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Needs Assessment for Commercial Management Capacity of Hazardous Waste in Texas: 2002 Update

Prepared by
Strategic Assessment Division

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Executive Summary

Background

In 1991, the 72nd Legislature directed the Texas Water Commission, now the Texas Commission on Environmental Quality (TCEQ), to conduct a biennial assessment of the need for commercial capacity to manage hazardous wastes generated in Texas. Section 361.0232 of the Texas Health and Safety Code specifies that in making the assessment, the TCEQ must consider the need for various technologies for commercial waste treatment and disposal, and must evaluate the need on a technology-by-technology basis.

This assessment report addresses the need for commercial management of hazardous wastes generated in Texas. Hazardous wastes are defined under state law as those wastes designated as hazardous under the federal Resource Conservation and Recovery Act (RCRA).

The 2002 update of the Needs Assessment provides an analysis of expected trends in commercial management of hazardous waste from 1999 to 2004. Determining the need for capacity to manage hazardous waste in Texas involves two issues:

- For the next three to five years, what will be the demand for commercial capacity to manage Texas-generated hazardous waste?
- What is the current commercial capacity in Texas for managing hazardous waste?

Factors Affecting the Estimate of Demand

The demand for commercial capacity to manage hazardous waste is an estimate based on the most reasonable assumptions about future activities. Since certain identifiable factors may increase or decrease the future demand for commercial hazardous waste management capacity, the TCEQ has developed three scenarios, based on low, medium, and high demand. These scenarios analyze how a commercial demand forecast for the year 2004 is sensitive to assumptions about future events.

The medium-demand scenario is considered the most likely to occur, and the critical assumptions used to develop this scenario are presented in Table ES-1. The assessment of need is based on a comparison of capacity and demand under the medium-demand scenario.

The critical future events that were varied in the low- and high-demand scenarios pertain to the following factors:

- the source reduction percentage that might be achieved by generators for their commercially managed wastes by 2004,
- the quantity of waste generated from Superfund site cleanups or other one-time cleanups, and
- the percentage of landfillable nonhazardous waste that might be disposed of at hazardous waste landfills.

Both the low- and high-demand scenarios are based on information available at this time and are considered possible but unlikely. The projection of demand was calculated using the most recent data available in a computerized format that has been reviewed by TCEQ staff.

While the baseline data used to estimate demand for this report reflects the management of hazardous waste under the current regulatory environment, the U.S. Environmental Protection Agency (EPA) is in the process of evaluating several initiatives that are expected to affect future demand for hazardous waste management. Among these issues are the following:

- the Hazardous Waste Identification Rule for process-generated wastes;
- emissions standards for boilers and industrial furnaces; and
- identification and regulation of newly listed wastes, including dye and pigment production wastes, chlorinated aliphatics, wastes from paint production, and inorganic chemical industry wastes.

Although the impact of these regulatory initiatives cannot be addressed at this time, TCEQ staff will incorporate the impact of new regulations promulgated by the EPA into future updates of this assessment report.

Another factor that affects demand for capacity in Texas on a daily basis is the interstate movement of hazardous waste. Texas' commercial management facilities accept waste from out-of-state generators, while Texas generators ship waste to facilities outside the state. This assessment focuses primarily on the issue of whether enough capacity is available in Texas to manage the hazardous wastes generated in Texas. However, a limited analysis of the impacts of wastes from out-of-state generators on Texas commercial capacity is provided.

Table ES-1
Assumptions Used in
Needs Assessment for 2004 Medium-Demand Forecast

A. Capacity Assessment Assumptions	
1.	Capacity estimates include only waste management units that are permitted, interim status (i.e., able to operate under temporary authorization), or, if a permit is not required, that are built and currently operating or will be in the near future.
2.	Only the permitted landfill capacity that could reasonably be expected to be constructed by 2004 was included.
3.	The capacities of units at commercial facilities used to manage only on-site generated wastes were not included in this assessment. For example, the landfills at Safety Kleen and Chemical Waste Management were not included in the commercial landfill capacity totals, since these landfills are not available for use by other generators in the state.
4.	This assessment does not evaluate the capacities of out-of-state facilities, some of which may manage wastes generated in Texas.

B. Demand Projection Assumptions	
1.	Source reduction projections were incorporated into the 2004 demand forecast by using projection information reported to the TCEQ by generators in *Annual Source Reduction and Waste Minimization Executive Summaries and Progress Reports (SR/WM Plans)*.
2.	The estimate of recurrent generation of newly regulated hazardous wastes (i.e., waste not or only partially restricted from land disposal during the baseline year) that will require commercial management in 2004 is a lower bound estimate. The estimate is based on reviewing notices of registration (NORs) on file at the TCEQ to identify waste streams with newly regulated EPA waste codes and is not adjusted to account for noncompliance with the notification requirements by generators of these wastes.

(continued)

Table ES-1
Assumptions Used in
Needs Assessment for 2004 Medium-Demand Forecast (Continued)

B. Demand Projection Assumptions (Continued)	
3.	It is assumed that an on-site treatment policy is successfully implemented for the state and federal Superfund programs. Based on this policy, total commercial demand from Superfund sites, including treatment of residuals and disposal of nonhazardous waste at hazardous waste facilities, is projected at approximately 1,794 tons between 1999 and 2002.
4.	Waste generation estimates from the Corrective Action and Voluntary Cleanup programs were based on limited data. The estimates reflect the data currently on file. The TCEQ will review and update these estimates in the future as additional information becomes available.
5.	The impacts of proposed rules or potential regulatory changes that may affect the demand for commercial capacity could not be evaluated at this time. These proposed rules include, but are not limited to: the Hazardous Waste Identification Rule for process-generated wastes, gasification rule, and emissions limits for boilers. These issues will be addressed in future needs assessments after the proposed rules are finalized and impacts can be assessed.
6.	To account for increases in waste generation due to statewide industrial growth, 1999 data were adjusted based on generators' estimates of future hazardous waste generation. A 34 percent economic growth rate was used to calculate growth in demand for facilities that did not project future waste generation rates.[1]
7.	It is assumed that wastes managed on site will continue to be managed on site in 2004, unless the wastes land disposed at the generator's facility in 1999 will have to meet land disposal restriction treatment standards prior to disposal by 2004. These wastes were assumed to go to commercial management facilities unless on-site options are currently available.
8.	Closure of units generating smaller quantities of waste (under 1,000 tons) are expected to continue at 1999 levels.

[1] Texas Gross Product Detail: Calendar Years 1970-2020, Spring 2002 State Comptroller's Economic Forecast.

Will There Be Enough Commercial Capacity in 2004?

Based on reported information and data modeling, Texas' commercial facilities are projected to have adequate capacity for the hazardous wastes generated in Texas in a number of technology categories. Technologies in which there is projected to be adequate capacity in Texas in 2004 are identified in Tables ES-2 and ES-3. Table ES-4 identifies technologies where there will **not** be sufficient capacity in Texas in the year 2004 under the medium-demand scenario to manage the hazardous wastes generated by Texas industries, businesses and institutions.

The statewide demand for some of the technologies in which a capacity shortage has been identified does not appear to be great, and only a limited number of facilities may be available nationally to manage these wastes. With the exception of zinc and catalyst recovery, most of these needs are small and/or there are other alternative methods of treatment or disposal. Currently, some of these needs may be met by shipping waste to facilities out of state or out of the country[2]. Table ES-4 lists the recycling and treatment technologies for which there is a statewide need, based on the medium-demand scenario and the in-state capacity available as of Spring 2002.

[2]This assessment does not evaluate the capacity or demand in this region of the U.S. or the nation as a whole.

Table ES-2
Technologies Where Sufficient Capacity Exists to Meet Demand in 2004[1] (Tons), Excluding Landfill

WASTE MANAGEMENT TECHNOLOGY[2]	2002 Capacity[3]	Reserve Capacity[4]	Medium-Demand Forecast 2004 Total[5]	Remaining Available Capacity[6]
Low Temperature Metals Recovery	185,685	37,137	10,415	138,133
High Temperature Metals Recovery				
Mercury Retorting	1,200	240	135	825
Lead	63,000	12,600	2,851	47,549
Solvent Recovery	131,330	26,266	38,718	66,346
Incineration-Liquids	234,801	46,960	76,332	111,509
Incineration-Solids and Sludges	119,881	23,976	47,393	48,512
Energy Recovery[7]	236,529	47,306	183,327	5,896
Sludge Treatment	417	83	61	272
Stabilization and Encapsulation	1,355,289	271,058	40,448	1,043,784
Landfill	See Table ES-3			
Deep-Well Injection	828,100	165,620	78,643	583,837
Fuel Blending	530,591	106,118	152,695	271,778
Aqueous Inorganic Treatment				
Precipitation	30,400	6,080	105	24,215
Oxidation	20,928	4,186	123	16,619
Neutralization	2,085	417	552	1,116
Aqueous Organic Treatment				
Biological Treatment	22,855	4,571	3,195	15,089
Chemical Oxidation	4,092	818	0	3,274
Neutralization	5,000	1,000	0	4,000
Other	30,400	6,080	1,521	22,799
Other Treatment				
Controlled Reaction	958	192	117	649
Deactivation	402	80	77	245
Specific Waste Exclusions[8]			46,587	

[1]Does not include wastes from out of state.
[2]Technologies where there is neither demand nor capacity in the State are not included in this table.
[3]Capacity estimated based on permitted, interim status and exempt facilities in Spring 2002.
[4] Section 361.0232 of the Texas Health and Safety Code requires that an appropriate reserve capacity be considered. This is calculated at 20 percent of 2002 capacity for each technology.
[5]Demand includes hazardous and nonhazardous wastes managed at hazardous waste management facilities.
[6]Calculated based on 2002 capacity minus reserve minus demand.
[7]Includes one cement kiln authorized to burn approximately 236,500 tons per year of mostly aqueous hazardous wastes.
[8]Includes but not limited to Precious Metal Recovery, Battery Recovery, and Universal Waste. See section 2.4.

Table ES-3
Technologies Where Sufficient Capacity Exists to Meet Demand in 2004[1] (Cubic Yards)
Landfill Only

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	1,789,926	97,252	1,692,674	10,412,000	2,420,935	9,683,739
Scenario 2: 50% Scenario[5]						
All Hazardous and 50% of Nonhazardous	1,839,488	71,028	1,768,460	10,412,000	2,436,092	9,744,368

[1]Does not include wastes from out of state.

[2]Calculated at 20 percent of permitted commercial capacity. In 2002, permitted capacity includes 10.9 million cubic yards of unconstructed capacity plus unutilized constructed capacity remaining at the end of 2004.

[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 residuals will be disposed of in hazardous waste landfills.

Table ES-4
Technologies Where Capacity Shortages Are Expected in 2004, Based on Capacity Available in 2002

WASTE MANAGEMENT TECHNOLOGY	1999 CAPACITY (tons)	RESERVE CAPACITY (tons)	PROJECTED 2002 TOTAL DEMAND(tons)	REMAINING AVAILABLE CAPACITY (tons)
Zinc Recovery	0	0	55,323	(55,323)
Catalyst Recovery	8,820	1,764	14,162	(7,106)
Industrial Furnace	0	0	4,531	(4,531)
Other Recovery	0	0	4,678	(4,678)
Land Treatment	0	0	127	(127)
Aqueous Inorganic				
Reduction	0	0	14	(14)
Other	0	0	1,884	(1,884)
Other Treatment				
Neutralization of Sludges and Solids	0	0	394	(394)
Other	0	0	688	(688)

Forecasting results are highly dependent upon the assumptions used to develop projections. The medium-demand forecast presented in the executive summary is based on information available at this time and the most reasonable assumptions about regulatory impacts and waste management practices in the future. Due to uncertainties about future events, high- and low-demand scenarios were developed to provide an upper and lower bound to the demand projections. The major assumptions in the high- and low-demand scenarios that are different from the medium-demand scenario are as follows:

High Demand

- 100,000 tons of additional waste will be generated from Superfund activities or other one-time remediation projects.
- All hazardous waste that is classified as nonhazardous after treatment will be disposed of in a commercial hazardous waste landfill.

The difference in available capacity between the medium- and high-demand scenarios is that in addition to the nine technology categories identified as

having insufficient capacity under the medium-demand scenario, the high-demand scenario forecasts there will be a shortage in sludge/solid incineration capacity in 2004.

Low Demand

- All facilities that did not provide source reduction data to the TCEQ will achieve a 50 percent reduction in waste generation by 2002 due to source reduction activities.
- Waste generated from remediation activities at Superfund sites is managed over a two-year period rather than a four-year period, thereby decreasing demand in the year 2004.
- All hazardous waste that is classified as nonhazardous after treatment will be disposed of in a nonhazardous waste landfill and will not use available hazardous waste landfill capacity.

Demand for almost all technologies decreases under the low-demand scenario. However, there is still insufficient capacity for the nine technology categories identified as having insufficient capacity under the medium-demand scenario.

Chapter 1: Introduction

In 1991, the 72nd Legislature directed the Texas Water Commission, now the Texas Commission on Environmental Quality (TCEQ), to conduct a needs assessment for commercial hazardous waste management capacity. Section 361.0232 of the Texas Health and Safety Code specifies that in conducting the assessment, the TCEQ consider the need for various technologies for commercial waste management and evaluate the need on a technology-by-technology basis. The Needs Assessment addresses the need for commercial management capacity for hazardous wastes generated in Texas. Hazardous wastes are defined under state law as those wastes designated as hazardous under the federal Resource Conservation and Recovery Act (RCRA)[6].

1.1 Purpose and Organization of Report

On October 25, 1994, the Commissioners adopted rules (Chapter 281.30 Applicability of Prioritization Procedure for Commercial Hazardous Waste Management Facility Permit Applications) that define how the TCEQ is to expedite the processing of applications for commercial capacity needed on a statewide basis. Under the 1994 rule, TCEQ, when prioritizing resources to process a permit application, must take into consideration whether the technology for which the applicant is requesting a permit is a needed technology. The determination as to whether a technology is needed is based on the results presented in the Needs Assessment. Technologies for which capacity shortages are expected in the projection year are considered needed technologies. This fifth update to the 1992 needs assessment provides more current information on commercial hazardous waste management capacity available in 2002. The demand projections included in this assessment have also been revised. In the previous five assessments, the TCEQ based demand projections on 1989, 1993, 1995 and 1997 waste management activities. This assessment of 2004 demand is based on 1999 data, to anticipate how Texas generators are likely to manage their hazardous waste in the future.

In 1991, the Commissioners appointed a task force to advise agency staff on the development of various environmental policy issues, including waste management, needs assessment, RCRA permit processing, and pollution prevention. Task Force 21 consisted of representatives from environmental groups, small businesses, large industrial generators, consulting firms representing industry, and local citizen groups. In a series of meetings in the fall of 1991, Task Force 21 representatives reached consensus on the assumptions used in developing the Needs Assessment. Although some of the methodologies have changed to reflect the availability of more recent data and other regulatory factors, the underlying components factored into the demand projections have not changed.

[6] Nonhazardous waste demand is addressed only as it impacts the availability of hazardous waste management capacity.

Chapter 2 of the Needs Assessment provides detailed information on the commercial management of hazardous wastes generated in Texas in 1999. Chapter 3 compares 2004 projected commercial demand to 2002 available capacity for a most reasonable or medium-demand scenario. Chapter 4 presents low- and high-demand scenarios. The low- and high-demand scenarios were developed to analyze how a 2004 commercial demand forecast is sensitive to assumptions about future events.

1.2 Capacity and Demand

The 2002 update of the Needs Assessment provides an analysis of expected trends in commercial management of hazardous waste from 1999 to 2004. Determining the need for capacity to manage hazardous waste in Texas involves two issues:

- For the next three to five years, what will be the demand for commercial capacity to manage Texas-generated hazardous waste?
- What is the current commercial capacity in Texas for managing hazardous waste?

1.2.1 Capacity

For purposes of this assessment, capacity is defined as the quantity of waste that a management facility can handle in a year[7]. Capacity to manage waste is limited either by permit conditions, operating practices, or size of the unit. Capacity is assessed by waste management category. These categories are based on technologies that are used to treat, dispose, or store the different assortments of hazardous waste. In a few cases, the categories are further subdivided to reflect the need for specific technologies to manage certain waste streams. For example, high temperature metals recovery includes technologies to recover mercury, lead, zinc, or catalysts. Appendix 2 lists the waste management categories addressed by this assessment and discusses the technologies in each category.

The capacity estimates in this report are the capacities of permitted, interim status[8], or exempt units at commercial waste management facilities as of Spring 2002[9]. In some cases, facilities have permitted capacity that has not been built. Unbuilt capacity covered by a RCRA, Underground Injection Control (UIC), or TCEQ air permit is included if the facility operator has plans for construction of the unit by the end of 2003. If there is an operational limit on the amount of waste that can be handled, this operational limit has been taken into account when determining the capacity of the system.

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[7] Capacity is expressed in tons per year, except for landfill capacity. Landfill capacity is typically not limited by the quantity of waste that can be handled within a year, but by the remaining permitted capacity.

[8] An interim status facility is one that is operating under a temporary authorization until a decision on the permit application is made. By filing the necessary documentation, facilities are able to obtain interim status authorization for waste management activities they were conducting before the effective date of a regulation.

[9] Landfill capacity is based on constructed capacity as of Spring 2002 plus capacity expected to be constructed between 2002 and 2004.

1.2.2 Demand

For purposes of this assessment, demand is defined as the quantity of waste that is expected to require commercial management in 2004. Demand is reported in tons per year by waste management category. The selection of 2004 as the projection year for this needs assessment is based on the fact that it typically takes several years from the initiation of a permit application to the construction and operation of a facility. An immediate, but temporary demand for capacity is not relevant to the issue of long-term (i.e., the two- to five-year timeframe) need. Because the information from this assessment will be used in the prioritization of RCRA permit applications, the year selected for the projection period should correspond to the time needed to bring a facility from permitting to operation. On the other hand, the further into the future the projection year is set, the greater the uncertainty of the projection due to changes in industrial processes, waste management technologies, the economy, and regulations.

The 2004 forecast was developed by applying several assumptions to the 1999 data reported to the TCEQ by generators and handlers of hazardous waste. The 1999 data were selected because they were the most recently computerized and complete data available to the TCEQ at the time the forecasts were prepared. The major assumptions used to develop the 2004 forecast are briefly summarized below and explained in detail in Appendices 2 through 4:

1. Expected source reduction and waste minimization activities by Texas generators will reduce the quantity of hazardous waste requiring commercial treatment and disposal;

2. Federal regulations promulgated after 1999 will be implemented by generators over the five-year projection period and will result in changes in waste management practices that impact the demand for commercial treatment and disposal capacity; and

3. Changes in economic activity between 1999 and 2004 will impact the quantity of goods manufactured in Texas and the hazardous waste generated from manufacturing processes.

Demand includes all wastes generated in Texas that are shipped to commercial facilities (whether in state or out of state)[10]. The initial commercial demand analysis will focus only on the demand by Texas facilities. Later, in Chapter 3, a simple analysis of the impacts of wastes from out-of-state generators on Texas commercial capacity is included.

1.2.3 Reserve Capacity

Section 361.0232 (c) of the Texas Health and Safety Code requires the TCEQ to consider an appropriate reserve capacity when calculating the availability of commercial capacity for hazardous waste. This is to assure the continuity of hazardous waste management and an effective enforcement program while encouraging waste reduction, recycling, and recovery. The TCEQ calculated reserve capacity at 20 percent of the 2002 available capacity for all waste management categories.

1.3 Overview of Changes from 2000 Needs Assessment

This document updates the capacity estimates presented in the previous Needs Assessment update (*Needs Assessment for Hazardous Waste Commercial Management Capacity in Texas, 2000 Update*). Since preparation of the most recent update, many changes have occurred to commercial capacity in Texas. These include changes in permitted capacity, the commercial availability of capacity, and construction plans. The capacity estimates in this document reflect the commercial capacity expected to be available in 2004, based on capacity authorized as of Spring 2002[11]. In addition, the estimates include permit exempt capacity (i.e., recycling capacity) that is operating or that is expected to be operating before 2004.

Precious metal recovery, battery recovery, universal waste, as well as other specific waste type amounts are included in the demand for 2004. Much of this type of waste is treated in non-permitted facilities, even though they accept waste commercially, and capacity for these non-permitted facilities could not be readily determined. The 2004 demand for these waste streams are included in Table ES-2 as specific waste exclusions. A few of the categories of treatment technologies have been redefined to better fit the descriptions of treatment. For example, hazardous wastes shipped to cement kilns to be used as fuel have been moved to the category of energy recovery from the category of liquid incineration. In Texas, cement kilns are only authorized to incinerate liquid waste, not solids or sludges. This restriction is not necessarily applied to waste shipped out of state where solids or sludges might be burned for the purpose of energy recovery.

[10] Shipments to captive (noncommercial) facilities in or out of state are not included in commercial demand totals. Captive facilities are facilities which manage waste for a limited number of other generators and are typically owned or controlled by the same parent company. Shipments to specific types of facilities that are not permitted (recycling and other related activities) are included in the commercial demand totals.

[11] Landfill capacity is based on constructed capacity as of January 2002 plus capacity expected to be constructed between 2002 and 2004.

Finally, one large zinc waste stream and the facility where it was treated was determined to be a captured system and was removed from commercial demand and capacity projections.

Wastes shipped to landfills is reported in tons; however capacity for landfills is determined by using cubic yards. In previous reports, tons of waste shipped to landfills was multiplied by an average factor of 1.1889 to convert tons into cubic yards. It has been determined that commercial landfills that accept hazardous waste in Texas use a factor of 0.769 to convert tons into cubic yards. This number is based on an aggregate average of hazardous waste shipped for disposal such as contaminated soils and sludges. For the purpose of this report, the factor of 0.769 used by the industry is used to convert tons into cubic yards.

Future updates to the Needs Assessment will incorporate changes to demand, as well as capacity. Ongoing federal initiatives to redefine hazardous waste and how it may be managed are likely to have a significant impact on the future demand for waste management. Until these federal regulations are finalized, it is difficult to forecast how the demand for commercial hazardous waste management will be affected.

Chapter 2: Management and Generation of Commercial Hazardous Waste in 1999

This chapter describes commercial hazardous waste generation and commercial demand in 1999. The TCEQ applied the assumptions on future waste management activities summarized in Chapter 1 to the waste management data reported to TCEQ in 1999 to develop the 2004 forecast presented in Chapter 3.

2.1 Generation

In 1999, Texas industries and businesses reported generating approximately 63 million tons of hazardous waste. Of the hazardous wastes generated in Texas, 98 percent was aqueous. These aqueous wastes are primarily wastewaters that are either managed on site or pretreated on site and then sent to a wastewater treatment facility. Hazardous waste shipped to commercial management facilities totaled 689,266 tons, approximately 1 percent of the total waste stream. Of the waste managed at a commercial facility, just over 1 percent, or 7,308 tons, was considered one-time wastes generated by Superfund actions and other cleanup activities. Most of the one-time wastes are contaminated soils.

Since 1987, source reduction practices have reduced the quantity of hazardous waste generated. The Texas Solid Waste Disposal Act (Section 361.0231 (a) of the Texas Health and Safety Code) declares it to be the policy of the state that adequate capacity should exist for the proper management of industrial and hazardous waste generated in the state. “Adequate capacity” is the capacity necessary to manage the industrial and hazardous waste that remains after application, to the maximum extent economically and technologically feasible, of waste reduction techniques. Wherever feasible, the generation of hazardous waste is to be reduced as expeditiously as possible. This policy has resulted in the adoption of important initiatives by both government and industries.

2.2 Management

Hazardous wastes in Texas are managed on site by the generator, shipped to a captive facility, sent out of state, or managed in state by commercial facilities. On-site or captive facilities, excluding wastewater, managed approximately 25 percent (15,660,758 of the 63 million tons) of hazardous waste generated. Of the hazardous waste generated in Texas, 464,382 tons was shipped to commercial facilities in state, while 217,575 tons was sent to commercial facilities out-of-state. Overall, approximately 1 percent of the hazardous wastes generated in Texas were managed at commercial facilities in 1999. Of this commercially managed waste, 32.5 percent were managed in out-of-state commercial facilities.

Texas' commercial facilities use a wide variety of technologies to manage waste. Based on 1999 data, the most important commercial recovery or treatment technologies utilized in state by volume are deep-well injection, incineration, energy recovery, and fuel blending. Texas industries rely heavily on out-of-state commercial facilities for zinc recovery, energy recovery, landfill, incineration, fuel blending and other treatments. Table 1 identifies how Texas' wastes sent to commercial facilities in 1999 were managed.

Table 1
1999 Commercial Demand by Texas Wastes (Tons)

	Texas Waste Received by In-state Commercial Facilities	Texas Waste Shipped to Out-of-State Commercial Facilities	Total Commercial Demand[1]
DISPOSAL			
Landfill	3,398	24,248	27,646
Deep-well Injection	137,616	1,246	138,862
RECOVERY OR TREATMENT			
Energy Recovery / Cement Kilns[2]	88,272	34,691	122,963
Fuel Blending	79,690	13,123	92,813
Solvent Recovery	16,195	22,364	38,559
Metals Recovery	2,488	44,707	47,195
Incineration-Liquids	51,088	5,486	56,574
Incineration-Solids and Sludges	26,655	9,511	36,166
Stabilization	28,993	17,467	46,460
Other[3]	16,778	42,246	59,024
STORAGE	20,517	1,818	22,335
TOTALS	471,691	216,907	688,598

1 Total commercial demand equals sums of columns 1 and 2. These figures do not include wastes generated and managed on site at commercial hazardous waste management facilities or treatment train (i.e., secondary and follow-on treatment processes) volumes for out-of-state waste. For example, waste sent for fuel blending is followed by energy recovery. However, only the fuel blending quantity is included in this data. Treatment train volumes are included in the 2004 projection data.
2 This category now includes waste demand and available capacity reported in previous Needs Assessments as "liquid incineration."
3 Waste managed at other permitted and non-permitted treatments and recovery facilities including precious metal recovery, universal waste, and other waste specific categories.

2.3 Land Disposal Restrictions (LDR)—40 CFR Part 268

The Hazardous and Solid Waste Amendments (HSWA) were added to RCRA in 1984. This prohibited land disposal of hazardous waste unless there will be no migration of the hazardous constituents through the land and groundwater. EPA also established treatment standards for all listed and characteristic wastes, that will reduce their toxicity and make them safe to be placed on the land. Land disposal includes, but is not limited to, placement in a landfill, surface impoundment, waste pile, injection well, land treatment facility, underground cave or mine or placement in a concrete vault or bunker intended for disposal purposes. Hazardous waste is made less dangerous to groundwater in two ways: by reducing the toxicity through the destruction or the removal of the harmful constituents, or by reducing a waste's leachability by immobilizing the hazardous components. If the waste does not meet the treatment standards, it cannot be land disposed unless the EPA grants a variance, extension, or exclusion. The LDR program also has prohibitions and limits regarding the dilution and storage of wastes. Tracking and record keeping ensuring proper management are also requirements of the LDR program. Recycling activity and treatment prior to recycling are not regulated under the LDRs, only the storage prior to these activities. Waste from conditionally exempt small quantity generators, waste pesticide and container residues disposed of by farmers on their own land, newly identified or listed hazardous wastes for which EPA has yet to promulgate land disposal treatment standards, and certain low-volume releases and laboratory wastes that are mixed with a facility's wastewater are not subject to the requirements of LDR.

2.3.1 Landfill

Before waste is placed in a landfill, or "land disposed", the waste must first meet the requirements of the LDRs. The hazardous constituents in the waste must be at or below the treatment standards set forth in 40 CFR section 268.42. Regulations require that a permitted landfill be lined, be sited on a stable geologic formation, and allow for no migration of the hazardous constituents.

2.3.2 Stabilization and Immobilization

Treatments cannot destroy all types of contaminants found in hazardous waste. Wastes where the hazardous constituents may migrate or leach out into the groundwater are stabilized before being placed in a landfill or other land application. Unlike organic compounds, metal elements cannot be broken down through combustion. Through stabilization, metal contaminants can be chemically and/or physically bound into the wastes that contain them. Some hazardous waste is added to cement, lime, fly ash or similar materials to reduce the mobility of the hazardous constituents and make the waste easier to handle. The option of stabilized hazardous waste being placed in a landfill for final disposal is considered in the calculations for waste associated with this technology for this report.

2.3.3 Metals Recovery

Metal recovery can be divided into two main categories: high temperature and low temperature recovery. Low temperature metal recovery could be as simple as precipitating the metal out of an aqueous solution. High temperature metal recovery includes retorting and smelting. Some wastes are incinerated and the metals are removed from the ash. Other specific types of metals recovery technology are ion exchange, reverse osmosis, and acid leaching. The category of metal recovery also includes catalyst recovery. To encourage reuse and recycling, TCEQ authorizes some metal recovery to be managed as precious metals recovery. See 2.4.2.

