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REPORT TO THE 77th LEGISLATURE

Appendix 3

Solid Waste Management in Texas Strategic Plan 2001-2005

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Solid Waste Management in Texas

Strategic Plan 2001-2005

Prepared by
Strategic Assessment Division

SFR-042/01
December 2000

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Published and distributed
by the
Texas Natural Resource Conservation Commission
Post Office Box 13087
Austin, Texas 78711-3087

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Table of Contents

Summary vii

Solid Waste Management Planning in Texas 1

Hazardous and Industrial Nonhazardous Waste Management 3
- Findings 3
- Goals, Objectives, and Recommendations 9
  - Waste Management Capacity 9
  - Waste Minimization and Pollution Prevention 10

Municipal Solid Waste (MSW) Management 13
- Findings 13
- Goals, Objectives, and Recommendations 20
  - Municipal Solid Waste Management Capacity and Services 20
  - Regional and Local Municipal Solid Waste Management Planning . . . 23
  - Waste Reduction 26

Appendix A Classification of Solid Waste 33
Appendix B Hierarchy of Solid Waste Management Methods 37
Appendix C Hazardous and Industrial Class 1 Nonhazardous Waste Generation and Disposal 41
Appendix D Municipal Solid Waste Disposal 53

Endnotes 59

List of Figures

Figure 1 Projected Hazardous Waste Generation in Texas 1998-2016 4

Figure 2 Projected Class 1 Nonhazardous Waste Generation in Texas 1998-2016 5

Figure 3 Number of MSW Landfills and MSW Disposal Capacity in Texas 1986-1998 14

Figure 4 MSW Landfill Disposal and Per Capita Disposal Rate in Texas 1986-1998 16

Figure C-1 Hazardous Waste Generation by TNRCC Region 43

Figure C-2 Location of Commercial Hazardous Waste Recycling, Treatment, and Disposal Facilities 44

Figure C-3 Industrial Class 1 Nonhazardous Waste Generation by TNRCC Region 45

Figure C-4 Location of Commercial Industrial Class 1 Nonhazardous Waste Disposal Facilities 46

Figure D-1 Number of Municipal Solid Waste Landfills by County 55

Figure D-2 Texas Regional Councils of Governments 57

List of Tables

Table 1 Municipal Solid Waste Generation in Texas 1998 13

Table 2 Estimated Sources of Disposal in MSW Landfills in Texas (by weight) 17

Table 3 Estimated Components of Disposal in MSW Landfills in Texas (by weight) 17

Table C-1 Ranks of Economic Sectors by Multimedia Aspects 47

Table C-2 Top Ten 4-digit Economic Sectors Statewide Based on Multimedia Environmental Aspects 47

Table C-3 Top Ten 4-digit SIC Codes Represented in More than One Regional Area 48

Table C-4 Hazardous Waste Treatment Disposal Technologies for Which Sufficient Capacity Exists to Meet Demand in 2002 . . 49

Table C-5 Commercial Hazardous Waste Landfill Capacity in 2002 50

Table C-6 Hazardous Waste Treatment Technologies for Which In-State Capacity May Not be Sufficient to Meet Demand in 2002 50

Table C-7 Comparison of 2000 Class 1 Nonhazardous Waste Disposal Capacity with Medium-Demand Forecast for Commercial Facilities 51

Table C-8 Commercial Class 1 Nonhazardous Landfill Capacity, End of 2004 51

Table D-1 1998 MSW Landfill Disposal in Texas by COG Region 56

Table D-2 Scenarios for Future MSW Generation and Landfill Disposal 58

Summary

The management of solid waste in Texas is a cooperative effort among a variety of federal, state, regional and local entities. This plan answers a few important questions about the status of solid waste management in Texas, and outlines a number of policy goals, objectives, and recommendations to be considered by the Texas Natural Resource Conservation Commission (TNRCC) and the entities it works with to protect the health of our citizens and the environment. This plan also addresses issues of capacity to manage our solid wastes, and efforts to reduce the amount of waste generated and disposed of in Texas.

Findings

Hazardous and Industrial Nonhazardous Waste Management

- **Texas continues to be successful in its efforts to minimize the amount of hazardous waste generated relative to manufacturing output. The quantity of industrial Class 1 nonhazardous waste declined over the last 5 to 10 years even though the manufacturing sector experienced substantial growth.**

- **Treatment and/or disposal capacity for hazardous and industrial nonhazardous waste appears to be sufficient to meet Texas' needs**.

Municipal Solid Waste (MSW) Management

- **Texas has between 20 to 30 years of available MSW landfill disposal capacity. However, MSW landfill disposal capacity is not equally distributed across the state, and some regions and local areas have only limited landfill capacity.**

- **Voluntary waste reduction (source reduction + recycling) programs have helped to limit the growth in the generation and disposal of municipal solid waste.**

- **There remain regional and local areas underserved by processing, collection, or transportation services.**

Goals And Objectives

Hazardous And Industrial Nonhazardous Waste Management

Goal 1: Ensure that industrial facilities have access to the type of commercial treatment and/or disposal services necessary to comply with environmental regulations.

1.1 Forecast demand for commercial hazardous and industrial Class 1 nonhazardous waste treatment and/or disposal capacity and track the availability of facilities to serve that demand.

1.2 Maximize TNRCC permitting resources and continue to make the permitting process more efficient.

Goal 2: Achieve continued reductions in the amount of hazardous and industrial nonhazardous waste generated and disposed of in Texas.

2.1 Continue to develop voluntary partnerships and promote environmental quality improvements achieved by industry.

2.2 Use market-based incentives to assist industries to further reduce waste generation.

2.3 Encourage innovation and flexibility to increase pollution prevention results through recycling efforts.

Goal 3: Prevent pollution while maximizing TNRCC resources.

3.1 Target efforts toward industrial wastes that pose the greatest significance to human health and the environment.

3.2 Develop and implement industry-specific pollution prevention programs targeted to the environmental problems faced by the regions in which those industries are located.

3.3 Leverage federal, state, and other education and information resources.

Municipal Solid Waste (MSW) Management

Goal 1: Ensure the proper management and disposal of municipal solid waste.

1.1 Continue to implement efficiency improvements in MSW permitting and regulatory processes.

1.2 Identify areas with less than 10 years of municipal solid waste disposal capacity available either within the region or through facilities in nearby and adjacent regions, and plan with public and private entities to

implement regional and local strategies to develop adequate capacity reserves.

1.3 Identify areas with inadequate collection, transportation, and/or processing services, and plan for and implement local and regional strategies to provide those services by public or private entities.

1.4 Support local efforts to identify areas with litter and illegal disposal problems, and implement enforcement and other programs to address those problems.

1.5 Incorporate the full range of MSW management needs into the environmental partnership programs (CLEAN TEXAS) and other outreach efforts.

Goal 2: Ensure the proper and safe management of solid waste, the availability of management alternatives, and implementation of statewide goals at the regional and local levels, through development and implementation of regional and local plans.

2.1 Implement a regional municipal solid waste management planning cycle to correspond to the state solid waste planning cycle, with updates and amendments to the regional plans every four years.

2.2 Clarify and then implement the role of regional plans and the COGs in MSW permitting decisions.

2.3 Use the Regional Solid Waste Grants Program as a tool to implement the regional solid waste management plans.

2.4 Clarify the role of local solid waste management plans.

2.5 Complete regional inventories of closed municipal solid waste landfill sites, and establish a process to maintain those inventories.

Goal 3: Reduce the amount of municipal solid waste generated and disposed of in Texas, through source reduction and recycling, to the extent feasible through voluntary approaches.

3.1 Benchmark and track the effectiveness of state, regional, and local waste reduction efforts.

3.2 Emphasize market-based incentives and market development.

3.3 Continue to use outreach and education programs to support program initiatives and to facilitate long-term changes in attitudes about source reduction and recycling.

3.4 Target waste reduction activities to the major components of waste disposal.

3.5 Target waste reduction activities to certain components of the waste stream that may pose special risks or problems.

3.6 Target waste reduction activities to each geographic region.

Solid Waste Management Planning in Texas

The *Texas Solid Waste Disposal Act* (Chapter 361, Texas Health & Safety Code) requires the Texas Natural Resource Conservation Commission (TNRCC) to prepare a state solid waste management strategic plan every four years. The Act directs that the plan consider all of the solid wastes under the TNRCC's jurisdiction, including hazardous wastes and nonhazardous solid wastes from industrial and municipal sources. Definitions of these wastes are included in Appendix A of this plan.

The State does not directly provide solid waste management services, although some financial assistance programs are available at the state level. The provision of solid waste management services in Texas is primarily the activity of private companies and local governments.

The TNRCC's primary role is to help ensure that the generation and management of these wastes are conducted in a manner protective of human health and the environment, through permitting and monitoring certain waste generation and management activities. The TNRCC also administers programs to encourage reductions in wastes generated and disposed of in Texas. The TNRCC, Texas General Land Office, Texas Department of Transportation, General Services Commission, and the Department of Economic Development also make up the Recycling Market Development Board, which recommends policy for state agency recycling and recycling market development activities. All state agencies and institutions are required to implement recycling programs and give preference to recycled content materials in purchasing decisions.

The state's 24 Councils of Governments (COGs) have been designated as the regional municipal solid waste (MSW) planning entities for Texas, and are responsible for developing municipal solid waste management plans (regional plans) to encourage regional approaches to providing services and reducing MSW generation and disposal.

This plan provides information concerning the status of solid waste management in Texas. The plan then outlines policy goals, objectives, and recommendations for action by TNRCC and regional and local entities. The plan includes policy direction for the COGs to follow in updating and implementing their regional plans. The regional plans are required to conform to the state plan.

This plan is divided into two sections. The first section deals with hazardous and industrial nonhazardous waste. The second part of the plan addresses the management of municipal solid waste.

Hazardous And Industrial Nonhazardous Waste Management

Hazardous wastes are those solid wastes defined as hazardous under federal Environmental Protection Agency (EPA) regulations. While most hazardous waste is generated from industrial sources, some municipal generation also occurs. For nonhazardous solid waste generated by industry, Texas groups the wastes into three categories: Class 1, 2, and 3. Class 2 and 3 wastes are similar in nature to municipal solid waste and much of those wastes may be managed at MSW facilities. This section of the plan deals with hazardous waste and industrial Class 1 nonhazardous wastes (see waste classification definitions in Appendix A).

Findings

Texas continues to be successful in its efforts to minimize the amount of hazardous waste generated relative to manufacturing output. The quantity of industrial Class 1 nonhazardous waste declined over the last 5 to 10 years even though the manufacturing sector experienced substantial growth.

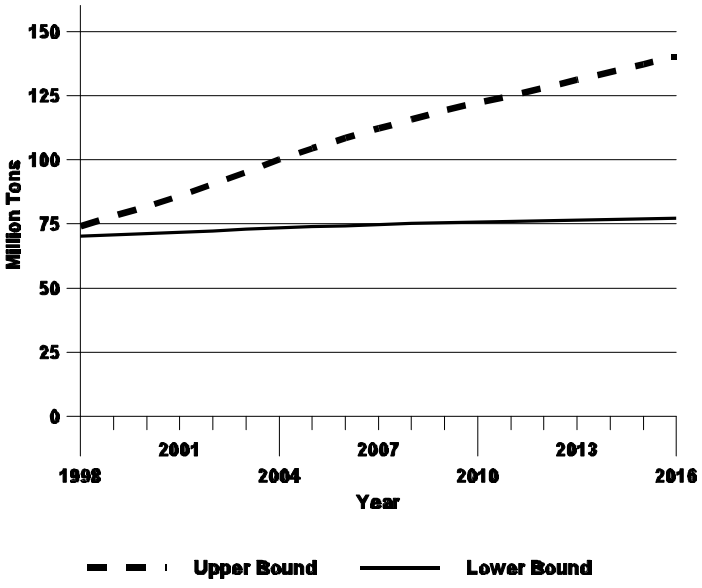
Hazardous Waste Generation and Minimization

Over the past ten years, the quantity of hazardous waste generated in Texas has remained fairly stable. Between 1987 and 1997, hazardous waste generation increased 10.5 percent (from 63 million to 69.6 million tons). Compared to a 71 percent growth in the Texas manufacturing sector, the increase in reported hazardous waste generation was relatively small. This is likely due to the technological improvements and waste reduction and minimization efforts by Texas' generators of waste.*

For estimates of future generation, the TNRCC projected hazardous waste generation rates under two scenarios. The lower bound scenario on Figure 1 shows generation if waste minimization continues at the rate experienced between 1987 and 1997. The upper bound scenario shows what would happen if the forecasted growth in the Texas manufacturing sector brings proportional increases in hazardous waste generation rates.

