"Solid Waste Management Issues in North Dakota"

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Steve Tillotson, Ass't Director,
Division of Waste Management,
North Dakota Department of Health

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North Dakota's citizens and businesses rely on system of 13 Municipal Solid Waste (MSW) landfills, Inert Waste Landfills and many recycling and composting facilities staffed by hundreds of hard working waste management professionals who keep our state a clean and healthy place to live. Recent issues of solid waste management center around replacing capacity, what are our needs, locating new facilities, what can be done to lengthen the lifetime of existing facilities and what options are available for managing our waste?

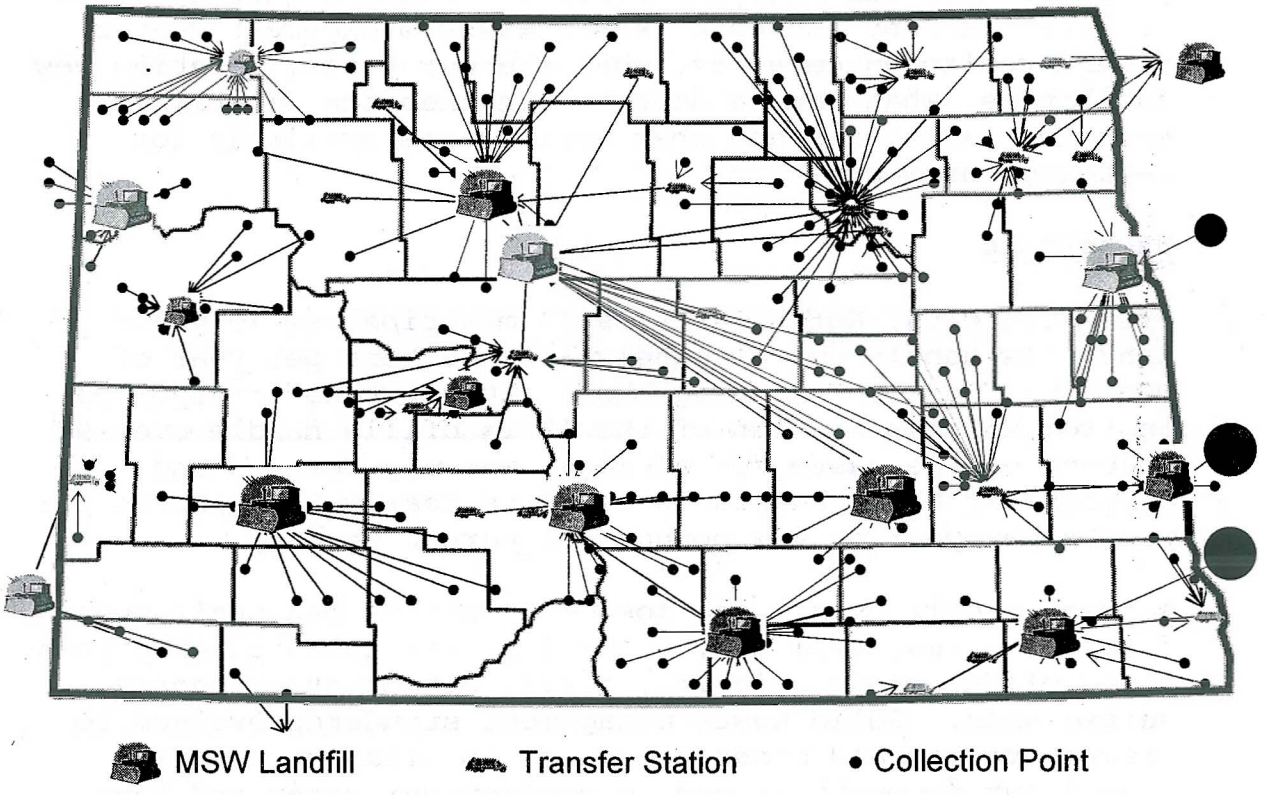
Background

From 2006 data, North Dakota's 13 municipal solid waste landfills handle approximately 672,000 tons per year of municipal waste, including about 110,000 tons transported in from Minnesota. Ten of the 13 landfills handle over 97 percent of the waste. On average, waste generated and disposed in North Dakota is equal to nearly 1800 pounds per person per year or 4.9 pounds per person per day.