2.3.4 Solvent Recovery

Solvents are volatile organic compounds used in an industrial process to dissolve raw materials, products or waste materials or, when is used as a cleaning agent, to dissolve contaminants. Solvent recovery includes fractionation, distillation, thin film evaporation, and solvent extraction.

2.3.5 Fuel Blending

Some hazardous waste are volatile in nature and may be reprocessed into fuel. This is an intermediate treatment category where the waste, after being blended into fuel, is shipped off to be burned at an energy recovery unit. In this report the prospects of the different stages of energy recovery, stabilization, and land disposal are taken into consideration.

2.3.6 Energy Recovery—Cement Kilns

Some hazardous waste can be used as fuel to recover its energy content. Facilities using hazardous waste energy recovery include cement, aggregate, and asphalt kilns, as well as other kinds of furnaces, boilers, and ovens. In the State of Texas, only cement kilns burning liquid hazardous waste provide this type commercial capacity. These units were originally considered to be exempt from regulatory constraints as recycling units. The EPA determined that there was a need for regulatory action to control emissions and published the Maximum Achievable Control Technologies (MACT) Rule which promulgated standards for hazardous waste burning cement kilns. This waste stream demand and available capacity are included in the summery tables as "Energy Recovery." In previous reports it was located under the category of liquid incineration. Provided it meets the requirements of section 266.112 cement kiln dust from this technology may be stabilized and placed in a landfill or as an ingredient in the material being made at the kiln, such as cement. See Appendix 2 for a list of systems that use this technology.

2.3.7 Incineration of Liquids, Solids, Sludges

It is possible to burn hazardous waste at high temperatures, rapid oxidation, to destroy the organic constituents. It is also known as controlled-flame combustion or calcination. Ash from this treatment technology is generally stabilized, to meet the LDRs, and then placed in a landfill. See Appendix 2 for a list of systems that use this technology.

2.3.8 Deep-Well Injection

Deep-well injection is a liquid waste disposal technology. Injection wells place treated or untreated liquid waste into geologic formations that have no potential to allow migration of contaminants into potential potable water aquifers. Currently, in Texas hazardous waste cannot be injected into salt domes.

2.3.9 Other

There is an abundance of other technologies used to meet the LDR regulations. Other types of recovery include acid regeneration and nonsolvent organic recovery. Aqueous inorganic treatment involves chemical precipitation and chemical and nonchemical oxidation. Aqueous organic treatment includes biological treatment, carbon absorption, and oxidation. Sludge treatment encompasses sludge dewatering, addition of excess lime, and adsorption. Other treatments such as neutralization, evaporation, and settling reduce levels of hazardous waste constituents to meet the LDRs.

2.3.10 Storage

Waste should not be permanently stored and should receive proper treatment or disposal. Waste should be stored only for a temporary period to collect quantities necessary to facilitate proper precessing, disposal, or recycling. Because all waste is eventually treated or disposed of, for the purpose of this report, storage capacity was not considered.

2.4 Specific Waste Exclusions

Besides the technologies mentioned in section 2.3, there are other opportunities for the management of waste streams that meet certain criteria. These options encourage the reuse and recycling of materials by allowing waste to be managed under alternative regulations other than the LDRs. Due to the different requirements of permitting, reporting, and other regulations that impact these waste streams, demand and capacity are difficult to calculate. For example, capacity at many of the facilities that handle these specific types of waste is not readily known as they are not required to be permitted. Also, in some cases, a generator may ship a waste to a treatment or disposal facility in accordance with the LDRs, while in other cases, other generators ship the same type of waste to a recycler. In addition, a shipment of the waste to the recycler may not be required to be reported to the TCEQ. For the purpose of this report, specific waste demand calculations are based on amounts of wastes that generators reported in 1999 and shipped to known facilities that treat waste though recycling or other methods. Unless otherwise noted, the demand of specific types of waste falls under the category of “specific waste exclusions.”

2.4.1 Recyclable Materials Used in a Manner Constituting Disposal

Products containing recyclable materials intended for the general public that are used in a manner constituting disposal that is applied, or placed on the land, are not restrained by the LDRs. The recyclable materials contained in the product are not presently regulated if the recyclable materials have undergone a chemical reaction in the course of producing the product so as to become inseparable by physical means. This includes fertilizers produced for the general public's use provided they meet the applicable treatment standards in 40 CFR (Code of Federal Regulations), Subpart D of Part 268 for each recyclable material they contain. The use of any waste, used oil, or other material which is contaminated with dioxin or any other hazardous waste (other than a waste identified solely on the basis of ignitability), for dust suppression or road treatment is prohibited.

2.4.2 Recyclable Materials Used for Precious Metal Recovery

Various materials are reclaimed to recover economically significant amounts of gold, silver, platinum, palladium, iridium, osmium, rhodium, ruthenium, or any combination of these. This includes facilities that recover silver from photographic processing. Some hazardous waste is incinerated to allow precious metals to be removed from the ash. The ash then will form a new hazardous waste stream that would be treated or disposed under the LDR regulations. While hazardous wastes that will be reclaimed for their precious metal content are exempt from many regulations, these materials lose any applicable exemptions if they are accumulated speculatively.

2.4.3 Spent Lead-Acid Batteries Being Reclaimed

Spent lead-acid batteries that are reclaimed are considered a recyclable material. Generators, transporters, or persons collecting spent lead-acid batteries with the purpose of reclaiming the reusable components are not subject to regulation under 40 CRF parts 262 through 266 and 270.

2.4.4 Universal Waste Rule

Universal waste is defined as common hazardous waste that comes from diverse sources. The Universal Waste Rule was passed to ease regulatory burdens on businesses. In Texas, universal wastes include batteries, pesticides, thermostats, lamps (fluorescent, mercury vapor, high-pressure sodium, low-pressure sodium, metal halide, and incandescent), cathode ray tubes (CRTs), and paint and paint-related waste. The "Universal Waste Rule" creates special management standards for streamlining the collection of these wastes. Currently, Texas is the only state that allows for paint and paint-related waste to be handled under the Universal Waste Rule.

2.4.5 Military Munitions

By design, military munitions are meant to be applied to the land under live firings. If munitions are used in the intended manner they are not regarded as a solid waste. However, military munitions that are being stored for a purpose

other than what was intended or removed from their landing spot for subsequent management off-range, including the destruction of these munitions, are considered solid waste and are subject to all pertinent regulations.

2.4.6 Used Oil

Much of used oil comes from small quantity generators and from multiple sources and collection stations. Used oil and oil filters meeting certain criteria (not being mixed with a listed or characteristic hazardous waste) are not considered hazardous waste.

2.5 Imports and Exports

From 1984 to 1989, Texas exported more hazardous waste than it imported. In 1991, Texas became a net importer of hazardous waste. This trend has continued. Figure 1 shows the trend in imports and exports biennially from 1985 through 1999. In 1999, Texas facilities exported 258,145 tons (includes approximately 40,570 tons to captive facilities) and received 270,642 tons of hazardous waste from out-of-state.

Wastes from out of state accounted for approximately 35.5 percent of the total waste received at commercial facilities in Texas in 1999. The demand by out-of-state generators is not included in the estimate of 2004 demand presented in Chapter 3. However, a sensitivity analysis is presented in Section 3.6 to evaluate the effects of imports on capacity availability for the four waste management technologies that received the majority of imported waste in 1999.

Figure 1
Hazardous Waste Imports into and Exports out of Texas, 1985–1999

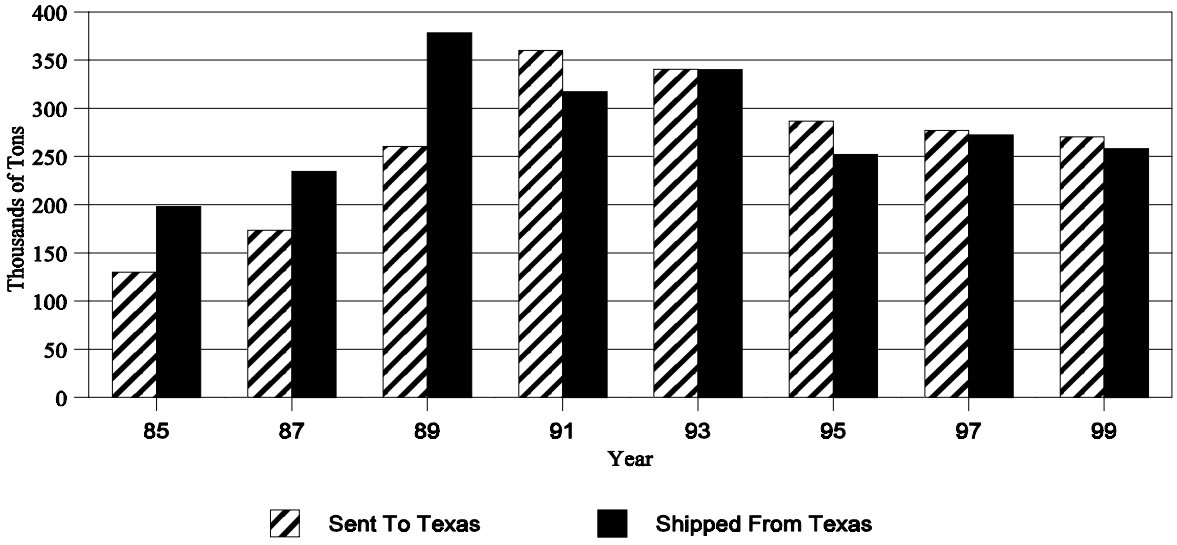
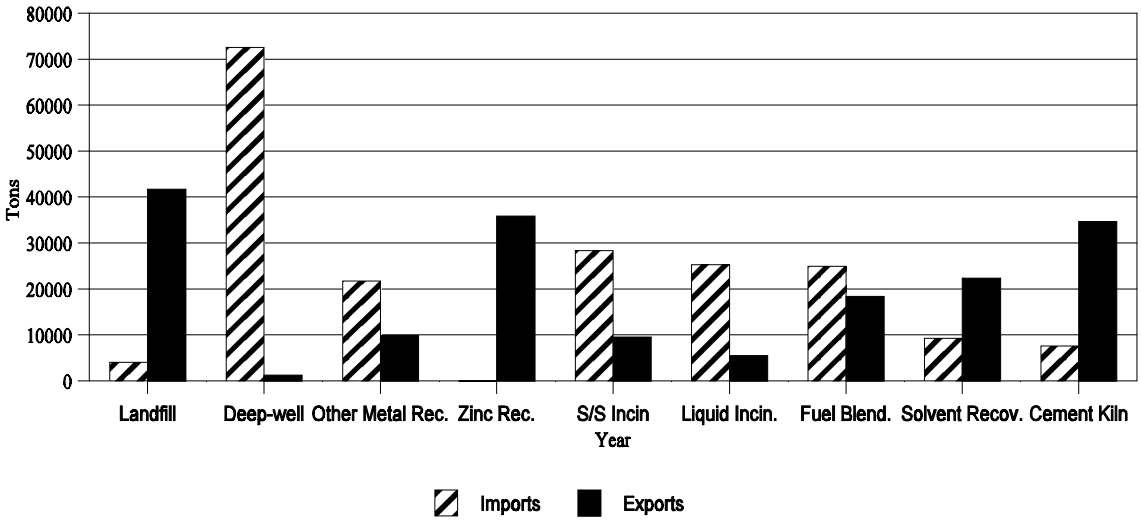


Figure 2 compares commercial imports and exports in 1999 for selected management categories. The availability of capacity in Texas drives the import and export totals for different waste management categories. In many cases, the wastes exported could not be managed by existing technologies available in state. However, sometimes there is interplay between the demand for different management technologies. For example, waste sent to cement kilns out of state could have been managed by in-state incinerators, but the generators chose to ship the waste out-of-state because of economic considerations.

Figure 2
Comparison of 1999 Commercial Imports into and Exports out of Texas in 1999—Selected Categories



2.6 Effects of Transportation

This report evaluates the need for commercial hazardous waste management facilities on a statewide basis. However, the regional need for such facilities may be different from the overall need. Many commercial facilities operate with only one or two types of technologies to treat or dispose of waste. Shipments to the nearest appropriate treatment or storage facility may be some distance from generators, even out-of-state in some cases.

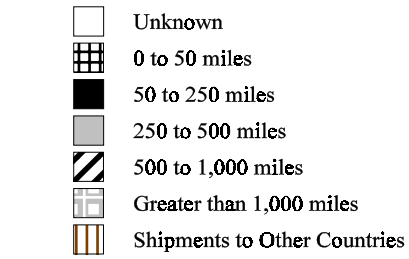
Based on site location information provided by facilities in their notice of registration, The number of road miles between generators and receivers was calculated. Table 2 shows the amount of waste, in tons, shipped across the state and exported out-of-state which includes amounts shipped to international destinations. The table represents hazardous waste generated in Texas and shipped to commercial hazardous waste management facilities only. Percentage of the distances that tons of hazardous waste traveled to commercial management facilities in 1999 is provided in Figure 3. As illustrated by this figure, the majority of hazardous waste shipped to

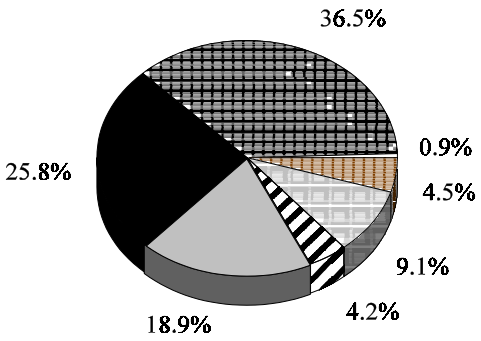
commercial waste management facilities travels within a 250 mile distance from the generator. While this shows that significant amounts of hazardous waste is shipped across Texas, it does not indicate the specific reason for the shipments. Factors such as available capacity, treatment methods, and price of treatment or disposal all affect the distance waste travels to its final destination. In section 3.2, Figure 4 shows the 2004 projected recurrent commercial hazardous waste medium-demand by county. This figure displays the distribution of waste generation across Texas, showing concentrations on the upper Gulf Coast and metropolitan areas such as Dallas-Ft. Worth.

Table 2
Hazardous Waste Shipped from Generators in Texas to Commercial Recycling, Treatment, and Disposal Facilities (Tons) in 1999

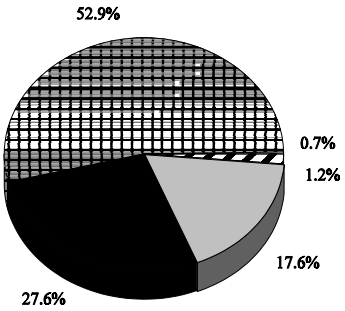
Road Miles Shipped	In-State Facilities	Out-of-State Facilities	Total
Unknown	3,400	2,400	5,800
0-50	245,600	5,100	250,700
50-250	127,900	49,400	177,300
250-500	81,600	48,000	129,600
500-1000	5,700	23,400	29,100
1000 or Greater		62,400	62,400
Shipments to Other Countries		31,000	31,000

Figure 3
Number of Road Miles Hazardous Waste Was Transported to Commercial Facilities in 1999

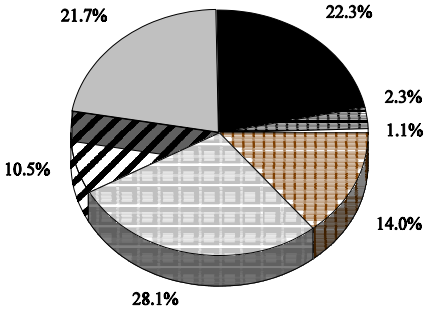




1999 Hazardous Waste Shipments to Commercial Facilities in and out of State



1999 Hazardous Waste Shipments to In-State Commercial Facilities



1999 Hazardous Waste Shipments to Out-of-State Commercial Facilities

Chapter 3: 2002 Capacity and 2004 Demand

This chapter describes the available hazardous waste management capacity in the state and compares the 2002 capacity to the projected demand for management in 2004. This chapter is divided into seven sections:

- Section 3.1 presents information on the capacity of facilities in Texas.
- Section 3.2 presents the results of the demand analysis. This section also describes the factors addressed by the analysis, as well as limitations of the projections. The 2004 commercial demand forecast presented in Section 3.2 is a medium-demand forecast, based on the most reasonable assumptions about regulatory impacts and waste management trends in the future.
- Section 3.3 identifies limitations of the 2004 projections.
- Section 3.4 summarizes results of the demand analysis.
- Section 3.5 compares the 2002 capacity and 2004 medium-demand forecast and identifies technologies for which the expected 2004 demand exceeds the available capacity.
- Section 3.6 examines the impact of managing imports on capacity availability for five waste management categories.

3.1 Available Capacity

In 2002, there were 28 permitted facilities that recycled, treated, or disposed of hazardous waste in Texas on a commercial basis.[12] The capacity for each of these technologies is summarized in Table 3. Capacity is considered available if the unit is constructed and managing wastes commercially The third column in Table 3 indicates whether all of the capacity in a waste management category was available in Spring 2002. Permit-exempt facilities are not included in this table.

Facilities managing hazardous wastes commercially have waste management units that may fall into one of three regulatory categories: the unit has a permit for the activity; the unit has interim status authorization for the activity until a permit is issued; or the unit is exempt from RCRA permitting under the hazardous waste management rules[13]. The capacity totals in Table 3 include waste management units that are in these three categories. If a unit was permitted, but not built and the facility operator did not have plans to complete construction of the unit by 2002, the capacity of the unit was not included in this assessment.

[12] For this assessment, storage capacity is considered ancillary to the treatment, processing or disposal services offered by the facility or company at its other locations.

[13] For this study, a facility is the site, whereas a unit is the process in which the waste is managed. For example, a rotary kiln incinerator is a unit.

The capacity totals on Table 3 include units at permitted commercial facilities that are available to manage hazardous waste from off-site generators. For example, some commercial facilities have units that are permitted only for management of wastes generated on site. Or, if not limited by permit, the facility operator has chosen to restrict its management of off-site wastes in certain units to reserve future capacity.

Table 3
2002 Permitted Commercial Management Capacity for Hazardous Waste

WASTE MANAGEMENT TECHNOLOGY	Capacity to Manage Wastes (Tons/year)	Number of Facilities	Availability Status[1]
Low Temperature Metals Recovery	185,685	4	Yes
High Temperature Metals Recovery			
Mercury Retorting	1,200	1	Yes
Lead	63,000	1	Yes
Catalyst	8,820	1	Yes
Solvent Recovery	131,330	7	Yes
Incineration-Liquids	234,801	4	Yes
Incineration-Solids and Sludges	119,881	4	Yes
Energy Recovery/Cement Kilns	236,529	1	Yes
Sludge Treatment	417	1	Yes
Stabilization and Encapsulation	1,355,289	4	Yes
Landfill[2]	2,306,200	2	No
Deep-Well Injection	1,430,944	2	Yes
Fuel Blending	530,591	10	Yes
Aqueous Inorganic Treatment			
Precipitation	30,400	1	Yes
Oxidation	20,928	1	Yes
Neutralization	2,085	1	Yes
Aqueous Organic Treatment			
Biological Treatment	22,855	1	Yes
Chemical Oxidation	4,092	2	Yes
Neutralization	5,000	1	Yes
Other	30,400	1	Yes
Other Treatment			
Controlled Reaction	958	2	Yes
Deactivation	402	1	Yes

[1] Yes -- All capacity available; No -- Part of total in column 1 for this management category is not constructed or is not currently available.
[2] Landfill capacity is the cubic yardage of cells (converted to tons) which is currently constructed plus capacity expected to be constructed between 2002 and 2004 based on current permits and operating practices. The ratio of 1.30 tons per cubic yard was used.

Some technologies have variables that impact the assessment of the appropriate capacity. There has also been a shift in measuring capacity for certain technologies from previous reports. Below is a list of some of these variables and shifts broken down into more detail.

- The capacity totals in Table 3 are based on realistic operating parameters, which may be lower than the environmental permit conditions. Capacity is never estimated to exceed a limit or restriction on waste handling set in a RCRA, UIC, or TCEQ air permit, even if the unit could handle more wastes by design.

- One zinc recovery facility in Texas receives waste from only one generator and is not available to other generators in the state. Neither the capacity of this facility nor the demand from the generator are included in the state-wide demand and capacity for 2004.

- The capacity for the category of catalyst recovery decreased by 3,000 tons from previous reports. One facility that recovered this type of waste closed and was dismantled in 2000. This brought about a shortage of capacity in this category in the medium demand scenario, where in previous reports there was sufficient capacity.

- Commercial disposal wells are authorized by permit to inject up to approximately 1.4 million tons of hazardous wastes or other liquid streams annually. All injection wells in this category have been granted no-migration petitions and these facilities can continue to inject hazardous wastes that have been restricted from land disposal.

- The capacity at the one operating cement kiln facility in Texas burning hazardous waste is allocated entirely to the energy recovery/cement kiln category. In previous reports capacity and demand from energy recovery/cement kilns were allocated to liquid incineration.

- Two commercial landfills in Texas have a total of approximately 12.2 million cubic yards of permitted landfill capacity remaining. It is unlikely that all the remaining 12.2 million cubic yards of permitted capacity will be made available by 2004 because of current construction schedules and operating practices. Therefore, only the capacity expected to be constructed at the two facilities by 2004 is included in the capacity estimates provided in Table 3.[14]

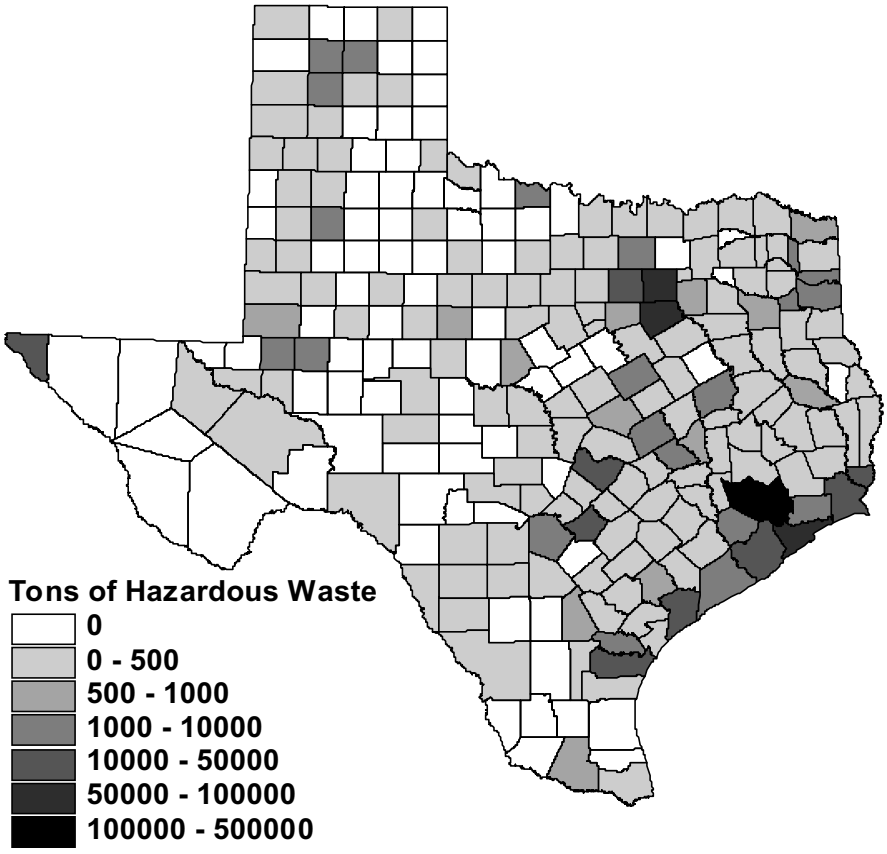
[14] The estimate provided in Table 3 is based on current or expected operating and cell construction practices.

Table 4
2004 Medium-Demand Forecast for Commercial Management Capacity of Hazardous Waste (Tons)[1]

WASTE MANAGEMENT TECHNOLOGY	Components of Demand			Projected 2004 Total Demand (Tons)
	Recurrent Federal Hazardous	Class I[2] Nonhazardous and Other	Superfund and Other Large Cleanups[3]	
Low Temperature Metals	9,484	931	0	10,415
High Temperature Metals				
Mercury Retorting	135	0	0	135
Zinc	55,32	0	0	55,323
Lead	2,851	0	0	2,851
Catalyst	13,904	258	0	14,162
Industrial Furnaces	4,531	0	0	4,531
Solvent Recovery	38,559	158	0	38,718
Other Recovery	4,678	0	0	4,678
Incineration-Liquids	54,496	19,382	2,454	76,332
Incineration-Solids and Sludges	46,062	2,218	112	47,383
Energy Recovery/Cement Kilns	183,571	324	0	183,327
Sludge Treatment	61	0	61	
Stabilization and Encapsulation	37,926	722	1,800	40,448
Landfills				
Hazardous Waste[4]	82,446	0	4,862	87,308
Nonhazardous Waste	0	18,856	18,763	37,619
Deep-Well Injection	148,436	45,652	2,400	196,488
Fuel Blending	138,251	13,524	920	152,695
Aqueous Inorganic Treatment				
Reduction	14	0	0	14
Precipitation	105	0	0	105
Oxidation	123	0	0	123
Neutralization	552	0	0	552
Other	384	0	1,500	1,884
Aqueous Organic Treatment				
Biological Treatment	1,112	2,083	0	3,195
Other	21	0	1,500	1,521
Other Treatment				
Neutralization of	394	0	0	394
Deactivation	77	0	0	77
Controlled Reaction	117	0	0	117
Other	688	0	0	688
Other Recyclable Materials[5]	46,587	0	0	46,587
TOTAL	815,565	104,108	34,372	1,007,670

[1]Does not include wastes from out of state.
[2]Class I industrial solid waste and other materials to unit.
[3]These waste streams are estimated based on limited available information. Includes hazardous and nonhazardous wastes from Superfund sites, corrective actions, large closures, and waste generated as a result of voluntary cleanups.
[4]Includes incinerator ash and stabilization residuals that are expected to be hazardous.
[5] Includes but not limited to Universal Waste, Precious Metal Recovery, and Battery Recovery.

Figure 4
2004 Projected Recurrent Medium Demand by County, Commercial Hazardous Waste



3.2 2004 Medium-Demand Forecast, Commercial Capacity

Table 4 shows the 2004 projected commercial hazardous waste management demand for wastes generated in Texas, based on the medium-demand scenario. The 2004 forecast was developed by applying assumptions about future waste management activities to the 1999 data submitted to the Commission by Texas generators and commercial facilities. Total 2004 commercial demand is estimated at 1,007,679 tons. Figure 4 shows the 2004 projected recurrent commercial hazardous waste medium-demand by county. This figure displays the distribution of waste generation across Texas, showing concentrations on the upper Gulf Coast and metropolitan areas such as Dallas-Ft. Worth.

3.2.1 Factors Included in the 2004 Demand Forecast

Several important factors have been incorporated into the 2004 demand estimates, which are explained in the following sections. Appendix 3 contains a description of the overall methodology used to assess commercial demand in 2004 and explains the individual analyses described in this section.

3.2.2 Land Disposal Restriction (LDR) Impacts For Newly Regulated Wastes

Federal LDR rules require that hazardous waste be treated before land disposal. The LDR rules set either a treatment standard or a specific technology for treatment of waste prior to land disposal. If a technology-based standard is set, the specified technology must be used to comply with the LDR rules. If a treatment standard is set, any technology that will treat the waste constituents to below the standards may be used**.** Congress required the EPA to establish by May 1990, treatment standards for all wastes identified as hazardous in 1984. All wastes identified as hazardous in 1984, including those that were granted a variance in 1990, were required to be treated prior to disposal by 1992.

In addition to establishing treatment standards for wastes identified as hazardous as of 1984, Congress required the EPA to establish treatment standards for "newly identified" hazardous wastes (i.e., wastes that were identified as hazardous after the Hazardous and Solid Waste Amendments (HSWA) to RCRA) six months after identification. The EPA did not meet this latter statutory deadline. As a result of a suit filed by the Environmental Defense Fund for failure to meet this deadline, the EPA established a schedule for adopting prohibitions and treatment standards for newly identified wastes. To fulfill the requirements of the court order, the EPA promulgated treatment standards for a variety of these newly identified wastes in August 1992 (Phase I), September 1994 (Phase II), April 1996 (Phase III), and April 1997 (Phase IV). In August 1998, the EPA also promulgated treatment standards for petroleum refinery wastes, a group of newly listed wastes that were addressed separately from wastes included in the Phase I through Phase IV rulemakings.

As stated previously, treatment standards for wastes identified as hazardous in 1984 became effective prior to 1993. In addition, treatment standards promulgated for all newly regulated wastes in the LDRs became effective prior to 1999. Therefore, the baseline data used to determine demand for commercial hazardous waste treatment capacity reflect management of hazardous waste according to these standards. However, the data do not reflect the management of waste for which treatment standards became effective after 1999 and only partially reflect the future management of waste for standards promulgated during 1999. In addition, although treatment standards were finalized for some wastes prior to 1999 the EPA made changes to the treatment standards following promulgation of the final rule that are not accurately reflected in the baseline data of this report.