* Although hazardous waste generation peaked between 1991 and 1995, this increase was due primarily to changes in reporting requirements rather than changes in the efficiency of industrial activities. Because the reporting requirements in 1997 are very similar to those in 1987, establishing a ten-year generation baseline using 1987 and 1997 data presents an accurate picture of historical industrial efficiency.

Figure 1
Projected Hazardous Waste Generation in Texas 1998-2016

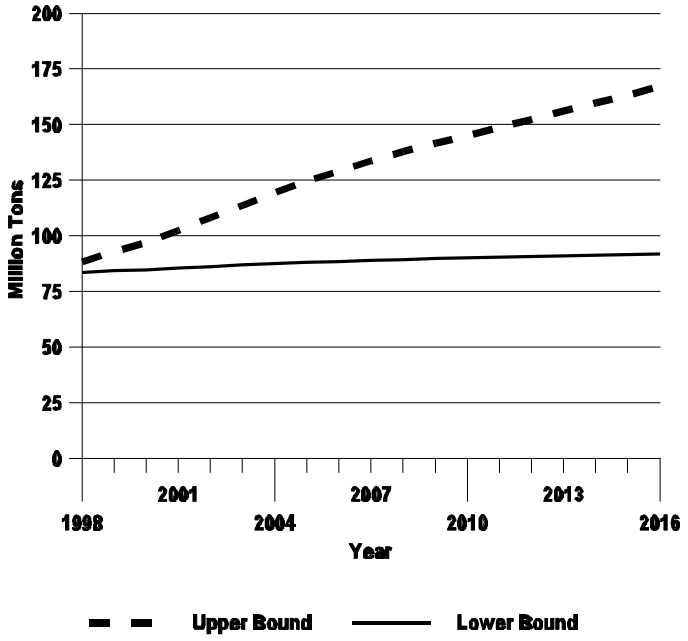


It is unlikely that the upper bound scenario would occur, as new businesses have access to more efficient technologies that were not available to businesses represented in the baseline data, and industries continue to implement additional improvements and waste minimization measures. In addition, federal and state regulations have been amended to allow greater opportunities for recycling in lieu of waste generation. At the same time however, some generators may have already made significant technological improvements and implemented waste minimization measures, with further improvements harder to achieve. Therefore, efforts aimed at minimizing the amount of waste generated will continue to be needed to keep waste generation rates from rising. Effective pollution prevention strategies will determine where actual generation will fall between the upper and lower bound.

Industrial Class 1 Nonhazardous Waste Generation and Minimization

Between 1993 and 1997, industrial Class 1 nonhazardous waste generation decreased 48 percent (159.8 million tons to 83 million tons), while growth in the Texas manufacturing sector increased 49 percent. The quantity of Class 1 nonhazardous waste declined even though the manufacturing sector experienced substantial growth. Since many of the pollution prevention

Figure 2
Projected Class 1 Nonhazardous Waste Generation in Texas 1998-2016



methods utilized to address hazardous waste can be transferred to Class 1 nonhazardous waste, this reduction is not surprising.

Unlike hazardous waste, 10-year trends analysis data is not readily available to estimate the historical ratio of industrial Class 1 nonhazardous waste generation and economic growth. However, many of the processes implemented to address hazardous waste can be transferred to reduce Class 1 nonhazardous waste. Based on this assumption, TNRCC developed a projection of Class 1 nonhazardous waste generation for a lower bound scenario using the 10-year historical ratio of generation to growth data for hazardous waste as shown on Figure 2. The upper bound was based on a proportional increase of waste generation to growth. Actual generation of Class 1 waste is likely to fall between the upper and lower bound scenarios.

Toxics Release Inventory (TRI) Reductions

This plan addresses waste management issues, and not necessarily broader issues of how all toxic and potentially toxic materials released to the environment may affect human health and environmental quality. However, the generation of solid wastes and whether those wastes are properly managed are components of a broader discussion of environmental quality. One indicator used to assess these broader issues, and which provides additional indications of the effectiveness of the state's hazardous and industrial waste

minimization programs, is the Toxics Release Inventory (TRI). Required under the federal *Emergency Planning and Community Right-to-Know Act* of 1986, and the corresponding *Texas Toxic Chemical Release Reporting Act* of 1989, industries must report routine and accidental releases and disposal of certain toxic chemicals. Texas led the nation in TRI releases and disposal in 1997, at 261 million pounds. However, Texas also led the nation in reductions in TRI releases at 41 percent between 1995 and 1997, and 44 percent reductions between 1988 and 1997. Members of CLEAN INDUSTRIES 2000, the TNRCC's voluntary pollution prevention program, accounted for 80 percent of the reductions in TRI releases from 1988 through 1997.

Regions and Industry Sectors to Target for Reductions

A significant amount of the hazardous and industrial Class 1 nonhazardous waste generated in Texas is from facilities located in the Gulf Coastal and Eastern regions of the state (see Figures C-1 through C-4, Appendix C). This type of information is being used by TNRCC to target state outreach and assistance efforts to those regions where it is most needed and will be most effective.

Based on recent analyses conducted by the TNRCC, the manufacturing sector has the greatest environmental significance in Texas, with industrial organic and inorganic chemicals and petroleum refining industries at the top of the list (see Tables C-1 through C-3, Appendix C). Note also, that the electric utility industry has environmental significance in the most number of areas. This highlights the need for targeting waste minimization and pollution prevention efforts to specific regions and to the types of industries that may have the greatest environmental significance in those regions.

Treatment and disposal capacity for hazardous and industrial nonhazardous waste appears to be sufficient to meet Texas' needs.

The majority (99 percent) of hazardous and industrial Class 1 nonhazardous waste generated in Texas is managed on-site, or treated and discharged to a wastewater treatment facility (68,668,800 tons of hazardous waste and 81,971,450 tons of industrial Class 1 nonhazardous waste). Industries that generate large quantities of hazardous and Class 1 nonhazardous waste are expected to continue to ensure that adequate on-site capacity exists to manage the waste generated from their operations. Those wastes not managed on-site or at captive facilities are treated or disposed of at commercial facilities.

In 1997, Texas was also a slight net importer of hazardous waste, with 272,300 tons leaving the state, primarily for treatment, and 276,900 tons received by the state, primarily for deep-well injection and incineration.

Conversely, Texas was a net exporter of industrial Class 1 nonhazardous waste in 1997, with 60,130 tons leaving the state and 16,070 tons imported for disposal in Texas.

According to the TNRCC's latest *Needs Assessment for Hazardous Waste Commercial Management Capacity (SFR-34/00)*, sufficient capacity exists to treat and dispose of the majority of hazardous waste generated by Texas facilities. Demand for a few treatment technologies is being met by out-of-state facilities, including a zinc recovery facility in Mexico. Regarding commercial hazardous waste landfill capacity, yearly demand is expected to reach 164,130 cubic yards in 2002, while unused permitted capacity is expected to be approximately 9,203,060 cubic yards (see Tables C-4 through C-6, Appendix C).

The latest available figures for industrial Class 1 nonhazardous waste from TNRCC's *Needs Assessment for Industrial Class 1 Nonhazardous Waste Commercial Disposal Capacity in Texas (SFR-38/00)* indicate that annual commercial disposal demand in 2004 will be 13,220 tons for deep-well injection, 7,380 tons for landfarming (land application), and 413,265 tons (570,105 cubic yards) for landfilling. In 2004, remaining capacity for deep-well injection is forecasted to be 1,470,830 tons, indicating that there will continue to be sufficient capacity to meet the demand for commercial deep-well injection. It is expected that the demand for landfarming will continue to be met by facilities in other states (Louisiana), since no commercial landfarms exist in Texas. Finally, the available permitted commercial class 1 landfill capacity by the beginning of 2005 is expected to be between 20,241,585 and 20,500,850 cubic yards. This estimate includes permitted capacity that is currently not constructed, and does not include an additional 5,060,400 to 5,125,215 cubic yards of reserve capacity. Based on these estimates, and assuming that currently-permitted landfill capacity is constructed as needed, the state appears to have sufficient disposal capacity to meet the demand for Class 1 waste disposal at commercial facilities well into the future, with the continued export of wastes suitable for landfarming (see Tables C-7 and C-8, Appendix C).

Summary

Progress can still be made in reducing waste generation; however, the cost to implement further waste minimization programs may be high relative to the quantity of waste that can be reduced. While the current regulatory structure is necessary to ensure baseline environmental protection, the challenge for the state will be to provide industry the flexibility to implement pollution prevention programs that look beyond compliance and focus on cost-effective conservation of resources, and which achieve the greatest environmental improvements for the least cost.

There appears to be sufficient commercial capacity available to treat and/or dispose of the hazardous and industrial Class 1 nonhazardous waste generated in Texas. For the future, TNRCC must continue to monitor conditions that may impact the availability of capacity, especially any potential shift in the on-site management of these wastes.

In addition, broader issues, of which waste management is only one component, include how to better target regulations, resources, and programs to address areas of greatest significance to human health and the environment. The following section provides goals and recommendations for how the state's waste management programs can be part of that broader overall effort.

Goals, Objectives, and Recommendations

Waste Management Capacity

Goal 1: Ensure that industrial facilities have access to the type of commercial treatment and/or disposal services necessary to comply with environmental regulations.

1.1 Forecast demand for commercial hazardous and industrial Class 1 nonhazardous waste treatment and/or disposal capacity and track the availability of facilities to serve that demand.

TNRCC Strategies

1.1.1 Continue to conduct an assessment of the need for hazardous waste treatment and disposal capacity every two years, and the need for industrial Class 1 nonhazardous waste disposal capacity every four years.

1.1.2 Analyze waste management trends that may impact capacity, such as changes to the level of on-site disposal.

1.1.3 Make information available to new businesses on the availability of various prevention, recycling, treatment and disposal technologies, and continue to make more information accessible electronically.

1.2 Maximize TNRCC permitting resources and continue to make the permitting process more efficient.

TNRCC Strategies

1.2.1 Continue to prioritize the processing of permit applications for new commercial hazardous waste treatment and disposal facilities based on need.

1.2.2 Continue improvements to increase efficiencies in permit processing, to include efforts to reduce the number of notices of deficiencies and problems with permit applications.

1.2.3 Continue to implement efficiency improvements begun with consolidation of some permitting processes and enhancements to public participation and notice procedures.

1.2.4 Continue improvements to permit development guidance and pre-application instructions.

Role of Other Entities

1.2.5 Applicants for a TNRCC permit need to work closely with the local community and the TNRCC staff early in the facility planning process.

Waste Minimization and Pollution Prevention

Goal 2: Achieve continued reductions in the amount of hazardous and industrial nonhazardous waste generated and disposed of in Texas.

2.1 Continue to develop voluntary partnerships and promote environmental quality improvements achieved by industry.

TNRCC Strategies

2.1.1 Continue to use award and recognition programs as a primary tool in the state's voluntary pollution prevention and waste minimization programs.

2.1.2 Implement a new generation of voluntary partnership programs for the beginning of the 21st Century, and place further emphasis on environmental improvement goals by industry that are supported by and are in concert with the goals of the community.

2.1.3 Develop case studies and program examples targeted to specific industry sectors and present other evidence to industries and local communities of the benefits of working together to prevent pollution and minimize waste.