As many recall, years ago most communities had their own disposal sites, typically a burning, rat infested dump in a flood plain, slough, ravine, gravel pit or other poorly suited area. Solid waste management standards evolved to prevent vermin and disease issues, to clean up the air around our communities and to protect our water and land from the amounts of chemicals and synthetic materials in our growing waste stream. Many dumps stopped taking MSW in past 40 years, concentrating waste in larger, professionally managed solid waste landfill facilities.

In the early 1990's, Federal "Subtitle D" rules promulgated by the U.S. Environmental Protection Agency (EPA) set the current standards for MSW landfills that approved states could implement if they wished to maintain state jurisdiction. MSW landfills in North Dakota are in suitable locations. While there are flexible design provisions for several very small landfills in the drier west, most facilities have liners, leachate collection systems, an engineered cover system, monitoring wells, a methane venting system, and financial assurance. If a site creates significant degradation of groundwater, the owner/operator is liable for cleanup. The state rules require trained and certified operators. Landfill operations are professional and less problematic. The word "dump" is a four letter word.

MSW Waste Flow in North Dakota

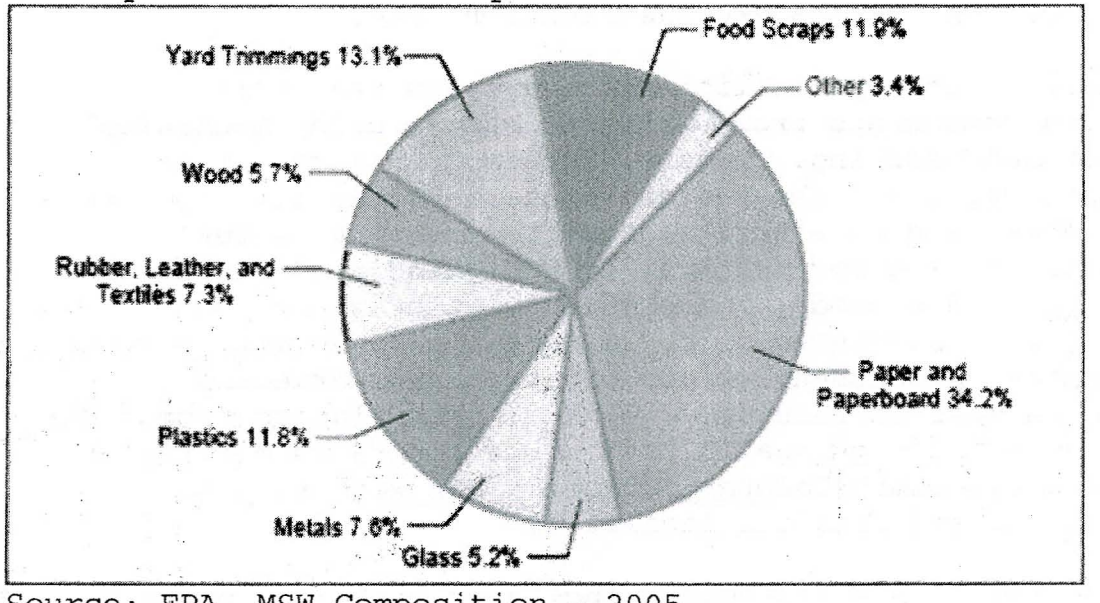


With the development of regional landfills, transfer stations and regional haulers, it is not unusual in North Dakota for MSW to be transported up to 125 miles or more for disposal. Some political subdivisions have their own inert waste landfills. The state solid waste plan in 1993 recognized the value of inert waste facilities and encouraged counties and cities work together to develop and

maintain inert waste sites. Adequate capacity for inert wastes appears to be a significant issue in many counties.