Wastes for which treatment standards were promulgated or revised during or after 1999 will be referred to as newly regulated wastes. To account for shifts in the demand for commercial waste management technologies resulting from treatment standards for newly regulated waste, the TCEQ reallocated waste reported as land disposed or treated using an alternate technology that is unlikely to meet the treatment standard in 1999 to an appropriate treatment technology based on the promulgated treatment standards. (Appendix 5 outlines the methodology for quantifying the impacts of treatment standards promulgated or revised during or after 1999 on commercial demand.)

Chlorinated Aliphatics Production Waste

On November 8, 2000, the EPA listed two chlorinated aliphatics production wastes as hazardous:

K174 Wastewater treatment sludges from the production of ethylene dichloride or vinyl chloride monomer (including sludges that result from commingled ethylene dichloride or vinyl chloride monomer wastewater and other wastewater).

K175 Wastewater treatment sludges from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process.

The EPA estimates commercial treatment demand for K174 nonwastewater may be 6,100 tons per year nationwide. However, because EPA is finalizing a conditional listing approach for the K174 wastes under which these wastes are not hazardous if disposed of in a Subtitle C or a nonhazardous waste landfill, it is possible that little or no hazardous waste treatment capacity will be required for this waste. For K175, EPA estimates that up to 130 tons per year may require alternative commercial treatment. Neither of these newly listed waste will cause significant impact on commercial hazardous waste treatment in Texas.

Inorganic Chemicals

On November 20, 2001, the EPA listed three inorganic chemicals as hazardous:

K176 Baghouse filters from the production of antimony oxide, including filters from the production of intermediates.

K177 Slag from the production of antimony oxide that is speculatively accumulated or disposed, including slag from the production of intermediates.

K178 Solids from manufacturing and manufacturing-site storage of ferric chloride from acids formed during the production of titanium dioxide using the chloride-ilmenite process.

The EPA estimates that 4.4 tons of K176 waste will be generated in Texas each year. This waste will be treated using stabilization and/or metals recovery to meet the final standards. Even though there is no recurrent generation of K177 waste in the state, there is 120,000 tons of contaminated soil and slag pile of K177 waste in Texas. However, this site is currently under a corrective action order with the state to clean up antimony contamination and is accounted for in the one-time demand calculations. There are no known generators or quantities of K178 waste in the state. None of these newly listed waste will cause significant impact on commercial hazardous waste treatment in Texas.

Hazardous Waste Identification Rule— Revisions to the Mixture and Derived-From Rules

On August 14th, 2001 the EPA finalized the mixture and derived-from hazardous waste regulations. These revisions excluded the mixtures and derivatives of wastes listed solely for the ignitability, corrosivity, and/or reactivity characteristics. They also put in place a conditional exemption from the mixture and derived-from rules for "mixed waste," that is waste that is both hazardous and radioactive. This new ruling currently has little or no effect in the management practices in the State of Texas.

Emissions Limits For Hazardous Waste Combustion Facilities

On April 19, 1996, the EPA proposed emissions standards for hazardous waste incinerators, waste-burning cement kilns, and lightweight aggregate kilns. The standards limit emissions of the following pollutants based on the performance of Maximum Achievable Control Technologies (MACT): dioxins and furans, mercury, lead, cadmium, antimony, arsenic, beryllium, chromium, particulate matter, and hydrochloric acid/chlorine gas. In the proposed rule, the EPA estimated that approximately 90 to 95 percent of existing sources would require substantial modifications and upgrades to comply with the proposed standards. Although large commercial incinerators and cement kilns are likely to be able to absorb the cost of retrofitting existing combustion units, many facilities operating small on-site combustion devices may not. If generators determine that retrofitting to comply with the emissions

standards is not a cost-effective option, some hazardous waste that was previously managed on site may be shipped off site to commercial facilities.

The EPA finalized emissions limits for hazardous waste incinerators, waste burning cement kilns, and lightweight aggregate kilns on July 30, 1999. The final regulations are complex and many generators will need to research the cost and benefits of complying with the new standards before making a decision on future waste management operations. Generators are unlikely to be able to provide information that will enable TCEQ staff to quantify the impacts of this new regulation so soon after promulgation of the final standards. According to the regulations, combustion facilities have three years to comply with the new standards. On April 5, 2002, the EPA published in the Federal Register (67 FR 16581) a final rule that acknowledges the agency will "miss the schedule for numerous source categories" in issuing MACT standards, and therefore provides facilities with a 24-month extension of time under which they can submit the second part of their applications for permits to meet MACT standards. According to the rule, this extension coincides with the time period in which the EPA expects to promulgate MACT standards for the remaining categories. Given the uncertainties associated with the new rule and the time allowed to comply with the requirements, the impacts of this rule have not been quantified for this assessment.

Definition of Solid Waste of Toxicity Characteristic

Effective March 13, 2002, in an attempt to provide some regulatory relief to hazardous waste recyclers from RCRA Subtitle C waste management requirements, the EPA revised the current regulatory definition of solid waste. First, the agency deleted regulatory language that classified mineral processing characteristic sludges and by-products being reclaimed as solid wastes under RCRA's hazardous waste management regulations. The agency also codified the decision that the Toxicity Characteristic Leaching Procedure (TCLP) may not be used for determining whether manufactured gas plant (MGP) waste is hazardous under RCRA. Currently, there are no active MGP facilities in existence. The change was determined not to be "significant regulatory action." The action did not involve the application of new technical standards. The purpose of this action was to take the necessary steps to eliminate drafting errors and ambiguity, minimize potential litigation, and provide clearer legal standards. The impacts of this EPA initiative on future waste management activity cannot be quantified at this time.

3.2.3 Upcoming Federal Regulatory Initiatives That May Impact Hazardous Waste Management Activities

The EPA is currently working on several regulatory initiatives that are likely to impact the way in which generators manage their hazardous wastes. Since these regulations have not been finalized and many could change significantly before becoming final, quantifying the impacts is not appropriate at this time. However, a brief discussion of the major regulatory initiatives is provided to highlight some of the upcoming changes that are expected to occur. The regulations discussed below will be quantified in future updates to the Hazardous Waste Needs Assessment when they have been finalized.

Proposed New Listings

Background

Before prohibiting a waste from land disposal without prior treatment, the EPA must make a determination that the waste is hazardous. Wastes are considered hazardous if they meet one of the following three criteria:

1. They are listed as hazardous waste;
2. They exhibit a characteristic of ignitability, corrosivity, reactivity, or toxicity; or
3. They are classified as acutely hazardous.

Listing a waste as hazardous is the most common method by which the EPA expands the universe of waste subject to hazardous waste regulations. In order to identify a waste as a listed hazardous waste, the EPA must determine whether the waste poses a substantial present or potential hazard to human health and the environment. If the EPA determines that a waste meets the listing criteria, a proposal is published in the *Federal Register* discussing the listing and the factors considered in making the listing determination. Based on comments received on the proposal and any additional information, the EPA may finalize the proposed listing. If the proposed listing is finalized, the EPA is required to develop treatment standards for the newly listed waste within six months of the listing. Dye and pigment production wastes are among the types of wastes being considered for listing or which have been listed but have no established treatment standards

Gasification Rule

Gasification systems are designed to convert carbon-containing materials into synthetic fuel or the basic components used in the petrochemical industry. Materials used successfully in gasification operations include coal, petroleum coke, hazardous oil-bearing secondary materials from the refining industry, municipal sewage sludge, hydrocarbon-contaminated soils, and chlorinated hydrocarbon by-products. This proposed rule would view gasification systems as production or manufacturing operation rather than as a hazardous waste management activity. This rule may encourage reductions in the volume of material sent for land disposal and reduce the reliance on virgin materials used in electricity production, petroleum refining, and chemical manufacturing industries.

Emissions Limits For Hazardous Waste Boilers and Other Industrial Furnaces

In addition to establishing standards for the combustion devices discussed in Section 3.2.1.1, the EPA will also be examining emissions standards for industrial boilers and other industrial furnaces. Although these regulations could also result in shifts from on-site to off-site management, the impact is likely to be significantly smaller than the MACT standards for incinerators, cement kilns, and aggregate kilns burning hazardous waste. The EPA estimates that industrial boilers and other industrial furnaces only burn approximately 15 to 20 percent of the total amount of hazardous waste combusted each year.

3.2.4 Source Reduction

The demand depicted in Table 7 (page 28) includes the expected effects of generators' source reduction efforts based on information provided by generators on projected hazardous waste generation in *Annual Source Reduction/Waste Minimization Plan Executive Summaries and Progress Reports* (*SR/WM Plans*). Waste generated by facilities who submitted updated projection data (projection facilities) accounted for approximately 26 percent of the waste sent to commercial facilities in 1997. Appendix 4 provides a more detailed description of the methodology used to account for source reduction activities between 1999 and 2004.

3.2.5 One-Time Waste Generation

The demand by one-time wastes includes demand resulting from cleanups at state and federal Superfund sites, closures of units no longer used for hazardous waste management, and corrective action and voluntary cleanup activity. The closure of tanks, incinerators, and container storage areas is assumed to continue at 1999 levels. Closure of these types of units does not generally result in the shipment of large quantities of waste off site. All of the large (over 1,000 tons) one-time waste streams identified in 1999 were subtracted from the baseline data used to determine 2004 commercial demand. Wastes sent to commercial facilities from the closure of tanks, incinerators, and container storage areas are included in the recurrent demand totals because it is expected that closure of these types of units will continue through and beyond 2004.

Projected demand from one-time activities is expected to equal 36,029 tons in 2004. Projections of one-time activities are based on limited data and uncertainty about remediation options. In general, the estimates reflect the best information currently available and the state's policy of selecting permanent on-site treatment options when feasible. Appendix 6 contains a detailed description of the methodology used to estimate one-time waste generation and management impacts in 2004.

3.2.6 Nonhazardous Waste Demand

In the past, nonhazardous waste has been 50 percent or more of total demand in two technology categories: deep-well injection and landfill. When developing demand projections for deep-well injection capacity in the year 2004, it was assumed that hazardous waste deep-well injection facilities would continue to receive nonhazardous industrial wastes at the same levels reported in 1999. Generators often do not have other options for managing their wastes and will continue to send their wastes to commercial hazardous waste management facilities. The nonhazardous waste demand totals include only nonhazardous wastes generated in Texas.

Two facilities are currently authorized to accept hazardous waste from off site for land disposal. One of these facilities has a nonhazardous waste landfill where capacity for the nonhazardous waste is separate from permitted capacity for the hazardous waste landfill. Therefore, disposal of nonhazardous waste does not utilize hazardous waste landfill capacity and is not included in the

2004 demand for hazardous waste capacity. In contrast, Class 1 waste received at the other commercial hazardous waste landfill is disposed of in the permitted hazardous waste landfill. Class 1 waste received at this facility is included in the landfill demand estimates because the nonhazardous waste utilizes hazardous waste capacity. The nonhazardous waste landfill demand totals on Table 7 (page 30) also reflect the demand for hazardous waste management capacity from disposal of characteristic waste generated from remediation activities which, after treatment, is no longer hazardous.

3.2.7 Economic Change

The Texas State Comptroller forecasts[15] a 34-percent growth in real earnings in the manufacturing sector of the Texas economy from 1999 to 2004. Recurrent waste quantities generated in 1999 by facilities that have not submitted projection data to the TCEQ were assumed to increase by 34 percent for the 2004 projection. Projection data provided by generators was assumed to include a growth factor. Therefore, for generators that submitted projection data, adjustments to reflect the State Comptroller's growth projections were made only to those years for which projection data were unavailable.

3.3 Limitations of the Projections

The 2004 projections are based on a snapshot of the demand for commercial management in 1999, taking into account the changes expected to occur before 2004 because of regulations that have been finalized. Limitations of these projections are noted below:

a. Treatment standards that became effective after 1999 are based on the concentration of the hazardous constituents. Therefore, any technology can be used to treat the wastes, provided the treatment standard is met. For the purpose of this report, the TCEQ projected the impact of treatment standards promulgated after 1999 based on the treatment technologies the EPA used to develop the concentration-based standards. Generators may use other technologies once the LDRs become effective.

b. Other federal rules not yet proposed or enacted may significantly affect 2004 demand (see Section 3.2.1.2) in the next year or two. Because these regulations have not been finalized, their future impacts are highly speculative at this time and have not been included in the projections.

c. Projections for the year 2004 are very sensitive to the demand from one-time activities including Superfund and the Corrective Action and Voluntary Cleanup programs. Estimates of waste moving off site from state or federal Superfund sites are based on the TCEQ's current knowledge of existing sites. The amount of historical data from the Corrective Action and Voluntary Cleanup programs is limited. In

[15] Based on most recent spring 2000 projections.

general, the estimates reflect the state's policy of selecting permanent on-site treatment options for these wastes when feasible and historical trends in waste management for these types of sites.

3.4 Summary of 2004 Medium-Demand Projections

Recurrent demand for hazardous waste management (column 1 on Table 5-page 17) is projected at 790,412 tons in 2004. Recurrent demand includes a) hazardous wastes managed commercially in 1999, b) wastes from household hazardous waste and agricultural waste collection programs expected to be in operation by 2004, c) hazardous wastes from closures under 1,000 tons expected to continue in 2004, d) and hazardous wastes land disposed of on site in 1999 which are expected to move off site by 2004 in order to meet LDR treatment requirements. If a generating facility had an on-site incinerator and minimum technology landfill in 1999, it was assumed that the generator could continue on-site management of its land-banned wastes which will require incineration in 2004.

Recurrent nonhazardous waste demand will total 104,108 tons in 2004. Of the recurrent nonhazardous waste demand at commercial hazardous waste management facilities, 43.8 percent is projected to go to commercial deep-wells for management. One-time waste management demand (hazardous and nonhazardous wastes) is projected to total 36,029 tons in 2004.

3.5 Capacity and Demand Analysis for Wastes Generated in Texas

Table 6 compares the results of the capacity assessment and demand projections by waste management technology. The second column in Table 6, Reserve Capacity, has been calculated at 20 percent of the 2002 capacity for each waste management technology. Reserve capacity is subtracted from the 2002 capacity in order to account for the factors described in Section 3.2.

The remaining available capacity (column 4) is the 2002 capacity minus the reserve capacity and the projected 2004 total demand. If the remaining available capacity is negative, then the capacity is not expected to meet demand in 2004. This analysis indicates that sufficient capacity will **not** be available in 2004 in the following waste management categories:

- Zinc Recovery
- Catalyst Recovery
- Industrial Furnaces
- Other Recovery
- Land Treatment
- Aqueous Inorganic Treatment - Reduction and Other
- Other Treatment - Neutralization of Solids and Sludges and Other

Table 7 presents the medium-demand forecast for landfill disposal from 2001 to 2004. Because landfill capacity is a finite volume limited by permit, the capacity remaining in 2004 will be a function of how much is disposed of in the interim. Capacity and demand for landfilling in Table 6 and subsequent

demand tables are reported in cubic yards because the volume of the waste determines how much landfill capacity is needed. Landfill demand is estimated in tonnage on Table 4 simply to allow for aggregation of total demand. In previous reports, tons of waste shipped to landfills was multiplied by a factor of 1.1889 to convert tons into cubic yards. Commercial landfills that accept hazardous waste in Texas use a factor of 0.769 to convert tons into cubic yards. This number is based on an aggregate average of hazardous waste shipped for disposal such as contaminated soils and sludges. For the purpose of this report, the factor of 0.769 used by the industry is used to convert tons into cubic yards.

To evaluate the impact of managing nonhazardous wastes at commercial hazardous waste landfills, the TCEQ developed two demand/capacity scenarios were developed and are presented on Table 7:

1) Scenario 1 100 percent of sludges from remediation activities and residues from treating characteristic wastes will be disposed of in hazardous waste landfills; or
2) Scenario 2 50 percent of sludges from remediation activities and residues from treating characteristic wastes will be disposed of in hazardous waste landfills.

The baseline demand for landfill disposal of hazardous waste was held constant in the two scenarios. However, the percentage of incinerator ash and stabilization residuals generated from treating baseline hazardous waste that is expected to be hazardous was either 50 percent or 100 percent depending on the scenario identified. As Table 7 indicates, there will be sufficient capacity through the year 2004 under either scenario. Scenario 2 more closely approximates the volume of nonhazardous waste historically managed at Texas hazardous waste landfills.

Two commercial landfill facilities have combined additional capacity of approximately 12.2 million cubic yards under existing permits[16]. Of this additional capacity, 10.4 million cubic yards is not expected to be available between 2001 and 2004 because the landfill operators are not likely to construct all landfill cells until after 2004. Difficulties in estimating landfill demand are due to the following uncertainties: the impacts of the Corrective Action and Voluntary Cleanup programs; and ongoing federal initiatives to develop new regulations for the management of process-generated wastes. The 2004 medium-demand scenario is a lower bound estimate of landfill demand when extrapolated beyond 2004.

The landfill demand estimates for nonhazardous waste on Table 7 are not comprehensive for the State of Texas. This estimate does not include nonhazardous wastes currently going to nonhazardous waste management

[16] The permit for one of the commercial landfill facilities expired in 1993. This facility has submitted an application for a permit renewal and can continue to operate under the existing permit conditions until the renewal is approved or denied.

facilities or municipal solid waste landfills. The nonhazardous waste demand estimate includes only the residue from treating hazardous wastes generated from one-time events such as Superfund, corrective action, voluntary cleanups, and remediation at federal facilities to nonhazardous levels. As noted previously, these nonhazardous wastes can be managed in industrial waste landfills if capacity is available.

3.6 Effects of Net Imports on Capacity Availability

The impact of imports on the availability of commercial capacity in Texas could be important in some critical waste management categories. States cannot restrict the importation of wastes from other states since waste is considered to be an article of commerce protected by the Commerce Clause of the *U.S. Constitution*. It is reasonable to expect Texas facilities to continue to receive out-of-state wastes for management.

The impacts of demand by out-of-state wastes on available Texas capacity in four waste management categories in which Texas is a net importer are examined in Table 5[17]. Data from 1999 were used to determine the quantities imported and exported for management at injection wells, sludge/solid and liquid incinerators and fuel blending facilities. To evaluate the effect out-of-state shipments to Texas might have on capacity availability in the future, TCEQ calculated a net import quantity which is shown on Table 5.

Although the net imports of out-of-state wastes exceeded 151,186 tons in 1999, as illustrated in Table 5, sufficient capacity exists for all four major import waste management categories. Based on this analysis, imports are not expected to have a significant impact on the capacity available to in-state generators. Appendix 1 contains a summary of the hazardous waste generation, management, import and export data for 1999.

[17] Net Imports = Quantity of out-of-state waste received by Texas commercial facilities (imported) minus the waste shipped out-of-state (exported).

Table 5
Effects of Net Import Demand on Capacity Availability (Tons)

WASTE MANAGEMENT TECHNOLOGY	CAPACITY AFTER MEETING DEMAND FROM INSTATE GENERATORS	NET IMPORTS (TONS/YEAR)	REMAINING AVAILABLE CAPACITY (TONS/YEAR)
Deep-Well Injection	948,268	72,566	875,702
Sludge/Solid Incineration	48,512	28,351	20,161
Liquid Incineration	111,509	25,309	86,200
Fuel Blending	271,778	24,960	246,818

Texas imports a relatively small amount (7,598 tons) of hazardous waste to be used as fuel in Energy Recovery systems. Currently there is only one facility, a cement kiln, that accepts waste for Energy Recovery in the state. After meeting the instate generation demand and subtracting 47,306 tons for reserve capacity, there is only 5,896 tons of available capacity left. If the additional 7,598 tons from imports are added to the demand calculated, it will create a 1,702 ton shortage in capacity.

Table 6
Comparison of 2002 Management Capacity for Hazardous Waste with 2004 Medium-Demand Forecast for Commercial Facilities (Tons)[1]

WASTE MANAGEMENT TECHNOLOGY	2002 Capacity[2]	Reserve Capacity[3]	Medium-Demand Forecast 2004 Total[4]	Remaining Available Capacity[5]
Low Temperature Metals	185,685	37,137	10,415	138,133
High Temperature Metals				
Mercury Retorting	1,200	240	135	825
Zinc	0	0	55,323	(55,323)
Lead	63,000	12,600	2,851	47,549
Catalyst	8,820	1,764	14,162	(7,106)
Industrial Furnaces	0	0	4,531	(4,531)
Solvent Recovery	131,330	26,266	38,718	66,346
Other Recovery	0	0	4,678	(4,678)
Incineration-Liquids	234,801	46,960	76,332	111,509
Incineration-Solids and Sludges	119,881	23,976	47,383	48,512
Energy Recovery/Cement Kilns	236,529	47,306	183,327	5,896
Sludge Treatment	417	83	61	272
Land Treatment	0	0	127	(127)
Stabilization and Encapsulation	1,355,289	271,058	40,448	1,043,784
Landfill	See Table 7			
Deep-Well Injection	1,430,944	286,189	196,488	948,268
Fuel Blending	530,591	106,118	152,695	271,778
Aqueous Inorganic Treatment				
Reduction	0	0	14	(14)
Precipitation	30,400	6,080	105	24,215
Oxidation	20,928	4,186	123	16,619
Neutralization	2,085	417	552	1,116
Other	0	0	1,884	(1,884)
Aqueous Organic Treatment				
Biological Treatment	22,855	4,571	3,195	15,089
Chemical Oxidation	4,092	818	0	3,274
Neutralization	5,000	1,000	0	4,000
Other	30,400	6,080	1,521	22,799
Other Treatment				
Neutralization of	0	0	394	(394)
Controlled Reaction	958	192	117	649
Deactivation	402	80	77	245
Other	0	0	688	(688)

[1]Does not include wastes from out of state.
[2]Capacity estimated based on permitted, interim status and exempt facilities in Spring 2002.
[3]Section 361.0232 of the Texas Health and Safety Code requires that an appropriate reserve capacity be considered. This is calculated at 20 percent of 2002 capacity for each technology.
[4]Demand includes hazardous and nonhazardous wastes managed at hazardous waste management facilities. See Table 4.
[5]Calculated based on 2002 capacity minus reserve minus demand.

Table 7
Medium-Demand Forecast for Hazardous Waste Landfill Capacity, 2002–2004

Waste Type	Projected Demand (Cubic yards)		
	2002	2003	2004
Total Hazardous[1]	53,262	55,085	58,199
Total Nonhazardous[2]	26,477	26,431	26,812
Total Demand	79,739	81,516	85,011

[1] Includes demand for landfilling from the following: 1) recurrently generated wastes in the 1999 baseline that were reported as going to landfill, and 2) incinerator ash and stabilization residuals expected to be hazardous and require disposal in a Subtitle C landfill. Residuals generated by a treatment facility that are expected to be disposed of at the treatment facility are not included in this estimate. The medium-demand forecast assumes that 50 percent of incinerator ash and stabilization residuals will be hazardous and require disposal in a commercial hazardous waste landfill. The remaining 50 percent will be nonhazardous and be disposed of at a nonhazardous waste landfill. See Table 7, Scenario 2.

[2] This is not a total state estimate for nonhazardous waste landfill demand. Includes only treatment residuals generated from the management of sludges from remediation activities under the Corrective Action, Voluntary Cleanup, and Closure programs and at Superfund and federal facilities that are expected to be nonhazardous. The medium-demand scenario assumes that 50 percent of the residuals will be nonhazardous but disposed of in a RCRA Subtitle C landfills. See Table 7, Scenario 2.

Table 8
Projected Available Capacity of Hazardous Waste Landfills under Medium-Demand Forecast, 2002–2004

Scenario	Available Capacity at End of Year (Cubic Yards)[1]			Reserve Capacity[2] (Cubic Yards)	Available Capacity in 2005[3] (Cubic Yards)
	2002	2003	2004		
Scenario 1: 100% Scenario[4]					
Hazardous and 100% of Nonhazardous	1,683,041	1,589,926	1,692,633	2,420,935	9,683,739
Scenario 2: 50% Scenario[5]					
All Hazardous and 50% of Nonhazardous	1,694,261	1,612,745	1,727,735	2,427,947	9,711,788

[1] Two commercial facilities have combined capacity of 12.2 million cubic yards under their existing permits. Of this capacity, 10.4 million cubic yards is not expected to be constructed until after 2004. Only unutilized constructed capacity from prior years and capacity which is expected to be constructed annually (based on construction schedules and historical operating practices) is included as available capacity at the beginning of the year. Approximately 1,774,000 cubic yards was available in March 2002. An additional 200,000 cubic yards is expected to be constructed in 2004.

[2] Calculated at 20 percent of permitted commercial capacity. In 2005, permitted capacity includes 10.4 million cubic yards of unconstructed capacity plus unutilized constructed capacity remaining at the end of 2004.

[3] Based on available permitted capacity after 2004 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 residuals will be disposed of in hazardous waste landfills.

Chapter 4: Sensitivity Analysis of Low- and High-Demand Scenarios

The demand forecast presented in Chapter 3 is based on information available at this time and the most reasonable assumptions about regulatory impacts and waste management practices in the future. Two scenarios have been developed to analyze how using different assumptions will affect the 2004 commercial demand forecast. The two scenarios described below are a lower and upper bound on the projected demand for commercial hazardous waste management capacity in 2004.

4.1 Low-Demand Scenario

Three important factors affecting the 2004 projected demand are: the quantity of waste which is source reduced by 2004, the timing of activities that are likely to generate one-time wastes, and the percentage of landfillable nonhazardous waste that is disposed of at commercial hazardous waste landfills. The low-demand scenario is based on the following assumptions:

- **Source Reduction Reaches 50 Percent** - All generators that have not submitted hazardous waste projection data will reduce their generation of recurrent wastes managed at commercial facilities by 50 percent from the 1999 baseline.

- **One-Time Generated Wastes** - Waste generated from remediation activities at Superfund sites is managed over a period of two years (2001 - 2002) instead of the four-year period (2001-2004) in the medium-demand scenario. Shifting remediation activities to early years decreases the quantity of waste that will be generated in the projection year.

- **No Nonhazardous Wastes Disposed of in Hazardous Waste Landfills** - It was assumed that nonhazardous wastes will be disposed of at industrial waste landfills and will not use available hazardous waste landfill capacity.

The results of the medium-demand forecast presented in Chapter 3 were adjusted to incorporate these three assumptions. The effects of these changes on 2004 projected demand and 2002 capacity availability can be seen on Tables 9 and 10.

Because the source reduction scenario assumed an across-the-board reduction of 50 percent, demand in almost all waste management categories is decreased under this scenario, relative to the medium-demand scenario in Chapter 3. Overall, the three assumptions have the most significant impact on demand in five categories: liquid incineration, energy recovery, deep-well injection, fuel blending, and landfilling. For example, demand for liquid incineration decreased from 103,265 to 79,210. After subtracting reserve capacity, TCEQ found that remaining available capacity increased from 84,575 to 108,631 tons.

Table 9
Comparison of 2002 Management Capacity for Hazardous Waste with 2004 Low-Demand Forecast for Commercial Facilities (Tons)[1]

WASTE MANAGEMENT TECHNOLOGY	2002 Capacity[2]	Reserve Capacity[3]	Low-Demand Forecast 2004 Total[4]	Remaining Available Capacity[5]
Low Temperature Metals Recovery	185,685	37,137	9,670	138,878
High Temperature Metals Recovery				
Mercury Retorting	1,200	240	88	872
Zinc	0	0	54,224	(54,224)
Lead	63,000	12,600	1,124	49,276
Catalyst	8,820	1,764	13,260	(6,204)
Industrial Furnaces	0	0	1,695	(1,695)
Solvent Recovery	131,330	26,266	29,139	75,925
Other Recovery	0	0	4,590	(4,590)
Incineration-Liquids	234,801	46,960	65,108	122,733
Incineration-Solids and Sludges	119,881	23,976	42,528	53,376
Energy Recovery/Cement Kilns	236,529	47,306	143,383	45,840
Sludge Treatment	417	83	30	303
Land Treatment	0	0	98	(98)
Stabilization and Encapsulation	1,355,289	271,058	26,122	1,058,109
Landfill	See Table 6			
Deep-Well Injection	1,430,944	286,189	166,706	978,050
Fuel Blending	530,591	106,118	132,814	291,659
Aqueous Inorganic Treatment				
Reduction	0	0	6	(6)
Precipitation	30,400	6,080	69	24,251
Oxidation	20,928	4,186	63	16,679
Neutralization	2,085	417	223	1,445
Other	0	0	383	(383)
Aqueous Organic Treatment				
Biological Treatment	22,855	4,571	1,400	16,884
Chemical Oxidation	4,092	818	0	3,274
Neutralization	5,000	1,000	0	4,000
Other	30,400	6,080	14	24,306
Other Treatment				
Neutralization of Solids/Sludges	0	0	245	(245)
Controlled Reaction	958	192	77	690
Deactivation	402	80	56	266
Other	0	0	615	(615)

[1]Does not include wastes from out of state.
[2]Capacity estimated based on permitted, interim status and exempt facilities in Spring 2002.
[3]Section 361.0232 of the Texas Health and Safety Code requires that an appropriate reserve capacity be considered. This is calculated at 20 percent of 2002 capacity for each technology.
[4]Demand includes hazardous and nonhazardous wastes managed at hazardous waste management facilities. See Table 4.
[5]Calculated based on 2002 capacity minus reserve minus demand.