2.1.4 Share information on capacity and demand and coordinate with pollution prevention efforts.

Role of Other Entities

2.1.5 Local and regional governmental entities, community groups, and industry should continue and increase efforts to develop partnerships which help to address issues of environmental quality, while supporting sound economic development.

2.2 Use market-based incentives to assist industries to further reduce waste generation.

TNRCC Strategies

2.2.1 Operate the Resource Exchange Network for Eliminating Waste (RENEW) to assist industries and businesses to market their surplus materials and by-products to other users.

2.2.2 Highlight to the public the impact consumer choices have on manufacturers' decisions toward waste minimization and pollution prevention.

2.2.3 Educate the regulated community regarding the applicability of the property tax abatement (Prop. 2) program for purchases of pollution prevention equipment.

2.3 Encourage innovation and flexibility to increase pollution prevention results through recycling efforts.

TNRCC Strategies

2.3.1 Under the Regulatory Flexibility Program, as directed under the Texas Regulatory Flexibility act of 1997 (S.B. 1591), continue streamlining waste exemption and variance procedures and educate the regulated community on these procedures.

2.3.2 Ensure that regulatory flexibility orders and programs have measures in place to evaluate the effectiveness of alternative approaches.

2.3.3 Work with the EPA to consider regulatory and program changes to allow industry more flexibility under federal laws and regulations, particularly changes to remove disincentives to reuse and recycling.

2.3.4 Compile further examples of where granting regulatory flexibility would provide substantial environmental benefits.

Role of Other Entities

2.3.5 Regulated industries need to continue to evaluate alternative approaches and to provide the sound scientific evidence to justify flexible alternatives.

Goal 3: Prevent pollution while maximizing TNRCC resources.

3.1 Target efforts toward industrial wastes that pose the greatest significance to human health and the environment.

TNRCC Strategies

3.1.1 Determine those industrial sectors which have the greatest significance to human health and the environment, and allocate resources to address the greatest risks.

3.1.2 Target resources to the types of wastes that have the greatest significance to human health and the environment.

3.1.3 Emphasize source reduction and environmentally-sound recycling.

Role of Other Entities

3.1.4 Industrial facilities and other businesses should evaluate their wastes based on greatest risk to human health and the environment, and prioritize waste reduction activities accordingly.

3.2 Develop and implement industry-specific pollution prevention programs targeted to the environmental problems faced by the regions in which those industries are located.

TNRCC Strategies

3.2.1 Develop pollution prevention strategies tailored to each region, and allocate regional pollution prevention program resources according to those strategies.

3.2.2 Encourage the use of supplemental environmental projects to address the risks to human health and the environment in the area where an alleged violation occurs.

Role of Other Entities

3.2.3 Local communities and industry, particularly those located in the major industrial areas of the state, should work together to develop partnerships and to recognize the environmental quality improvements that may result from those partnerships.

3.3 Leverage federal, state, and other education and information resources.

TNRCC Strategies

3.3.1 Continue to make available industry-specific information on environmentally-efficient technologies to new businesses.

3.3.2 Continue to develop web-based training and education resources, as well as make important information available via the Internet.

3.3.3 Continue on-site assistance activities and training.

3.3.4 Use existing federal, state, and other education and outreach resources to inform the public of the benefits of targeting pollution prevention programs to those wastes with the most significance to human health and the environment.

Municipal Solid Waste (MSW) Management

Municipal Solid Wastes (MSW) are those solid wastes which are generated by municipal and other non-industrial sources (see waste classification definitions in Appendix A). This section of the plan deals with municipal solid waste not classified as hazardous waste.

Findings

Texas has between 20 to 30 years of available MSW landfill disposal capacity. However, MSW landfill disposal capacity is not equally distributed across the state, and some regions and local areas have only limited landfill capacity.

Table 1
Municipal Solid Waste Generation in Texas 1998

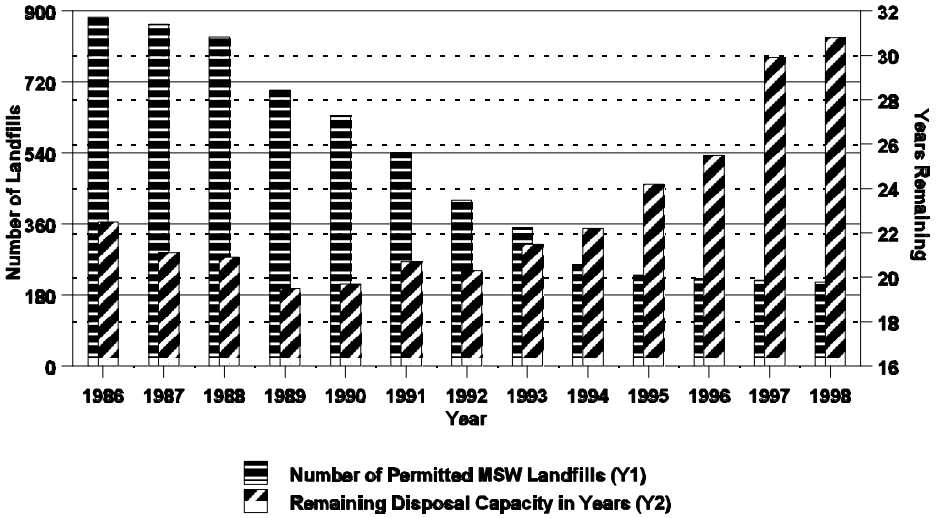
Disposal	**+**	***Net Exports***	**+**	***Recycling***	**=**	***Generation***
23,301,051 tons (64%)		*359,383 tons (1%)*		*12,740,234 tons (35%)*		*36,400,668 tons (100%)*
Landfill: 23,259,425						
Combustion: 41,626						

- Texas ranked second in 1998 among all states in total tons of MSW landfilled.[1] This is not surprising given the state's population, gross state product, and the number of businesses and industries in Texas.
- In 1998, Texas imported 35,684 tons of waste from five other states and Mexico, which was disposed of in MSW disposal facilities, and exported 395,067 tons of MSW to three other states. These figures only represent waste to disposal facilities, and not materials imported or exported for recycling, land application of sludge, and other non-disposal destinations.
- An official recycling rate for Texas of 35 percent was estimated in 1997, as a result of a voluntary statewide survey of recyclers coordinated by TNRCC through the Recycling Coalition of Texas.
- Using 1998 population estimates developed by the Texas State Data Center for Texas of 19,759,614, Texas' per person (per capita) generation rate was 10.1 pounds/person/day. The latest national estimates issued by the EPA for 1996 showed an average national generation rate of 4.3 pounds/person/day.[2] However, the EPA's definition of MSW and estimation methodology differed from the Texas approach. Applying the EPA definitions of MSW, the per capita MSW generation rate for Texas would be closer to 7.6 pounds/person/day.
- The total per capita disposal rate was 6.46 pounds/person/day, with a landfill disposal rate of 6.45 pounds/person/day.

MSW Generation and Disposal

In 1998, Texas had a remaining MSW landfill capacity of 1,300,609,247 cubic yards, which equates to approximately 716,302,147 tons. If the yearly demand for landfill disposal, as reported in 1998, remains constant and no new capacity is built, currently-permitted MSW landfill space available statewide could last as long as 29 years from the end of fiscal year (FY) 2000 (see Table D-1, Appendix D).

Figure 3
Number of MSW Landfills
and
MSW Disposal Capacity in Texas 1986-1998



Based on a 1998 per capita disposal rate of 6.45 pounds/person/day, projected population growth could reduce the life expectancy of current landfills to 22 years, from the end of FY 2000. However, other factors, such as further increases in recycling and other efficiencies will reduce reliance on landfill disposal. The true remaining statewide landfill life expectancy from the end of FY 2000 is between 20 and 30 years (see Table D-2, Appendix D).

However, this assumes that no new capacity will be constructed. It is expected that new projects and expansion of existing facilities will continue, so that landfill disposal capacity in the state will remain above 20 years for the foreseeable future.

As shown on Figure 3, while the number of MSW landfills has decreased dramatically, landfill capacity has actually increased. This is due to the fact that most of the landfill closures involved relatively small, community-based landfills which could not afford to upgrade to the new federal Subtitle D requirements, while larger regional landfills have expanded and new landfills have been permitted.

The average size of a MSW landfill in Texas has grown from 50 acres in 1986 to almost 150 acres in 1998, and much of the state's capacity is now represented by permitted above-ground disposal space (the average permitted above-ground height for MSW landfills in Texas is now approximately 70 feet). Average tipping fees, while increasing, also remain relatively low in relation to other parts of the U.S., at an average of $24.96 per ton.

Regional and Local MSW Disposal Capacity

The more immediate issues of capacity for the state involve local and regional access to the available capacity. In 1986, most of the state's 254 counties had at least one MSW landfill; that number is now less than 135 counties (see Figure D-1, Appendix D). In 1998, Texas had 213 permitted MSW landfills that reported open, with 184 reporting as active and receiving waste. Forty-seven of the landfills (22 percent) were Type IV facilities, permitted to accept only brush, construction and demolition debris, and certain other non-putrescible waste.

The 24 Regional Councils of Governments (COGs) are designated as the regional solid waste management planning agencies for the state (see Figure D-2, Appendix D). In 1998, two COG regions had under ten years of remaining disposal capacity, South Texas Development Council and Coastal Bend Council of Governments (see Table D-1, Appendix D). These and the other COGs need to continue to assess their capacity needs at the regional level, and ensure that areas with less that ten years of remaining capacity develop plans to meet their disposal needs.

Voluntary waste reduction (source reduction + recycling) programs have helped to limit the growth in the generation and disposal of municipal solid waste.

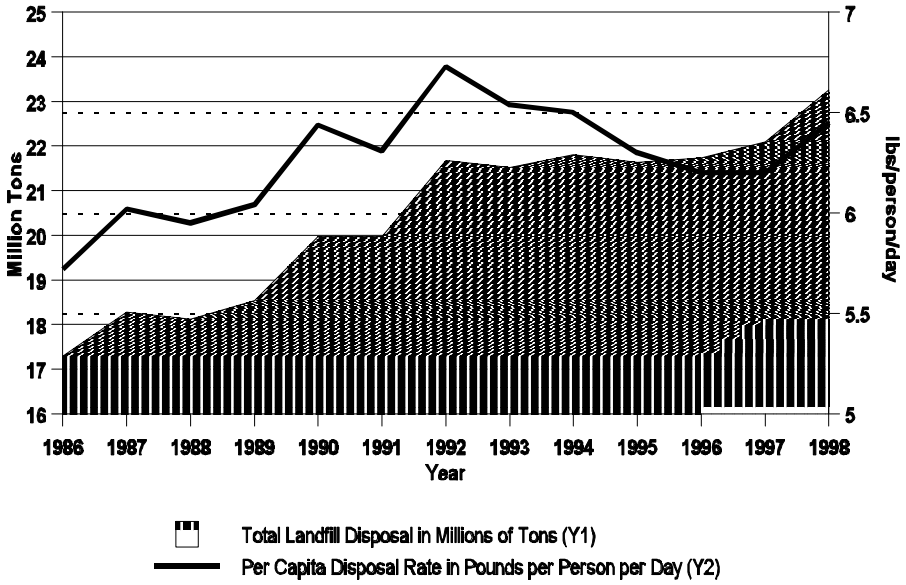
Waste Reduction in Texas

In 1997, Texas was able to determine an official recycling rate, through a voluntary statewide survey of recyclers coordinated by the TNRCC and conducted through the Recycling Coalition of Texas. Based on this survey, a statewide MSW recycling rate of 35 percent was determined, which equates to over 12.7 million tons of materials recycled. If this same recycling rate was assumed for 1998, Texas ranked approximately tenth among all states in 1998 for recycling rate, and third in total tons recycled.[3] However, recycling rates are not determined in the same way by all states, so these rankings should be viewed for general comparisons only. This 35 percent also does not account for reductions in the amount of waste generated due to source reduction.