Due to the wide spread impact of the new Federal standards, the 1991 legislature required a state-wide planning program for counties, cities and waste businesses and set phased goals for reducing the volume of municipal waste disposed in landfills so that by 2000, at least a 40 percent reduction in waste disposal was envisioned. A fee on solid waste services helped pay for the planning effort and for a few years provided grants for political subdivisions for education and for recycling equipment. Waste reduction and reuse, recycling, composting and, as appropriate, energy recovery are commonly preferred over land disposal.

Municipal solid waste composition - United States



Source: EPA, MSW Composition - 2005

While the state did not meet the forty percent legislative waste reduction and recycling goal, enhanced recycling and yard waste compost programs help residents and businesses hold down costs and conserve resources. Recycling businesses employ hundreds of people in North Dakota.

One should notice that cardboard, paper and yard waste make up nearly half our waste materials. Indeed, yard waste in the spring and fall can be half the waste stream. While some landfills will not accept grass and leaves, some still do, taking valuable space in our facilities. Similarly, cardboard is commonly a large portion of our waste stream.

Metals too, are valuable commodities with ready markets. Plastics, while about 12 percent in weight are about 20 percent by volume.

Solid Waste Options and Technologies

Alternatives and options for management of our solid waste range in complexity, cost and viability. Options that are currently successful in our state include source separated recycling, yard waste composting, biomass (wood) recovery, landfill methane recovery and energy recovery from certain waste streams. Options often mentioned include materials recovery facilities (MRFs), MSW composting (aerobic and anaerobic), energy recovery systems such as incineration with steam or electrical generation, pyrolysis, gasification, plasma arc gasification, etc.

Material Recovery Facilities are systems that sort out various components from the waste stream using mechanical and/or hand sorting. Papers, metals, plastics, glass, etc, can be recycled. The residual materials may be composted for conversion to a soil amendment, made into a fuel product (Refuse Derived Fuel or RDF), incinerated for energy, or disposed. There must be markets for the recyclable, composted or RDF material and the cost for the equipment, processing, transportation and marketing expenses must be carefully weighed. Recyclables from a MRF may not be as high quality as source separated materials. Rapid City, South Dakota operates a MRF with related composting and landfill facilities.

Composting of MSW (co-composting) uses bacteria to break down the organic fractions and may also be used to manage yard waste, municipal sewage waste and food processing residuals. Anaerobic composting can generate bio-gasses (methane) for energy recovery, but probably costs more to complete due to the physical plant needed (vessel). MSW composting makes a soil amendment which typically has a lower value than yard waste compost or manure compost. MSW compost may not be appropriate for food chain crops due to contaminants. Rapid City South Dakota and several waste authorities in Minnesota have MSW compost facilities.

Energy Recovery systems for MSW saw a lot of interest in the 1970s and 1980s; however, few major incineration facilities have been built since the mid - 1990s.

Incinerators have high capitol costs and to be cost effective, must have a year around market for the heat or install electrical generators. The Waste to Energy Industry has faced increased cost for air pollution controls, the loss of tax advantages, and a long pay-back time. They need access to a modern landfill for the residual ash. The increased value of energy and renewable resources may spur greater interest in MSW energy recovery systems. Tipping fees for such systems often range from $60 to $100 per ton. Siting such facilities may run into similar public concern as disposal facilities.

Incineration can be either a mass burn (unsorted waste) system or a processed waste system which removes recyclable metals, glass, etc. up front. A number of Minnesota counties and waste authorities built incineration facilities in the 1970s and 1980s with significant assistance from the state. While a converted district heating system operated in Devils Lake in the 1980's, currently only separated wastes are burned for energy recovery in our state, including shredded wood, used oil and shredded tires.

