waste reduction, and other techniques are all underway in many parts of Minnesota, but incineration has become the most popular alternative to traditional landfills. More than half of the garbage now generated in the state, and nearly three-fourths of that generated in the metro area, has been committed to new incinerators (15). The changeover has been dubbed by some as the "rush to burn," and critics have argued that in addition to environmental and health risks, reliance on burners will preclude efforts to reduce garbage, or to re-use it through recycling and composting.

Incinerator company officials and county environmental specialists have contended that pollution from the new generation of state-of-the-art burners will be minimal, and well below any state or federal health standards. Incineration is a clean and efficient alternative to landfills, they say, because the harmful contents of garbage that could contaminate groundwater are destroyed, the volume is reduced, and the technology has proven itself in many parts of Europe.

Regulators are caught in the middle. They know landfills have polluted soil and groundwater, and after the fact cleanups are unacceptable and costly. Incinerators, on the other hand, can be closely monitored and controlled, and may be shut down if they violate pollution standards. But state and metro officials also realize that their knowledge about incinerators is changing rapidly, and that European technology applied in the U.S. has not always lived up to the promises of its promoters. "We are learning a tremendous amount of information at an extremely fast pace," acknowledges the Metro Council's Rafferty, "so that many of the things we believed in early 1985 when we enacted our solid waste policy plan, we no longer believed just a year and a half later when we finished the environmental impact statement for Hennepin County's mass burn facility. . . . We thought that incinerators were clean and safe, and that ash would not be a problem." Now it has become clear, Rafferty says, that burners are not risk-free, although they still seem to be a safer option than traditional landfills. "We believe that incineration is better than landfills," summarizes MPCA air quality expert Louis Chamberlain, "but we think there are a number of things that are better than incineration."

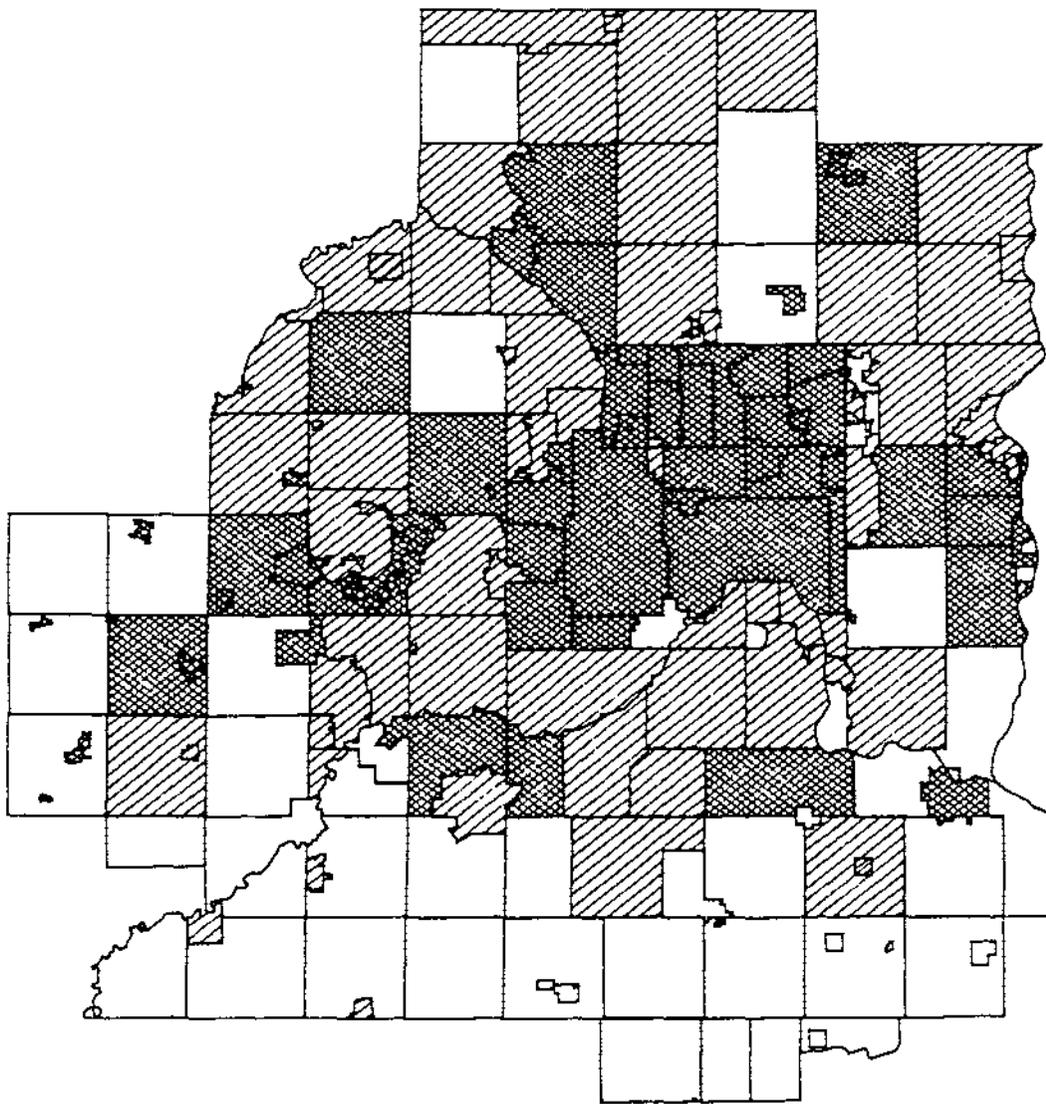
A thorough discussion of the environmental impacts of garbage incineration could cite dozens of recent scientific articles on several sides of the issue. Some of the main concerns are the amounts of lead, cadmium and dioxins that will be emitted from burners or concentrated in their ash, and whether those pollution levels constitute long term threats to