According to the 1997 survey, there are over 500 known private recycling operations in the state. Through a separate annual survey conducted by the TNRCC in 1998, it was determined that over 186 cities in Texas offered curbside recycling services, 239 offered drop-off recycling, and 215 offered yard trimmings collection. In all, recycling is estimated to create over 20,000 jobs in Texas, and provide over $2 billion in added value to the Texas economy.[4]

Under statutory requirements, the TNRCC is required to establish a waste reduction goal, and may adjust the goal as needed, taking into account the state's disposal capacity, economic and technical feasibility, and projected population growth. The original goal established by the Legislature was to

Figure 4
MSW Landfill Disposal
and
Per Capita Disposal Rate in Texas 1986-1998



achieve a 40 percent recycling rate by 1994. This goal was changed to a 40 percent reduction in the amount of MSW disposed of in the state.

Having achieved a 35 percent recycling rate, it is clear that Texas' waste reduction efforts have made substantial progress. Although the amount of waste disposed of each year continues to increase, as shown in Figure 4, the trends in waste disposal indicate that waste reduction efforts have lessened the growth in disposal.

Waste Sources and Components to Target for Further Reductions

Further achievements in waste reduction will need to come from targeting those sources and components of the waste stream that offer the greatest potential for reductions. Substantial reductions may still be possible in the amount of paper, particularly from commercial sources, and yard trimmings

from both commercial and residential sources. Reductions should also be possible in waste generated from construction and demolition activities.

Table 2
Estimated Sources of Disposal in MSW Landfills in Texas (by weight)

Residential	32%
Commercial	35%
C&D*	19%
Nonhazardous Industrial	5%
Other	9%

*Construction and Demolition Activities
Source: 1998 Annual MSW Facility Reports

Table 3
Estimated Components of Disposal in MSW Landfills in Texas (by weight)

Glass	5%
Plastic	8%
Paper	36%
Yard Trimmings	20%
Metal	5%
Food	9%
Wood	6%
Other	11%

Source: Estimated from the results of six local waste characterization studies in Texas, conducted between 1990 and 1998.

The waste composition percentages included in Table 3 are based upon six separate Texas studies conducted between 1990 and 1998. These percentages are similar to the percentages issued by the EPA for their characterization of waste in the U.S. (1996 was the latest data year) and so these constitute a "good average" to use within the context of this plan.

In addition, with construction and demolition (C&D) debris and yard trimmings making up a substantial percentage of the waste stream, more extensive use of Type IV landfills (permitted to accept only brush, construction and demolition debris, and certain other non-putrescible waste) could help to further extend the lives of more costly Type I landfills.

There remain regional and local areas underserved by processing, collection, or transportation services.

Collection and Transportation

Landfill capacity is not spread equally across the state, and the closure of numerous small, community-based landfills has resulted in substantial increases in the distances from communities to an available landfill (see Figure D-1, Appendix D). Also, while disposal fees are still relatively low, transportation costs and the cost and availability of basic collection services are important

issues to consider at the local level. The COGs and local governments need to assess the availability of public and private services in their jurisdictions, and attempt to facilitate the provision of convenient and affordable services to residents and businesses.

Liquid Waste Processing

Liquid wastes, particularly septage and grit and grease trap waste, must be processed to remove the liquids before the materials can be disposed of in a MSW landfill. The number of liquid waste processing facilities has increased in the state, with 15 permitted and 6 registered liquid waste processing facilities (Type 5TS) and 32 MSW landfills authorized to process liquid wastes. Most of the major urban areas of the state now have processing services available within a reasonable distance. However, some rural areas, especially along the border with Mexico and in West Texas may still have need for services. Improper disposal of grit and grease trap waste in sanitary sewer systems can cause major problems for the system, both in the pipes and at the treatment plant. In addition, illegal dumping of these wastes (particularly into rivers and lakes) can pose a risk to human health and the environment.

Nuisance Dumping and Illegal Disposal

Increased distances to disposal facilities and increased transportation costs, as well as a lack of affordable collection services in some areas, contributes to an increase in littering and illegal disposal of MSW in parts of the state. Illegal dumping of solid waste was identified as a major environmental concern by respondents in all regions of the state under a survey process conducted by the TNRCC in 1998. Also, in a 1997 survey by TNRCC of officials in the 32 counties along the Texas-Mexico border, county officials estimated that a total of 20,073 reported illegal dumping sites existed in those counties.[5] While each area of the state is different, these figures are indicative of the problems being experienced in the rural and underserved areas of the state.

Household Hazardous Waste (HHW)

Concern with the disposal of potentially toxic or harmful materials in MSW landfills, both from residential sources in the form of Household Hazardous Waste (HHW) and waste from Conditionally Exempt Small Quantity Generator (CESQG) businesses and industries, was cited by the EPA as a major reason for the development of more stringent federal standards for the construction and operation of MSW landfills (Subtitle D rules). However, even with the upgrade of facilities to Subtitle D standards, it is important to reduce the amount of these materials that are disposed of in MSW landfills to the greatest extent possible. These materials can pose problems in the collection system, and when they are improperly disposed of through other means.

Materials Excluded from the MSW Disposal System

Certain materials are excluded by federal and/or state laws and regulations from the MSW disposal system, including whole scrap tires (tires must be split, quartered, or shredded to be disposed of), used oil and oil filters, lead-acid batteries, and antifreeze. Local public and private entities have the primary responsibility for dealing with these materials, with the preferred approach of reusing and recycling as much of these materials as possible. The key for dealing with scrap tires is to continue efforts to develop markets for their use. For other automotive materials, collection and recycling programs are available in most areas of the state through public or private entities, and education efforts need to be focused on increasing the use of these programs by individual do-it-yourselfers (DIYs).

Summary

The state as a whole has maintained and even increased both the volume and estimated number of years of landfill capacity. Continuous monitoring of this capacity will be necessary to ensure that shifts in this trend are identified early enough to implement any needed state-level actions. For the current planning cycle, the state approach will be to use regional planning to help identify regional and local needs, and support local efforts to address those needs. Further efficiencies in the state's permitting and regulatory processes will also be considered to help ensure that local needs are being met.

As the TNRCC establishes a defined state planning cycle, to be conducted on a four-year basis, the agency will target amendments to the existing regional plans and more consistent implementation and revisions to those plans on the same four-year cycle. At the same time, the role and use of local solid waste management planning must be better defined.

In addition, progress can still be made in both reducing waste generation and in diverting from disposal the waste that is generated, through reuse and recycling. A recycling rate of over 40 percent is achievable; however, the ability of each region to recycle varies, depending on geographic location (urban vs. rural) and the availability of markets and other local factors. However, even with increases in recycling to over 50 percent by 2005, Texas would potentially only gain about four to five years of additional disposal capacity (see Table D-2, Appendix D). Therefore, the emphasis needs to be on the benefits of waste reduction in terms of economics and conservation of natural resources. Programs should target those sources and types of waste where reductions can be made through continued voluntary efforts.

The following section provides goals and recommendations for how the state will assure the availability of management services for MSW, continue

progress on reducing the amount of MSW generated and disposed of, and reduce the amount of nuisance dumping and illegal disposal.

Goals, Objectives, and Recommendations

Municipal Solid Waste Management Capacity and Services

Goal 1: Ensure the proper management and disposal of municipal solid waste.

1.1 Continue to implement efficiency improvements in MSW permitting and regulatory processes.

TNRCC Strategies

1.1.2 Continue to implement efficiency improvements that began with consolidation of some permitting processes and enhancements to public participation and notice procedures.
1.1.2 Use alternative dispute resolution processes, as well as bifurcated hearings to settle land use concerns.
1.1.3 Continue improvements to permit development guidance and pre-application instructions.
1.1.4 Further encourage applicants to participate in pre-application meetings and discussions with permitting staff early in the process.

Role of Other Entities

1.1.5 The COGs should take on a greater role in helping to resolve local issues and concerns before a permit application is submitted to the TNRCC. As part of this role, the COGs should establish voluntary pre-application review and public participation procedures through their existing solid waste advisory committees, and should actively encourage potential applicants to participate in those processes early in planning for a facility.

1.2 Identify areas with less than 10 years of municipal solid waste disposal capacity available either within the region or through facilities in nearby and adjacent regions, and plan with public and private entities to implement regional and local strategies to develop adequate capacity reserves.

TNRCC Strategies

1.2.1 Continue to assess statewide and regional disposal capacity, and ensure that regional and local leaders are aware of when the capacity in their area has reached 10 years or less.
1.2.2 Target outreach and assistance efforts by TNRCC regional program staff to communities that have less than 10 years of remaining capacity available, to ensure that those communities are planning to meet their needs.

Role of Other Entities

1.2.3 The COGs in their regional solid waste management plans should assess disposal capacity needs, and should target local areas with less than 10 years of capacity for development of local plans or technical studies to identify the best approach to meet those local capacity needs.

1.2.4 Local governments should consider establishing long-term agreements with private disposal service providers, cooperative agreements with other local governments, or other mechanisms to assure long-term availability of disposal capacity, where those options exist.

1.2.5 The COGs, local governments, and landfill operators should continue to consider integrated waste management options, as well as the use of Type IV and Arid Exempt (AE) landfill designations where appropriate, to ensure the availability of Type I disposal capacity.

1.3 Identify areas with inadequate collection, transportation, and/or processing services, and plan for and implement local and regional strategies to provide those services by public or private entities.

TNRCC Strategies

1.3.1 TNRCC regional assistance staff should work jointly with the COGs to target assistance activities to those local areas that lack basic solid waste services, including liquid waste transportation, processing, and disposal.

1.3.2 Provide basic planning and assistance tools on the Internet, for use by local communities in assessing and developing programs to effectively meet their needs, including needs for liquid waste management.

Role of Other Entities

1.3.3 The COGs in their regional solid waste management plans should identify those subregional areas which lack adequate collection services and/or access to available disposal facilities, and identify actions to ensure that those needs are met.

1.3.4 The COGs in their regional solid waste management plans should include regional and multi-regional solutions for providing services, and should encourage use of citizens' collection stations and transfer stations where appropriate.

1.3.5 The COGs in their regional solid waste management plans should assess liquid waste processing and disposal needs, and should include strategies for addressing those needs through public or private entities.

1.4 Support local efforts to identify areas with litter and illegal disposal problems, and implement enforcement and other programs to address those problems.

TNRCC Strategies

1.4.1 Encourage local entities to evaluate the factors leading to litter and illegal disposal problems, and to take the lead in implementing comprehensive remedies to address those factors, to include: education, provision of basic collection and disposal services, and increased law enforcement activities.

1.4.2 Continue to provide training and education opportunities for environmental enforcement staff at the local level.

1.4.3 Continue to develop and make available information and models to assist local governments to establish programs to address both litter and illegal disposal activity, as well as the underlying causes of litter or illegal disposal problems in the community.

Role of Other Entities

1.4.4 Local governments should recognize their responsibilities for addressing problems with littering and illegal disposal of municipal solid waste, with support and assistance from the state.

1.4.5 The COGs in their regional solid waste management plans should identify those areas with litter and illegal dumping problems, and identify entities that should establish a local enforcement program, with an emphasis on regional cooperation.

1.4.6 Based on the priorities established in their regional plans, the COGs should use the solid waste grant funding programs to support development of local enforcement programs, and those programs should be standardized to ensure that the grant funding is effectively utilized.

1.5 Incorporate the full range of MSW management needs into the environmental partnership programs (Clean Texas) and other outreach efforts.

TNRCC Strategies

1.5.1 Use the state environmental partnership programs (Clean Texas) to obtain local commitments for ensuring that basic solid waste management services for residents are provided by public or private entities, addressing litter or illegal dumping of MSW, and other key MSW management needs, in addition to committing to certain waste reduction goals and programs.

1.5.2 Continue efforts to make a full range of guidance materials available for use by local governments in addressing MSW management needs, including waste reduction, full-cost accounting, pay-as-you-throw, contracting for MSW collection and disposal, and providing collection services to rural areas.

1.5.3 Use the Texas Environmental Excellence Awards program to recognize innovative efforts by local governments and private service providers to provide solid waste collection services and to address illegal dumping problems in rural and underserved areas.