Gasification and Plasma Arc gasification systems are higher technology and higher cost energy recovery systems. Dakota gasification in Beulah is the largest coal gasification system in the western hemisphere. Of interest, Dakota Gasification Company in Beulah did a pilot study of gasifying shredded tires with success. Gasification has some environmental benefits and is evolving.

The Plasma Arc process relies on extremely high temperatures to break down materials to elemental gaseous form. No large scale plasma arc facilities are in operation in the United States. Plasma Arc Gasification has been used in small scale facilities, particularly for higher risk hazardous waste and medical waste. High cost, reliability and the durability of the liners are challenges.

Pyrolysis of MSW is a medium to high temperature process that would makes liquid and gaseous fuels from the starved air combustion of carbon-rich materials. It was tried the in the 1970's, but there are no known pyrolysis units for MSW operating in the U.S.

Methane gas recovery from landfills reduces longer term liability of landfills. The Fargo landfill, the largest

MSW facility in the state, has a successful methane recovery system, selling gas to an adjacent agricultural processor and also generating electricity. Other North Dakota facilities are investigating methane recovery; however, having adequate moisture and adequate waste volume may be challenges. Capitol costs for the collection and cleanup system, pipelines, generators and internal plumbing are issues. A local market must be available for the gas or electricity. Landfill methane systems only recover a small percentage of the energy content of disposed waste. Methane recovery qualifies for renewable energy credits and has been a success story for Fargo.

Biomass recovery separates organic materials from the waste stream for use as product (landscaping and erosion control), for boiler fuel and, promisingly, for cellulosic ethanol. Wood and paper products make up significant portions of the waste managed by facilities, many separate clean wood and some process and market it with growing success. Biomass fuel is used for fuel at a number of facilities in Bismarck and in Enderlin and is even marketed to out of state users. Wood and waste biomass is a sustainable fuel which burns cleaner than coal. Recent studies by the UND Energy and Environmental Research Center show a number of North Dakota State facilities could easily utilize wood chips for fuel with minor modifications to their coal handling systems. Down the road, we may see stronger interest in MSW for cellulosic ethanol.

Source separated recycling and yard waste composting are the most successful waste management alternatives in North Dakota and many states. Many companies, businesses and homeowners sort their waste for recycling facilities or collection programs. Cardboard, papers, metals, wood, yard waste, concrete, asphalt concrete, plastic and glass are commonly recycled materials. Many communities have drop-off sites and some have curbside collection systems. Compost systems operate at many solid waste facilities. Some businesses process their own materials for their own use. Some communities have collection programs for household hazardous materials, electronics, etc. to reduce the toxicity of the waste stream and keep communities safer. Education and enhancement of these more cost-effective options, particularly for the bulkier and more valuable materials and toxic materials is encouraged.

Some communities are using or investigating Volume Based Pricing or Pay As You Throw (PAYT) fee systems to charge waste generators for the amount they throw away, encouraging waste reduction and recycling and reducing the subsidy for large generators. As with all commodities, recycled materials are sensitive to market forces, processing costs and transportation costs.

Recycling and composting enjoy popular support and little opposition in facility siting so long as it they operate properly. The increased economic activities world wide, rising world population, and dwindling resources favor recycling. The material disposed in landfills worldwide represents a tremendous loss of resources and energy. Commodities we take for granted are becoming more valuable. Recycling avoids the cost of disposal; however, this cost savings is not always realized by the recycling entity or by the waste generator.

Recent Issues - Solid Waste Facilities and Siting

Like all public utilities, solid waste facilities have a design life. When a facility nears its design life, new options must be secured; the old site must be closed. One option is to transport waste to another facility, which may affect the life cycle of the receiving facility and adds transportation costs. Alternatively, finding a suitable site, willing land owners, doing preliminary site investigation and design, and addressing local zoning requirements is a serious process for public officials. Based on recent experience, siting a solid waste facility appears to be a fifteen to twenty year process for landfills and probably for most of the alternatives discussed above. There is no guarantee that the long and expensive siting process will be successful for any type of solid waste facility.

