Champaign County Solid Waste Management Plan

PART IV
FACILITIES, SITING CRITERIA AND SYSTEM COSTS

Prepared by the
Intergovernmental Solid Waste Disposal Association
209 W Clark St, Champaign, IL 61820

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Jerry Lyke, *Champaign County, Chairman*
Michael LaDue, *Champaign, Vice-Chairman*
Joe Whelan, *Urbana, Second Vice-Chairman*

Joan Barr, *Urbana*
Joe Corley, *Champaign County*
June Mank, *Champaign*
Susan McGrath, *Champaign County*
Gary Shae, *Champaign*
Charlie Smyth, *Urbana*

The ISWDA staff for this project:

James J. Pendowski, *Manager*
Principal Author: Part 1: Solid Waste Characteristics
Part 4: Facilities, Siting Criteria and System Costs

Laura J. Marshall, *Planner*
Principal Author: Part 2: Source Reduction
Part 3: Recycling
Part 4: Facilities, Siting Criteria and System Costs

Alan W. Mitchell, *Engineer*
Principal Author: Part 1: Solid Waste Characteristics
Technical Assistance: Part 4: Facilities, Siting Criteria and System Costs

Amy J. Smith, *Administrative Assistant*

Melisa M. McLean, *Planning Intern*

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Municipalities

Art Zangerl, City of Urbana Representative, Co-Chairman
William Fierke, City of Champaign Representative
Dick Squire, Champaign County Representative

Citizens Organizations

Sherry DeWan, League of Women Voters, Co-Chairman
Deanna Glosser, Audubon Council
Catherine Hogue, NAACP
James E. Strehlow, AFL-CIO

Industry

Terry Dudley, Market Place Mall
James D. McCalment, Kraft, Inc.

Private Solid Waste Industry

Roger L. Boss, United Waste Systems
Cindy Eaglen, Disposal Waste
Kenneth D. Valentine, Hustler's Disposal

Local Recyclers

Mark Loughmiller, Community Recycling Center

Other

Hal Barnhart, private citizen
Timothy M. Hoss, University of Illinois Representative
Thomas Kleiss, Champaign County Farm Bureau

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SECTION ONE: Introduction

In 1986, the Illinois Solid Waste Management Act (PA 84-1319) was signed into law. The Solid Waste Management Act established a hierarchy for solid waste management for local governments in the State. That hierarchy, and its objectives, were stated as follows:

> It is the purpose of this Act to reduce reliance on land disposal of solid waste, to encourage and promote alternative means of managing solid waste, and to assist local governments with solid waste planning and management. In furtherance of those aims, while recognizing that landfills will continue to be necessary, this Act establishes the following waste management hierarchy, in descending order of preference, as State policy:
>
> (1) volume reduction at the source;
> (2) recycling and reuse;
> (3) combustion with energy recovery;
> (4) combustion for volume reduction;
> (5) disposal in landfill facilities.

In order to assist local governments in the complex task of implementing this management hierarchy, the State of Illinois established a solid waste planning grant program. The Intergovernmental Solid Waste Disposal Association (ISWDA), was one of the first entities in the State to receive a grant under this program.

The Solid Waste Planning and Recycling Act (PA 85-1198) became effective January 1, 1989. The intention of the Act was to further clarify the directives for local solid waste planning and management. The Solid Waste Planning and Recycling Act requires the following information be included in local plans:

(1) A description of the origin, content and weight or volume of municipal waste currently generated within the County's boundaries, and the origin, content, and weight or volume of municipal waste that will be generated within the County's boundaries during the next 20 years, including an assessment of the primary variables affecting this estimate and the extent to which they can reasonably be expected to occur.

(2) A description of the facilities where municipal waste is currently being processed or disposed of and the remaining available permitted capacity of such facilities.

(3) A description of the facilities and program that are proposed for the management of municipal waste generated with the County's boundaries during the next 20 years, including, but not limited to their size, expected cost and financing method.