Table 10
Low-Demand Forecast for Hazardous Waste Landfill Capacity, 2002–2004

Waste Type	Projected Demand (Cubic yards)		
	2002	**2003**	**2004**
Capacity at Beginning of Year[1]	1,774,000	1,722,701	1,677,535
Demand			
Total Hazardous[2]	51,299	45,166	37,470
Total Nonhazardous[3]	N/A	N/A	N/A
Total Demand[4]	51,299	45,166	37,470
Remaining Capacity at End of Year	1,722,701	1,677,535	1,838,065

[1] Two commercial facilities have combined capacity of 12.2 million cubic yards under their existing permits. Of this capacity, 10.4 million cubic yards is not expected to be constructed until after 2004. Only unutilized constructed capacity from prior years and capacity which is expected to be constructed annually (based on construction schedules and historical operating practices) is included as available capacity at the beginning of the year. Approximately 1,774,000 cubic yards was available in March 2002. An additional 200,000 cubic yards is expected to be constructed in 2004.

[2] Includes demand for landfilling from the following: 1) recurrently generated wastes in the 1999 baseline that were reported as going to landfill, and 2) incinerator ash and stabilization residuals expected to be hazardous and require disposal in a Subtitle C landfill. Residuals generated by a treatment facility that are expected to be disposed of at the treatment facility are not included in this estimate. The low demand forecast assumes that 50 percent of incinerator ash and stabilization residuals will be hazardous and require disposal in a commercial hazardous waste landfill. The remaining 50 percent will be nonhazardous and will be disposed of at a nonhazardous waste landfill.

[3] It was assumed that nonhazardous wastes will be disposed of at industrial waste landfills and will not use available hazardous waste landfill capacity.

[4] For this scenario, it is assumed that nonhazardous wastes are **not** disposed at hazardous waste landfills.

Table 10 shows the impact of the three assumptions on the availability of landfill capacity through 2004. As was the case under the medium-demand scenario, there is sufficient landfill capacity through 2004. The decrease in demand between the medium- and low-demand scenario can be attributed primarily to the assumption that nonhazardous waste will be disposed of in industrial landfills and will not subtract from available hazardous waste landfill capacity. Assuming that Superfund activities will occur during a two-year (2001-2002) rather than a four-year (2001-2004) period does not result in a significant decrease in the quantity of hazardous waste landfilled between 1999 and 2002 in the low-demand scenario. The gradual increase in the quantity of hazardous waste requiring landfill capacity between 1999 and 2002 can be attributed to the increase in economic growth and corresponding waste generation, which exceeds the rate of source reduction.

4.2 High-Demand Scenario

High-demand scenario assumptions are described below.

- **100,000 tons per year from Superfund sites or other one-time events** - This quantity was selected for the high-demand scenario because it approximates historic levels of large Superfund and closure annual demand on commercial facilities. Most soil and debris are subject to land disposal restrictions, these waste streams must be treated prior to disposal.

  The 100,000 ton demand is characterized as follows:

  1. 50,000 tons per year of soil with organic contaminants. This waste stream was allocated to solid/sludge incineration, followed by stabilization and disposal in a hazardous waste landfill.

  2. 50,000 tons per year of soil/solids with metal contaminants. This waste stream was allocated to stabilization, and could be disposed of in a nonhazardous waste landfill and meet regulatory requirements. However, for this scenario it was assumed that these wastes will be disposed of at a hazardous waste landfill.

- **Impact of Nonhazardous Waste Landfill Demand on Hazardous Waste Landfill Capacity** - The high-demand scenario assumes that all landfillable nonhazardous waste included in this assessment will be disposed of at a hazardous waste landfill. As discussed in Chapter 3, the estimate of nonhazardous waste landfill demand in this assessment is **not** a comprehensive estimate of all nonhazardous waste landfill demand for the state.

Tables 11 and 12 display the results of the increased demand on treatment and disposal capacity availability. Because of the types of waste streams and treatment trains included in the high-demand scenario, the scenario projects an increased need for solid/sludge incineration stabilization, and landfill disposal beyond the medium-demand forecast.

Table 11
Comparison of 2002 Management Capacity for Hazardous Waste with 2004 High-Demand Forecast for Commercial Facilities (Tons)[1]

WASTE MANAGEMENT TECHNOLOGY	2002 Capacity[2]	Reserve Capacity[3]	High-Demand Forecast 2004 Total[4]	Remaining Available Capacity[5]
Low Temperature Metals	185,685	37,137	10,415	138,133
High Temperature Metals				
Mercury Retorting	1,200	240	135	825
Zinc	0	0	55,323	(55,323)
Lead	63,000	12,600	2,851	47,549
Catalyst	8,820	1,764	14,162	(7,106)
Industrial Furnaces	0	0	4,531	(4,531)
Solvent Recovery	131,330	26,266	38,718	66,346
Other Recovery	0	0	4,678	(4,678)
Incineration-Liquids	234,801	46,960	76,332	111,509
Incineration-Solids and Sludges	119,881	23,976	97,393	(1,488)
Energy Recovery/Cement Kilns	236,529	47,306	183,327	5,896
Sludge Treatment	417	83	61	272
Land Treatment	0	0	127	(127)
Stabilization and Encapsulation	1,355,289	271,058	40,448	1,043,784
Landfill	See Table 6			
Deep-Well Injection	1,430,944	286,189	196,488	948,268
Fuel Blending	530,591	106,118	152,695	271,778
Aqueous Inorganic Treatment				
Reduction	0	0	14	(14)
Precipitation	30,400	6,080	129	24,191
Oxidation	20,928	4,186	123	16,619
Neutralization	2,085	417	552	1,116
Other	0	0	1,884	(1,884)
Aqueous Organic Treatment				
Biological Treatment	22,855	4,571	3,195	15,089
Chemical Oxidation	4,092	818	0	3,274
Neutralization	5,000	1,000	0	4,000
Other	30,400	6,080	1,521	22,799
Other Treatment				
Neutralization of	0	0	394	(394)
Controlled Reaction	958	192	117	649
Deactivation	402	80	77	245
Other	0	0	688	(688)

[1]Does not include wastes from out of state.
[2]Capacity estimated based on permitted, interim status and exempt facilities in Spring 2002.
[3]Section 361.0232 of the Texas Health and Safety Code requires that an appropriate reserve capacity be considered. This is calculated at 20 percent of 2002 capacity for each technology.
[4]Demand includes hazardous and nonhazardous wastes managed at hazardous waste management facilities. See Table 4.
[5]Calculated based on 2002 capacity minus reserve minus demand.

Table 12
High-Demand Forecast for Hazardous Waste Landfill Capacity, 2002–2004

Waste Type	Projected Demand (Cubic yards)		
	2002	2003	2004
Capacity at Beginning of Year[1]	1,774,000	1,625,427	1,472,578
Demand			
Total Hazardous[2]	62,898	64,433	67,661
Total Nonhazardous[3]	85,674	88,416	95,719
Total Demand[4]	148,573	152,849	163,381
Remaining Capacity at End of Year	1,625,427	1,472,578	1,509,197

[1] Two commercial facilities have combined capacity of 12.2 million cubic yards under their existing permits. Of this capacity, 10.4 million cubic yards is not expected to be constructed until after 2004. Only unutilized constructed capacity from prior years and capacity which is expected to be constructed annually (based on construction schedules and historical operating practices) is included as available capacity at the beginning of the year. Approximately 1,774,000 cubic yards was available in March 2002. An additional 200,000 cubic yards is expected to be constructed in 2004.

[2] Includes demand for landfilling from the following: 1) recurrently generated wastes in the 1999 baseline that were reported as going to landfill, and 2) incinerator ash and stabilization residuals expected to be hazardous and require disposal in a Subtitle C landfill. Residuals generated by a treatment facility that are expected to be disposed of at the treatment facility are not included in this estimate. The high-demand forecast assumes that 100 percent of incinerator ash and stabilization residuals will be hazardous and require disposal in a commercial hazardous waste landfill.

[3] This is not a total state estimate for nonhazardous waste landfill demand. Includes only treatment residuals generated from the management of sludges from remediation activities under the Corrective Action, Voluntary Cleanup, and Closure programs and at Superfund and federal facilities which are expected to be nonhazardous. The high-demand scenario assumes that 100 percent of the residuals will be nonhazardous but disposed of in a RCRA Subtitle C landfill.

[4] For this scenario, it is assumed that all nonhazardous wastes are disposed at hazardous waste landfills.

4.3 Comparison of Demand Scenarios for Landfills—Low, Medium, and High

The low-demand scenario results in the lowest demand for landfill capacity because nonhazardous waste is assumed to be disposed of in an industrial landfill. Consequently, the total amount of hazardous waste landfill capacity demanded decreases from a total of 633,600 cubic yards over the four-year period to 437,315 cubic yards.

In contrast, the high-demand scenario assumes that all nonhazardous waste will be disposed of in hazardous waste landfills and a larger quantity of Superfund waste will be generated. This assumption resulted in an increase in demand from 633,600 cubic yards over the four-year period to 1,390,060 cubic yards.

4.4 Comparison to Other State Planning Documents

Section 104(c)(9) of the Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA or Superfund) (42 U.S.C.§9604(c)(9)) requires states to assure access to adequate treatment and disposal capacity to manage the hazardous waste reasonably expected to be generated within the state over 20 years. Pursuant to the statute, States submit Capacity Assurance Planning (CAP) to the EPA for approval, based on guidelines published by the EPA. States that have approved CAPs are eligible to receive new Superfund remedial action funding. The EPA last requested the States to update the CAP in 1993, and there has been no indication from the EPA that it expects to require States to update the CAP in the near future.

Although the analysis required by the EPA for a CAP and this Needs Assessment address many of the same issues, the two documents are not identical in coverage nor conclusions. The primary use of the CAP, from the EPA's perspective, is to determine whether there is adequate national treatment and disposal capacity. For this reason, the EPA has published a guidance document to assist states in developing CAPs that are nationally consistent and can be used to assess national capacity.

This assessment was developed based on issues and factors identified in Texas statute, as well as consultation with a task force representing Texas citizens, and environmental and industry groups. Appendix 9 contains a memo outlining the significant differences between the CAP and needs assessment methodologies.

Appendix 1

Trends in Texas Hazardous Waste Management
Based on 1999 Data (AS-123/02a)

TRENDS IN TEXAS HAZARDOUS WASTE MANAGEMENT BASED ON 1999 DATA

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
STRATEGIC ASSESSMENT DIVISION

TRENDS IN TEXAS
HAZARDOUS WASTE MANAGEMENT
BASED ON 1999 DATA

This booklet presents 1999 hazardous waste management data for the State of Texas. The data are obtained from monthly and annual reports submitted to the Texas Commission on Environmental Quality (TCEQ) from generators and handlers of hazardous waste in Texas. Significant trends in waste management are also identified and factors contributing to some of these trends are discussed.

The 1999 data have been reviewed and represent the most recent set of complete information available to the TCEQ as of December 2001. Questions regarding this document should be directed to the Office of Environmental Policy, Analysis, and Assessment at 239-4900.

Section 1
Overview of Hazardous Waste Generation and Management

Yearly totals of hazardous waste generation in Texas ranged from 60 to 65 million tons from 1986 to 1990. However, the United States Environmental Protection Agency (EPA) implemented a new federal regulation, often called the toxicity characteristic (TC) rule, which changed the definition of hazardous waste. This federal rule regulated previously nonhazardous waste streams with concentrations of organic constituents above specified test levels as hazardous waste. As a result, the quantity of hazardous wastes generated in Texas jumped to 139.4 million tons in 1991, more than double the quantity generated in 1990 under the old definition. The full impact of the regulations was not realized, however, until 1993 when the quantity of hazardous waste generated increased to its highest level at 181.3 million tons. Hazardous waste generation totaled approximately 156 million tons in 1995. In 1997, the EPA clarified reporting requirements for wastewaters and the reported quantity of hazardous waste generation totaled approximately 69.6 million tons. In 1999 the quantity of hazardous waste generation decreased further to the pre-1990 range of approximately 63 million tons.

The decrease in hazardous waste generation between 1995 and 1997 is directly related to the EPA's clarification of reporting requirements. Wastewaters that are not required to be reported must meet the following criteria:

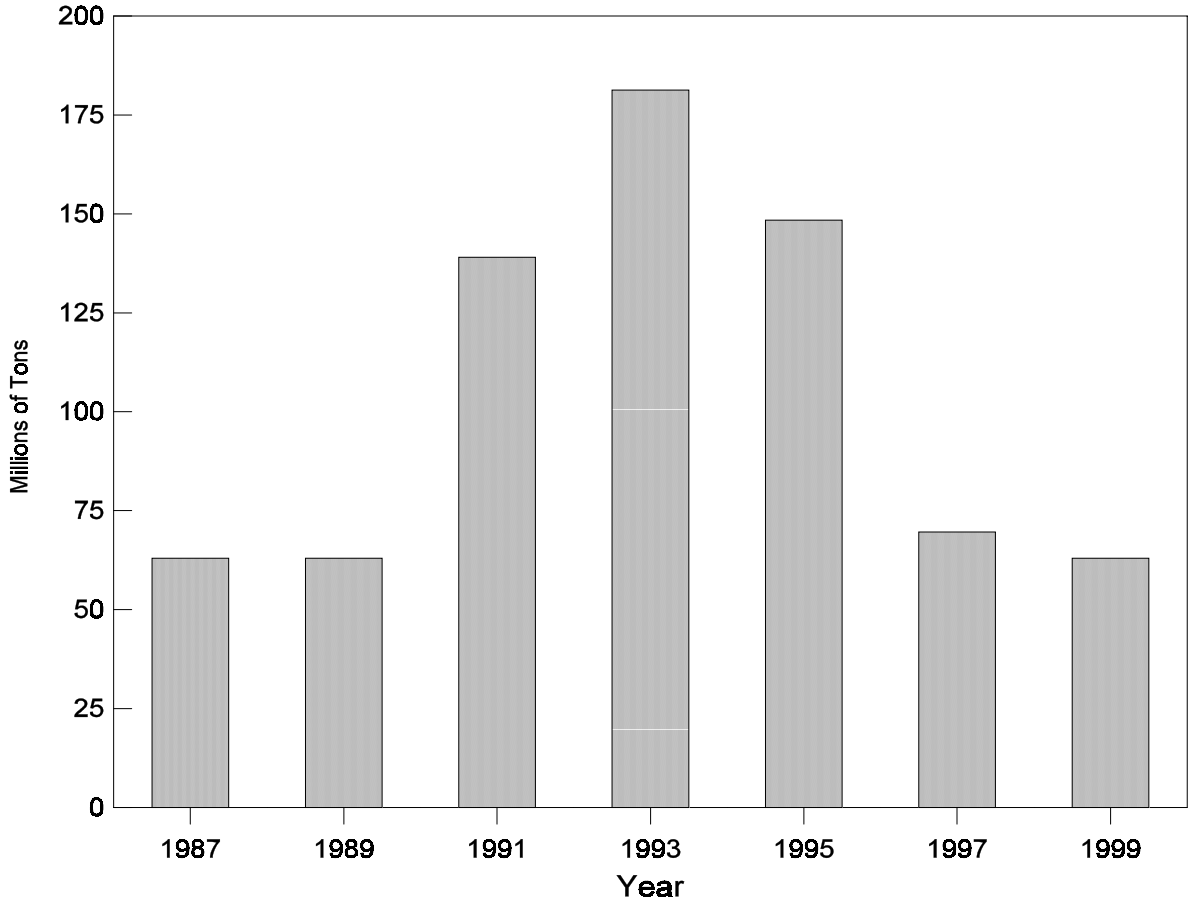
- The wastewater is not a "listed" hazardous waste- that is, it does not have an EPA hazardous waste code beginning with the letter F, D, P, or U.

- The wastewater is treated immediately on site in one or more units that are classified as "tanks" or "wastewater treatment plants" and make up a Resource Conservation and Recovery Act (RCRA) permit-exempt wastewater treatment unit or a RCRA permit-exempt totally enclosed treatment facility.

- After being treated, the wastewater is a Class 2 nonhazardous waste.

This impact of the reporting requirement clarification has greatly changed the pattern of waste generation in Texas. This shift makes past trends and future predictions difficult when these wastewaters from the years between 1990 and 1997 are included. Figure 1 illustrates the quantity of hazardous waste generated in Texas biennially from 1987 to 1999.

Figure 1
Hazardous Waste Generation in Texas



1.1 The Hierarchy of Hazardous Waste Management

There is a hierarchy of the preferred methods for hazardous waste management corresponding to their potential to negatively impact safety and the environment. The state's goal is to protect the public health and environment, through source reduction to eliminate the generation of hazardous waste[18]. Methods towards the top of the hierarchy reduce the amount of hazardous materials that eventually become waste and this, in turn, reduces the future threats to public health and the environment. Advancement up through the hierarchy is encouraged on both the state and federal levels for facilities where it is economically and technologically feasible.

[18] From Texas Health and Safety Code 361.023.

The hierarchy is as follows:

1. Source reduction
2. Reuse or recycling of waste
3. Treatment to destroy hazardous characteristics
4. Treatment to reduce hazardous characteristics
5. Underground injection
6. Land disposal

Figure 2
Commercial Management of Texas Generated Waste over Time[19]

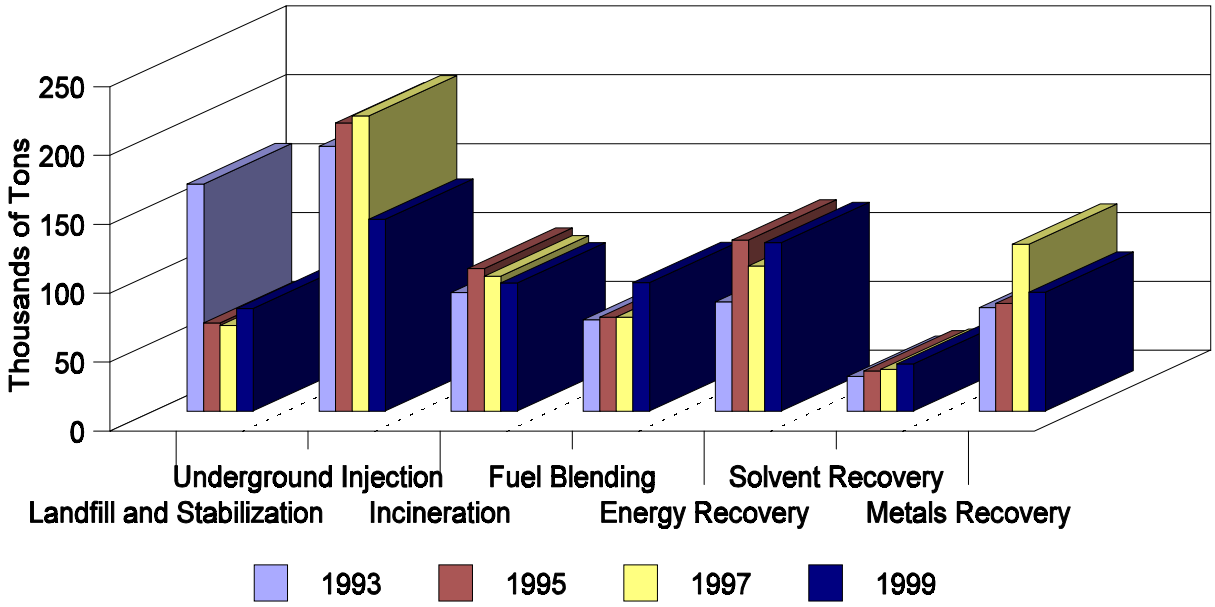


Figure 2 shows the amount of waste managed, in tons, for some of the largest waste management methods for hazardous waste generated in Texas between 1993 and 1999. The spike in 1997 for metal recovery is attributed to large volumes of waste treated by zinc recovery techniques. Sections 2 and 3 describe the trends of commercial hazardous waste management in greater detail.

The most desirable method of hazardous waste management is source reduction. Source reduction is the elimination of pollution at the source and not an end-of-pipe management. Source reduction can involve equipment, process, or technology modifications, product reformulation or redesign, raw material substitution, and improvements in maintenance or inventory controls. These measures can make industrial processes more efficient and reduce costs related to waste management.

[19] Incineration includes liquids, solids, and sludges.

The next level of management is reuse or recycling of the waste. This includes: using the hazardous waste as raw materials, reprocessing, or the recovering useful components, such as catalyst and metals, that could be used multiple times. The universal waste rule and other specific waste management techniques encourage the reuse and recycling of hazardous waste.

The mid-levels of hazardous waste management involve treating the waste to destroy or reduce the level of the hazardous constituents. One of the most common forms of treatment to destroy the hazardous constituents of hazardous waste is incineration. Burning waste, however, may produce ash that in itself is hazardous and must be disposed. Most wastewater is treated using mid-level hazardous waste management techniques. If the waste is being treated by destruction and the facility is capable and suitable, on-site management of the waste is preferred.

The final two methods of management are deep-well injection followed by land disposal. Pursuant to these two methods, the hazardous waste is disposed of – not destroyed, treated, or reduced. Before a facility disposes of the waste, it may be stabilized or fixed to reduce the chances of the hazardous components being released into the environment.

Measuring the shift from one level of the hierarchy to another over time is difficult. Source reduction is especially hard to quantify. For example, a majority of the dramatic drop in hazardous waste generation between 1993 to 1997 is from the EPA clarification of the reporting requirements for wastewaters.

1.2 Wastewaters

Of the total quantity of hazardous waste generated in 1999, approximately 46.7 million tons (74 percent) are wastewaters managed in on-site wastewater treatment processes or discharged to industrial wastewater treatment facilities specifically designed to manage these types of industrial wastewaters[20]. Of this, 7.8 million tons represent wastewaters directly discharged to a POTW (publicly owned treatment works) with no prior treatment and an additional 3.5 million tons (5.5 percent) are pretreated and then discharged to POTWs.

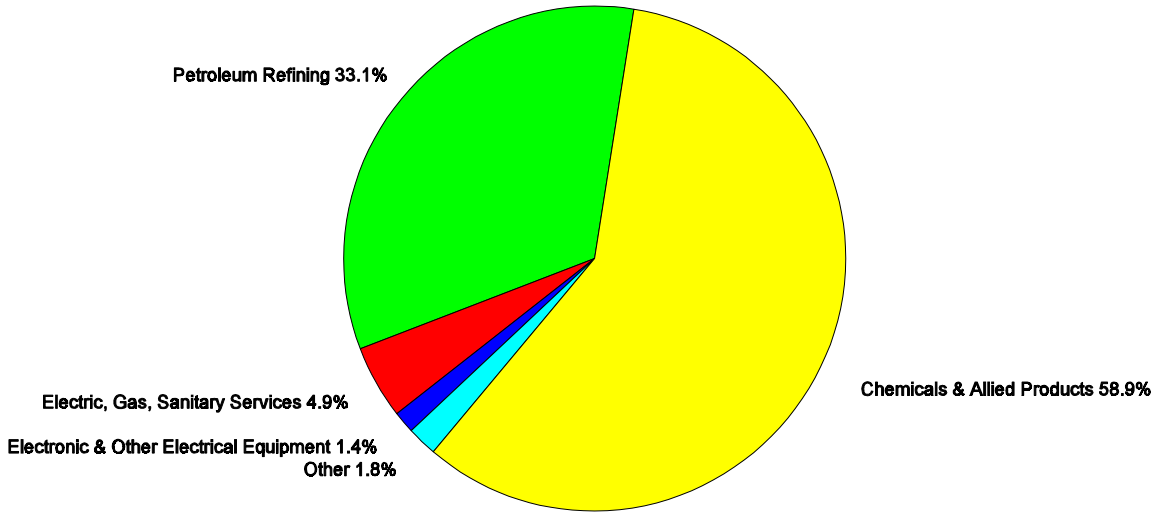
Depending on the design or type of unit managing these wastewaters, the unit (such as a tank or surface impoundment) may be subject to hazardous waste permitting requirements. This 46.7 million ton estimate is not based on whether the unit managing the wastewater was exempt from RCRA permitting in 1999.

[20] This estimate includes wastewaters discharged to captive wastewater treatment plants. A captive facility is one that has an agreement to manage wastes from a limited number of waste-generating facilities. The waste generating and management facilities may be owned by the same company.

1.3 Large Generators

In 1999, the four industries generating the largest quantities of hazardous waste in Texas included: chemicals and allied products; petroleum refining; electric, gas, and sanitary services; and electronic and other electrical equipment. Figure 3 illustrates the percentage of hazardous waste generated by industrial sector in Texas.

Figure 3
1999 Waste Generation by SIC Code

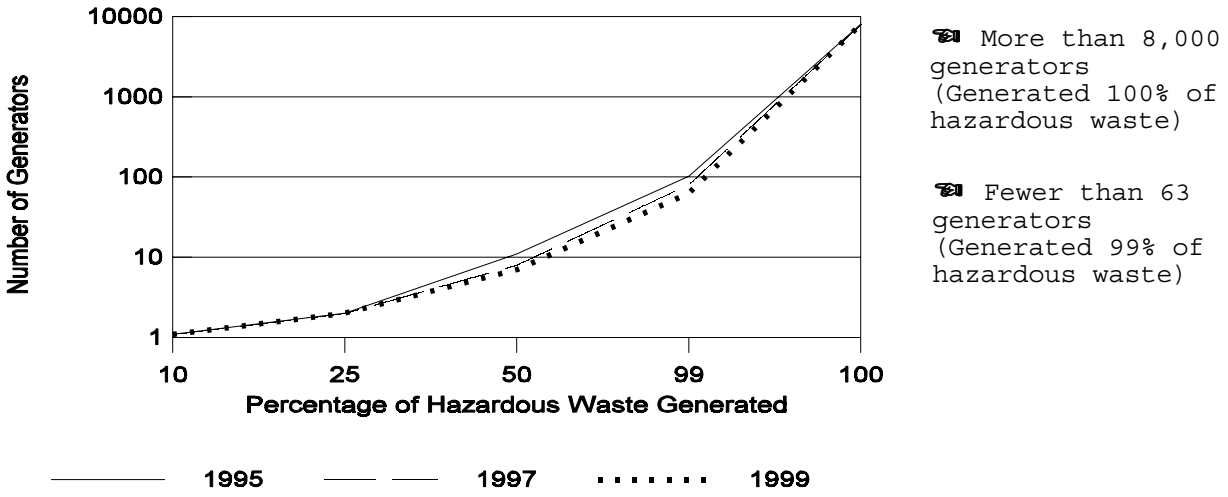


Together, industries in the standard industrial classification (SIC) categories of petroleum refining and chemicals and allied products accounted for 92 percent of all hazardous waste generated in 1999. The proportion of hazardous waste generated in Texas by the petroleum refining industry decreased from 40 percent in 1997 to 33 percent in 1999.

The disproportionately large contribution of the petroleum refining and the chemicals and allied products industries to statewide hazardous waste generation is a result of the TC rule. This federal rule resulted in the regulation of large quantity organic wastewater streams common to these two industries. As discussed previously, the TC rule more than doubled the quantity of statewide hazardous waste generation in 1991-1995. The EPA clarified the TC rule regarding wastewater and reduced the total amount of waste reported however, the rule clarification still had a more significant impact on the classification of waste generated by the petroleum refining and chemical manufacturing industries than on other industries in the state. For example, before the TC Rule in 1987, petroleum refineries and chemical manufacturers generated 76 percent of all hazardous waste, versus 92 percent in 1999.

A relatively few number of generators produce the majority of hazardous waste in Texas. In 1999, seven facilities generated 52 percent of the hazardous waste generated in the state. Sixty-three facilities generated 99 percent of the hazardous waste in Texas in 1999. In 1997, eight facilities accounted for 52 percent of the total quantity of hazardous waste generated in Texas, and eighty-one facilities accounted for 99 percent of the 1997 total.

Figure 4
Generators Responsible for Hazardous Waste Generation (1995–1999)[21]



1.4 Overview of Management by Location

Approximately 98.5 percent of the hazardous waste generated in Texas is either managed on site or treated and discharged to a wastewater treatment facility. Table 1 provides an overview of waste management by location for 1999. A little more than one percent of all hazardous waste generated is shipped off site for management at a commercial or captive facility, either in or out of state. Of the hazardous waste shipped off site for commercial management in 1999, approximately 33 percent was shipped to out-of-state commercial facilities. Figure 5 illustrates the percentage of hazardous waste managed by location in 1999.