Regional and Local Municipal Solid Waste Management Planning

Goal 2: Ensure the proper and safe management of solid waste, the availability of management alternatives, and implementation of statewide goals at the regional and local levels, through development and implementation of regional and local plans.

2.1 Implement a regional municipal solid waste management planning cycle to correspond to the state solid waste planning cycle, with updates and amendments to the regional plans every four years.

TNRCC Strategies

2.1.1 As part of the solid waste grants program, require that the COG regional solid waste management plans be amended on a four-year cycle, to correspond to the cycle for amending the state solid waste management plan.

2.1.2 Require the COGs to report on the status of implementing their regional plans, through biennial reports to the TNRCC.

2.2 Clarify and then implement the role of regional plans and the COGs in MSW permitting decisions.

TNRCC Strategies

2.2.1 Establish better-defined policy direction, and consider possible regulatory changes, on what in the regional plans must be conformed with by permit applicants. Some of the key policy direction may include:

- Plan conformance decisions will be based on performance-based considerations.
- Local or regional need for capacity should not, by itself, be a factor in the conformance decision.

- Plan conformance should not impose requirements for how a facility is constructed or operated to be protective of human health and the environment; that is the responsibility of the TNRCC.
- The COGs in their regional solid waste management plans should address land use compatibility and local facility siting concerns. The factors addressed by the COGs should correspond to the same factors listed in the regulations to be considered by the TNRCC: compatibility of land use, zoning in the vicinity, community growth patterns, and other factors associated with the public interest.
- Define and clarify the process for how conformance is to be determined at the COG level, and for how the TNRCC will use the COG recommendations and make a decision on conformance.

Role of Other Entities

2.2.2 The COGs in their regional solid waste management plans should identify the factors that should be used to evaluate a permit application for conformance with the regional plan.

2.2.3 The COGs should establish clearly defined processes within the COG for how conformance recommendations will be made to the TNRCC.

2.3 Use the Regional Solid Waste Grants Program as a tool to implement the regional solid waste management plans.

TNRCC Strategies

2.3.1 Redefine the solid waste grant standards and requirements to allow for flexibility in use of the funds to address the particular needs of each region and to emphasize the use of the grant funds to implement the regional solid waste management plans.

Role of Other Entities

2.3.2 The COGs in their regional solid waste management plans should include priorities for use of solid waste grant funds which, once approved, will form the basis for regional solid waste grant funding decisions.

2.4 Clarify the role of local solid waste management plans.

TNRCC Strategies

2.4.1 Define how approved local solid waste management plans will be considered in MSW permitting decisions. Amend regulations as needed and develop policies and procedures to use the local plans as required by statute.

Role of Other Entities

2.4.2 The COGs should target areas with critical needs for development of a local solid waste management plan or a specific technical study to identify how those needs can be addressed.

2.5 Complete regional inventories of closed municipal solid waste landfill sites, and establish a process to maintain those inventories.

TNRCC Strategies

2.5.1 Work with the COGs to complete the inventories and incorporate those into the regional solid waste management plans.

2.5.2 Establish a process to maintain and update the regional inventories, once the inventories are completed and incorporated into the regional solid waste management plans.

2.5.3 In addition to the inventory of "closed" landfills, have the regional solid waste management plans include location and status information for all permitted landfills, including those that are open, inactive, partially closed, and fully closed.

Role of Other Entities

2.5.4 The COGs in their regional solid waste management plans should address whether further assessments are needed of the risks posed by closed landfill sites in their regions.

2.5.5 The COGs, local governments, and landowners should work together to determine whether any of the closed landfill sites should be studied further to assess the risks posed by that site to human health or the environment.

Waste Reduction

Goal 3: Reduce the amount of municipal solid waste generated and disposed of in Texas, through source reduction and recycling, to the extent feasible through voluntary approaches.

3.1 Benchmark and track the effectiveness of state, regional, and local waste reduction efforts.

TNRCC Strategies

3.1.1 Continue to evaluate progress of the state's waste reduction programs through tracking the amount of municipal solid waste disposed of and assessing changes in that amount in relation to changes in the state's population and economy.

3.1.2 Conduct further research and give greater consideration to the impact of economic changes (vs. population changes) on disposal rates and amounts.

3.1.3 Determine an appropriate mechanism to estimate the state's recycling rate on a regular basis.

3.1.4 Continue to compile information on the number of recycling projects and programs conducted by local governments and businesses. Consideration will be given to involving the COGs to a greater degree in conducting surveys of local governments and businesses.

3.1.5 All grant-funded waste reduction projects will be required to continue to monitor and report on the results of those activities.

3.1.6 Continue to encourage landfills to install and use scales to more accurately measure the amount of waste received and disposed.

3.1.7 Consider mechanisms to track the level of compliance by state agencies, state courts and judicial agencies, and university systems and institutions of higher education with the requirements to institute recyclables separation and collection programs.

3.1.8 Support the Recycling Market Development Board efforts to track the level of compliance by state agencies with requirements to give preference in purchasing to products made of recycled materials.

Role of Other Entities

3.1.9 The COGs in their regional solid waste management plans should identify the status of local governmental entities' compliance with requirements to establish programs for the separation and collection of recyclables from governmental facilities.

3.2 Emphasize market-based incentives and market development.

TNRCC Strategies

3.2.1 Compile and provide access to market information at a statewide level.
3.2.2 Work with the Recycling Market Development Board to continue to encourage purchases of recycled-content products by state agencies.
3.2.3 Continue the Texas Recycled voluntary marketing program for recycled-content products.
3.2.4 Continue to consider improvements to the composting refund program to provide incentives to development of additional composting operations.
3.2.5 Educate local and regional entities on how to develop cooperative agreements and programs to enhance markets for recyclables.

Role of Other Entities

3.2.6 The COGs and other regional and local entities should consider establishing cooperative purchasing and market development programs to support markets for recyclable materials and for products made from those materials.
3.2.7 Municipalities, counties, and districts should comply with statutory requirements to establish programs for the separation and collection of recyclables at government facilities and operations, and for giving preference in purchasing to products made from recycled materials.

3.3 Continue to use outreach and education programs to support program initiatives and to facilitate long-term changes in attitudes about source reduction and recycling.

TNRCC Strategies

3.3.1 Statewide education programs will continue to focus on outreach to teachers with the Teaching Environmental Sciences program, and cooperation with the Texas Education Partnership to build a framework for environmental education by Texans for Texas students.

3.3.2 Support regional outreach and assistance through assistance program staff in the TNRCC regional offices.

3.3.3 Continue to use the CLEAN TEXAS partnership programs to provide guidance and encourage model programs by local governments and regional entities.

Role of Other Entities

3.3.4 Each COG should establish a regional outreach and education program under the regional coordination activities conducted with solid waste grant funds.

3.3.5 Local source reduction and recycling programs need to include an education and outreach component, both to explain how the services are to be accessed, and to outline the benefits to the community of participating in the program.

3.4 Target waste reduction activities to the major components of waste disposal.

TNRCC Strategies

3.4.1 Focus state outreach, market development, technical assistance, and education efforts on achieving further reductions in:

- Paper, especially from commercial, governmental, and institutional sources
- Yard trimmings and brush
- Construction and demolition debris

Role of Other Entities

3.4.2 State agencies should consider programs for yard trimmings and brush diversion and use of compost or mulch at state-maintained facilities, as well as standards for reuse and recycling in state-funded construction and demolition projects.

3.4.3 Local governments should consider programs for governmental facilities, as well as local restrictions and controls, to reduce the disposal of yard trimmings, brush, and construction and demolition debris.

3.4.4 The COGs in their regional solid waste management plans should identify programs to target source reduction and diversion of paper, yard trimmings, and construction and demolition debris.

3.5 Target waste reduction activities to certain components of the waste stream that may pose special risks or problems.

TNRCC Strategies

3.5.1 Consider education, outreach, and technical assistance to target reductions in the generation of Household Hazardous Waste (HHW).

3.5.2 Continue to provide communities with technical assistance on organizing collection and reuse and recycling programs for HHW.

3.5.3 Continue Texas Country Cleanup programs to offer rural residents a disposal outlet for properly rinsed pesticide containers, and collection for recycling of used oil, oil filters, tires, and automotive batteries.

3.5.4 Continue to register used oil collection centers and make that information available to local communities and the public, to ensure that individuals are aware of available collection resources.

Role of Other Entities

3.5.5 The COGs and local governments should emphasize source reduction of HHW in education and outreach programs, in conjunction with programs to collect these materials.

3.5.6 The COGs in their regional solid waste management plans should identify where deficiencies exist in the collection and/or marketing of used oil and tires, and outline regional and local alternatives for dealing with these materials.

3.5.7 The COGs should consider facilitating cooperative contracting agreements between local governments to help collect and recycle these materials.

3.6 Target waste reduction activities to each geographic region.

TNRCC Strategies

3.6.1 Support regional outreach and assistance through assistance program staff in the TNRCC regional offices.

3.6.2 Continue efforts to develop partnership arrangements between the COGs and the TNRCC regional office assistance programs, and use the COG programs to leverage state outreach and assistance efforts for encouraging waste reduction.

Role of Other Entities

3.6.3 The COGs should identify in their regional solid waste management plans where the greatest benefits can be achieved through waste reduction, and local implementation efforts should focus on those activities that will achieve the greatest results.

3.6.4 The COGs' solid waste grant funding decisions should be directly tied to implementation of the regional solid waste management plans.

Appendices

Appendix A
Classification of Solid Waste

Classification of Solid Waste

The definitions and classification of solid waste are guided by both federal and state laws and regulations. The information provided below summarizes the main definitions from the laws and regulations, but should not be used for determining regulatory compliance.

Solid Waste - Includes garbage, refuse, sludge from a waste treatment plant, water supply treatment plant or air pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, municipal, commercial, mining, and agricultural operations, and from community and institutional activities.

Hazardous Waste - A solid waste identified or listed as a hazardous waste by the administrator of EPA pursuant to the federal Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, 42 USC, §6901 et. seq, as amended.

Industrial Solid Waste - Solid waste resulting from or incidental to any process of industry or manufacturing, or mining or agricultural operations. Under Texas laws and regulations, solid wastes generated by industrial sources, and which do not fall under the definition of a hazardous waste, are further grouped into one of three classifications:

- **Class 1 waste** - Any industrial solid waste that, because of its concentration or physical characteristics, may pose a substantial present or potential danger to human health or the environment when improperly managed. Class 1 wastes may be disposed of at an authorized on-site facility, a permitted industrial solid waste disposal facility, or a municipal solid waste disposal facility with a dedicated Class 1 disposal trench and which is authorized to accept Class 1 wastes.
- **Class 2 waste** - Any industrial solid waste that cannot be described as hazardous, Class 1, or Class 3. These wastes are less threatening to human health and the environment. Empty chemical containers and industrial plant trash may fall into this category. Class 2 materials may be disposed of at industrial or Type I municipal solid waste disposal facilities.
- **Class 3 waste** - Inert and essentially insoluble industrial solid waste, usually including but not limited to such materials as rock, brick, glass, dirt, and certain plastics and rubber. These wastes can be accepted at any disposal facility, including a Type IV municipal solid waste landfill.

Municipal Solid Waste (MSW) - Solid waste resulting from or incidental to municipal, community, commercial, institutional, and recreational activities, including garbage, rubbish, ashes, street cleanings, dead animals, abandoned automobiles, and all other solid waste other than industrial solid waste.

Special Waste - A waste which because of the size of the waste matrix, the concentration, and the physical, chemical, or biological characteristics of the waste requires special handling, trained people, and/or special disposal methods. Special wastes are listed in the MSW regulations, and MSW landfills may be authorized to accept special wastes through a pre-approved *Special Waste Acceptance Plan* or an individual *Request of Disposal of a Special Waste Form*.

Appendix B
Hierarchy of Solid Waste Management Methods

Hierarchy of Solid Waste Management Methods

The Texas Solid Waste Disposal Act (Chapter 361, Texas Health & Safety Code) establishes priorities for the management of solid waste in Texas. These priorities are outlined below.