(4) An evaluation of environmental, energy, life-cycle cost and economic advantages and disadvantages of the proposed waste management facilities and programs.

(5) A description of the time schedule for the development and operation of each proposed facility or program.

(6) The identity of potential sites within the County where each proposed waste processing, disposal and recycling facility will be located or an explanation of how the sites will be chosen. For any facility outside the County that the County proposes to utilize, the plan shall explain the reasons for selecting such facility.

(7) The identity of the governmental entity that will be responsible for implementing the plan on behalf of the County and explanation of the legal basis for the entity's authority to do so.

The purpose of this part of the Champaign County Solid Waste Management Plan is to evaluate various solid waste management facilities for Champaign County. Included in this evaluation are discussions of siting criteria, facility costs, environmental impacts and estimated timetables for development. From this analysis, a review of facility management, financing strategies, and system costs will be discussed and a preferred system will be recommended. Operating entities for proposed systems and facilities will also be discussed.

There are numerous ways in which solid waste can be managed. These methods revolve around two basic stages of the cycle of solid waste generation and disposal: waste handling (i.e., collection and processing) and waste disposal. Waste handling, in the context of integrated solid waste management, includes collection, transfer and processing of solid waste. Processing solid waste can include recycling, composting and source reduction efforts. Waste disposal is the management of solid waste, which may or may not have been processed, after collection. Some types of disposal options require some degree of processing such as recyclable material collections, incinerators and municipal waste composting systems. All disposal options require landfilling of the non-processible, non-recoverable fraction of the municipal wastestream. Consequently, for the purpose of evaluation, three basic solid waste management facility types will be assessed: transfer and processing facilities (including material recovery and composting facilities developed adjunct to such facilities); incineration facilities and landfills.

SECTION TWO: Siting Procedures for Solid Waste Facilities in Illinois

In Illinois, the State and local governments establish siting criteria for regional pollution control facilities including transfer and processing, and landfill facilities. The current siting process is described in the Environmental Protection Act, Section 39(c), and is commonly known as the SB 172 process. The process requires approval from the municipality where the facility will be located before State agencies will review and issue any permits. The Illinois Environmental Protection Agency (IEPA) and the Illinois Pollution Control Board (IPCB) are the primary agencies that oversee and permit solid waste facilities in Illinois. Other state agencies may have requirements that must be met depending on the type of facility under consideration. A new waste disposal facility must meet the design, operating and siting criteria established by the IPCB while IEPA enforces the IPCB's regulations. The IEPA reviews all applications for a new waste disposal facility only after the applicant has complied with the requirements of SB 172, as listed in the Environmental Protection Act (The Act). The requirements for SB 172 include a public notice procedure and local approval for siting a facility.

The Environmental Protection Act (Act) defines regional pollution control facility as "*any waste storage site, sanitary landfill, waste disposal site, waste transfer station, waste treatment facility or waste incinerator that accepts waste from or serves an area that extends over the boundaries of any local general purpose government.*" A number of state mandated criteria must be met in order to receive local and state permit approval.

Permitting requirements for regional pollution control facilities are stated in Sections 39(c) and 39.2 of the Act. The location of the facility must first be approved by the appropriate local government. Listed below are the nine siting criteria (as of January 1, 1990) contained in the Act which pertain to regional pollution control facilities.