Multi-County Planning Activities



MINNESOTA WASTE MANAGEMENT BOARD

Figure 1. Joint county waste management programs.



Type of Service

-  Curbside Collection
-  Dropoff
-  No Service

Figure 2. Metropolitan area recycling services, 1988.

public health. The 1988 Minnesota Legislature realized the potential problems with ash, and in what some officials call a "time-out bill," designated it temporarily as a "special waste" that deserves further study. For the next couple of years, incinerator wastes must be stored in segregated areas of landfills on an interim basis until more knowledge is obtained about ash constituents, the conditions under which it will leach into groundwater, and the likely regulations that will be established by state and federal authorities.

In addition to these questions, some incinerator opponents have also raised questions about the public policy process involved in approving incinerators. Leslie Davis, president of a Minneapolis-based organization called Earth Protector, Inc., has crusaded against several proposed burners, landfill expansions, and incinerator ash disposals during the past several years. "There were meetings, informational meetings, about these projects," Davis says, "but no public hearings, nobody under oath, no cross-examination, no expert witnesses brought into the state. Hearing after hearing has been denied. Court case after court case was denied a full look to get full disclosure. If there was full disclosure the public would be incensed."

Although the verdict is still out on just how safe incinerators will be, it has been largely concerns about their costs that have cooled enthusiasm for burner projects during the past year. Brett Smith, former director of planning for the Minnesota Waste Management Board and now a section chief in the MPCA's Office of Waste Management, Grants and Assistance, has noticed that the vast majority of counties outside the metro area have recently become much more interested in composting and other alternatives than in incineration. "A lot of counties are realizing that it's going to be very costly to do waste-to-energy projects because of the kinds of air pollution control equipment that are going to be required," he said. "There's lots of nervousness about waste-to-energy now. Cost is the thing you can put your finger on the clearest. The public concern regarding environmental impacts has also grown compared to what it was when some of these first incinerators came through."

Future Landfills

Whatever combinations of strategies are adopted by various counties, it's clear that some landfill capacity will continue to be needed in the future. John Curry, divisional vice-president of landfill market development for Browning-Ferris Industries (BFI), speaks confidently of a "new generation" of landfills that will receive the non burnables, the non-recyclables, and perhaps the ash residue from refuse-derived fuel (RDF) and mass-burn incinerators. "What we've done in the industry is taken a real strong look at the future of land disposal," he says. "Our company's landfills in Minnesota have been developed, at least for the future capacity, with clay liners and collection systems." Curry explains that the strategy to protect underlying groundwater from pollution is to minimize the amount of rainfall that could infiltrate a landfill (cover each filled section, or "cell," with an impermeable clay cap), and to provide layers of separation between the garbage itself and the underground soil and water (install synthetic liners, thick clay bases and liquid collections systems). "Unfortunately, what's been developed in the past has created some problems for us," admits Curry, "but I think we've overcome a lot of those problems. We now have technologies that do protect the environment, and landfills are a necessary part of the total waste system. We can have burn plants and recycling and

Metropolitan Council data show that average disposal costs within the Twin Cities were \$28.60 per ton in mid-1988, up from \$12.50 per ton in 1985. . . prices are likely to at least double again during the next couple of years.

composting. We can have all the alternatives to landfills, but there is still going to be a need for land disposal capacity."