Facilities that have on-site hazardous waste management reported using many different waste management technologies. These technologies include: deep-well injection, energy or other recovery, incineration, landfill disposal, land treatment, and a variety of other recovery and treatment processes. The technology responsible for the largest percentage of waste treated on-site is wastewater treatment processes.

[21] Graph provided for illustrative purposes. Not drawn to scale. Conditionally Exempt Small Quantity Generators (CESQGs) are not required to submit annual waste summary data. Therefore, the totals provided do not include these facilities unless they voluntarily submitted data in 1999.

Captive arrangements play a critical role in meeting waste management needs for many of the state's large generators. Captive facilities accept waste from only facilities that are owned or effectively controlled by the same corporation and are not available to receive waste from outside generators. Captive in-state facilities managed 122,700 tons of hazardous waste from related Texas facilities in 1999. Captive facilities reported receiving wastes for a variety of technologies, including land treatment, energy or material recovery, deep-well injection, incineration, and landfilling.

The most notable changes in management activity between 1997 and 1999 are:

(1) Overall decrease in waste generation;
(2) Pretreatment and discharge to POTW increased by 3 million tons;
(3) Redefining the wastewater category to show direct discharge to POTW without any prior treatment;
(4) Decrease in on-site landfilling; and
(5) Decrease in other on-site treatment categories.

Some of the decrease in the quantity of hazardous waste reported as treated on-site or in a captive wastewater treatment system is a direct result of the clarification of reporting requirements for wastewasters. The increase in the pretreatment and discharge to a publically owned treatment works (POTW) is a direct result of a single 3 million ton waste stream (which is pretreated by screening) that was classified as being treated on-site in previous reports. The category of direct discharge to POTW has also been added to this report. The reclassifying of pretreated and direct-discharged wastewaters was responsible for the majority of the decrease in the on-site or captive wastewater treatment category.

Many facilities are reducing their hazardous waste generation by reuse or recycling programs. Metals, catalyst, and other valuable reusable materials are being reclaimed at the generation facility or shipped to a recovery facility instead of being incinerated or disposed by other techniques such as landfilling or deep-well injection. This trend, as well as other general waste source reduction methods that increase plant efficiencies, account for much of the decrease in hazardous waste management on-site.

Table 1
Management of Hazardous Waste Generated
in Texas in 1999 by Location (Tons)

Location/Type of Management	In State	Out of State	Total
Commercial[22]	451,200[23]	216,900	668,000
Captive	128,100[24]	41,200	169,300
On Site	15,492,100		15,492,100
Deep-Well Injection	14,144,900		14,144,900
Incineration	484,000		484,000
Energy or Thermal Recovery	617,900		617,900
Landfill	40,200		40,200
Land Treatment	1,000		1,000
Other[25]	234,100		234,100
Wastewater	46,681,000		46,681,000
On Site or Captive[26]	35,432,000		35,432,000
Discharge to POTW (no prior treatment)	7,751,700		7,751,700
Pretreatment and Discharge to POTW	3,497,400		3,497,400
TOTAL	**62,752,400**	**258,100**	**63,010,600**

[22] Includes waste shipped to permitted and non-permitted commercial facilities.

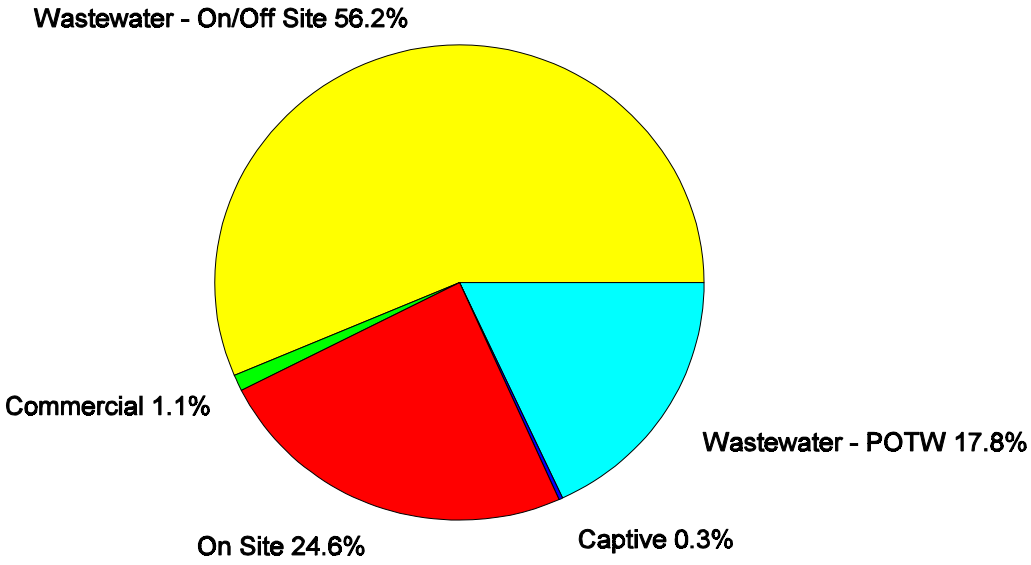
[23] To avoid double counting, this figure does not include the quantity of hazardous waste shipped to in-state storage facilities, because storage is an intermediate management step. After storage, waste is shipped to other facilities for processing or disposal. This processing or disposal facility, if in Texas, will report receipt of the waste from the storage facility. If the processing or disposal facility is out of state, then the in-state storage facility will report shipment of the waste to the out-of-state facility.

[24] To avoid double counting, this figure does not include the quantity shipped to in-state captive storage facilities. See discussion for number 14 above.

[25] Includes treatment and other recovery.

[26] Estimated based on the quantity of hazardous waste managed on-site using wastewater treatment processes, discharged under NPDES permit number or discharged to off-site industrial wastewater treatment plants. Type of on-site wastewater treatment processes included in this waste management category are: filtration, neutralization, sedimentation, flocculation, activated sludge, and precipitation.

Figure 5
Texas Hazardous Waste Management by Location/Type in 1999[27]



1.5 Generation by County

With its large chemical and petroleum industrial base, Texas leads the nation in hazardous waste generation. Table 2 lists the fifteen counties that are accountable for 99% of the hazardous waste generated in Texas. The majority of this activity is located in the Upper Gulf Coast Region as illustrated in Figure 6. Three counties in the Houston-Galveston area (Harris, Brazoria, and Galveston) account for 68% of the hazardous waste generated in Texas. There is a scattering of other large generators of hazardous waste throughout the state; however the bulk of the state's counties have little to no hazardous waste generation.

[27] Percentage does not total 100 due to rounding.

Table 2
Hazardous Waste Generation in Texas in 1999 by County (Tons)[28]

County	Lab Packs[29]	Inorganic Liquids[30]	Organic Liquids[31]	Inorganic Solids[32]	Organic Solids[33]	Inorganic Sludges[34]	Organic Sludges[35]	Gases[36]	Totals
Harris	240	15,196,626	6,454,743	47,132	20,478	18,039	28,504	645	21,766,167
Brazoria	100	10,660,213	3,890,835	7,700	608	49	25,353	0	14,584,859
Galveston	29	3,855,024	2,379,822	21,756	6,178	355	103,051	2	6,366,188
Nueces	16	5,739,975	10,483	5,345	8,390	380	4,645	0	5,769,235
Victoria	8	2,794,871	166,087	67	2,325	0	4	0	2,963,362
El Paso	5	2,901,933	644	13,393	109	198	830	1	2,917,405
Jefferson	18	1,880,501	84,150	22,759	1,944	2,219	12,284	0	2,003,875
Harrison	2	1,345,638	42,041	704	99	1,757	51,628	0	1,441,869
Moore	0	1,345,476	3	293	15	0	1,843	0	1,347,631
Calhoun	0	1,040,970	37,689	708	238	1	9,039	1	1,088,646
Orange	28	758,514	113,527	14,178	882	1	229	0	887,331
Travis	69	588,410	4,010	970	191	936	47	0	594,634
Dallas	79	233,878	63,450	4,075	546	957	1,115	17	304,118
Potter	1	300,886	84	892	223	8	32	0	302,127
San Patricio	0	202,344	26,486	1,274	131	47	0	0	230,284
Other Counties	258	238,714	75,993	55,124	13,266	2,248	78,057	7	463,667
Totals	853	49,083,974	13,350,049	196,341	55,623	27,488	316,662	671	63,031,069

[28] Includes 20,517 tons of waste generated and shipped for storage. These waste are double counted when shipped to other locations for treatment or disposal.

[29] Lab packs of mixed wastes, chemicals, lab waste.

[30] Waste that is primarily inorganic and highly fluid, with low suspended inorganic solids and low organic content.

[31] Waste that is primarily organic and is highly fluid, with low inorganic solids content and water content.

[32] Waste that is primarily inorganic and solid, with low organic content and waste content: not pumpable.

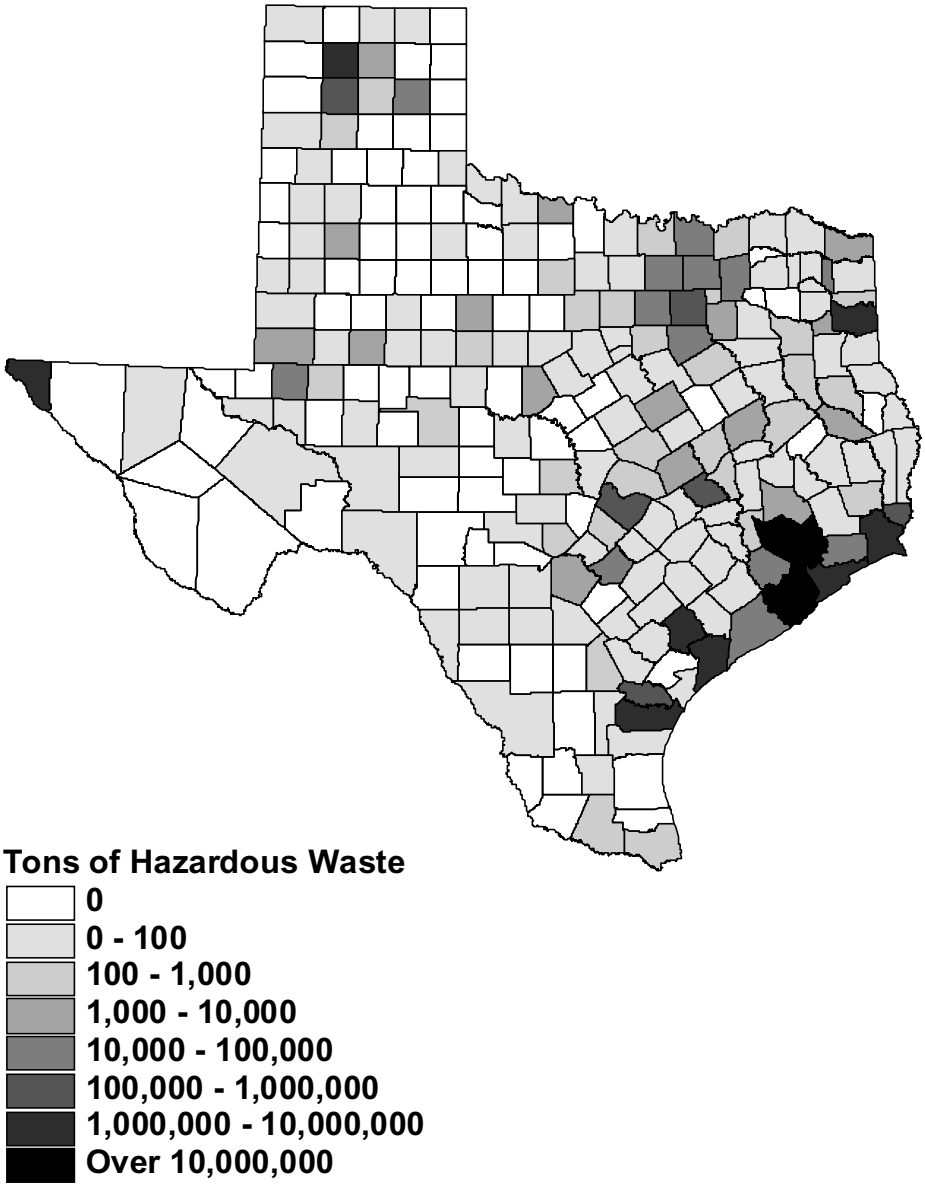
[33] Waste that is primarily organic and solid, with low-to-moderate inorganic content and waster content; not pumpable.

[34] Waste that is primarily inorganic and solid, with low organic content and waste content: pumpable

[35] Waste that is primarily organic and solid, with low-to-moderate inorganic content and waste content; pumpable

[36] Waste that is a gas at atmospheric pressure, includes both organic and inorganic.

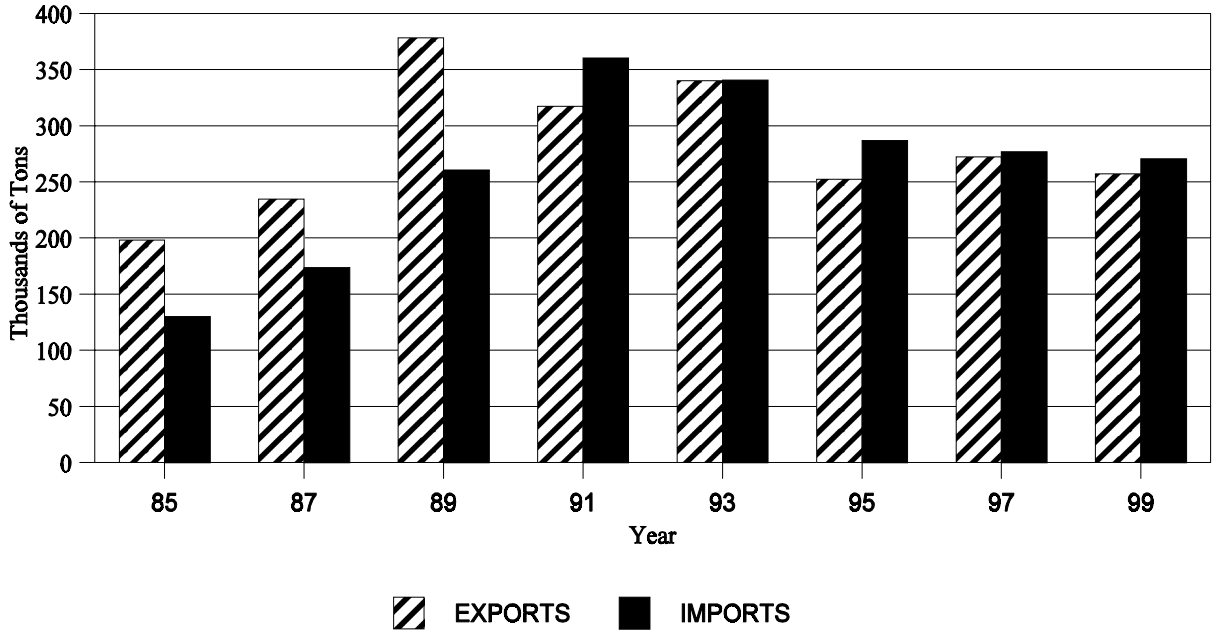
Figure 6
Hazardous Waste Generation in Texas
in 1999 by County (Tons)



Section 2
Exports and Imports of Commercial Hazardous Waste

In 1991, Texas became a net importer of hazardous waste. This trend continued in 1999. Texas generators exported 258,100 tons of hazardous waste and Texas commercial and noncommercial facilities received 270,600 tons of hazardous waste from out-of-state in 1999. Figure 7 compares hazardous waste exports and imports biennially from 1985 to 1999.

Figure 7
Exports And Imports of Hazardous Waste



2.1 Total Exports

Texas generators shipped 258,100 tons of waste out-of-state for management in 1999. As illustrated on Figure 7, this is a slight decrease from the export levels of 1997. For 1999 it is estimated that 84 percent of the shipments to out-of-state facilities were to commercial facilities. Shipments to commercial facilities totaled 216,900 of the 258,100 tons shipped out-of-state in 1999.

2.1.1 Commercial Facility Exports

Table 3 compares the quantities of hazardous waste exported for commercial management in 1997 and 1999. The fourth column on Table 3 indicates the percentage change from 1997 to 1999 by waste management category. For example "+6" indicates that 6 percent more waste was received for energy recovery in 1999 than 1997. A negative number indicates the percentage decrease from 1997 to 1999.

Table 3
Exports of Hazardous Waste to Out-of-State Commercial Facilities
(1997 - 1999)

Waste Management Method	1997 (Tons)	1999 (Tons)	Percentage Change
Landfill[37]	39,200	41,700	+6
Deep-well Injection	1,800	1,250	-31
Incineration - Liquids	6,400	5,486	-14
Incineration - Solids/Sludges	14,900	9,511	-36
Energy Recovery	40,600	34,691	-15
Fuel Blending	18,400	13,123	-29
Solvent Recycling	12,400	17,493	+41
Zinc Recovery	85,400	35,875	-58
Other Treatment or Recovery[38]	23,000	12,248	-47
Specific Waste Exclusions[39]		38,830	
Storage	1,800	1,800	0
TOTAL	**243,900**	**216,900**	**-11**

Of the 216,900 tons of hazardous waste shipped out of state for commercial management in 1999, seventeen percent was shipped for zinc recovery, sixteen percent was burned at cement kilns or other energy recovery facilities, nineteen percent was landfilled, six percent was blended into fuel, and eighteen percent was processed under specific waste exclusions. The waste management technologies with the most notable changes in the quantity of waste exported from 1997 to 1999 include deep-well injection, energy recovery, liquid incineration, zinc recovery, and other treatment or recovery. The remainder of this section describes some of the factors contributing to the increases and decreases in exports for the waste management technologies listed previously.

(1) Zinc Recovery

[37] Includes waste shipped out of state for stabilization which is typically land disposed of after treatment.

[38] Includes waste reported in the "other metals recovery" category in Table 2 of the *Needs Assessment for Hazardous Waste Commercial Management Capacity in Texas (2002 Update) [To be published in FY 2003].*

[39] Includes, but is not limited to, universal waste, precious metal recovery, and spent lead-acid batteries. This number was not tracked in detail in 1997 and was allocated to other categories.

Exports of waste containing zinc for recovery decrease by 61 percent between 1997 and 1999. Steel industry representatives contacted indicated much of this decrease is ueo to lower than normal production in 1999 with one facility shutting down entirely. Much of the zinc waste for recovery is generated from the galvanizing process of nails and other galvanized steel products. Discussions with industry representatives indicated that the steel industry's production fluctuates depending on the economy and market price for its products.

(2) Sludge/Solid Incineration

Exports of sludges/solids for incineration have decreased by 5,389 tons. Whereas the amount of waste shipped out-of-state for sludge/solid incineration has not changed significantly, how some the waste was categorized did. One large recurring shipment of over 4,000 tons to an out-of-state treatment facility was determined to be sent to a commercial facility in previous reports. Recent research by TCEQ concluded that this waste is being shipped to a captive facility.

(7) Specific Waste Exclusions

This category was not included in previous reports. This categorization includes universal waste, precious metal recovery, spent lead-acid batteries, and other specific waste that are not regulated by the LDRs (Land Disposal Restrictions). Current regulations encourage generators to have the hazardous waste they produce to be classified as one of these excluded wastes. A large shift was noted by one generator from incinerating the sludges left over from their manufacturing process, which was treated on-site, to shipping it out of state for precious metal recovery to reclaim the high metal content from the sludge. A portion of this waste classification was included in the "Other Treatment or Recovery" category, in previous reports.

(4) Solvent Recycling

Based on the data in Table 3, the quantity of hazardous waste exported for solvent recycling increased by 5,093 tons between 1997 and 1999. In general, most sources saw a reduction in generation of hazardous waste treated by technologies using solvent recycling. In contrast, one plant expanded its operations with a new production line. This new source generated over 8,000 tons of hazardous waste and accounted for the increase in waste being shipped out of Texas for solvent recycling.

(5) Other Treatment or Recovery

Waste allocated to "Other Treatment or Recovery" (which includes non zinc metal recovery) dropped 47% from 1997 to 1999. Much of this shift is from a more detailed survey of the out-of-state receivers of Texas' hazardous waste and what process they use to treat or dispose of the waste. Some of this waste is now accounted for in the "Specific Waste Exclusions" category, in particular precious metal recovery. There were also a few recurrent waste streams that were determined to be sent to captive facilities rather than to commercial waste treatment or disposal facilities.

2.1.2 Destination of Exports

Availability of in-state capacity, economics, and geographic proximity to facilities in other states appears to be the predominant factor affecting the decisions to ship hazardous wastes out of state for commercial management. The states and country with commercial facilities receiving the largest quantities of Texas-generated waste for the 1999 reporting year were:

- ♦ Louisiana 30%
- ♦ Arizona 19%
- ♦ Arkansas 16%
- ♦ Mexico 13%
- ♦ Oklahoma 5%
- ♦ Illinois 4%
- ♦ Kansas 3%
- ♦ Kentucky 2%

The states and country listed above have landfills, zinc recovery facilities, facilities that employ energy recovery units, or other metal recovery facilities that can manage a variety of waste streams (including solids). Twenty-nine other states and three countries received the remaining 9 percent of hazardous waste exports.

Table 4
Imports of Hazardous Waste to Commercial Facilities
(1997 - 1999)

Waste Management Method	1997 (Tons)	1999 (Tons)	Percentage Change
Landfill	1,800	3,982	+121
Deep-Well Injection	61,700	56,714	-8
Incineration - Liquids	25,400	15,647	-38
Incineration - Solids/Sludges	41,000	20,590	-50
Energy Recovery	6,800	6,670	-2
Fuel Blending	31,100	32,422	+4
Solvent Recycling	11,500	2,340	-80
Metal Recovery	21,700	8,272	-62
Stabilization	3,900	41,454	+975
Other Treatment or Recovery	4,800	924	-83
Storage	14,600	17,378	+19
TOTAL	**224,300**	**206,393**	**-8**

2.2 Total Imports

Texas facilities received 286,800 tons of hazardous waste for management in 1999 from out-of-state generators. As Table 4 indicates, there was an eight percent drop in the total amount of hazardous waste imported in 1999 compared to the 1997 levels. Even though the total amount of waste imported to Texas diminished slightly, there were some increases and decreases that had significant impacts to the different subcategories, with the most dramatic of these being waste shipped to Texas for stabilization, which is ultimately landfilled. Imports to both commercial and captive facilities are discussed below.

2.2.1 Imports to Commercial Facilities

Commercial waste management facilities in Texas received approximately 206,000 tons of hazardous waste from out of state for management in 1999. Twenty-seven percent of the hazardous waste from out of state was deep-well injected and twenty percent was stabilized. Sixteen percent of the hazardous wastes from out of state was blended into fuel. Approximately 4,000 tons of out-of-state hazardous waste was landfilled in 1999. Table 4 compares the quantity of hazardous wastes managed by commercial facilities in 1997 and 1999. As illustrated in Table 4, the most notable percentage changes between 1997 and 1999 are in the landfill, sludge/solid incineration, solvent recycling, metal recovery and stabilization categories. The changes for each of these categories are discussed in the following sections.

(1) Landfill

Although the percentage change for "landfill" appears to be extremely high, the overall increase was 2,100 tons. Based on a review of the data, a single one-time shipment of 2,900 tons was responsible for this increase. If this one source was subtracted, there would have been a slight decrease for commercial imports of landfilled hazardous waste.

(2) Liquid and Sludge/Solid Incineration

Imports for sludge/solid incineration decreased by 50 percent between 1997 and 1999. The majority of this decrease was due to a decrease in the quantity of waste shipped to one commercial facility from New York state. Based on a discussion with the commercial facility representative, this decrease reflected a drop in tonnage after a one-time shipment, in 1997, of Polychlorinated Biphenyl (PCB)-contaminated waste that was generated as a result of a large spill cleanup. Throughout the country the number of incinerators permitted to accept PCBs is limited, as is the number of commercial treatment alternatives for this kind of waste. As a result, the generator was required to transport this waste into Texas.

Liquid incineration decreased by 38 percent. This drop in imports is largely attributed to the categorization of commercial vs. captive waste. Research of the out-of-state generators revealed that commercial facilities were receiving waste from more facilities owned by the same parent company, than previously known.

(3) Stabilization

Stabilization had the largest impact of commercial waste imports to Texas. Between 1995 and 1997 there was a 3,700 ton increase of waste shipped to Texas for stabilization. This was attributed to a new commercial landfill that accepts waste for stabilization. This trend continued to climb ten fold in 1999. Much of the waste shipped to Texas for stabilization is from one-time shipments from corrective actions or other related activities, one of which was slightly over 15,000 tons alone.

(4) Metals Recovery

Imports to recover metal from hazardous waste decreased by 62%. One facility accepting approximately 9,600 tons less waste in 1999 than 1997 accounts for most of this reduction. Changes in regulations and processes prompted this facility to temporarily limit its intake of hazardous waste for treatment. Following discussions with facility representatives TCEQ ascertained that the facility has once again increased the amount of waste that it accepts for treatment which will be reflected in future reports.

(5) Other Treatment or Recovery

There was a decrease in other types of treatment and recoveries of eighty-three percent. TCEQ determined one facility fuel blends its waste and moved those wastes into the appropriate category instead of being categorized as "other treatment." There were also numerous technologies and facilities that saw slight reductions in their respected numbers. None of these reductions were a significant trend alone.

2.2.2 Imports To Captive Facilities

Captive facilities typically are large industrial generators that have developed waste management capacity on site and make this capacity available to other plant sites owned or operated by the same parent company, irrespective of state boundaries. In some cases, this is a reciprocal arrangement. Several of Texas' large industrial generators also ship waste to captive facilities out-of-state for management. There was approximately 9,500 tons of captive waste received by noncommercial facilities**.** Almost all of this waste was treated by using liquid and sludge/solid incineration technologies.

Approximately 54,300 tons of hazardous waste imported in 1999 was received by commercial waste management facilities where the facility that shipped the waste is owned or operated by the same commercial facility that received the waste. This intra-company shipment is considered to be captive; however, it does have a large impact on the commercial capacity of these facilities. The largest proportion of this waste was deep-well injected, followed by both liquid and sludge/solid incineration.

2.2.3 Origin of Imports

Geographic proximity, intra-company shipments between commercial waste management sites, and availability of capacity in the generating state are factors that affect the out-of-state generators' decisions regarding where to manage waste. The states with generators that accounted for 77 percent (more than 208,500 tons) of the hazardous waste received by Texas facilities were:

- Louisiana 29%
- Alabama 10%
- California 8%
- Puerto Rico 6%
- Oklahoma 5%
- Kentucky 4%
- Indiana 3%
- Arkansas 3%
- Kansas 3%
- Nebraska 2%
- New Mexico 2%
- Florida 2%

Shipments from Mexico to Texas commercial facilities totaled approximately 3,100 tons.

Section 3
Commercial Management of Texas Hazardous Waste

In 1999, Texas generators shipped 471,691 tons of hazardous waste to in-state commercial facilities and 216,907 tons of hazardous waste to out-of-state commercial facilities. This brought the quantity of Texas hazardous waste shipped to in- and out-of-state commercial facilities to 688,598 tons. Table 5 details the waste management technologies used by commercial facilities managing Texas-generated hazardous wastes.

The 1999 commercial demand level of 688,598 tons represented a small decrease compared to the 1997 commercial demand of 742,700 tons. In 1999, exports accounted for approximately 31 percent of commercial demand. Neither of the in-state or out-of-state commercial demand figures includes the following: nonhazardous waste managed at hazardous waste management facilities or on-site management of hazardous waste generated by commercial facilities. There was a decrease of 54,102 tons of waste being managed at commercial facilities between 1997 and 1999, which was most likely due to continued source-reduction efforts.

The five treatment technology categories with the most significant percentage changes between 1997 and 1999 are deep-well injection, fuel blending, zinc recovery, stabilization, and specific waste exclusions. A summary of the waste management activities that contributed to the changes for the four in-state commercial treatment categories is provided below. Section 2 of this report provides a summary of the changes for waste shipped to out-of-state facilities.

(1) Deep-well injection

The amount of waste that was deep-well injected in 1999 decreased by 74,884 tons from 1997. Most of this reduction was due to a smaller market for deep-well injected waste in 1999. Waste minimization programs and alternative methods of treatment reduced the amount of waste available for injection into deep-wells. The method of treatment that had the most impact on the reduction of waste being deep-well injected is wastewater treatment facilities are more frequently treating some of low level hazardous waste and thereby avoiding the more expensive method of deep-well injection.