The county board of the county or the governing body of the municipality, as determined by paragraph (c) of Section 39 of this Act, shall approve or disapprove the request for local siting approval for each new regional pollution control facility which is subject to such review. An applicant for local siting approval shall submit sufficient details describing the proposed facility to demonstrate compliance, and local siting approval shall be granted only if the proposed facility meets the following criteria:

1. *the facility is necessary to accommodate the waste needs for the area it is intended to serve;*

2. *the facility is so designed, located and proposed to be operated that the public health, safety and welfare will be protected.*

3. *the facility is located so as to minimize incompatibility with the character to the surrounding area and to minimize the effect on the value of the surrounding property;*

4. *the facility is located outside the boundary of the 100 year flood plain or the site is flood-proofed;*

5. *the plan or operations for the facility is designed to minimize the danger of the surrounding area from fire, spills, or other operational accidents;*

6. *the traffic patterns to or from the facility are so designed as to minimize the impact on existing traffic flows;*

7. *if the facility will be treating, storing or disposing of hazardous waste, an emergency response plan exists for the facility which includes notification,*

containment and evacuation procedures to be used in case of an accidental release;

8. *if the facility is to be located in a county where the county board has adopted a solid waste management plan, the facility is consistent with that plan; and*

9. *if the facility will be located within a regulated recharge area, any applicable requirements specified by the (Illinois Pollution Control) Board for such areas have been met.*

The county board or the governing body of the municipality may also consider the previous operating experience and past record, including convictions or admissions of violations, of the applicant (and any subsidiary or parent corporation) in the field of solid waste management when considering criteria number 2 and 5 of Section 39.2.

The local government must act on the siting application within 180 days. It must either approve or deny a request to site a regional pollution control facility and a written statement must be prepared. If no local decision is made with 180 days, the application is deemed approved. Denial of siting approval must be based on the site not qualifying under one, or more, of the nine criteria in SB 172. Local zoning and land use requirements, other than the listed criteria, may not be applied to siting decisions for regional pollution control facilities. After obtaining local approval, an applicant has two years to develop the site. A development permit is issued by IEPA. Once the facility is developed and ready to open, IEPA will issue an operation permit for facility.

Although the State and Federal governments develop siting criteria for solid waste facilities, local governments can create additional criteria. The local criteria can be based, in part, on the state permit requirements and basic locational requirements of the facility. Items such as traffic impacts, compatible land use, aesthetics and nuisance control are all examples of the criteria local governments may refine or expand when developing siting criteria. These criteria vary with the type of solid waste facility under consideration. The locally derived criteria for the solid waste facilities under review in Champaign County will be addressed by the facility type in Section Three.

SECTION THREE: Facility Characteristics, Environmental Impacts and Potential Sites

As discussed in Section One, there are two basic areas where solid waste can be manipulated; waste handling and waste disposal. Both waste handling and waste disposal have various management techniques that include different types of facilities. Waste handling management techniques include collection, transfer and processing of solid waste. The facilities associated with waste handling are transfer stations, including auxiliary processing functions such as recycling or material recovery activities. Waste disposal management techniques include facilities for incineration, municipal waste composting and landfilling. In this section, different facilities will be reviewed including their characteristics and specific local siting criteria; potential locations in Champaign County; length of time to develop and estimated costs.

TRANSFER AND PROCESSING FACILITIES

Characteristics

The basic function of a transfer facility is to aggregate smaller loads of solid waste into larger loads for shipment to final disposal. This is typically accomplished by unloading smaller packer trucks into larger transfer trailers. Usually, direct haul to a landfill by small packer trucks begins to become uneconomical at distances greater than 15 miles. Beyond that distance, transfer stations can reduce the unit cost for solid waste transport. While the original intent of most transfer stations was to consolidate small loads into larger loads for transportation to a distant landfill, many transfer facilities have expanded their purpose to include some level of processing, such as material recovery or composting. A review of these three facility types follows.

The packer trucks entering a transfer facility dump their loads onto a floor, into a pit or directly into the transfer vehicle. Solid waste dumped on a floor or into a pit requires additional machinery, such as a wheel loader or a grapple, to move it into the transfer truck. Some transfer facilities compact the waste prior to transferring it. This allows a more efficient use of the transfer vehicles and possible fewer trips. The compaction can take place before the solid waste is placed on the trailer or after it is on the trailer. Usually the waste is compacted into bales of varying sizes. Some transfer trailers have compactors on board. The capacity of the transfer facility will depend on how quickly the packer trucks can unload or how quickly the transfer trailers can be loaded. Apart from a small amount of volume reduction due to compaction, there is no weight reduction of the wastestream; the same amount of solid waste entering the facility leaves the facility.