The new generation of landfills will not be cheap. Between 1987 and 1990, Curry calculates that BFI will spend \$18 million to design, engineer, and build a state-of-the-art liner and leachate collection system for the next 37 acres that will be filled at the 250-acre Pine Bend landfill, the largest facility in the state. Northern States Power Company has already built a special new "monofill" in Red Wing for its RDF ash, and is designing another near Mankato for the residues produced by the Wilmarth power plant (Figure 4).

In addition to the higher costs of designing, engineering, and building this new generation of landfills or ash monofills, waste disposal firms will also have to provide financial guarantees to assure proper closure of the facilities and at least 20 years of subsequent groundwater monitoring. "There will have to be some sort of financial mechanism and financial fund developed," says BFI's Curry, "whether it's a trust fund or a letter of credit or a surety of some sort . . . That's also a part of the future of land disposal. It's going to be in the millions of dollars."

Leapfrogging Costs

All of these economic realities have already begun to affect the gate rates or "tipping fees" that waste companies charge their customers. Average disposal costs across the nation nearly doubled between 1982 and 1987, and are certain to go much higher very soon. MPCA informal surveys of landfill operators in Minnesota indicate that average fees in 1988 were about \$15 per ton outside the seven county metro area.

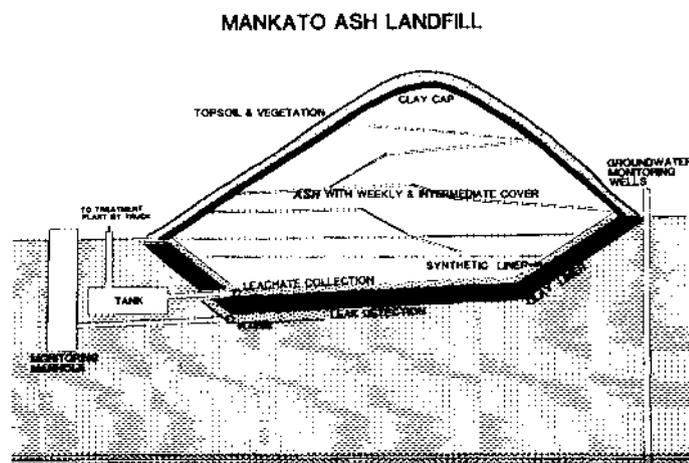


Figure 3. Monofill cell for ash residue disposal.

Metropolitan Council data show that average disposal costs within the Twin Cities were \$28.60 per ton in mid-1988, up from \$12.50 per ton in 1985 (16). MPCA groundwater and solid waste supervisor Art Dunn estimates that today's prices are likely to at least double again during the next couple of years, and to climb higher after that. "What we have is a large looming debt," says Dunn. "Solid waste has not in the past paid its fair share. It has not recouped what the potential costs are for closure, groundwater monitoring, the potential for groundwater cleanup, methane gas control, and leachate collection and treatment." What it means, Dunn adds, is that beginning in the 1990s, citizens are going to have to pay for past "sins," as well as the true costs of operating current landfills and the projected estimates for future problems.

Garbage as a New Utility

Some lawmakers have become aware of the higher fees, and the fact that only a handful of firms, most of them large, now control most of the landfill capacity in densely populated areas of the state. To reduce the possibility that operators might charge "unjust and unreasonable rates," the 1988 legislature took the first step towards public regulation of landfill disposal fees. The new law prohibits increases in any disposal fees in the metropolitan area until June 1, 1989, "except to reflect documented increases in the costs of operation of the disposal facility." In the meantime, landfill owners have been told to file annual reports that list their current disposal fees and any proposed changes. And an inter-agency task force has been directed to study how disposal rates should be regulated in Minnesota, and by whom, and to report back to lawmakers at the beginning of 1989.

BFI's Curry says the additional requirements are unnecessary. "I'm really not sure where this whole issue of rate regulation's going to go. Obviously I don't feel that there's a chance for gouging or improper use of the disposals in charging the public overstated fees." Bruce Parker, general counsel for the National Solid Waste Management Association in Washington, D.C., has some stronger opinions: "The new law impedes the competitiveness of the solid waste management industry," he says, because it will create "procedural red tape, delays in decision making, rigidity, excessive informational requirements and processing time, drastically increased costs for regulators and businesses, and disincentives for capital investment in expansions or new technologies (17)." It's clear that utility-like regulation of disposal fees will be a major issue in 1989 and beyond.