(2) Fuel Blending

One increase of 30,090 tons of waste for fuel blending is the result of a general trend from all facilities that use this technology. These facilities are blending more waste as fuel instead of using other treatment techniques or disposing of the waste. Fuel blending is also an intermediate step in the treatment process of hazardous waste management. Most of the waste that is fuel blended is burned at cement kilns or other energy recovery units. The category of energy recovery increased by 23,167 tons.

Zinc Recovery

TCEQ has determined that there are no commercial shipments of waste for zinc recovery being received in Texas. Currently, there is only one facility accepting waste for zinc recovery in the state. This one facility is located on another plant's property and by design is only able to accept waste from the facility where it is located and is not available to receive waste from other outside generators. This facility operates as a captive system and not as a commercial facility as in previous reports.

Stabilization

As stated in section 2.2.1, the treatment category of stabilization increased for imports to Texas. This trend continued for waste generated and treated within the state, showing an increase of 18,493 tons. The larger values in stabilization can be attributed to increases of amount of the waste received at one facility.

Table 5
Commercial Management of Hazardous Waste Generated in Texas in 1999 (Tons)

Waste Management Method	Texas Waste Received by In-State Commercial Facilities	Texas Waste Shipped to Out-of-State Commercial Facilities	Total Commercial Demand[40]
Landfill	3,398	24,248	27,646
Deep-Well Injection	137,616	1,246	138,862
Incineration-Liquids	51,088	5,486	56,574
Incineration-Solids and	26,655	9,511	36,166
Cement Kilns - Liquids Cement Kilns - Sludge/Solids	88,272 0	30,555 4,136	118,827 4,136
Fuel Blending	79,690	13,123	92,813
Solvent Recovery	16,195	22,364	38,559
Zinc Recovery	0	35,875	35,875
Other Metals Recovery	2,488	8,833	11,320
Stabilization	28,993	17,467	46,460
Specific Waste	801	38,830	39,631
Other	15,977	3,416	19,393
Storage	20,517	1,818	22,335
TOTAL	471,691	216,907	688,598

[40] Total commercial demand equals sums of columns 1 and 2. These figures do not include wastes generated and managed onsite at commercial hazardous waste management facilities or treatment train volumes for out-of-state waste (i.e., waste sent to fuel blending will be followed by energy recovery. However, only the fuel blending quantity is included in this data).

Appendix 2

Waste Management Technologies

Land Disposal Restrictions Analysis

Introduction And Background

The Environmental Protection Agency's (EPA) Land Disposal Restriction (LDR) program prohibits land disposal of hazardous wastes unless such wastes meet promulgated treatment standards and are exempted from these rules. EPA established the LDR program under the authority of the Hazardous and Solid Waste Amendments of 1984 (HSWA). Under HSWA, Congress explicit by directs that reliance on land disposal should be minimized or eliminated, and that land disposal, particularly landfills and surface impoundments, should be the least favored method for managing hazardous wastes.

EPA has set concentration-based or technology-based standards (also known as Best Demonstrated Available Technologies - BDATs) for hazardous wastes which substantially reduce the likelihood of migration of hazardous constituents from the waste to minimize short-term and long-term threats to human health or the environment. Hazardous wastes assigned concentration-based standards may be land disposed if regulated constituents are present at concentrations less than the standards. Hazardous wastes assigned technology-based standards must be managed by the assigned technologies (BDATs) prior to land disposal.

Treatment standards for land disposed hazardous wastes have been implemented according to a schedule set by Congress. The effective dates of the LDR rules are as follows:

- Solvent and Dioxin Wastes (November 1986)
- California List Wastes (July 1987)
- First Third Scheduled Wastes (August 1988)
- Second Third Scheduled Wastes (June 1989)
- Third Third Scheduled Waste (May 1990)
- Newly Listed and Newly Identified Waste Phase I (1992)
- Newly Listed and Newly Identified Waste Phase II (1994)
- Newly Listed and Newly Identified Waste Phase III (1996)
- Newly Listed and Newly Identified Waste Phase VI (1997)

The LDR rules will continue to impact the need for commercial hazardous waste capacity in Texas. The implementation of LDR rules on wastes currently land disposed could have significant effects on the demand for certain commercial technologies, particularly stabilization and incineration.

Waste Management Technologies

Hazardous waste treatment, processing, and disposal technologies have been grouped into 17 broad categories. These broad categories have been divided into subcategories in some cases, in order to cross reference the management technologies to the land disposal restriction (LDR) rules. Subcategories in all capital letters are LDR technology codes.

1. Low Temperature Metals Recovery -Any system operating at low to moderate temperatures used to recover metals from a hazardous waste stream for reuse. High temperature metals recovery can be found in Category 15. Systems found under this category include:

   010 RMETL
   Ion Exchange
   Reverse Osmosis
   Resin or Solid Adsorption
   Freeze Crystallization
   Ultrafiltration
   Simple Precipitation/Crystallization
   Acid Leaching
   Other Metals Recovery

   011 Other
   Electrolytic Metals Recovery

2. Solvent Recovery - Any system used to recover solvents from a hazardous waste stream for reuse. Systems found under this category include:

   020 RORGS
   Fractionation/Distillation
   Thin Film Evaporation
   Phase Separation
   Other Solvent Recovery

3. Other Recovery - Any system used to reclaim constituents from a waste stream for reuse that does not fall under the categories 1, 2, or 15. This is the catch-all recovery category. Systems found under this category include:

   030 RCGAS
   Recovery of Compressed Gases for Direct Use or Resale

   031 RORGS
   Nonsolvent Organic Recovery

   032 RCORR
   Acid Regeneration
   Recovery of Acids or Bases

   033 LLEXT
   Solvent Extraction or Liquid/Liquid Extraction

034 CARBREG
Regeneration of carbon filters in multiple hearth furnace

035 Other recovery technologies

4. Incineration - Liquids - Any system used to destroy liquid hazardous waste streams by combustion. Systems found under this category include:

040 INCIN
Liquid Injection Incinerators
Rotary Kilns with Liquid Injection
Two-Stage Incinerators
Fixed Hearth Incinerators
Multiple Hearth Incinerators
Fluidized Bed Incinerators
Pyrolytic Destructors

5. Incineration - Sludges/Solids - Any system used to destroy sludge and/or solid hazardous wastes by combustion. This category is INCIN (050) under the LDR rules. Systems found under this category include:

050 INCIN
Rotary Kilns
Two-Stage Incinerators
Fixed Hearth Incinerators
Multiple Hearth Incinerators
Fluidized Bed Incinerators
Pyrolytic Destructors

6. Energy Recovery or Fuel Substitution - Any system that burns hazardous waste for its fuel value. In Texas, only cement kilns provide commercial capacity in this category. Systems found under this category, either commercial or on site, could include:

060 FSUBS
Cement, Aggregate, and Asphalt Kilns
Blast Furnaces

060 FSUBS (Continued)
Coke Ovens
Sulfur Recovery Furnaces
Smelting, Melting and Refining Furnaces
Other Furnaces
Industrial Boilers
Other Energy Recovery Units
Reuse of Compressed Gases for Fuel Use

7. Aqueous Inorganic Treatment - Any system used to remove or destroy inorganic constituents from an aqueous (water-based) hazardous waste stream. Systems found under this category include:

070 CHRED
Chromium Reduction and Chemical Reduction

071 PRECP
Chemical Precipitation

072 CHOXD
Cyanide Oxidation
General Oxidation

073 Other Aqueous Inorganic Treatment
Ion Exchange
Reverse Osmosis
Settling/Clarification

074 NEUTR
Neutralization

8. Aqueous Organic Treatment - Any system used to remove or destroy organic constituents from an aqueous (water-based) hazardous waste stream. Systems found under this category include:

080 BIODG
Biological Treatment

081 CARBN
Carbon Adsorption

082 SSTRP
Steam Stripping

083 WETOX
Wet Air Oxidation

084 CHOXD
Chemical Oxidation

085 LLEXT
Solvent Extraction or Liquid/Liquid Extraction

086 Other
Other Aqueous Organic Treatment
Air Stripping
Filtration
Air floatation
Oil skimming
Settling/Clarification

087 NEUTR
Neutralization

9. Other Treatment - Any system used to treat hazardous waste streams that does not fall under categories 1 through 8, 10, 11, 15 and 17. This is the catch-all treatment category. Systems found under this category include:

090 DEACT
Deactivation of Hazardous Characteristics of ignitability, corrosivity and/or reactivity.

091 NEUTR
Neutralization

092 ADGAS
Venting of Compressed Gases into an Absorbing or Reacting Unit

093 AMLGM
Amalgamation of Liquid Mercury

094 Other
Settling/Clarification (if stand alone process)
Other Treatment

095 WTRRX
Controlled Reaction with Water

10. Sludge Treatment - Any system used to treat hazardous waste sludges not including stabilization/fixation, incineration, or recovery technologies. Only "stand-alone" processes are included in this category (100). Systems found under this category include:

Sludge Dewatering
Addition of Excess Lime or Caustic to Increase Alkalinity
Absorption/adsorption to Render Nonliquid

11. Stabilization/Fixation - Any system that chemically or physically reduces the mobility of hazardous constituents by binding the hazardous constituents into a solid mass with low permeability that resists leaching. This does not include addition of adsorbates to render a waste stream nonliquid or lime/caustic addition to increase alkalinity (refer to Category 10). Systems found under this category include:

110 MACRO
Macroencapsulation
Microencapsulation

111 STABL
Cement-Based Stabilization
Pozzolanic-Based Stabilization

112 VITRI
Vitrification uses heat to melt a mixture of glass formers and waste materials into molten slag, which then cools and incorporates the metals and other materials into the glass/slag matrix.

12. Land Treatment - Also called land application or land farming. This management practice is considered to be land disposal under the Hazardous and Solid Waste Amendments of 1984 (HSWA). There are no operating commercial landfarms in Texas at this time. (120)

13. Land Disposal - Surface impoundments closed as landfills (disposal impoundments), landfills, and salt domes are also considered to be land disposal under HSWA. These three technologies are considered together in this category, because of the impact of the LDR rules on land disposal technologies. (130)

    Landfills
    Surface impoundments closed as landfills
    Salt domes

    Some hazardous wastes, after treatment, can be managed in nonhazardous waste landfills (131).

14. Deep-Well Injection - A type of underground injection beneath the deepest stratum containing an underground source of drinking water defined in the regulation pursuant to the Safe Drinking Water Act as Class I wells (40 CFR Section 144.6A). This management practice is considered to be land disposal under HSWA. (140)

15. High Temperature Metals Recovery - Any system (typically an industrial furnace) that recovers metals or inorganics through the use of thermal treatment. Systems found under this category include:

    150 RBERY
    Recovery of beryllium in thermal treatment units

    151 RMERC
    Retorting or roasting in a thermal unit capable of volatilizing and recovering mercury

    152 RZINC
    High temperature resmelting for zinc recovery

    153 RTHRM
    Thermal recovery of metals or inorganics in units identified as industrial furnaces

    154 RLEAD
    Recovery of lead in secondary lead smelters.

    155 CATREC
    Recovery of catalyst

16. Fuel Blending-Processing of wastes into fuels. These fuels can be burned in a combustion unit with authorization to burn hazardous waste fuel from offsite. This is an intermediate waste management category and is not the final management category. After blending, waste fuels often go to cement kilns for combustion. (160)

17. Nonaqueous Treatment--Any system used to destroy organic or inorganic constituents from a nonaqueous (primarily solids or organics) waste stream. Systems found under this category include:

    170 BIODG
    Biological Treatment

    171 CHOXD
    Chemical Oxidation

    172 CHRED
    Chemical Reduction

    173 WETOX
    Wet Air Oxidation

Appendix 3

Methodology Description:
2004 Projection of Commercial Demand

Methodology Description:
2004 Projection of Commercial Demand

Task: Project 2004 demand for commercial waste management by Texas-generated waste.

Approach: The TCEQ developed the 2004 demand projection based on the following steps. The [ ] refer to methodologies described in greater detail separately.

STEP I. Define the Baseline Data

The 1999 waste management data are the most recent data available in a computerized format which have been reviewed. The 1999 data have also been corrected for identified reporting errors by generators and receivers.

Data are submitted by generators annually (and monthly, if shipping to out-of-state facilities)[41]. All Texas receivers of manifested hazardous or Class 1 waste are required to submit monthly receiver reports to the TCEQ.

The database developed from Steps A and B below will be referred to as the 2002hazneeds database.

A. Reviewed 1999 commercial data for accuracy.

1. Reviewed 1999 in-state commercial receipt totals by facility. The 1999 total quantity of waste received as reported by the facility was compared to reports from generators to determine if any large quantity waste streams were not reported as received by the commercial facility. Large quantity waste streams are defined as those greater than 100 tons for the calendar year. Discrepancies with a difference greater than 100 tons of the total quantity reported received were clarified by contacting the generator or receiver to determine if there was a reporting error.

2. Contacted generators who reported a storage handling code for waste streams over 100 tons that were shipped to out-of-state facilities. The ultimate disposition of the waste stream was used in the demand analysis.

A. Developed a base year commercial demand database using the 1999 data. This base year commercial database contains data on waste managed at Texas commercial facilities in 1999 and waste sent to out-of-state facilities. The database does not include:

1. Shipments to captive facilities out of state: These shipments were identified for companies with regional waste management facilities. Annual reports from in-state generators with known management facilities in other states were reviewed to determine if 1999 shipments were made to a captive facility. Staff identified 36,395 tons shipped to out-of-state captive facilities, primarily for stabilization and landfilling.[42]

[41] To eliminate duplicative reporting requirements, in May 1997, the TCEQ finalized rules that eliminated the requirement that generators prepare monthly waste shipment summaries for waste shipped out of state. However, generators are still required to report out-of-state shipments on the annual waste summary.

[42] The quantity shipped to captive facilities includes both recurrent and remediation generated wastes.

2. One-time cleanup waste shipments shipped off site: One-time cleanup wastes are wastes from state or federal Superfund actions, closures and corrective actions. [See Appendix 5 Methodology Description: Estimating One-Time Waste Demand For Capacity.]

3. Shipments to storage facilities in or out of state: Except in a few instances, wastes shipped to storage facilities are re-shipped to another commercial facility for treatment, disposal, or recycling. The final disposition of the temporarily stored waste is reported by the receiver and the final disposition is included in the data set 2004 hazgen.

4. Shipments of newly regulated waste to commercial landfills in 1999. These wastes are addressed under a separate methodology described in Section II.

STEP II. Incorporate Factors Affecting 2004 Commercial Demand of Recurrent Waste Streams

New federal regulations will affect the 2004 demand for commercial hazardous waste management capacity. The projected impacts of the following in the 1999 baseline data were incorporated by reallocating newly regulated waste land disposed of in 1999 to EPA's promulgated treatment standard. [See Appendix 4 Methodology Description: Estimating Commercial Demand by Recurrent Generation of Newly Regulated Hazardous Waste.]:

1. Newly Listed Wastes;
2. Hazardous Waste Identification Rule - Revisions to the Mixture and Derived-From Rules; and
3. Emissions Limits for Hazardous Waste Combustion Facilities.
4. Definition of Solid Waste - Toxicity Characteristic.

STEP III. Estimate 2004 Commercial Demand by Recurrent Wastes

Other non-regulatory factors will affect 2004 commercial demand by recurrent waste streams. Source reduction programs will reduce waste generation rates, economic growth will increase waste generation rates, and new household hazardous waste and pesticide collection programs will increase demand for commercial management.

A. Source Reduction and Economic Growth[43]

To assess the impact of source reduction and economic growth, TCEQ divided the baseline data was into two groups, Projected and Nonprojected. Projected data includes records for which the generator is identified as having submitted an *Annual Source Reduction/Waste Minimization Plan Executive Summary and Progress Report* (*SR/WM Plan*) identifying expected hazardous waste generation quantities for 2000 through 2004[44].

[43] See Appendix 3 for a more detailed discussion on the methodology for incorporating source reduction factors into the 2002 estimate of demand.

[44] The projection year depends on the first year the requirement to submit a plan became effective. See Table A2-1 for a detailed schedule of Annual Source Reduction/Waste Minimization Plan due dates and projection years.

Nonprojected data include records for generators that have not submitted hazardous waste projection data. The methodology used to estimate source reduction and economic growth factors for each of these two sets of data is described in Steps 1 and 2 below:

1. Projected Data

The projected data set includes facilities that submitted projected hazardous waste generation data. Waste from projection generators accounts for 76 percent of the recurrent quantity of waste treated at commercial hazardous waste management facilities in 1999. The year for which generators are required to report projected hazardous waste generation quantities varies based on the date generators were required to submit their first SR/WM Plan Report.

Facilities that submitted an *SR/WM Plan* were assumed to have incorporated source reduction, economic growth, and any other relevant factors into their projection estimates. Based on the information provided in the reports, it was not possible to quantify the impact of individual factors affecting projections of future generation. Therefore, only the cumulative impact of these factors was calculated.

The average annual percentage change between the base year and the projection year was calculated based on the amount of hazardous waste reported as generated in 1999 and the amount expected to be generated in the projection year based on the *SR/WM Plan*. The 1999 commercial baseline data were increased or decreased on a generator-specific basis for each year between the base year and the projection year. Projected annual growth rates reported by the State Comptroller in the Spring, 2002, for the manufacturing sector of the economy were used to increase data for each year beyond the last projection year through the year 2004[45].

2. Nonprojected

Waste from nonprojection generators accounts for 24 percent of the recurrent quantity of waste treated at commercial hazardous waste management facilities in 1999. Due to the lack of source reduction data for nonprojection generators, only economic growth factors were considered when adjusting the 1999 baseline data[46]. Wastes in the 1999 baseline were assumed to increase at a rate consistent with projected statewide real growth in earnings. The State Comptroller projects that earnings will increase in the manufacturing sector of the Texas economy by 34 percent from 1999 to 2004. It is assumed that this growth in earnings in the Texas economy translates into a concurrent growth in recurrent waste generation, resulting from plant expansions or new business openings.

B. Agricultural Collection Program

Based on discussions with staff, TCEQ will target three county areas for agricultural waste collection annually. These collections are estimated to collect

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[45] *Texas Gross State Product Detail: Calendar Years 1970 - 2020*, Spring 2002 State Comptroller's Economic Forecast.

[46] The low-demand scenario provides some indication of the impact source reduction by non-projection facilities may have on commercial demand. This scenario assumes that non-projection facilities will decrease wastes by 50 percent between 1999 and 2004. In this scenario, TCEQ staff applied economic growth rates after adjusting the data to reflect the 50 percent source reduction assumption.

approximately 285.79 tons of hazardous waste. These wastes were allocated to the categories for fuel blending, liquid incineration, stabilization and landfilling.

C. Household Hazardous Waste Collection Program

Based on discussions with staff, TCEQ will hold 80 household hazardous waste collections will be held annually. These collections are estimated to collect 25 tons of waste per collection, for a total commercial demand of 2,000 tons. The wastes were allocated to the categories for liquid incineration, solid/sludge incineration, fuel blending, stabilization and landfilling.

STEP IV. Estimate Demand by One-time Wastes for Commercial Management in 2004

One-time waste demand on commercial management in 2004 is calculated and presented separately. [See Methodology Description: Estimating One-Time Waste Demand for Capacity.]

STEP V. Quantify 2004 Commercial Demand

Commercial demand for 2004 is calculated by adding the totals from Sections I through IV together. The results of the projection are displayed by waste management category and recurrent and one-time wastes in this assessment.

Appendix 4

Methodology Description:
Estimating the Impact of Source Reduction on Commercial Demand

Methodology Description:
Estimating the Impact of Source Reduction on Commercial Demand

Task: Estimate the impact of source reduction initiatives on commercial waste management demand.

Approach: The baseline data used to estimate commercial demand for hazardous waste management technologies were divided into two categories:

(1) Data from facilities which submitted an *Annual Source Reduction/Waste Minimization Plan Executive Summary and Progress Report* (Projection Facilities).

Facilities in the first group provided projections of the quantity of hazardous waste they expect to generate in 2000 through 2004[47]. Waste from projection facilities accounted for 76 percent of the total quantity of waste treated at commercial hazardous waste management facilities in 1999. The average annual percentage change between the base year and the projection year was calculated based on the amount of hazardous waste reported as generated in 1999 and the amount expected to be generated in the projection year. The 1999 commercial baseline data were increased or decreased on a generator-specific basis for each year between the base year and the projection year.

(2) Data from facilities that did not submit an *Annual Source Reduction/Waste Minimization Plan* (Nonprojection facilities).

Waste from nonprojection generators accounts for 24 percent of the total quantity of waste treated at commercial hazardous waste management facilities in 1999. Due to the lack of source reduction data for nonprojection generators, only economic growth factors were considered when adjusting the 1999 baseline data. The low-demand scenario provides some indication of the impact source reduction by non-projection facilities may have on commercial demand. This scenario assumes that non-projection facilities will decrease wastes by 50 percent between 1999 and 2004. In this scenario, growth rates were applied after adjusting the data to reflect the 50 percent source reduction assumption.

Limitations to Data and Projections

1. *SR/WM Plans* identify the total amount of hazardous waste that facilities expect to generate in the projection year. To estimate the expected reduction in commercial demand, TCEQ calculated annual percentage change was calculated based on the quantity of waste a facility generated in 1999 and the quantity of waste expected to be generated in the projection year. Because projection estimates reflect the total amount of waste a facility expects to generate, not just the portion managed at commercial facilities, the calculated percentage change may be higher or lower than expected changes in the quantity of waste managed offsite. For example, if a generator's source reduction efforts are concentrated primarily on waste managed onsite, the percentage change calculation will overstate source reduction for off-site shipments to commercial facilities.

[47] The projection year depends on the first year the requirement to submit a plan became effective. See Table A2-1 in Appendix 2 for a detailed schedule of *Annual Source Reduction/Waste Minimization Plan* due dates and projection years.

2. Not all generators are required to submit projections through 2001. Since no source reduction was assumed beyond the projection year, the impact of source reduction efforts on the projection of commercial demand in the year 2002 is lower than expected.

3. Projection data submitted by facilities accounts for a variety of other factors in addition to source reduction such as growth, process changes, implementation of on-site treatment processes, etc. The source reduction estimate presented is lower than expected because some of these other factors result in an increase in waste generation and minimize the impact of source reduction efforts.

4. Due to the lack of source reduction information for generators that were not required to submit *SR/WM Plans*, the baseline data were not adjusted to account for source reduction activities. Given the increased trend toward source reduction, however, it is unlikely that none of these generators will reduce the quantity of hazardous waste they generate between 1999 and 2002.

Due to the data limitations noted above, source reduction factors were reviewed to verify that they appear realistic based on information the TCEQ receives on industry's source reduction activities. Contact with the regulated community is maintained through surveys, trade fairs, seminars, committees, and task force meetings.

Appendix 5

Methodology Description:
Estimating Commercial Demand by Recurrent Generation of Newly Regulated Hazardous Waste

Methodology Description:
Estimating Commercial Demand by Recurrent
Generation of Newly Regulated Hazardous Waste

Task: Estimate the impact of recurrent generation of hazardous waste streams regulated during or after 1999 (newly regulated waste) on the demand for Texas commercial hazardous waste management capacity in 2004.

Approach: The following steps were used to estimate the volume of newly regulated, recurrent wastes requiring commercial management in 2004 as a result of regulations promulgated during or after 1999. TCEQ relied primarily on the EPA's estimates to quantify the impact of the regulations affecting newly listed waste.

1. Chlorinated Aliphatics Production Waste

Step 1: Defined the population of facilities and waste streams affected by the regulations. Reviewed notice of registration (NORs) data on file as of June 2002. From this review, staff extracted all information for wastes that carried a K174, or K175 EPA waste code. Information available includes generator name, relevant EPA hazardous waste codes, and quantity of waste generated.

Step 2: Reviewed the capacity analysis conducted by the EPA for Chlorinated Aliphatics Production Waste requiring commercial management.

Step 3: Determined Texas' percentage of hazardous waste generation by the EPA's projection of demand for commercial treatment for Chlorinated Aliphatics Production.

Step 4: Adjusted 1999 quantities based on State Comptroller's projections of economic growth in Texas. The purpose of these adjustments is to reflect expected changes in generation activity between 1999 and 2004.

Results

The EPA estimates that commercial treatment demand for K174 nonwastewater may be 6,100 tons per year nationwide. However, because EPA is finalizing a conditional listing approach for the K174 wastes under which these wastes would not be hazardous if disposed of in a Subtitle C or a nonhazardous waste landfill, it is possible that little or no hazardous waste treatment capacity will be required for this waste. For K175, EPA estimates that up to 130 tons per year may require alternative commercial treatment. Neither of these newly listed wastes will cause significant impact on commercial hazardous waste treatment in Texas.

1. Inorganic Chemicals

Step 1: Defined the population of facilities and waste streams affected by the regulations. Reviewed notice of registration (NORs) data on file as of June

2002. From this review, staff extracted all information for wastes that carried a K176, K177 or K178 EPA waste code. Information available includes generator name, relevant EPA hazardous waste codes, and quantity of waste generated.

Step 2: Reviewed the capacity analysis conducted by the EPA for Inorganic Chemical Production Waste requiring commercial management.

Step 3: Determined Texas' percentage of hazardous waste generation by the EPA's projection of demand for commercial treatment for the three newly listed Inorganic Chemical Waste.

Step 4: Adjusted 1999 quantities based on State Comptroller's projections of economic growth in Texas. The purpose of these adjustments is to reflect expected changes in generation activity between 1999 and 2004.

Results

The EPA estimates that in Texas 4.4 tons of K176 waste will be generated in Texas each year. This waste will be treated using stabilization and/or metals recovery to meet the final standards. Even though there is no recurrent generation of K177 waste in the state there are 120,000 tons of contaminated soil and a slag pile of K177 waste at a facility in Texas. However, this site is currently under a corrective action order with the state to clean up antimony contamination and is accounted for in the one-time demand calculations. There are no known generators or quantities of K178 waste in the state. None of these newly listed waste will cause significant impact on commercial hazardous wastes treatment in Texas.

Limitations of the Data Source

Data from Large Generators Industrial generators are required to notify the TCEQ of all waste management activities. Historically, the large industrial facilities are usually aware of the federal and state notification requirements under RCRA. Based on the review for this assessment, it appears that data on generation and management of wastes from large facilities, such as the organic chemical manufacturers and petroleum refineries, is fairly complete.

Data from Municipal Generators Municipal Conditionally Exempt Small Quantity Generators (CESQGs) of hazardous waste are not required to notify the TCEQ or the EPA of their hazardous waste generation activity under state or federal rules. Although some CESQGs notify the TCEQ to receive a state registration number, the TCEQ's NOR database does not include information for all CESQGs in the state. As a result, some newly regulated waste streams generated by CESQGs will not be captured in the analysis described in this appendix. However, the quantity of statewide newly regulated waste streams generated by CESQGs are not expected to result in significant shifts in commercial demand projections.

Limitations of the Estimate

Treatment standards for newly regulated wastes are concentration-based standards. Therefore, any technology can be used to treat newly regulated wastes, provided that the treatment standard is met. To account for the impact treatment standards for newly regulated waste will have on commercial hazardous waste management capacity in the future, TCEQ allocated the quantity of newly regulated waste land disposed in 1999 to the treatment technologies the EPA used when developing the concentration-based standards. Generators may not use these technologies to comply with the LDR requirements.

The estimate of newly regulated wastes only addresses waste considered hazardous before 2002. Wastes that may become hazardous in the future could not be estimated using the methodology already discussed. It is extremely difficult to anticipate the impact of proposals for new listings of hazardous waste. However, Texas has regulated all industrial wastes since the 1970's, and the TCEQ has information on generation and management of almost all industrial Class I wastes. If a waste is currently a Class I nonhazardous waste being managed at a commercial facility, then it will be taken into account as nonhazardous demand at a commercial hazardous waste management facility. Health and Safety Code section 361.0234 requires that the needs assessment be updated every two years. The TCEQ expects to incorporate future listings of additional hazardous wastes into future updates of the Needs Assessment.

Appendix 6

Methodology Description:
Estimating One-Time Waste Demand for Capacity

Methodology Description:
Estimating One-Time Waste Demand for Capacity

Task: Estimate the impact of wastes from one-time events on 2004 commercial capacity. One-time wastes are defined as wastes from one-time events such as state-sponsored remedial or Superfund actions, federal Superfund actions, closures, corrective actions, and voluntary cleanups.

Approach: This methodology focuses on activities that generate one-time wastes and could potentially cause significant changes in the availability of commercial hazardous waste management capacity.

The approach to estimating the impact of one-time wastes on the demand for future commercial capacity is based on the premise that there will be a continuing off-site movement of small quantities of waste from unit closures. These small quantity waste streams result from the closing of units such as tanks, incinerators, and container storage areas. On a year-to-year basis, these quantities are assumed to continue at current levels. This assumption is based on discussions with staff of the TCEQ.