Transfer facilities have become logical points to introduce other waste processing functions such as material recovery (for either source separated or mixed waste materials) or composting activities. To add these functions, additional equipment and space are required. The amount of equipment and space needed is dependent upon the technology, the level of recovery desired, or the degree of composting desired. Simple material recovery activities that can occur at a transfer facility are the removal of corrugated cardboard from commercial loads and the removal of large items such as wood pallets or white goods from any load. However, many facilities are being developed which offer more elaborate recovery systems. Through the use of conveyors, trommels, magnets, and a growing variety of other technologies, various materials are recovered from the mixed waste brought to the facility. Materials such as metals, plastics, wood, glass and cardboard can be recovered, with varying degrees of success, at a material recovery facility (MRF). Hazardous materials, such as batteries or household hazardous wastes may be removed during material recovery.

There are two types of MRF's. The first, which is may also be called an intermediate processing facility (IPF), is a facility that only accepts previously sorted recyclables. These recyclables can be from curbside, drop-off or other collection programs and can be separated or commingled. Processing consists of further separation (if needed) and then preparation for market. However, all the incoming material has been separated from the mixed waste stream. The second type of MRF accepts mixed waste for processing as well as source separated materials. This processing removes additional recyclables from the mixed wastestream. Once the recyclables are removed from the mixed waste, they are prepared for market and the residual mixed waste is transferred to final disposal. A similar range of technologies is used at both facilities. By combining the processing of separated recyclables and the recovery of recyclables from mixed waste, it would be possible to share processing equipment.

MRF's using a minimal amount of technology rely on employees hand picking various materials out of the wastestream. Facilities that employ more technology rely solely on mechanical means to separate materials. Most facilities use some combination of manual and mechanical separation. Depending on the technology and other factors, a 10-20% mass reduction in the wastestream can occur at a MRF. Of all the waste entering the facility, after material recovery, 80-90% is transferred to final disposal.

In conjunction with material recovery, composting of municipal solid waste can occur. Composting is added downline of the material recovery component. Although municipal solid waste composting is widely used in Europe, it has not been one of the traditional solid waste management options in the U.S. Various projects involving municipal waste composting have recently begun in the U.S., most notably, the Riedel facility in Portland, Oregon and the Agripost facility in Dade County, Florida. Other smaller pilot projects are also in progress. There are no composting facilities for municipal solid waste operating in Illinois at this time.

The term composting is used to describe a variety of processes. These processes focus on the decomposition of the organic fraction of the wastestream. The different fractions of the wastestream decompose at different rates: food waste decomposes faster than leather. The various composting processes are designed to maximize the ideal conditions for biological decomposition. The various composting processes range from very simple to highly mechanized. Likewise, the length of time required to complete the composting process will vary with the process. Basically, the composting process requires only air and water. However, to establish and maintain ideal conditions, some preprocessing of the waste is required.

The waste is preprocessed in the material recovery component. Recyclables such as glass, aluminum and plastic as well as other large, non-organic items are removed from the waste as are other items such as hazardous waste. The remaining waste is usually fed into a grinder or hammermill to reduce it to small pieces. This material is then composted. Some systems use a windrow system which consists of triangular shaped rows of material that are periodically turned. Air may be forced through the piles to increase the rate of decomposition. The more mechanized composting systems use rotating drums or augers within closed vessels to assure maximum efficiency. For the final stage of composting, curing, some systems place the material in windrows while other systems retain the material in the vessel until curing is almost complete.