Hazardous Waste. In generating, treating, storing, and disposing of hazardous waste, the following methods are preferred to the extent economically and technologically feasible, in the order listed:

(1) source reduction;
(2) reuse or recycling of waste, or both;
(3) treatment to destroy hazardous characteristics;
(4) treatment to reduce hazardous characteristics;
(5) underground injection; and
(6) land disposal.

Municipal Solid Waste. For municipal solid waste, not including sludge, the following methods are preferred, in the order listed:

(1) source reduction and waste minimization;
(2) reuse or recycling of waste;
(3) treatment to destroy or reprocess waste to recover energy or other beneficial resources if the treatment does not threaten human health, safety, or the environment; or
(4) land disposal.

Municipal Sludge. For municipal sludge, the following methods are preferred, in the order listed:

(1) source reduction and minimization of sludge production and concentrations of heavy metals and other toxins in sludge;
(2) treatment of sludge to reduce pathogens and recover energy, produce beneficial by-products, or reduce the quantity of sludge;
(3) marketing and distribution of sludge and sludge products if the marketing and distribution do not threaten human health, safety, or the environment;
(4) applying sludge to land for beneficial use;
(5) land treatment; or
(6) landfilling.

Appendix C
Hazardous and Industrial Class 1 Nonhazardous Waste Generation and Disposal

FIGURE C-1
Hazardous Waste Generation by TNRCC Region 1997

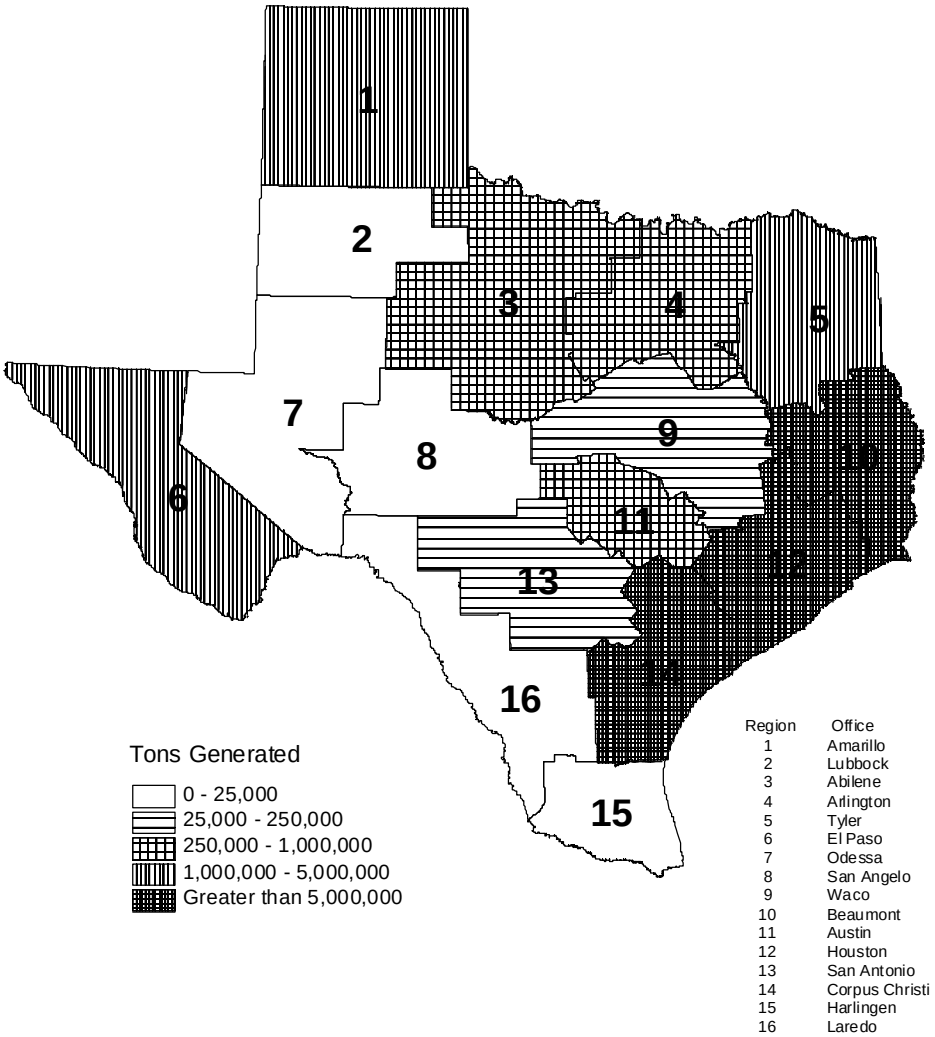
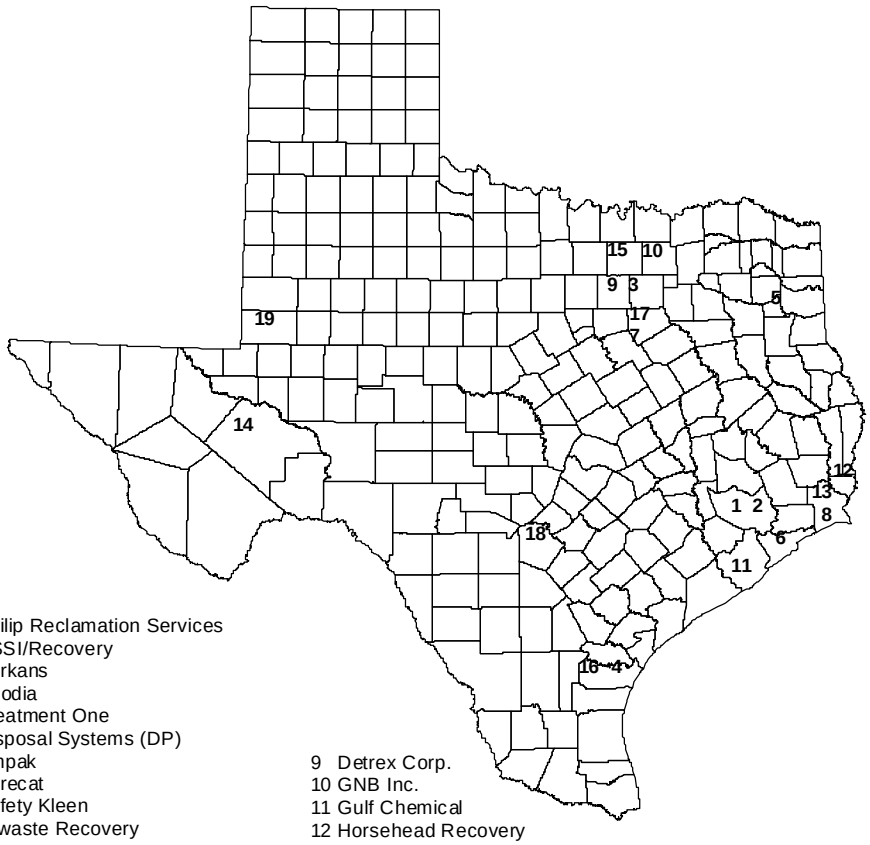


FIGURE C-2
Location of Commercial Hazardous Waste Recycling, Treatment, and Disposal Facilities



1 Philip Reclamation Services
NSSI/Recovery
Parkans
Rhodia
Treatment One
2 Disposal Systems (DP)
Empak
Eurecat
Safety Kleen
3 Allwaste Recovery
Heat
4 Disposal Systems (CC)
Encycle
5 Alpha Omega
6 Duratherm
7 Chemical Reclamation
8 Chemical Waste Management (PA)
9 Detrex Corp.
10 GNB Inc.
11 Gulf Chemical
12 Horsehead Recovery
13 Arch Chemicals
14 Schlumberger Well Services
15 Safety Kleen
16 Texas Ecologist
17 TXI
18 Safety Kleen
19 Waste Control Specialists

FIGURE C-3

Industrial Class 1 Nonhazardous Waste Generation by TNRCC Region 1997

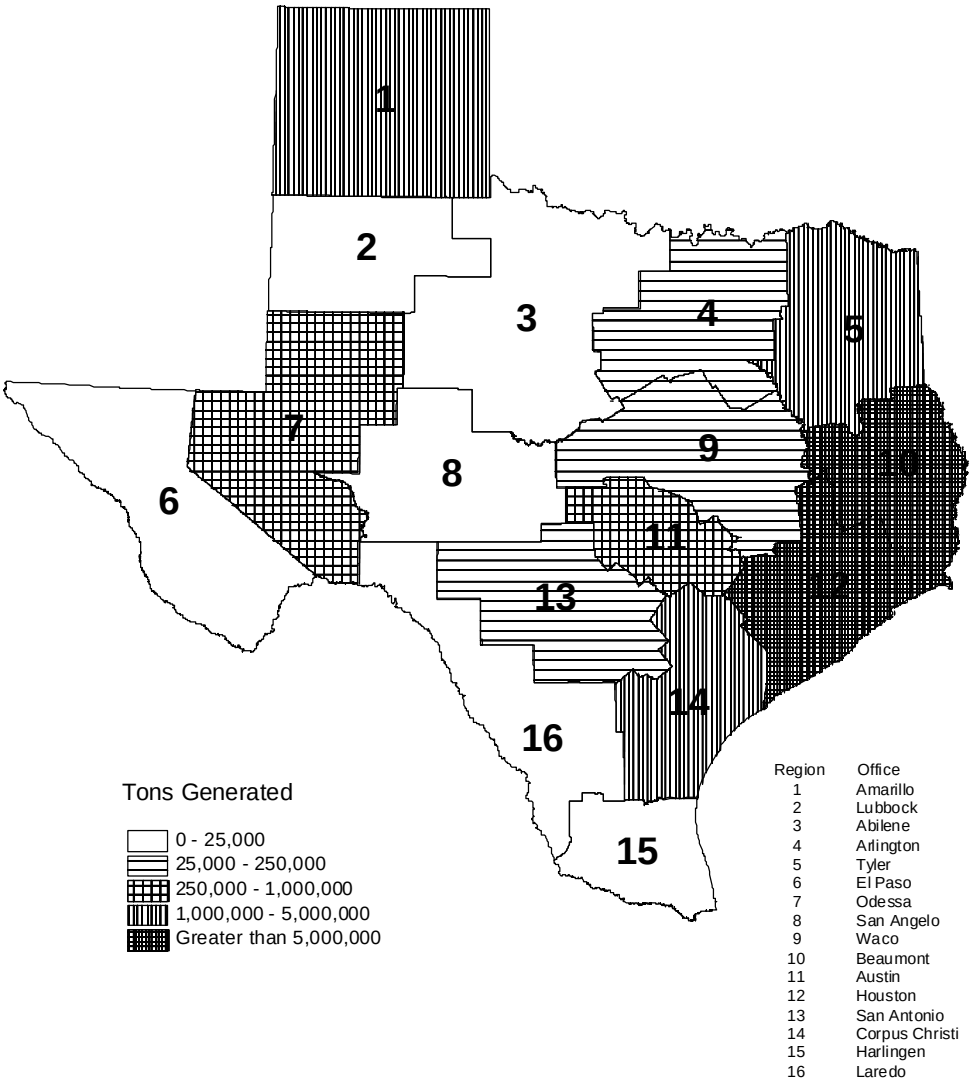
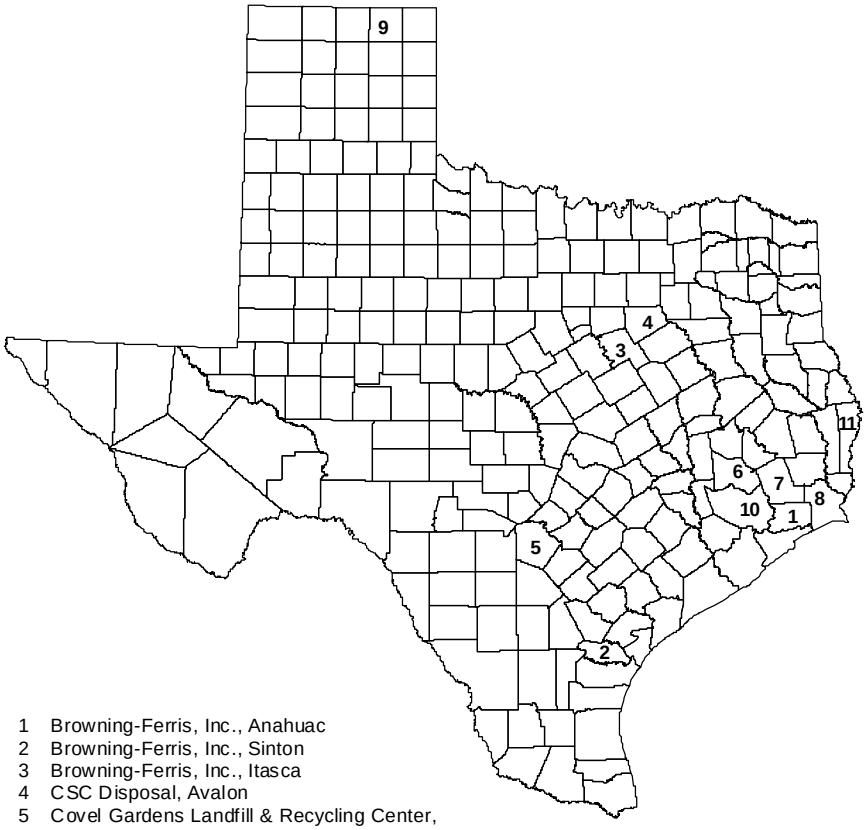