A New Garbage Ethic

The changing laws and regulations, higher costs, scarce landfill space and new technology mean that Minnesota is in the midst of a major shift in solid waste management. Just as the state phased out its open dumps during the 1970s, counties are now moving away from sanitary landfills to incineration and other techniques. This time, however, there is no single technology that appears to be as environmentally benign as sanitary landfills once did. Counties and citizens have learned that each technology has some advantages, some disadvantages, and many unanswered questions. They are struggling against time to determine what mix of technologies will be best for their particular circumstances—whether as a single county or as a regional group.

But the success of it all depends not upon government officials and state laws, but also on the 4.2 million Minnesotans who each throw away between 3 and 5 pounds of trash

per day. In spite of thousands of hours of discussion and millions of dollars committed to incinerator projects, in spite of numerous new recycling and composting initiatives that have engaged the energies of hundreds of local officials and volunteer citizens, virtually no one seems to have done any serious thinking, writing or speaking about waste reduction, the 1980 Waste Management Act's top priority for action (18).

"I think by any measuring stick that (waste reduction) has been a total failure," says state Senator Gene Merriam, author of the act and one of the key players in Minnesota's waste legislation during the past decade. "It hasn't been accomplished, and I don't see how that's going to happen, and it's unfortunate." Merriam says "it's pretty easy to get discouraged" by how little has been accomplished during the past 10 years. He's optimistic about re-use and recycling, which he considers to be on the verge of some dramatic breakthroughs, but says what happens in the next 5 to 10 years will determine whether Minnesota begins to make the necessary changes in solid waste management.

The next step is really up to citizens. Merriam compares the process to the starting of a train, where each car jerks along and starts separately. "The legislature can get up and running and after a couple of years in 1980 can promulgate great things and expect county boards to jump," he says. "But they've got to go through the learning process too. They did, and it took a couple of years, and then we're looking to the municipalities that are going to be recycling. Well they just now all of a sudden got jerked to a start."

If Merriam's analysis is true, the responsibility for garbage has finally returned to its source—the individuals, households and businesses who for the most part have not considered solid waste as much of an issue until now. A handful of municipalities have already begun mandatory recycling programs, and others, including St. Paul, are considering them. One or two other communities have adopted the "disincentives" of higher fees to pick up leaves and yard wastes. But the true test will not be whether government can force changes in behavior, but whether Minnesotans will voluntarily alter some of their habits. How many people think twice when a store clerk puts a single package of gum or candy or film into a plastic bag that will immediately be discarded? Who stops to notice—much less complain about—the redundant packaging—the wrappers around wrappers—that envelop so many consumer products? Do we really need apples, oranges, or other fruit to be mounted and grouped on cardboard trays, and covered with plastic wrap? Must everything from wristwatches to children's toys be encased in molded plastic containers that have no other uses?

In the past, discussions about garbage policy have involved a limited number of people: elected officials, waste management company representatives, consultants, haulers, and occasionally a few concerned citizens who lived near proposed landfill or incinerator sites. Now that the issue has finally come to rest with individual citizen responsibility, leaders need to work more aggressively and creatively with neighborhood groups, churches, and civic organizations. Only by making garbage a grass-roots issue will recycling and composting and waste reduction stand any chance of significant success. Only by involving more individuals will critical thinking occur, so that old habits change and new ideas emerge. Is trash an expensive waste, or is it a valuable commodity? Will we develop new ways to re-use some of our resources, or will we continue to toss them out, burn them up, and bury them without regard to the future?