The composting process will transform all the organic material in the wastes into a mixture of humus and mulch. In theory, there are no residuals, however there are always some materials, such as rocks, wood or non-organic waste that does not decompose. Therefore, the final step is usually a screening of the material to remove this material and any other non-organic material, such as plastic, that is present. This humus and mulch can be used as a soil amendment if tests show that the presence of heavy metals or other hazardous materials are below industry standards. However, there is a very small market for this material and it is frequently landfilled. This places composting in the volume reduction category rather than recycling as a solid waste management option.

At a facility with composting, there is an approximate 50% mass reduction of the incoming waste. Part of this reduction is the 10-20% of material recovered as part of the material recovery function. Composting will then reduce the organic fraction of the wastestream by 30-50%.

Environmental Impacts

Transfer stations have several environmental impacts associated with them. However, ground or surface water pollution are typically not a major environmental impacts associated with transfer facilities. The major environmental impacts associated with transfer facilities are traffic impacts and potential health threats from operational accidents. Other impacts include noise, odor, vermin and other impacts generally associated with commercial or industrial development such as run-off and aesthetics.

A transfer facility does not usually generate a significant volume of new traffic associated with the collection of municipal waste. However, the facility will attract existing traffic to a central point. Therefore, the primary routes of access are an important determinant when selecting a site. This is particularly true for the areas through which the primary access routes are located. In Champaign County, a transfer station would have approximately 168 vehicles per day (in 1992) using the facility. There would be about 82 packer trucks and 70 private vehicles bringing waste to the site. Sixteen (16) vehicles would be required to transfer the waste to a landfill. By 2010, this should increase to about 109 packer trucks and 72 private vehicles bringing waste to the facility and 19 vehicles transferring waste to a landfill.

One of the potential environmental concerns at a transfer facility is the threat to human health of a fire, spill or explosion at the facility. Despite restrictions on disposal methods, a transfer facility that accepts municipal solid waste must be prepared to handle such unwanted material as explosives or hazardous wastes. Although these may not be permitted in mixed waste, they are occasionally placed in mixed municipal waste either through ignorance of the laws or in a deliberate attempt to circumvent the laws. Households generate a variety of hazardous wastes that may be disposed of in mixed municipal waste legally. Therefore, it is important to consider the possible effects of an operational accident involving these materials.

Material recovery and municipal waste composting, have the same basic environmental impacts; composting operations have a few additional potential impacts.

At a transfer station with material recovery, the environmental problems involve traffic and material storage. As with a transfer facility alone, the additional component does not generate new traffic related to solid waste collection; it does focus the traffic at a central point. Additional traffic associated with a MR/TF may be area residents using a recycling drop-off site or buy back station, or an increase in truck activity associated with materials being shipped to market. A facility servicing Champaign County would see about 194 vehicles per day (in 1992). The number of private vehicles would increase by 26, from 70 to 96, due to the recycling buy back and drop-off functions at the site. There would still be 82 packer trucks delivering waste. Instead of all transfer trucks taking waste to a landfill, 13 would move residual waste to a landfill while 3 would take recyclables to market.

Material storage is the other possible environmental impact associated with the material recovery component. If material is stored outside for significant periods of time, it may encourage mice and other small creatures to nest there or it may attract insects. There could also be an aesthetic impact. These impacts would revolve around additional potential for windblown debris. Outdoor storage could also degrade the value of the recovered material, particularly for paper products.

If composting were added, there would be a few additional environmental concerns in addition to those listed for a transfer station with material recovery. The composting process itself represents no harmful environmental impacts. However, there is a potential impact from rain water washing a nutrient-rich leachate off the site. There is also the possibility of the pile going anaerobic and releasing unpleasant odors. However, with a properly designed composting yard and facility with good operational practices, these problems can be avoided.

Traffic flows would not be significantly changed with the addition of composting. If it were added after the material recovery component, it would reduce the number of vehicles going to the landfill. The same number of vehicles would be bringing waste to the facility and the same number of vehicles would be taking secondary materials to market. (Appendix 1 details the vehicle counts for all facilities).