FIGURE C-4
Location of Commercial Industrial Class 1 Nonhazardous Waste Disposal Facilities



1 Browning-Ferris, Inc., Anahuac
2 Browning-Ferris, Inc., Sinton
3 Browning-Ferris, Inc., Itasca
4 CSC Disposal, Avalon
5 Covel Gardens Landfill & Recycling Center, San Antonio
6 Crossroads Environmental, Conroe*
7 Environmental Processing, Inc., Mont Belvieu*
8 Newpark Industrial Development, Winnie*
9 Thomas Disposal Co., Perryton*
10 Waste Management of Texas, Atascocita
11 Waste Management of Texas, Newton County

* Deep-well Injection Facilities

TABLE C-1
Ranks of Economic Sectors by Multimedia Aspects

Economic Sector	Range of 2-digit SIC Codes	Multimedia Environment Aspects Rank
Manufacturing	20-39	1
Transportation, Communication, and Utilities	40-49	2
Mining	10-14	3
All Invalid and Blank SICs[1]	N/A	4
Service Industries	70-89	5
Public Administration	91-97	6
Wholesale Trade	50-51	7
Nonclassifiable Establishments	99	8
Agriculture, Forestry, and Fishing	01-09	9
Retail Trade	52-59	10
Construction	15-17	11
Finance, Insurance, and Real Estate	60-67	12

[1]Represents records where SICs were missing, not an attribute of the dataset, or was not a valid SIC.
Source: TNRCC, *Characterization of Regional Entities by Standard Industrial Classification Codes*, January 25, 2000.

TABLE C-2
Top Ten 4-digit Economic Sectors Statewide
Based on Multimedia Environmental Aspects (Pollutant Releases/Other Activity)

SIC Code	Sector Name	Rank of Multimedia Environmental Aspects	Rank of Air Aspects	Rank of Land Aspects	Rank of Water Aspects
2869	Industrial Organic Chemicals	1	2	1	1
2911	Petroleum Refining	2	1	2	2
2819	Industrial Inorganic Chemicals	3	5	4	3
2821	Plastics Material and Synthetic Resins, and Nonvulcanizable Elastomers	4	6	3	4
2822	Synthetic Rubber	5	10	9	5
4953	Refuse Systems	6	18	6	14
3312	Steel Works, Blast Furnaces (including Coke Ovens), and Rolling Mills	7	15	13	10
4226	Special Warehousing and Storage	8	20	6	13
4911	Electric Services	9	3	21	18
9711	National Security	10	12	16	15

Source: TNRCC, *Characterization of Regional Entities by Standard Industrial Classification Codes*, January 25, 2000.

TABLE C-3
Top 10 4-digit SIC Codes Represented in More than One Regional Area[1]

SIC Code	Sector Name	East	East Central	Gulf Coast	Lower Border	Northwest	South Central	West Central	West
4911	Electric Utilities	X	X	X	X	X	X	X	X
2911	Petroleum Refining	X		X		X		X	X
2821	Plastics, synthetic resins, and nonvulcanizable elastomers	X	X	X		X			
9711	National security	X					X	X	X
3312	Steel works, blast furnaces (including coke ovens), rolling mills	X	X				X		X
other	Invalid or blank SICs[2]	X			X	X	X	X	X
2851	Paints, varnishes, lacquers, enamels, and allied products		X		X			X	
2822	Synthetic rubber			X		X			
3721	Aircraft		X				X		
3674	Semiconductors and related devices		X				X		
4953	Refuse systems		X	X					
2819	Industrial inorganic chemicals, NEC		X	X					
2869	Industrial organic chemicals, NEC			X		X			
3331	Primary smelting and refining of copper					X			X

[1]Eight regional areas were identified by TNRCC for evaluation purposes. These area boundaries do not directly correspond to the TNRCC regions or the COG regions, although those regions are incorporated into the eight areas.
[2]Represents records where SICs were missing, not an attribute of the dataset, or was not a valid SIC.
Source: TNRCC, *Characterization of Regional Entities by Standard Industrial Classification Codes*, January 25, 2000.

TABLE C-4
Hazardous Waste Treatment and Disposal Technologies for Which Sufficient Capacity Exists to Meet Demand in 2002[1] Excluding Landfills (Tons)

Waste Management Technology	1999 Capacity[2]	Reserve Capacity[3]	Demand Forecast 2002 Total[4]	Remaining Available Capacity[5]
Low Temperature Metals Recovery	98,165	19,635	27,310	51,220
High Temperature Metals Recovery				
Mercury Retorting	1,200	240	150	810
Lead	63,000	12,600	3,000	47,400
Catalyst	11,820	2,365	2,380	7,075
Solvent Recovery	131,330	26,270	36,450	68,610
Incineration-Liquids/Cement Kilns[6]	442,670	88,535	237,120	117,015
Incineration-Solids and Sludges	124,000	24,800	81,180	18,020
Incineration-Gases	520	105	410	5
Sludge Treatment	400	80	140	180
Stabilization and Encapsulation	953,800	190,760	115,670	647,370
Deep-Well Injection	1,430,945	286,190	380,930	763,825
Fuel Blending	530,590	106,120	102,610	321,860
Aqueous Inorganic Treatment				
Precipitation	30,400	6,080	2,350	21,970
Oxidation	178,000	35,600	510	141,890
Neutralization	2,090	420	470	1,200
Aqueous Organic Treatment				
Chemical Oxidation	4,100	820	90	3,190
Neutralization	5,000	1,000	0	4,000
Other	53,255	10,650	14,100	28,505
Other Treatment				
Controlled Reaction	960	190	0	770
Deactivation	220	45	0	175

[1]Does not include wastes from out of state.
[2]Capacity estimated based on permitted, interim status and exempt facilities in Summer 1999
[3]Senate Bill 1099 requires that an appropriate reserve capacity be considered. This is calculated at 20 percent of 1999 capacity for each technology.
[4]Demand includes hazardous and nonhazardous wastes managed at hazardous waste management facilities
[5]Includes one cement kiln authorized to burn approximately 236,500 tons per year of mostly aqueous hazardous wastes.

TABLE C-5
Commercial Hazardous Waste Landfill Capacity in 2002[1] (Cubic Yards)

Scenario	Constructed Capacity Available in 2002	2002 Projected Medium Demand	Constructed Capacity Remaining at end of 2002	Permitted Unconstructed Capacity Remaining	Reserve Capacity[2]	Remaining Available Capacity[3]
Scenario 1: 100% Scenario[4] All Hazardous and 100% of Nonhazardous	523,840	226,900	296,940	10,952,700	2,249,930	8,999,710
Scenario 2: 50% Scenario[5] All Hazardous and 50% of Nonhazardous	715,250	164,130	551,120	10,952,700	2,300,760	9,203,060

[1]Does not include wastes from out of state.
[2]Calculated at 20 percent of permitted commercial capacity. In 2003, permitted capacity includes 10.9 million cubic yards of unconstructed capacity plus unutilized constructed capacity remaining at the end of 2002.
[3]Based on available permitted capacity after 2002 plus remaining permitted capacity minus reserve capacity.
[4]Assumes 100 percent of remediation sludges, characteristic waste treatment residues, and incinerator ash and stabilization treatment residuals will be disposed of in hazardous waste landfills.
[5]Assumes 50 percent of remediation sludges, characteristic waste treatment residues and incinerator ash and stabilization treatment residues will be disposed of in hazardous waste landfills.

TABLE C-6
Hazardous Waste Treatment Technologies for Which In-State Capacity (Tons) May Not Be Sufficient to Meet Demand in 2002

Waste Management Technology	1999 Capacity	Reserve Capacity	Projected 2002 Total Demand	Remaining Available Capacity
Zinc Recovery	32,000	64,000	131,630	(106,030)
Other Recovery	0	0	5,330	(5,330)
Aqueous Inorganic				
Reduction	0	0	90	(90)
Other	0	0	590	(590)
Aqueous Organic				
Biological Treatment	0	0	1,170	(1,170)
Other Treatment				
Neutralization of Sludges and Solids	0	0	390	(390)
Other	0	0	4,610	(4,610)

Table C-7
Comparison of 2000 Class 1 Nonhazardous Waste Disposal Capacity with Medium-Demand Forecast for Commercial Facilities (tons)[1]

Waste Management Technology	2000 Capacity[2]	Reserve Capacity[3]	Medium-Demand Forecast 2004 Total[4]	Remaining Available Capacity[5]
Deep-Well Injection	1,855,060	371,010	13,220	1,487,830
Landfarm	0	0	7380	(7,380)[6]
Landfill	See Table C-8			

[1]Does not include wastes from out of state.
[2]Capacity estimated based on permitted facilities as of January 2000.
[3]Reserve capacity is calculated at 20 percent of capacity for each technology.
[4]Demand includes Class 1 wastes and Class 1 residuals generated from the treatment of hazardous waste that are expected to be disposed of at Class 1 waste disposal facilities.
[5]Calculated based on 2000 capacity minus reserve capacity minus demand.
[6]It is expected that demand will continue to be met by out-of-state facilities.

Table C-8
Commercial Class 1 Nonhazardous Landfill Capacity, End of 2004 (Cubic Yards)

Scenario	2004 Projected Medium Demand	Reserve Permitted Capacity End of 2004[1]	Remaining Available Permitted Capacity End of 2004[2]
Scenario 1: 100% Scenario[3]	642,595	5,060,400	20,241,585
Scenario 2: 50% Scenario[4]	570,105	5,125,215	20,500,855

[1]Calculated at 20 percent of permitted commercial capacity.
[2]Based on available permitted capacity after 2004, which may include both constructed and unconstructed capacity, minus reserve capacity. It is assumed that construction of permitted landfill capacity will occur as needed to meet demand.
[3]Assumes 100 percent of remediation sludges, characteristic waste treatment residues, and nonhazardous waste sent to Class 1 waste landfills in the baseline year will be disposed of at commercial nonhazardous waste landfills.
[4]Assumes 50 percent of remediation sludges, characteristic waste treatment residues, and 100 percent of nonhazardous waste sent to Class 1 waste landfills in the baseline year will be disposed of at commercial nonhazardous waste landfills.