Spill wastes are not addressed separately by this methodology for a number of reasons. Shippers and receivers of one-time spill wastes are required to report waste management activities to the TCEQ on a monthly or annual basis. Analysis of historical data indicates that spills of hazardous waste are generally not significant in quantity. Because of the diverse materials spilled, the number of incidents annually, and the low quantities typically involved, the demand for management of spill wastes is assumed to continue in the future and increase in proportion to projected economic growth in Texas. Spill wastes are generally not considered to be amenable to waste minimization because of the mixed media involved. Also spill wastes include wastes that have been abandoned and must be removed immediately to protect public health and safety.

Large quantity one-time shipments from closures and Superfund actions were identified from the 1999 baseline data used to project 2004 waste demand for commercial capacity. This approach was taken to avoid double-counting of demand by one-time wastes on commercial capacity in the projection year. Superfund and closure wastes were a significant component of commercial demand in 1987, 1988 and 1989, especially for landfills. The 2004 commercial demand by wastes from large one-time cleanups and closures was estimated separately. The methodology to identify 1999 one-time shipments and estimate future one-time shipments is described in Sections A and B.

A. Identified and excluded from the baseline large, one-time shipments to commercial facilities and one-time quantities land disposed of on site in 1999.

1. Reviewed shipments over 1,000 tons to commercial landfill or incineration facilities to determine if they were one-time shipments.

a. All large-quantity shipments of contaminated soils from unregistered shippers to commercial facilities were assumed to be from one-time events. These unregistered shippers are identified as shippers XXX01 through XXX14 on shipment and receipt

summary data submitted to the TCEQ monthly. Shippers are allowed to use the XXXnn designation when they do not generate waste on an ongoing basis, but have a waste to be shipped on an infrequent or one-time basis. For example, Superfund site shipments are made under the XXXnn designation. (The last two characters of the shipper's identification number indicate the TCEQ region in which the waste was generated.)

b. All 1999 large quantity shipments from registered shippers to commercial landfills or incinerators were verified by one of the following methods:

1. Comparing 1999 quantities with historical generation and management quantities;

2. Reviewing waste stream descriptions submitted by generators on their NOR to determine the type of activity that resulted in generation of the waste; or

3. Contacting the generator to determine whether the waste was generated from a one-time type activity.

Approximately 18,000 tons of waste generated in 1999 was from one-time events. These wastes were not included in the 1999 baseline data used to determine 2004 demand for commercial management.

B. Projected 2004 commercial demand from state and federal Superfund actions, closures, corrective actions, and voluntary cleanups.

1. Superfund or Sites to be Ranked

Amounts of one-time wastes from state or federal Superfund activities that go to commercial facilities between 2001 and 2004 were projected. One-time waste quantity and management requirements are estimated. The estimate of waste from remediation actions includes waste from state or federal Superfund sites.

The estimate for state and federal Superfund sites is based on conducting remediation activities at 18 sites between 2001 and 2004. The quantity of waste expected to be generated from activities at these facilities during the four-year period that will require management at a commercial facility is as follows:

- 10 tons of characteristically hazardous waste requiring stabilization followed by disposal in a nonhazardous waste landfill. The medium-demand scenario assumes that 50 percent of the stabilization residuals will be disposed of in a RCRA Subtitle C landfill.

- 167 tons of hazardous waste requiring management in a solid/sludge incinerator (ash from the incinerator requires stabilization and management in a RCRA landfill).

- 510 tons of hazardous waste requiring management in a liquid incinerator/cement kiln (ash from the incinerator requires stabilization and management in a RCRA landfill).

- 3 tons for metal recovery

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- 1,001 tons of hazardous waste requiring management in a landfill.

The demand for waste management at hazardous commercial facilities as a result of waste generated during Superfund activities is approximately 1,691 tons over the four-year period. Including treatment and disposal of the residuals, the demand increases to 1,794 tons over the four-year period. The small quantity of waste expected to move off site from state and federal Superfund sites reflects the TCEQ and federal Superfund program's policy of selecting cost-effective permanent on-site treatment remedies to render wastes nonhazardous. This policy may not be implemented when sites are located in residential neighborhoods or they are too small to allow cost-effective on-site treatment of waste.

2. Emergency Response

Although emergency response actions are initiated each year to respond to contamination from spills, as stated previously, the quantity of waste generated from spills is usually small and is included in the baseline data. Therefore, no large one-time quantities must be added for emergency response activities.

3. Corrective Action and Large Closures

Approximately 12,000 tons of hazardous waste generated from closure and corrective action activities is estimated to require treatment at commercial hazardous waste management facilities annually. Including residuals, closure and corrective action activities are projected to increase the annual demand for commercial treatment by approximately 14,500 tons. Waste generated from these activies is expected to require the following treatment:

- Aqueous Organic— 1,500 tons
- Aqueous Inorganic—1,500 tons
- Deep-well Injection—2,400 tons
- Liquid Incineration/Energy Recovery—2,400 tons
- Landfill—1,800 tons
- Stabilization—1,800 tons
- Fuel Blending—600 tons

4. Voluntary Cleanup Program

The TCEQ established the Voluntary Cleanup Program (VCP) in the fall of 1995. The VCP allows eligible participants to enter into a voluntary cleanup agreement with the TCEQ for remediation of their property. Some of the facilities undergoing remediation through the VCP will not have on-site treatment capacity. Therefore, remediation activities conducted at these properties are likely to generate waste that will require commercial treatment. Approximately 85 cleanups were estimated to be conducted under the VCP annually. Based on a review of applications received to date, 11 of these 85 facilities will generate waste requiring treatment at a commercial facility. On average, these 11 facilities were estimated to generate approximately 521 tons of hazardous and 4,400 tons of nonhazardous waste annually. Approximately 50 percent of the nonhazardous waste will be disposed of in a hazardous waste landfill.

Limitations of the Data and 2002 Projections:

1. Corrective Actions The amount of historical data on corrective actions implemented since promulgation of the risk reduction rules is limited and may not be representative of future waste generation. Many facilities have not yet selected remedies for their site. Consequently, it is difficult to predict the amount of waste that may be generated. The estimates presented in this document will be reviewed and updated in future assessments as more facilities select remedies or complete corrective actions at their sites.

2. Voluntary Cleanup Program Estimates of waste generation from sites conducting remediation under the VCP are difficult to predict. Many of the sites that participate in this program initiate and complete cleanup in a short period of time. Consequently, data for facilities that are currently participating in the program may not be representative of facilities applying to the program in the future. The estimates presented in this report reflect the VCP data currently available. The TCEQ will review and update these estimates in the future as additional information becomes available.

3. Superfund or State Remedial Action Wastes The estimate of waste moving off site from state or federal Superfund sites is based on the TCEQ's current knowledge of existing sites. In general, the estimates reflect the state's policy of selecting permanent on-site treatment options when feasible and historical trends in waste management for these types of sites. The TCEQ is continually discovering additional sites that will be addressed as either a state emergency removal action, a state Superfund action, or a federal Superfund action. It is impossible to anticipate the types of wastes or type of action which might be taken in the future to remediate hazards posed by these undiscovered sites. The estimates included in this projection are based on known sites which have been evaluated or the number of state Superfund sites expected to be remedied in 2004.

Appendix 7

Methodology Description:
Transportation of Hazardous Waste to Commercial Facilities

Methodology Description:
Transportation of Hazardous Waste to Commercial Facilities

Task: Determine the number of miles Texas generators ship hazardous waste for commercial management.

Approach: The following steps are used to determine the distance hazardous waste traveled to reach a commercial management destination in 1999.

I. Identified Site Location of Generator and Receiver

City location information was downloaded from a facility's notice of registration (NOR) to identify the site location of each commercial hazardous waste receiver and each generator that shipped hazardous waste to a commercial waste management facility in 1997. For those facilities that did not identify a city location on the NOR,tThe EPA's *Envirofacts* database was queried using a facility's EPA identification number. In some cases, staff was unable to determine the site location of a particular generator. For example, conditionally exempt small quantity generators (CESQGs) are not required to register with or submit an NOR to the TCEQ and use CESQG as a solid waste registration number. Since more than one generator may report under this solid waste registration number, the city is undeterminable in which the generator is located.

II. Determined Road Mileage Between Generator and Receiver

After identifying the site location of commercial waste management facilities and generators shipping hazardous waste to these facilities in 1999, TCEQ staff grouped records downloaded from monthly waste receipt summaries and annual waste summaries into two databases:

1) Shipments to in-state commercial waste management facilities; and
2) Shipments to out-of-state commercial waste management facilities.

Sections A and B describe how TCEQ staff obtained mileage information for each generator/receiver city combination contained in the two databases listed above.

A. In-state Shipments

To identify the number of road miles between a Texas generator and a Texas commercial receiver, the state mileage guide available on the Texas Comptroller of Public Accounts web page was queried. For generators in a city with more than one Texas location, county information from the NOR was used to determine the appropriate location.

B. Out-of-state Shipments

The Official State Mileage Guide provided by the Texas Comptroller of Public Accounts only provides mileage information for select out-of-state cities. Therefore, computer software available on the Internet was used to determine the number of miles between a Texas generator and out-of-state receiver.

III Determined Quantity of Hazardous Waste Transported for Five Mileage-Range Scenarios

Mileage information obtained for each generator/receiver city combination was added to each monthly waste receipt summary and annual waste summary record in the 1999 database of commercial waste management activity. This database was then queried to determine the quantity of hazardous waste, in tons, shipped for each of the following five mileage ranges:

1) 0 to 50 miles
2) 51 to 250 miles
3) 251 to 500 miles
4) 501 to 1,000 miles
5) >1,000 miles
6. Out of the country.

Limitations of the Estimate

1. Mileage data is based on road miles. However, some hazardous waste is transported by rail. The information provided in monthly waste receipt summaries and annual waste summaries does not allow for distinguishing the method of transportation.

2. City locations could not be identified for all generators. For example, mileage calculations could not be obtained for shipments from Texas generators to foreign countries because the out-of-country receiver identification information is too generic to identify the receiving facility's city location. City locations for approximately 99 percent of the hazardous waste shipped to commercial waste management facilities in 1999 was identified.

3. Transporters of hazardous waste may not travel the same routes used to calculate distance for the Official State Mileage Guide and the Internet transportation software. For example, hazardous waste transporters may not drive directly from the generator to a commercial receiver. In some cases the transporter may consolidate waste from several different generators prior to driving to the commercial destination. In addition, road closures or other unexpected events may require transporters to take alternate routes.

Appendix 8

List of Permitted Commercial Management Facilities for Hazardous Waste

Update of Permitted Commercial Hazardous Waste Management Capacity, 2002 Needs Assessment

Name	EPA ID	Metals Recovery	Solvent Recovery	Incineration Solids/Sludge	Liquid Incineration Energy Recovery	Aqueous Inorganic	Aqueous Organic	Other Treatment	Sludge Treatment	Stabilization	Landfill	Injection	Catalyst Recovery	Fuel Blending
Allwaste Recovery	TXD102599339						x							
Alpha Omega	TXD981514383	x												
Arch Chemicals*	TXD008097487				x									
Chemical Reclamation	TXD046844700		x											x
Chemical Waste Mgmt (PA)	TXD000838896			x	x									
Detrex Corp	TXD980626154		x											
Disposal Systems (DP)	TXD000719518		x							x		x		x
Disposal Systems (CC)	TXR000001016											x		
Duratherm	TXD981053770													x
Empak	TXD097673149													x
Encycle Texas	TXD008117186	x				x								
Eurecat	TXD106829963												x	
GNB Inc.	TXD006451090	x												
Gulf Chemical	TXD074195678	x												
HEAT	TXD980624035		x											x
NSSI/Recovery	TXD982560294	x	x			x	x	x						x
Philip Reclamation**	TXD074196338									x				x
Rhodia Inc.***	TXD008099079			x	x									
Safety Kleen****	TXD055141378			x	x									
Safety Kleen	TXD077603371	x	x											x
Safety Kleen*****	TXD052649027		x											x
Schlumberger Well	TXD987988318							x						
Texas Ecologist	TXD069452340									x	x			
Treatment One	TXD055135388					x	x	x	x					x
TXI	TXD007349327			x	x									
Waste Control	TXD988088464									x	x			

* Formerly Olin Corp **Formerly Eltex ***Formerly Rhone Poulenc ****Formerly Rollins *****Formerly USPCI

Metals Recovery = 010, 151, 152, 154;
Aqueous Inorganic = 071, 072, 074
Stabilization = 111

Solvent Recovery = 020
Aqueous Organic = 084, 086, 087
Landfill = 130

Incineration Solids/Sludges = 050
Other Treatment = 095
Injection = 140

Liquid Incineration/Energy Recovery = 040, 060
Sludge Treatment = 100
Catalyst Recovery = 155

Fuel Blending = 160

Last edited 9/99

Appendix 9

Memo Dated 12/21/93:
"Comparison of Capacity Assurance Planning and Needs Assessment"

Texas Natural Resource Conservation Commission

INTEROFFICE MEMORANDUM

DATE: 12/21/93

TO: Needs Assessment File

THRU: Dan Eden, Director, Waste Policy Division

FROM: Kathey A. Ferland, Manager, Capacity Assessment Section, Waste Policy Division

SUBJECT: Comparison of Capacity Assurance Planning and Needs Assessment

Periodically, the TNRCC prepares documents pertaining to capacity and demand for offsite hazardous waste management in Texas. These documents are described below:

1. The Needs Assessment for Hazardous Waste Commercial Management Capacity in Texas (Needs Assessment), is prepared to satisfy a state requirement (Texas Health and Safety Code, Section 361.0232). The document identifies the need for specific technologies for commercial waste management and will be used in conjunction with rules to prioritize the TCEQ's processing of RCRA permit applications for commercial capacity. State law delineates factors to be included in this assessment of need. In addition, critical assumptions and parameters for the assessment were developed in consultation with Task Force 21, which represents industrial, environmental, and citizen groups in the state.

2. A Capacity Assurance Plan (CAP) is required under the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund), Section 104 (c)(9). The purpose of this section of CERCLA was for states to assure access to adequate hazardous waste treatment and disposal capacity for the hazardous wastes generated within their borders. EPA develops its own guidance on how to prepare CAPs, in order for each state's CAP projections to be consistent and comparable. EPA will prepare a national capacity analysis from the state CAPs.

Table 1 delineates the significant differences in the methodologies used to prepare the two documents. Thus, even though the documents may include projections for the same time period, there are likely to be differences in the conclusions. Overall, the Needs Assessment reflects a more realistic approach to estimating the need in Texas. The approach illustrated by the 1993 CAP methodology reflects the need for national consistency in estimation and the limited resources available from EPA for conducting state-specific analysis.

TABLE 1: SIGNIFICANT DIFFERENCES BETWEEN THE "1993 CAPACITY ASSURANCE PLAN" AND THE "NEEDS ASSESSMENT FOR HAZARDOUS WASTE COMMERCIAL MANAGEMENT CAPACITY IN TEXAS"

Issue	CAP	Needs Assessment
Which capacity is included?	Only built and operating capacity which is commercially available for hazardous waste management is counted.	All built, operating, permitted (operating or expected to be operating by 1995), and RCRA permit exempt (if operating, or expected to be operating before 1995).
How is landfill capacity estimated?	All unused permitted landfill capacity is counted.	The rate of expected annual actual utilization of existing instate commercial landfills was calculated, based on operator's projections and historical data.
How is capacity estimated?	Total operating capacity at each commercial facility estimated.	State law requires that a reserve capacity be included in the consideration of need. This reserve was subtracted from the total operating capacity. Reserve equals 20 percent of capacity.
How is industrial growth factored into the analysis?	No industrial growth is assumed. Projections are flatlined from 1991 baseline.	Industrial growth projected at statewide annual average, based on projected growth in earnings.
What are the effects of source reduction on demand in the future?	For Phase 1 CAP, source reduction is not taken into account by states. Instead, EPA will calculate a total national demand based on a 10 percent reduction in the recurrent waste projections submitted by the states.	Source reduction is calculated at the generator and waste stream level, based on generator information collected through periodic surveys.
How are other wastes managed at commercial facilities addressed?	States are only to include hazardous wastes (either federal or state definition) in the CAP demand estimates.	State law specifies that the demand for nonhazardous waste capacity shall be factored into the assessment of need.

Appendix 10

**Definitions from Subchapter A: Industrial Solid Waste and Municipal Hazardous Waste in General—
Sections 335.1–335.15, 335.17–335.25, and 335.28–335.31**

Definitions from Subchapter A: Industrial Solid Waste and Municipal Hazardous Waste in General— Sections 335.1–335.15, 335.17–335.25, and 335.28–335.31 Effective November 15, 2001

§335.1. Definitions.

The following words and terms, when used in this chapter, shall have the following meanings, unless the context clearly requires otherwise.

Aboveground tank - A device meeting the definition of tank in this section and that is situated in such a way that the entire surface area of the tank is completely above the plane of the adjacent surrounding surface and the entire surface area of the tank (including the tank bottom) is able to be visually inspected.

Act - Texas Health and Safety Code, Chapter 361.

Active life - The period from the initial receipt of hazardous waste at the facility until the executive director receives certification of final closure.

Active portion - That portion of a facility where processing, storage, or disposal operations are being or have been conducted after November 19, 1980, and which is not a closed portion. (See also "closed portion" and "inactive portion.")

Administrator - The administrator of the United States Environmental Protection Agency or his designee.

Aquifer - A geologic formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs.

Authorized representative - The person responsible for the overall operation of a facility or an operation unit (i.e., part of a facility), e.g., the plant manager, superintendent, or person of equivalent responsibility.

Battery - Has the definition adopted under §335.261 of this title (relating to Universal Waste Rule).

Boiler - An enclosed device using controlled flame combustion and having the following characteristics:

(A) the unit must have physical provisions for recovering and exporting thermal energy in the form of steam, heated fluids, or heated gases;

(B) the unit's combustion chamber and primary energy recovery section(s) must be of integral design. To be of integral design, the combustion chamber and the primary energy recovery section(s) (such as waterwalls and superheaters) must be physically formed into one manufactured or assembled unit. A unit in which the combustion chamber and the primary energy recovery section(s) are joined only by ducts or connections carrying flue gas is not integrally designed; however, secondary energy recovery equipment (such as economizers or air preheaters) need not be physically formed into the same unit as the combustion chamber and the primary energy recovery section. The following units are not precluded from being boilers solely because they are not of integral design:

(i) process heaters (units that transfer energy directly to a process stream), and

(ii) fluidized bed combustion units; and

(C) while in operation, the unit must maintain a thermal energy recovery efficiency of at least 60%, calculated in terms of the recovered energy compared with the thermal value of the fuel; and

(D) the unit must export and utilize at least 75% of the recovered energy, calculated on an annual basis. In this calculation, no credit shall be given for recovered heat used internally in the same unit. (Examples of internal use are the preheating of fuel or combustion air, and the driving of induced or forced draft fans or feedwater pumps); or

(E) the unit is one which the executive director has determined, on a case-by-case basis, to be a boiler, after considering the standards in §335.20 of this title (relating to Variance to be Classified as a Boiler).

Certification - A statement of professional opinion based upon knowledge and belief.

Class 1 wastes - Any industrial solid waste or mixture of industrial solid wastes which because of its concentration, or physical or chemical characteristics, is toxic, corrosive, flammable, a strong sensitizer or irritant, a generator of sudden pressure by decomposition, heat, or other means, or may pose a substantial present or potential danger to human health or the environment when improperly processed, stored, transported, or disposed of or otherwise managed, as further defined in §335.505 of this title (relating to Class 1 Waste Determination).

Class 2 wastes - Any individual solid waste or combination of industrial solid waste which cannot be described as Hazardous, Class 1 or Class 3 as defined in §335.506 of this title (relating to Class 2 Waste Determination).

Class 3 wastes - Inert and essentially insoluble industrial solid waste, usually including, but not limited to, materials such as rock, brick, glass, dirt, and certain plastics and rubber, etc., that are not readily decomposable, as further defined in §335.507 of this title (relating to Class 3 Waste Determination).

Closed portion - That portion of a facility which an owner or operator has closed in accordance with the approved facility closure plan and all applicable closure requirements. (See also "active portion" and "inactive portion.")

Closure - The act of permanently taking a waste management unit or facility out of service.

Commercial hazardous waste management facility - Any hazardous waste management facility that accepts hazardous waste or PCBs for a charge, except a captured facility or a facility that accepts waste only from other facilities owned or effectively controlled by the same person, where "captured facility" means a manufacturing or production facility that generates an industrial solid waste or hazardous waste that is routinely stored, processed, or disposed of on a shared basis in an integrated waste management unit owned, operated by, and located within a contiguous manufacturing complex.

Component - Either the tank or ancillary equipment of a tank system.

Consignee - The ultimate treatment, storage, or disposal facility in a receiving country to which the hazardous waste will be sent.

Container - Any portable device in which a material is stored, transported, processed, or disposed of, or otherwise handled.

Containment building - A hazardous waste management unit that is used to store or treat hazardous waste under the provisions of §335.152(a)(19) or §335.112(a)(21) of this title (relating to Standards).

Contaminant - Includes, but is not limited to, "solid waste," "hazardous waste," and "hazardous waste constituent" as defined in this subchapter, "pollutant" as defined in the Texas Water Code, §26.001, and Texas Health and Safety Code, §361.431, "hazardous substance" as defined in the Texas Health and Safety Code, §361.003, and other substances that are subject to the Texas Hazardous Substances Spill Prevention and Control Act, Texas Water Code, §§26.261 - 26.268.

Contaminated medium/media - A portion or portions of the physical environment to include soil, sediment, surface water, ground water or air, that contain contaminants at levels that pose a substantial present or future threat to human health and the environment.

Control - To apply engineering measures such as capping or reversible treatment methods and/or institutional measures such as deed restrictions to facilities or areas with wastes or contaminated media which result in remedies that are protective of human health and the environment when combined with appropriate maintenance, monitoring, and any necessary further corrective action.

Decontaminate - To apply a treatment process(es) to wastes or contaminated media whereby the substantial present or future threat to human health and the environment is eliminated.

Designated facility - A Class 1 or hazardous waste storage, processing, or disposal facility which has received an EPA permit (or a facility with interim status) in accordance with the requirements of 40 CFR Parts 270 and 124; a permit from a state authorized in accordance with 40 CFR Part 271 (in the case of hazardous waste); a permit issued pursuant to §335.2 of this title (relating to Permit Required) (in the case of nonhazardous waste); or that is regulated under §335.24(f), (g), or (h) of this title (relating to Requirements for Recyclable Materials and Nonhazardous Recyclable Materials) or §335.241 of this title (relating to Applicability and Requirements) and that has been designated on the manifest by the generator pursuant to §335.10 of this title (relating to Shipping and Reporting Procedures Applicable to Generators of Hazardous Waste or Class 1 Waste and Primary Exporters of Hazardous Waste). If a waste is destined to a facility in an authorized state which has not yet obtained authorization to regulate that particular waste as hazardous, then the designated facility must be a facility allowed by the receiving state to accept such waste.

Destination facility - Has the definition adopted under §335.261 of this title (relating to Universal Waste Rule).

Discharge or hazardous waste discharge - The accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying, or dumping of waste into or on any land or water.

Disposal - The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste (whether containerized or uncontainerized) into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including groundwaters.

Disposal facility - A facility or part of a facility at which solid waste is intentionally placed into or on any land or water, and at which waste will remain after closure. The term "disposal facility" does not include a corrective action management unit into which remediation wastes are placed.

Drip pad - An engineered structure consisting of a curbed, free-draining base, constructed of a non-earthen materials and designed to convey preservative kick-back or drippage from treated wood, precipitation, and surface water run-on to an associated collection system at wood preserving plants.

Environmental Protection Agency hazardous waste number - The number assigned by the EPA to each hazardous waste listed in 40 CFR Part 26l, Subpart D and to each characteristic identified in 40 CFR Part 26l, Subpart C.

Environmental Protection Agency identification number - The number assigned by the EPA or the commission to each generator, transporter, and processing, storage, or disposal facility.

Essentially insoluble - Any material, which if representatively sampled and placed in static or dynamic contact with deionized water at ambient temperature for seven days, will not leach any quantity of any constituent of the material into the water in excess of current United States Public Health Service or EPA limits for drinking water as published in the Federal Register.

Existing portion - That land surface area of an existing waste management unit, included in the original Part A permit application, on which wastes have been placed prior to the issuance of a permit.

Facility - Includes:

(A) all contiguous land, and structures, other appurtenances, and improvements on the land, used for storing, processing, or disposing of municipal hazardous waste or industrial solid waste. A facility may consist of several storage, processing, or disposal operational units (e.g., one or more landfills, surface impoundments, or combinations of them);

(B) for the purpose of implementing corrective action under §335.167 of this title (relating to Corrective Action for Solid Waste Management Units), all contiguous property under the control of the owner or operator seeking a permit for the storage, processing, and/or disposal of hazardous waste. This definition also applies to facilities implementing corrective action under Texas Water Code, §7.031 (Corrective Action Relating to Hazardous Waste).

Final closure - The closure of all hazardous waste management units at the facility in accordance with all applicable closure requirements so that hazardous waste management activities under Subchapter E of this chapter (relating to Interim Standards for Owners and Operators of Hazardous Waste Storage, Processing, or Disposal Facilities) and Subchapter F of this chapter (relating to Permitting Standards for Owners and Operators of Hazardous Waste Storage, Processing or Disposal Facilities) are no longer conducted at the facility unless subject to the provisions in §335.69 of this title (relating to Accumulation Time).

Free liquids - Liquids which readily separate from the solid portion of a waste under ambient temperature and pressure.

Generator - Any person, by site, who produces municipal hazardous waste or industrial solid waste; any person who possesses municipal hazardous waste or industrial solid waste to be shipped to any other person; or any person whose act first causes the solid waste to become subject to regulation under this chapter. For the purposes of this regulation, a person who generates or possesses Class 3 wastes only shall not be considered a generator.

Groundwater - Water below the land surface in a zone of saturation.

Hazardous industrial waste - Any industrial solid waste or combination of industrial solid wastes identified or listed as a hazardous waste by the administrator of the EPA pursuant to the Resource Conservation and Recovery Act of 1976, §3001. The administrator has identified the characteristics of hazardous wastes and listed certain wastes as hazardous in 40 CFR Part 26l. The executive director will maintain in the offices of the commission a current list of hazardous wastes, a current set of characteristics of hazardous waste, and applicable appendices, as promulgated by the administrator.

Hazardous substance - Any substance designated as a hazardous substance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 40 CFR Part 302.

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

Hazardous waste constituent - A constituent that caused the administrator to list the hazardous waste in 40 CFR Part 261, Subpart D or a constituent listed in Table 1 of 40 CFR §261.24.

Hazardous waste management facility - All contiguous land, including structures, appurtenances, and other improvements on the land, used for processing, storing, or disposing of hazardous waste. The term includes a publicly or privately owned hazardous waste management facility consisting of processing, storage, or disposal operational hazardous waste management units such as one or more landfills, surface impoundments, waste piles, incinerators, boilers, and industrial furnaces, including cement kilns, injection wells, salt dome waste containment caverns, land treatment facilities, or a combination of units.

Hazardous waste management unit - A landfill, surface impoundment, waste pile, industrial furnace, incinerator, cement kiln, injection well, container, drum, salt dome waste containment cavern, or land treatment unit, or any other structure, vessel, appurtenance, or other improvement on land used to manage hazardous waste.

In operation - Refers to a facility which is processing, storing, or disposing of solid waste or hazardous waste.

Inactive portion - That portion of a facility which is not operated after November 19, 1980. (See also "active portion" and "closed portion.")

Incinerator - Any enclosed device that:

(A) uses controlled flame combustion and neither meets the criteria for classification as a boiler, sludge dryer, or carbon regeneration unit, nor is listed as an industrial furnace; or

(B) meets the definition of infrared incinerator or plasma arc incinerator.

Incompatible waste - A hazardous waste which is unsuitable for:

(A) placement in a particular device or facility because it may cause corrosion or decay of containment materials (e.g., container inner liners or tank walls); or

(B) commingling with another waste or material under uncontrolled conditions because the commingling might produce heat or pressure, fire or explosion, violent reaction, toxic dusts, mists, fumes, or gases, or flammable fumes or gases.

Individual generation site - The contiguous site at or on which one or more solid waste or hazardous wastes are generated. An individual generation site, such as a large manufacturing plant, may have one or more sources of solid waste or hazardous waste but is considered a single or individual generation site if the site or property is contiguous.

Industrial furnace - Includes any of the following enclosed devices that use thermal treatment to accomplish recovery of materials or energy:

(A) cement kilns;

(B) lime kilns;

(C) aggregate kilns;

(D) phosphate kilns;

(E) coke ovens;

(F) blast furnaces;

(G) smelting, melting, and refining furnaces (including pyrometallurgical devices such as cupolas, reverberator furnaces, sintering machines, roasters, and foundry furnaces);

(H) titanium dioxide chloride process oxidation reactors;

(I) methane reforming furnaces;

(J) pulping liquor recovery furnaces;

(K) combustion devices used in the recovery of sulfur values from spent sulfuric acid;

(L) halogen acid furnaces (HAFs) for the production of acid from halogenated hazardous waste generated by chemical production facilities where the furnace is located on the site of a chemical production facility, the acid product has a halogen acid content of at least 3.0%, the acid product is used in a manufacturing process, and, except for hazardous waste burned as fuel, hazardous waste fed to the furnace has a minimum halogen content of 20% as generated; and

(M) other devices the commission may list, after the opportunity for notice and comment is afforded to the public.