State or Federal Regulations and Criteria

As previously discussed, a transfer facility, and its associated activities, is required to meet siting criteria established by the State as well as the local government's criteria. There may be facility specific regulations at the Federal or State level. Transfer facilities have one additional State regulation in Illinois. The Environmental Protection Act requires that IEPA establish other conditions pertinent to the siting and development of regional pollution control facilities. One section of the Act is specifically directed towards the location of transfer stations. Section 22.14(a) of the Act states:

> *No person may establish any regional pollution control facility for use as a garbage transfer station, which is located less than 1000 feet from the nearest property zoned for primarily residential uses or within 1000 feet of any dwelling, except in counties of at least 3,000,000 inhabitants. In counties of at least 3,000,000 inhabitants, no person may establish any regional pollution control facility for use as a garbage transfer station which is located less than 1000 feet from the nearest property zoned for primarily residential uses, provided, however, a station which is located in an industrial area of 10 or more contiguous acres may be located within 1000 feet but no closer than 800 feet from the nearest property zoned for primarily residential uses.*

The IEPA treats the 1,000 foot set-back mentioned in the statute as being measured from the edge of the property line. This interpretation is derived from the fact that the Act refers to a facility or site, which is further defined as a location, place, or tract of land. Thus, the 1,000 foot set-back would be measured from the property line of the proposed regional pollution control facility to the nearest piece of property zoned residential. However, this would not be the case for a dwelling located in a non-residentially zoned area. In this case, the IEPA interprets the 1,000 foot set-back being measured from the property line of the regional pollution control facility to the edge of the structure or dwelling. Since a transfer and/or processing facility will generate nonprocessible residuals which must be landfilled, it is subject to these restrictions.

The State also establishes criteria as part of the permitting process. While these criteria are not part of the State statutes, it is still necessary to include them in the early stages of facility development. If the design or permit criteria are not met, then the facility may not be granted a development or operating permit. The IEPA has begun to develop permit criteria for transfer stations and its derivatives. Currently, the draft criteria for municipal waste transfer stations are shown in Table 1.

TABLE 1

Criteria For Municipal Waste Transfer Stations

I. Applicability

These criteria apply to owners and operators of facilities that collect and store municipal waste prior to removal to a permitted facility for processing or disposal.

II. General

A. Certificate of local approval pursuant to Section 39 of the Governmental Protection Act.

B. Surface
   1. Fence (6-foot high chain-link type) or
   2. Totally enclosed building

III. Safety

Facility shall have a contingency plan to address any accident or equipment failure at the site.

IV. Operation

A. A notice stating the hours of operation of the transfer station shall be conspicuously posted at the entrance of the site.

B. Compacted waste may be stored overnight in a transfer trailer either inside the transfer station floor or on the grounds of the facility.

C. All buildings, containers and other equipment in the transfer station shall be cleaned at the end of each operating day.

D. All litter shall be collected from the transfer station and grounds and properly handled at the end of each day or more often if necessary.

E. The company shall employ a vector control specialist to inspect the transfer station area at least once a month and report results to the company. If necessary vector control measures shall be taken.

F. No municipal waste transfer station shall accept, receive, store or transfer special waste.

V. Closure

A. At closure the facility owner/operator shall notify the Agency of closure of the facility.

B. If the Agency finds that all waste has been removed, the Agency shall certify, in writing, to the owner and operator that the completion and closure requirements have been met.

VI. Post-Closure

After closure, the owner of the property shall maintain the site for one year. All waste, litter, vector and odor problems shall be remedied by the owner/operator.

Source: Permit Section, Division of Land Pollution Control, Illinois EPA.

Part of the draft criteria are the requirements for closure and post-closure. For a transfer station, the owner of the facility must notify the IEPA that the facility is closing and remove all the waste from the premises. The IEPA will verify that the waste has been removed. The owner of the site must then maintain the property for one year. During that year, any problems must be remedied. These closure and post-closure requirements are likely to be required of any transfer station derivative such as a material recovery facility or a composting facility.