Appendix D
Municipal Solid Waste Disposal

FIGURE D-1

Number of Municipal Solid Waste Landfills by County 1998

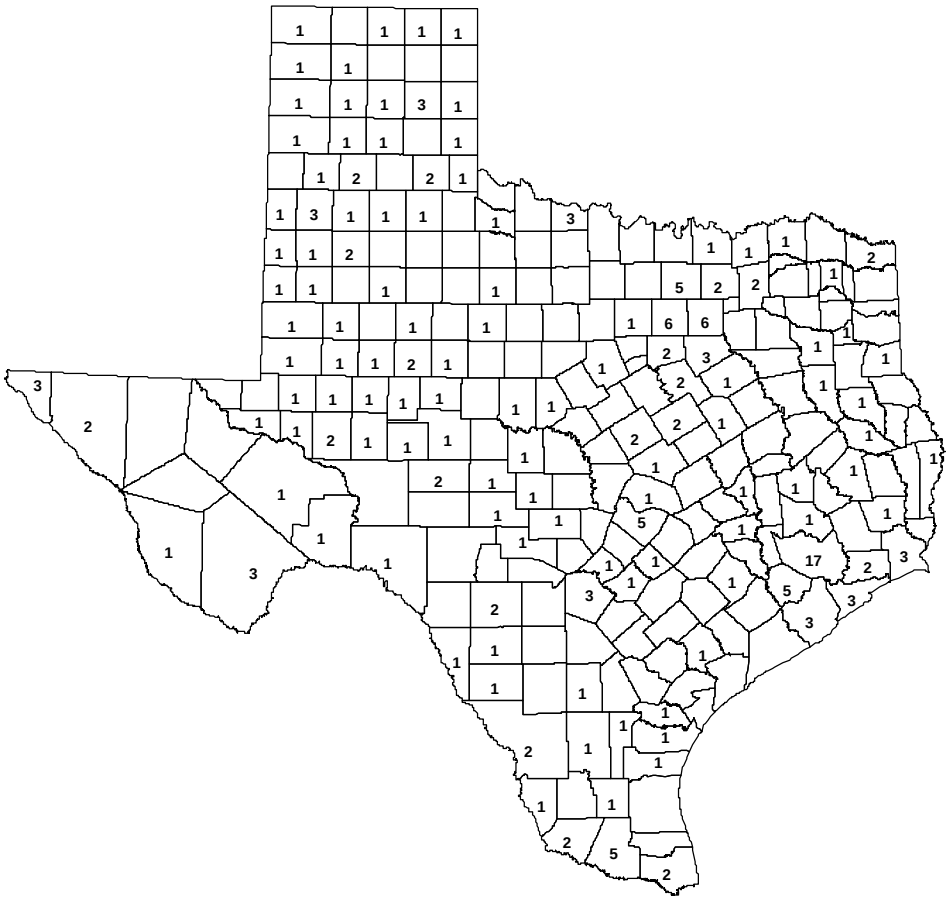
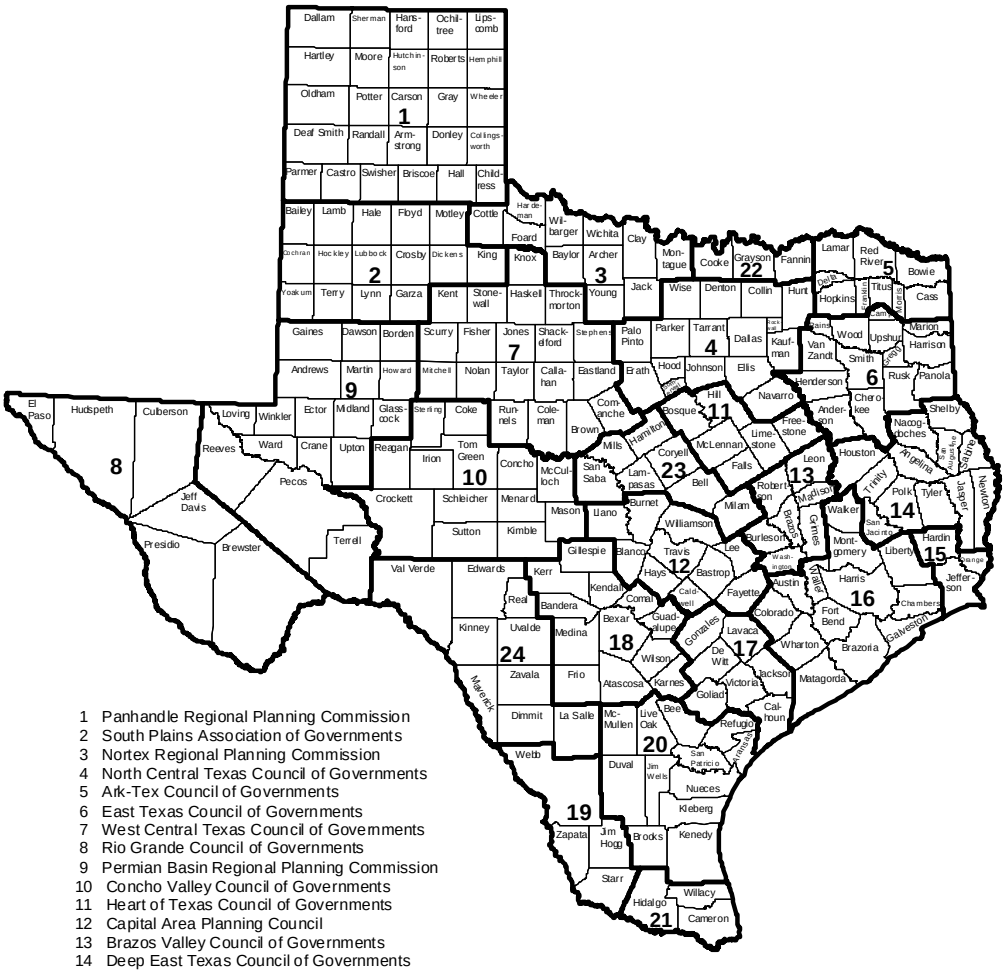


TABLE D-1
1998 MSW Landfill Disposal in Texas by COG Region

COG	Number of Landfills	Disposal (Tons)	Remaining Capacity (end of 1998)		
			Tons	Years (Based on 1998 annual disposal amount)	Years[1] (Based on 1998 Per Capita Disposal and Projected Population Growth)
1	23	439,723	24,434,709	56	45
2	14	385,428	68,438,671	178	177
3	4	216,815	5,186,311	24	22
4	29	6,982,587	194,540,930	28	16
5	4	305,452	5,360,253	18	16
6	4	564,154	17,723,748	31	26
7	8	300,094	34,788,667	116	121
8	9	304,526	8,506,233	28	17
9	14	389,893	48,906,410	125	85
10	11	124,228	6,470,096	52	38
11	5	433,186	37,326,369	86	84
12	7	1,867,399	49,518,760	27	19
13	2	184,250	2,858,815	16	13
14	4	206,712	17,478,852	85	79
15	4	536,020	17,097,807	32	34
16	33	6,000,485	99,972,378	17	12
17	1	117,785	4,962,678	42	40
18	7	2,144,591	50,009,341	23	18
19	5	286,744	1,316,324	5[2]	2[2]
20	7	563,185	4,705,273	8[3]	6[3]
21	7	571,593	7,158,469	13	8
22	2	51	3,272,036	>100[4]	>100[4]
23	3	252,465	4,061,222	16	13
24	6	82,059	2,207,795	27	21
Totals	**213**	**23,259,425**	**716,302,147**	**31**	**24**

[1] Assumes that all waste generated within each region has and will continue to be disposed of in that region, with no importation or exportation of waste. This is not the case in many regions, and the individual regional estimates are provided for comparison purposes only.
[2]Expansion to the Laredo Landfill will extend the available capacity for the region. In addition, several possible new landfills are being considered for this region.
[3]Newly permitted landfills will extend the available capacity for the region.
[4]A partially active landfill in COG Region 22 is expected to begin full operations again, so the 51 tons of disposal for 1998 will increase in the future. Using 1995 disposal data for the region, it is estimated that the region would still have 18-20 years of remaining capacity.

FIGURE D-2
Texas Regional Councils of Governments (COGs)



1 Panhandle Regional Planning Commission
2 South Plains Association of Governments
3 Nortex Regional Planning Commission
4 North Central Texas Council of Governments
5 Ark-Tex Council of Governments
6 East Texas Council of Governments
7 West Central Texas Council of Governments
8 Rio Grande Council of Governments
9 Permian Basin Regional Planning Commission
10 Concho Valley Council of Governments
11 Heart of Texas Council of Governments
12 Capital Area Planning Council
13 Brazos Valley Council of Governments
14 Deep East Texas Council of Governments
15 South East Texas Regional Planning Commission
16 Houston-Galveston Area Council
17 Golden Crescent Regional Planning Commission
18 Alamo Area Council of Governments
19 South Texas Development Council
20 Coastal Bend Council of Governments
21 Lower Rio Grande Valley Development Council
22 Texoma Council of Governments
23 Central Texas Council of Governments
24 Middle Rio Grande Development Council

TABLE D-2
Scenarios for Future MSW Generation and Landfill Disposal

Year	1998	2000	2005	2010	2015	2020	2025	2030
Scenario 0: yearly disposal amount remains unchanged at the 1998 level								
Disposal (tons)	23,259,425	23,259,425	23,259,425	23,259,425	23,259,425	23,259,425	23,259,425	23,259,425
Capacity (tons)	716,302,147	669,783,297	553,486,172	437,189,047	320,891,922	204,594,797	88,297,672	(27,999,453)
Remaining capacity reaches zero in 2029								
Year	1998	2000	2005	2010	2015	2020	2025	2030
Population[1]	19,759,614	20,344,798	22,163,392	24,128,862	26,303,320	28,684,972	31,230,859	33,912,528
Scenario 1: accounts for increases in population; per capita disposal rate remains unchanged at the 1998 level								
Disposal (tons)	23,259,425	23,947,862	26,088,529	28,402,083	30,961,638	33,765,081	36,761,844	39,918,437
Pounds/person/day	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45
Capacity (tons)	716,302,147	668,750,834	542,589,524	405,206,216	255,517,135	92,298,618	(85,517,076)	(278,796,074)
Remaining capacity reaches zero in 2023								
Scenario 2: accounts for increases in population; recycling rate increases to 40% by 2005, with a corresponding reduction in the per capita disposal rate								
Disposal (tons)	23,259,425	23,441,849	24,158,097	26,300,460	28,670,619	31,266,619	34,041,636	36,964,656
Pounds/person/day	6.45	6.31	5.97	5.97	5.97	5.97	5.97	5.97
Capacity (tons)	716,302,147	669,506,020	550,057,496	422,839,923	284,227,147	133,086,051	(31,572,097)	(210,549,336)
Remaining capacity reaches zero in 2025								
Scenario 3: accounts for increases in population; recycling rate increases to 50% by 2005, with a corresponding reduction in the per capita disposal rate								
Disposal (tons)	23,259,425	22,320,672	20,046,975	21,824,759	23,791,575	25,945,799	28,248,575	30,674,168
Pounds/person/day	6.45	6.01	4.96	4.96	4.96	4.96	4.96	4.96
Capacity (tons)	716,302,147	671,179,721	566,434,008	460,865,779	345,841,534	220,420,985	83,783,659	(64,735,996)
Remaining capacity reaches zero in 2027								

[1]Texas State Data Center, July 1999 (1.0 Growth Scenario)

Note - All scenarios assume that no new disposal capacity would be permitted. Also, it is unlikely that there will be a direct one-for-one correlation between an increase in the recycling rate and a decrease in the per capita disposal rate.

Endnotes

Endnotes

1. BioCycle. *Annual State of Garbage in America Report*, April 1999.

2. United States Environmental Protection Agency. *Characterization of Municipal Solid Waste in the United States* (EPA530-Recommendation-98-007), May 1998.

3. Biocycle

4. Southern States Energy Board. *Economic Benefits of Recycling in Southern States*, 1995.

5. Texas Natural Resource Conservation Commission. *Illegal Dumping Assessment of Impacts on County Governments in the Texas-Mexico Border Region*, AS-138, July 1997.

PUBLICATIONS MC 195
TEXAS NATURAL RESOURCE
CONSERVATION COMMISSION
P O BOX 13087
AUSTIN TX 78711-3087

SFR-042/01

December 2000