Footnotes

1. State and metropolitan officials estimate that each citizen discards 900-1000 pounds of trash per year from his or her home. The other half ton is the per capita average of the solid wastes generated by businesses and other institutions.
2. Although most of the open dumps were shut down during the 1970s, some of them still exist throughout portions of the state. As recently as November, 1987, for example, Itasca County signed a stipulation agreement with the MPCA to close nearly 50 small dumps in north central Minnesota.
3. The statistics above apply only to landfills that accept mixed municipal garbage. The MPCA also issues solid waste permits for a number of other facilities, including garbage transfer stations, composting sites and large demolition debris landfills. Medical wastes and radioactive materials are governed by different sets of regulations, and may only be sent to specialized incinerators and out-of-state disposals.
4. The three sites are the Medina, Burnsville and Pine Bend landfills. Two other operations, the Anoka municipal landfill and the Flying Cloud landfill in Eden Prairie, have been trying for several years to receive permits that will allow expansion of their disposals.
5. Environmental liability insurance is expensive and almost impossible to purchase, so many of the larger landfills in Minnesota are self-insured. The issue of closure costs has been addressed by the MPCA, which amended its solid waste rules in September of 1988, and now requires that all landfill owners have financial accounts to pay for closing landfills and monitoring their groundwater for at least 20 years (As a practical matter, the MPCA began imposing such conditions on larger landfills before 1988 as part of the agency's permit renewal procedures).
6. Five other landfills in Minnesota have been allowed to expand since 1980, including two in the metropolitan area: Woodlake and Burnsville.
7. Minnesota has no licensed site for commercial disposal of hazardous wastes. Some companies, most notably 3M, operate their own incinerators to burn certain byproducts, but many other firms must spend increasingly more money to ship their hazardous wastes to incinerators and disposals in other parts of the country.
8. By Executive Order, Governor Rudy Perpich transferred the Waste Management Board's functions, responsibilities, and 53 employees to the MPCA and the Environmental Quality Board on October 7, 1988. The action may be challenged by some state legislators in 1989.
9. Most of these prohibitions became effective within a year or two of enactment. The recent ban on landfill disposal of yard wastes begins in 1990 in the metro area, and in 1992 throughout the rest of Minnesota.
10. The five counties are: Anoka, Hennepin, Benton, Sherburne, and Stearns. NSP expects the processing facility to begin receiving a total of 1500 tons of garbage per day from the counties by mid-1989. The processed garbage is called "refuse-derived fuel," or RDF.
11. The cost estimate includes the capital expense of the burner and associated equipment, several solid waste transfer stations, financing costs, and debt service. Other incinerator prices cited elsewhere in this article also include most of these "total project" costs.
12. In addition to burning about 28 percent of its garbage in the downtown Minneapolis incinerator, Hennepin County officials plan to export another 21 percent of the trash to the Anoka County-NSP project and to Reuters Inc., which operates a plant in Eden Prairie that converts garbage into densified RDF pellets. Hennepin County also expects to eventually recycle 29 percent of its solid waste, compost 9 percent of it, and landfill the remaining portion.
13. Mass-burn incinerators produce about 30 percent ash (by weight) from the solid wastes put into them. RDF technology, which isolates about 25 percent of the metals, recyclables and non-burnables from the mixed municipal waste before burning, produces about 10 percent ash from the "processed garbage" fed into the incinerators. In both technologies, then, about one-third of the original garbage remains as ash or non-burnable matter.
14. Two other large scale incinerators are under study at the present time, but whether or not they will both be constructed is uncertain. In July of 1988, Dakota County officials approved an 800 ton per day, \$126 million, mass-burn incinerator. An environmental impact statement (EIS) must be finished and accepted by the Metropolitan Council before the MPCA citizens' board decides whether or not to grant air quality and solid waste processing permits. In a separate project, Wabasha and Houston have joined Winona County in an effort to build a 150 ton per day, \$19 million, modular mass-burn incinerator in southeastern Minnesota. A draft EIS raised questions about whether dioxin emissions from the burner that land on the Mississippi River would accumulate in fish tissue and represent a future health threat for humans. The MPCA citizens' board is expected to decide on the issuance of permits in late 1988 or early 1989.
15. These figures are based on the assumption that the 12 large permitted incinerators in the state operate near capacity 82 percent of the time. The estimates will be higher if either Dakota County or Winona County builds its facility.
16. These figures are for tipping fees only. The reason county officials and others often cite much higher rates (\$70 to \$90 per ton, for instance) is because they include the costs of collecting and transporting the waste to landfills.
17. The National Solid Wastes Management Association filed a lawsuit in Hennepin County District Court in June of 1988 to challenge the constitutionality of the Minnesota law.
18. Two reports completed in November and early December of 1988 have mentioned waste reduction, but only within a much broader context. The Governor's Select Committee on Recycling and the Environment (SCORE) and the MPCA's recently adopted Solid Waste Management Policy have each made recommendations on several garbage issues that will be considered as legislators draft and debate a comprehensive recycling bill during the next few months.