Beginning in 1992, the City of Grand Forks began evaluating various solid waste alternatives and decided to locate a new regional MSW landfill. Through an extensive screening process, the city found an apparently suitable site, obtained state approval to proceed, began site investigation and design and purchased the property. After investing millions of dollars and spending precious time, some lost due in part to the 1997 floods; the city's zoning request was denied in 2007.

Continuing after 2007, the city again investigated various solid waste alternatives, including incineration, plasma arc gasification, and MSW composting, but the technology, need for energy markets, and the cost as well as the need for a disposal facility for even the residual ash material was cited as reasons for pursuing a landfill.

The community located a site within their Extraterritorial Zoning area and pursued a permit there. There was significant interest and concern expressed by local residents on land use and environmental health issues. The zoning was approved by the city. A state permit was approved in 2009 after a thorough review and hearing process and the city anticipates construction to be substantially complete this year. The city has one of the broadest recycling programs in North Dakota and is interested in pursuing that option further to reduce reliance on disposal.

Other cities and counties may face similar challenges for MSW and Inert Waste. Several MSW facilities see capacity limits in the next twenty years or so. Others will pile higher or go into adjacent properties if they can get zoning and regulatory approval. Some would like to look forward thirty to forty years to determine where they will go next. In addition, many counties and cities do not have adequate capacity for even inert waste.

Simpler, more economical Inert Waste facilities help residents and businesses handle bulky construction and demolition waste and disaster debris in a protective but more cost effective manner. Inert waste includes concrete, brick, wood, metal, plastic and similar wastes which do not normally pose environmental hazards. Inert waste landfills also allow for the stockpiling of recyclable appliances and metal, yard waste composting, used oil drop-off sites, concrete and asphalt processing, etc. Clean wood materials such as trees and demolition lumber are often used for fire wood or mulched for landscaping or biomass fuel. Small communities can burn clean unusable wood occasionally if a Burning Variance is obtained from the Department. Inert waste facilities play a vital role for communities, keeping them clean and providing emergency services.

The value of adequate inert waste disposal capacity is evident in the debris cleanup from recently flooded or tornado damaged communities. Recent tornadoes or storms in

Dickinson, Rolla, Northwood, Coleharbor, etc. as well as the flood events in Linton, Valley City, Jamestown, Grand Forks, etc. highlight the need for infrastructure and equipment for managing tremendous amounts of inert debris.

Management of construction and demolition waste, recyclable metals, abandoned equipment and waste materials is also an evident problem for counties and cities faced with declining or abandoned buildings, dangerous properties, old industrial or military properties, junk metal and vehicle accumulations etc. There is growing concern on increasing accumulations of waste, junk, scrap metal, vehicles, etc. in rural areas and communities. Small communities and rural areas often do not have the resources, equipment, and staff to effectively manage these problems.

Conclusion

Solid Waste Management is an issue affecting every business, industry and resident in North Dakota. In many areas, there is not adequate capacity for the simplest waste from construction, demolition and natural disasters, affecting the viability of our counties and cities. To remain effective, continued evolution, replacement and enhancement of solid waste management options are needed.

Facility siting is a significant barrier and some question whether it should be more of a regional responsibility.

Recycling, yard waste composting, and biomass recovery are viable options for much of our waste stream but the state's recycling rate is rather low. Continued efforts on waste education, waste reduction and recycling, yard waste management and composting, and as appropriate, energy recovery, were recognized as priorities from the solid waste planning effort of the 1990s. As a society, we must look at the long term implications of waste management.

Anyone interested in North Dakota's Solid Waste Management Program, or the issues discussed above, is encouraged to contact Steve Tillotson, Assistant Director of the Division of Waste Management, at 701-328-5163.

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