Industrial solid waste - Solid waste resulting from or incidental to any process of industry or manufacturing, or mining or agricultural operation, which may include hazardous waste as defined in this section.

Injection well - A well into which fluids are injected. (See also "underground injection.")

Inner liner - A continuous layer of material placed inside a tank or container which protects the construction materials of the tank or container from the contained waste or reagents used to treat the waste.

International shipment - The transportation of hazardous waste into or out of the jurisdiction of the United States.

Lamp - Has the definition adopted under §335.261 of this title (relating to Universal Waste Rule).

Land treatment facility - A facility or part of a facility at which solid waste or hazardous waste is applied onto or incorporated into the soil surface and that is not a corrective action management unit; such facilities are disposal facilities if the waste will remain after closure.

Landfill - A disposal facility or part of a facility where solid waste or hazardous waste is placed in or on land and which is not a pile, a land treatment facility, a surface impoundment, an injection well, a salt dome formation, a salt bed formation, an underground mine, a cave, or a corrective action management unit.

Landfill cell - A discrete volume of a solid waste or hazardous waste landfill which uses a liner to provide isolation of wastes from adjacent cells or wastes. Examples of landfill cells are trenches and pits.

Leachate - Any liquid, including any suspended components in the liquid, that has percolated through or drained from solid waste or hazardous waste.

Liner - A continuous layer of natural or man-made materials, beneath or on the sides of a surface impoundment, landfill, or landfill cell, which restricts the downward or lateral escape of solid waste or hazardous waste, hazardous waste constituents, or leachate.

Management or hazardous waste management - The systematic control of the collection, source separation, storage, transportation, processing, treatment, recovery, and disposal of solid waste or hazardous waste.

Manifest - The waste shipping document which accompanies and is used for tracking the transportation, disposal, treatment, storage, or recycling of shipments of hazardous wastes or Class 1 industrial solid wastes. The form used for this purpose is TNRCC-0311 (Uniform Hazardous Waste Manifest) which is furnished by the executive director or may be printed through the agency's "Print Your Own Manifest Program."

Miscellaneous unit - A hazardous waste management unit where hazardous waste is stored, processed, or disposed of and that is not a container, tank, surface impoundment, pile, land treatment unit, landfill, incinerator, boiler, industrial furnace, underground injection well with appropriate technical standards under Chapter 331 of this title (relating to Underground Injection Control), corrective action management unit, containment building, staging pile, or unit eligible for a research, development, and demonstration permit or under Chapter 305, Subchapter K of this title (relating to Research Development and Demonstration Permits).

Movement - That solid waste or hazardous waste transported to a facility in an individual vehicle.

Municipal hazardous waste - A municipal solid waste or mixture of municipal solid wastes which has been identified or listed as a hazardous waste by the administrator of the United States Environmental Protection Agency.

Municipal solid waste - 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 waste.

Off-site - Property which cannot be characterized as on-site.

On-site - The same or geographically contiguous property which may be divided by public or private rights-of-way, provided the entrance and exit between the properties is at a cross-roads intersection, and access is by crossing, as opposed to going along, the right-of-way. Noncontiguous properties owned by the same person but connected by a right-of-way which he controls and to which the public does not have access, is also considered on-site property.

Operator - The person responsible for the overall operation of a facility.

Owner - The person who owns a facility or part of a facility.

Partial closure - The closure of a hazardous waste management unit in accordance with the applicable closure requirements of Subchapters E and F of this chapter (relating to Interim Standards for Owners and Operators of Hazardous Waste Storage, Processing, or Disposal Facilities; and Permitting Standards for Owners and Operators of Hazardous Waste Storage, Processing or Disposal Facilities) at a facility that contains other active hazardous waste management units. For example, partial closure may include the closure of a tank (including its associated piping and underlying containment systems), landfill cell, surface impoundment, waste pile, or other hazardous waste management unit, while other units of the same facility continue to operate.

Permit - A written permit issued by the commission which, by its conditions, may authorize the permittee to construct, install, modify or operate a specified municipal hazardous waste or industrial solid waste storage, processing, or disposal facility in accordance with specified limitations.

Person - Any individual, corporation, organization, government or governmental subdivision or agency, business trust, partnership, association or any other legal entity.

Pesticide - Has the definition adopted under §335.261 of this title.

Petroleum substance - A crude oil or any refined or unrefined fraction or derivative of crude oil which is a liquid at standard conditions of temperature and pressure.

(A) Except as provided in subparagraph (C) of this paragraph for the purposes of this chapter, a "petroleum substance" shall be limited to a substance in or a combination or mixture of substances within the following list (except for any listed substance regulated as a hazardous waste under the federal Solid Waste Disposal Act, Subtitle C (42 United States Code §§6921, et seq.)) and which is liquid at standard conditions of temperature (20 degrees Centigrade) and pressure (1 atmosphere):

(i) basic petroleum substances - i.e., crude oils, crude oil fractions, petroleum feedstocks, and petroleum fractions;

(ii) motor fuels - a petroleum substance which is typically used for the operation of internal combustion engines and/or motors (which includes but is not limited to stationary engines and engines used in transportation vehicles and marine vessels);

(iii) aviation gasolines - i.e., Grade 80, Grade 100, and Grade 100-LL;

(iv) aviation jet fuels - i.e., Jet A, Jet A-1, Jet B, JP-4, JP-5, and JP-8;

(v) distillate fuel oils - i.e., Number 1-D, Number 1, Number 2-D, and Number 2;

(vi) residual fuel oils - i.e., Number 4-D, Number 4-light, Number 4, Number 5-light, Number 5-heavy, and Number 6;

(vii) gas-turbine fuel oils - i.e., Grade O-GT, Grade 1-GT, Grade 2-GT, Grade 3-GT, and Grade 4-GT;

(viii) illuminating oils - i.e., kerosene, mineral seal oil, long-time burning oils, 300 oil, and mineral colza oil;

(ix) lubricants - i.e., automotive and industrial lubricants;

(x) building materials - i.e., liquid asphalt and dust-laying oils;

(xi) insulating and waterproofing materials - i.e., transformer oils and cable oils;

(xii) used oils - (See definition for "used oil" in this section); and

(B) For the purposes of this chapter, a "petroleum substance" shall include solvents or a combination or mixture of solvents (except for any listed substance regulated as a hazardous waste under the federal Solid Waste Disposal Act, Subtitle C (42 United States Code §§6921, et seq.)) and which is liquid at standard conditions of temperature (20 degrees Centigrade) and pressure (1 atmosphere) i.e., Stoddard solvent, petroleum spirits, mineral spirits, petroleum ether, varnish makers' and painters' naphthas, petroleum extender oils, and commercial hexane.

(C) The following materials are not considered petroleum substances:

(i) polymerized materials, i.e., plastics, synthetic rubber, polystyrene, high and low density polyethylene;

(ii) animal, microbial, and vegetable fats;

(iii) food grade oils;

(iv) hardened asphalt and solid asphaltic materials - i.e., roofing shingles, roofing felt, hot mix (and cold mix); and

(v) cosmetics.

Pile - Any noncontainerized accumulation of solid, nonflowing solid waste or hazardous waste that is used for processing or storage, and that is not a corrective action management unit or a containment building.

Primary exporter - Any person who is required to originate the manifest for a shipment of hazardous waste in accordance with the regulations contained in 40 CFR Part 262, Subpart B, which are in effect as of November 8, 1986, or equivalent state provision, which specifies a treatment, storage, or disposal facility in a receiving country as the facility to which the hazardous waste will be sent and any intermediary arranging for the export.

Processing - The extraction of materials, transfer, volume reduction, conversion to energy, or other separation and preparation of solid waste for reuse or disposal, including the treatment or neutralization of solid waste or hazardous waste, designed to change the physical, chemical, or biological character or composition of any solid waste or hazardous waste so as to neutralize such waste, or so as to recover energy or material from the waste or so as to render such waste nonhazardous, or less hazardous; safer to transport, store or dispose of; or amenable for recovery, amenable for storage, or reduced in volume. The transfer of solid waste for reuse or disposal as used in this definition does not include the actions of a transporter in conveying or transporting solid waste by truck, ship, pipeline, or other means. Unless the executive director determines that regulation of such activity is necessary to protect human health or the environment, the definition of processing does not include activities relating to those materials exempted by the administrator of the Environmental Protection Agency pursuant to the federal Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, 42 United States Code §§6901 et seq., as amended.

Publicly-owned treatment works (POTW) - Any device or system used in the treatment (including recycling and reclamation) of municipal sewage or industrial wastes of a liquid nature which is owned by a state or municipality (as defined by the Clean Water Act, §502(4)). The definition includes sewers, pipes or other conveyances only if they convey wastewater to a POTW providing treatment.

Receiving country - A foreign country to which a hazardous waste is sent for the purpose of treatment, storage, or disposal (except short-term storage incidental to transportation).

Remediation - The act of eliminating or reducing the concentration of contaminants in contaminated media.

Remediation waste - All solid and hazardous wastes, and all media (including groundwater, surface water, soils, and sediments) and debris, which contain listed hazardous wastes or which themselves exhibit a hazardous waste characteristic, that are managed for the purpose of implementing corrective action requirements under §335.167 of this title (relating to Corrective Action for Solid Waste Management Units) and the Texas Water Code, §7.031 (Corrective Action Relating to Hazardous Waste. For a given facility, remediation wastes may originate only from within the facility

boundary, but may include waste managed in implementing corrective action for releases beyond the facility boundary under the Texas Solid Waste Disposal Act, Texas Health and Safety Code Annotated (Vernon Pamphlet 1993), §361.303 (Corrective Action), §335.166(5) of this title (relating to Corrective Action Program), or §335.167(c) of this title (relating to Corrective Action for Solid Waste Management Units).

Remove - To take waste, contaminated design or operating system components, or contaminated media away from a waste management unit, facility, or area to another location for storage, processing, or disposal.

Shipment - Any action involving the conveyance of municipal hazardous waste or industrial solid waste by any means off-site.

Sludge dryer - Any enclosed thermal treatment device that is used to dehydrate sludge and that has a maximum total thermal input, excluding the heating valve of the sludge itself, of 2,500 Btu/lb of sludge treated on a wet-weight basis.

Small quantity generator - A generator who generates less than 1,000 kg of hazardous waste in a calendar month.

Solid Waste -

(A) Any 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, but does not include:

(i) solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows, or industrial discharges subject to regulation by permit issued pursuant to the Texas Water Code, Chapter 26 (an exclusion applicable only to the actual point source discharge that does not exclude industrial wastewaters while they are being collected, stored or processed before discharge, nor does it exclude sludges that are generated by industrial wastewater treatment);

(ii) uncontaminated soil, dirt, rock, sand and other natural or man-made inert solid materials used to fill land if the object of the fill is to make the land suitable for the construction of surface improvements. The material serving as fill may also serve as a surface improvement such as a structure foundation, a road, soil erosion control, and flood protection. Man-made materials exempted under this provision shall only be deposited at sites where the construction is in progress or imminent such that rights to the land are secured and engineering, architectural, or other necessary planning have been initiated. Waste disposal shall be considered to have occurred on any land which has been filled with man-made inert materials under this provision if the land is sold, leased, or otherwise conveyed prior to the completion of construction of the surface improvement. Under such conditions, deed recordation shall be required. The deed recordation shall include the information required under §335.5(a) of this title (relating to Deed Recordation), prior to sale or other conveyance of the property;

(iii) waste materials which result from activities associated with the exploration, development, or production of oil or gas or geothermal resources, as those activities are defined in this section, and any other substance or material regulated by the Railroad Commission of Texas pursuant to the Natural Resources Code, §91.101, unless such waste, substance, or material results from activities associated with gasoline plants, natural gas or natural gas liquids processing plants, pressure maintenance plants, or repressurizing plants and is a hazardous waste as defined by the administrator of the United States Environmental Protection Agency pursuant to the federal Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, 42 United States Code §§6901 et seq., as amended; or

(iv) a material excluded by 40 CFR §261.4(a)(1) - (19), as amended through May 11, 1999, (64 FR 25408), subject to the changes in this clause, or by variance granted under §335.18 of this title (relating to Variances from Classification as a Solid Waste) and §335.19 of this title (relating to Standards and Criteria for Variances from Classification as a Solid Waste). For the purposes of the exclusion under 40 CFR §261.4(a)(16), 40 CFR §261.38 is adopted by reference as amended through July 10, 2000 (65 FR 42292), and is revised as follows, with "subparagraph (A)(iv) under the definition of 'Solid Waste' in 30 TAC §335.1" meaning "subparagraph (A)(iv) under the definition of 'Solid Waste' in §335.1 of this title (relating to Definitions)":

(I) in the certification statement under 40 CFR §261.38(c)(1)(i)(C)(4), the reference to "40 CFR §261.38" is changed to "40 CFR §261.38, as revised under subparagraph (A)(iv) under the definition of 'Solid Waste' in 30 TAC §335.1 ," and the reference to "40 CFR §261.28(c)(10)" is changed to "40 CFR §261.38(c)(10)";

(II) in 40 CFR §261.38(c)(2), the references to "§260.10 of this chapter" are changed to "§335.1 of this title (relating to Definitions)," and the reference to "parts 264 or 265 of this chapter" is changed to "Chapter 335, Subchapter E of this title (relating to Interim Standards for Owners and Operators of Hazardous Waste Storage, Processing, or Disposal Facilities) or Chapter 335, Subchapter F of this title (relating to Permitting Standards for Owners and Operators of Hazardous Waste Storage, Processing, or Disposal Facilities)";

(III) in 40 CFR §261.38(c)(3), (4), and (5), the references to "parts 264 and 265, or §262.34 of this chapter" are changed to "Chapter 335, Subchapter E of this title (relating to Interim Standards for Owners and Operators of Hazardous Waste Storage, Processing, or Disposal Facilities) and Chapter 335, Subchapter F of this title (relating to Permitting Standards for Owners and Operators of Hazardous Waste Storage, Processing, or Disposal Facilities), or §335.69 of this title (relating to Accumulation Time)";

(IV) in 40 CFR §261.38(c)(5), the reference to "§261.6(c) of this chapter" is changed to "§335.24(e) and (f) of this title (relating to Requirements for Recyclable Materials and Nonhazardous Recyclable Materials)";

(V) in 40 CFR §261.38(c)(7), the references to "appropriate regulatory authority" and "regulatory authority" are changed to "executive director";

(VI) in 40 CFR §261.38(c)(8), the reference to "§262.11 of this chapter" is changed to "§335.62 of this title (relating to Hazardous Waste Determination and Waste Classification)";

(VII) in 40 CFR §261.38(c)(9), the reference to "§261.2(c)(4) of this chapter" is changed to "§335.1(129)(D)(iv) of this title (relating to Definitions)"; and

(VIII) in 40 CFR §261.38(c)(10), the reference to "implementing authority" is changed to "executive director."

(B) A discarded material is any material which is:

(i) abandoned, as explained in subparagraph (C) of this paragraph;

(ii) recycled, as explained in subparagraph (D) of this paragraph; or

(iii) considered inherently waste-like, as explained in subparagraph (E) of this paragraph.

(iv) a military munition identified as a solid waste in 40 CFR §266.202.

(C) Materials are solid wastes if they are abandoned by being:

(i) disposed of;

(ii) burned or incinerated; or

(iii) accumulated, stored, or processed (but not recycled) before or in lieu of being abandoned by being disposed of, burned, or incinerated.

(D) Except for materials described in subparagraph (H) of this paragraph, materials are solid wastes if they are "recycled" or accumulated, stored, or processed before recycling as specified in this subparagraph. The chart referred to as Table 1 indicates only which materials are considered to be solid wastes when they are recycled and is not intended to supersede the definition of solid waste provided in subparagraph (A) of this paragraph.

(i) Used in a manner constituting disposal. Materials noted with an asterisk in Column 1 of Table 1 are solid wastes when they are:

(I) applied to or placed on the land in a manner that constitutes disposal; or

(II) used to produce products that are applied to or placed on the land or are otherwise contained in products that are applied to or placed on the land (in which cases the product itself remains a solid waste). However, commercial chemical products listed in 40 CFR §261.33 are not solid wastes if they are applied to the land and that is their ordinary manner of use.

(ii) Burning for energy recovery. Materials noted with an asterisk in Column 2 of Table 1 are solid wastes when they are:

(I) burned to recover energy; or

(II) used to produce a fuel or are otherwise contained in fuels (in which cases the fuel itself remains a solid waste). However, commercial chemical products, which are listed in 40 CFR §261.33, not listed in §261.33 but that exhibit one or more of the hazardous waste characteristics, or would be considered nonhazardous waste if disposed, are not solid wastes if they are fuels themselves and burned for energy recovery.

(iii) Reclaimed. Materials noted with an asterisk in Column 3 of Table 1 are solid wastes when reclaimed (except as provided under 40 CFR §261.4(a)(17)). Materials without an asterisk in Column 3 of Table 1 are not solid wastes when reclaimed (except as provided under 40 CFR §261.4(a)(17)).

(iv) Accumulated speculatively. Materials noted with an asterisk in Column 4 of Table 1 are solid wastes when accumulated speculatively.

TABLE 1

	Use Constituting Disposal S.W. Def. (D)(i) (1)	Energy Recovery/Fuel S.W. Def. (D)(ii) (2)	Reclamation S.W. Def. (D)(iii) (3)[2]	Speculative Accumulation S.W. Def. (D)(iv) (4)
Spent materials (listed hazardous & not listed characteristically hazardous)	*	*	*	*
Spent materials (nonhazardous)[1]	*	*	*	*
Sludges (listed hazardous in 40 CFR §261.31 or §261.32)	*	*	*	*
Sludges (not listed characteristically hazardous)	*	*		*
Sludges (nonhazardous)[1]	*	*		*
By-products (listed hazardous in 40 CFR §261.31 or §261.32)	*	*	*	*
By-products (not listed characteristically hazardous)	*	*		*
By-products (nonhazardous)[1]	*	*		*
Commercial chemical products (listed, not listed characteristically hazardous, and nonhazardous)	*	*		
Scrap metal other than excluded scrap metal (see §335.17(9)) (hazardous)	*	*	*	*
Scrap metal other than excluded scrap metal (see §335.17(9)) (nonhazardous)[1]	*	*	*	0

NOTE: The terms "spent materials", "sludges", "by-products", "scrap metal" and “excluded scrap metal” are defined in §335.17 of this title (relating to Special Definitions for Recyclable Materials and Nonhazardous Recyclable Materials).

[1]These materials are governed by the provisions of §335.24(h) only.

[2]Except as provided in 40 CFR §261.4(a)(17) for mineral processing secondary materials

(E) Materials that are identified by the administrator of the EPA as inherently waste-like materials under 40 CFR §261.2(d) are solid wastes when they are recycled in any manner.

(F) Materials are not solid wastes when they can be shown to be recycled by being:

(i) used or reused as ingredients in an industrial process to make a product, provided the materials are not being reclaimed;

(ii) used or reused as effective substitutes for commercial products;

(iii) returned to the original process from which they were generated, without first being reclaimed or land disposed. The material must be returned as a substitute for feedstock materials. In cases where the original process to which the material is returned is a secondary process, the materials must be managed such that there is no placement on the land. In cases where the materials are generated and reclaimed within the primary mineral processing industry, the conditions of the exclusion found at 40 CFR §261.4(a)(17) apply rather than this provision; or

(iv) secondary materials that are reclaimed and returned to the original process or processes in which they were generated where they are reused in the production process provided:

(I) only tank storage is involved, and the entire process through completion of reclamation is closed by being entirely connected with pipes or other comparable enclosed means of conveyance;

(II) reclamation does not involve controlled flame combustion (such as occurs in boilers, industrial furnaces, or incinerators);

(III) the secondary materials are never accumulated in such tanks for over 12 months without being reclaimed; and

(IV) the reclaimed material is not used to produce a fuel, or used to produce products that are used in a manner constituting disposal.

(G) Except for materials described in subparagraph (H) of this paragraph, the following materials are solid wastes, even if the recycling involves use, reuse, or return to the original process, as described in subparagraph (F) of this paragraph:

(i) materials used in a manner constituting disposal, or used to produce products that are applied to the land;

(ii) materials burned for energy recovery, used to produce a fuel, or contained in fuels;

(iii) materials accumulated speculatively; or

(iv) materials deemed to be inherently waste-like by the administrator of the EPA, as described in 40 CFR §261.2(d)(1) - 2.

(H) With the exception of contaminated soils which are being relocated for use under §350.36 of this title (relating to Relocation of Soils Containing Chemicals of Concern for Reuse Purposes) and other contaminated media, materials that would otherwise be identified as nonhazardous solid wastes if disposed of are not considered solid wastes when recycled by being applied to the land or used as ingredients in products that are applied to the land, provided these materials can be shown to meet all of the following criteria:

(i) a legitimate market exists for the recycling material as well as its products;

(ii) the recycling material is managed and protected from loss as would be raw materials or ingredients or products;

(iii) the quality of the product is not degraded by substitution of raw material/product with the recycling material;

(iv) the use of the recycling material is an ordinary use and it meets or exceeds the specifications of the product it is replacing without treatment or reclamation, or if the recycling material is not replacing a product, the recycling material is a legitimate ingredient in a production process and meets or exceeds raw material specifications without treatment or reclamation;

(v) the recycling material is not burned for energy recovery, used to produce a fuel or contained in a fuel;

(vi) the recycling material can be used as a product itself or to produce products as it is generated without treatment or reclamation;

(vii) the recycling material must not present an increased risk to human health, the environment, or waters in the state when applied to the land or used in products which are applied to the land and the material, as generated:

(I) is a Class 3 waste under Chapter 335, Subchapter R of this title (relating to Waste Classification), except for arsenic, cadmium, chromium, lead, mercury, nickel, selenium, and total dissolved solids; and

(II) for the metals listed in subclause (I) of this clause:

(-a-) is a Class 2 or Class 3 waste under Chapter 335, Subchapter R of this title; and

(-b-) does not exceed a concentration limit under 30 TAC §312.43(b)(3), Table 3; and

(viii) notwithstanding the requirements under §335.17(a)(8) of this title (relating to Special Definitions for Recyclable Materials and Nonhazardous Recyclable Materials):

(I) at least 75% (by weight or volume) of the annual production of the recycling material must be recycled or transferred to a different site and recycled on an annual basis; and

(II) if the recycling material is placed in protective storage, such as a silo or other protective enclosure, at least 75% (by weight or volume) of the annual production of the recycling material must be recycled or transferred to a different site and recycled on a biennial basis.

(I) Respondents in actions to enforce the industrial solid waste regulations who raise a claim that a certain material is not a solid waste, or is conditionally exempt from regulation, must demonstrate that there is a known market or disposition for the material, and that they meet the terms of the exclusion or exemption. In doing so, they must provide appropriate documentation (such as contracts showing that a second person uses the material as an ingredient in a production process) to demonstrate that the material is not a waste, or is exempt from regulation. In addition, owners or operators of facilities claiming that they actually are recycling materials must show that they have the necessary equipment to do so and that the recycling activity is legitimate and beneficial.

(J) Materials that are reclaimed from solid wastes and that are used beneficially are not solid wastes and hence are not hazardous wastes under 40 CFR §261.3(c) unless the reclaimed material is burned for energy recovery or used in a manner constituting disposal.

(K) Other portions of this chapter that relate to solid wastes that are recycled include §335.6 of this title (relating to Notification Requirements), §335.17 of this title (relating to Special Definitions for Recyclable Materials and Nonhazardous Recyclable Materials), §335.18 of this title (relating to Variances from Classification as a Solid Waste), §335.19 of this title (relating to Standards and Criteria for Variances from Classification as a Solid Waste), §335.24 of this title (relating to Requirements for Recyclable Materials and Nonhazardous Recyclable Materials), and Subchapter H of this chapter (relating to Standards for the Management of Specific Wastes and Specific Types of Materials).

Sorbent - A material that is used to soak up free liquids by either adsorption or absorption, or both. Sorb means to either adsorb or absorb, or both.

Spill - The accidental spilling, leaking, pumping, emitting, emptying, or dumping of solid waste or hazardous wastes or materials which, when spilled, become solid waste or hazardous wastes into or on any land or water.

Staging pile - An accumulation of solid, non-flowing remediation waste, as defined in this section, that is not a containment building and that is used only during remedial operations for temporary storage at a facility. Staging piles must be designated by the executive director according to the requirements of 40 CFR §264.554, as adopted by reference under §335.152(a) of this title (relating to Standards).

Storage - The holding of solid waste for a temporary period, at the end of which the waste is processed, disposed of, recycled or stored elsewhere.

Surface impoundment or impoundment - A facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold an accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well or a corrective action management unit. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons.

Tank - A stationary device, designed to contain an accumulation of solid waste which is constructed primarily of non-earthen materials (e.g., wood, concrete, steel, plastic) which provide structural support.

Thermal processing - The processing of solid waste or hazardous waste in a device which uses elevated temperatures as the primary means to change the chemical, physical, or biological character or composition of the solid waste or hazardous waste. Examples of thermal processing are incineration, molten salt, pyrolysis, calcination, wet air oxidation, and microwave discharge. (See also "incinerator" and "open burning.")

Thermostat - Has the definition adopted under §335.261 of this title.

Totally enclosed treatment facility - A facility for the processing of hazardous waste which is directly connected to an industrial production process and which is constructed and operated in a manner which prevents the release of any hazardous waste or any constituent thereof into the environment during processing. An example is a pipe in which acid waste is neutralized.

Transfer facility - Any transportation-related facility including loading docks, parking areas, storage areas, and other similar areas where shipments of hazardous or industrial solid waste are held during the normal course of transportation.

Transit country - Any foreign country, other than a receiving country, through which a hazardous waste is transported.

Transport vehicle - A motor vehicle or rail car used for the transportation of cargo by any mode. Each cargo-carrying body (trailer, railroad freight car, etc.) is a separate transport vehicle. Vessel includes every description of watercraft, used or capable of being used as a means of transportation on the water.

Transporter - Any person who conveys or transports municipal hazardous waste or industrial solid waste by truck, ship, pipeline, or other means.

Treatment - To apply a physical, biological, or chemical process(es) to wastes and contaminated media which significantly reduces the toxicity, volume, or mobility of contaminants and which, depending on the process(es) used, achieves varying degrees of long-term effectiveness.

Underground injection - The subsurface emplacement of fluids through a bored, drilled, or driven well; or through a dug well, where the depth of the dug well is greater than the largest surface dimension. (See also "injection well.")

Underground tank - A device meeting the definition of tank in this section whose entire surface area is totally below the surface of and covered by the ground.

Universal waste - Any of the hazardous wastes defined as universal waste under §335.261(b)(13)(F) of this title that are managed under the universal waste requirements of Subchapter H, Division 5 of this chapter (relating to Universal Waste Rule).

Universal waste handler - Has the definition adopted under §335.261 of this title.

Universal waste transporter - Has the definition adopted under §335.261 of this title.

Unsaturated zone or zone of aeration - The zone between the land surface and the water table.

Uppermost aquifer - The geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected within the facility's property boundary.

Used oil - Any oil that has been refined from crude oil, or any synthetic oil, that has been used, and, as a result of such use, is contaminated by physical or chemical impurities. Used oil fuel includes any fuel produced from used oil by processing, blending, or other treatment. Rules applicable to nonhazardous used oil, oil characteristically hazardous from use versus mixing, Conditionally Exempt Small Quantity Generator (CESQG) hazardous used oil, and household used oil after collection that will be recycled are found in Chapter 324 of this title (relating to Used Oil) and 40 CFR Part 279 (Standards for Management of Used Oil).

Wastewater treatment unit - A device which:

(A) is part of a wastewater treatment facility subject to regulation under either the Federal Water Pollution Control Act (Clean Water Act), 33 United States Code §466 et seq., §402 or §307(b), as amended;

(B) receives and processes or stores an influent wastewater which is a hazardous or industrial solid waste, or generates and accumulates a wastewater treatment sludge which is a hazardous or industrial solid waste, or processes or stores a wastewater treatment sludge which is a hazardous or industrial solid waste; and

(C) meets the definition of tank or tank system as defined in this section.

Water (bulk shipment) - The bulk transportation of municipal hazardous waste or Class 1 industrial solid waste which is loaded or carried on board a vessel without containers or labels.

Well - Any shaft or pit dug or bored into the earth, generally of a cylindrical form, and often walled with bricks or tubing to prevent the earth from caving in.