Local Criteria And Potential Sites

The locational criteria used to identify potential sites for a transfer facility are, in part, determined by its function. The application of processing technologies can further increase material recovery rates, a primary solid waste management objective. This processing at a centralized facility will also act as a potential diversion point for undesirable or household hazardous wastes from the wastestream prior to landfilling. This high level of processing would also set the stage for composting technologies to be added in the future. Consequently, additional local requirements would include: minimum site size needed to accommodate all anticipated waste processing functions; general location preference in relation to sources of waste generation and recyclables; traffic volume generated by the proposed facility and its functions; transportation access requirements for transshipment to markets or landfills; and, compatible land use patterns.

Minimum Size

A transfer facility typically provides weighing facilities; an enclosed area for dumping and storage; outside areas for turning and backing movements; queuing space for packer trucks and transfer trailers; and, a compacting unit for managing the residue. The addition of waste processing and material recovery to a transfer facility requires space for processing and/or separating recyclables. Proximity to transportation for access to markets will also need to be considered. In addition, a site must have space for equipment, personnel and storage for recycled and recovered materials. Both the transfer and a material recovery functions require access drives, a scale, gate house, and have public drop-off and disposal areas.

These functions combined in a single facility are estimated to require a minimum of 4 acres. The composting component, if added, would require additional space. Depending on the technology used, the site would require between 5 to 15 additional acres. Altogether, the size of a site which would allow for the possible future development of volume reduction options and increases in wastestream volume is about 30 acres. This includes areas for buffering and screening the site. It is possible that a site as small as 10-20 acres could be adapted to all of the possible options depending on the technology chosen.

Centroid of Waste Generation

Transportation and access are also strong locational determinants. Since the collection of solid waste occurs at numerous points throughout the County (each home and business), there is a single point that is the most accessible. Usually near the geographic center of an area, this point, called the centroid of waste generation, will minimize the sum of the collection distances from every collection point. Since Champaign County's population is concentrated in the cities of Champaign and Urbana, the two cities produce the majority of solid waste in the County. Part I, Solid Waste Characteristics, details waste generation and the different wastesheds that exist in Champaign County.

The centroid of waste generation in the County is located near the center of Section 27 in Somer Township (about 1/2 mile east of Route 45 and 2 miles north of Urbana). The geographic center of the Cities of Champaign and Urbana is the intersection of Springfield and Wright, in a residential neighborhood. Since transfer and processing facilities are industrial in nature, they should be located in an industrial area. Hence, the prohibitions contained in the Illinois Environmental Protection Act. Therefore, a distance of five miles from the center of Champaign-Urbana was used. This distance forms the nearest outlying edge where it would be feasible to develop a facility. Another radius was drawn around the centroid of generation for the County. These circles identified the general area to locate appropriate sites. (See Figure 1)

Transportation Access

The access roads to and from the facility must be able to handle this anticipated traffic. The types of road adaptable to estimated traffic volumes are State highways, city collectors, Federal highways, county-state aid highways, and paved county roads (with improvements). Interstate highways can only be used when an interchange is close enough to use with other types of roads to allow uncomplicated access. An additional access factor is the utilization of rail transport. Rail transport of recovered materials to markets can reduce the amount of truck traffic at the facility and provide a larger marketing area. As overseas markets expand, it will become necessary to be able to access those markets, especially for paper or fiber. Shipping materials to ocean ports such as New Orleans or Seattle by rail can allow access to overseas markets in the most economic manner. A mixed transportation pattern of residuals by truck and recyclables by rail is less expensive than trucking all materials, and allows for the greatest flexibility in accessing markets. Consequently, because of the need for roads that can handle truck traffic and the need for rail access, the facility should be located near the major Champaign-Urbana transportation corridors.

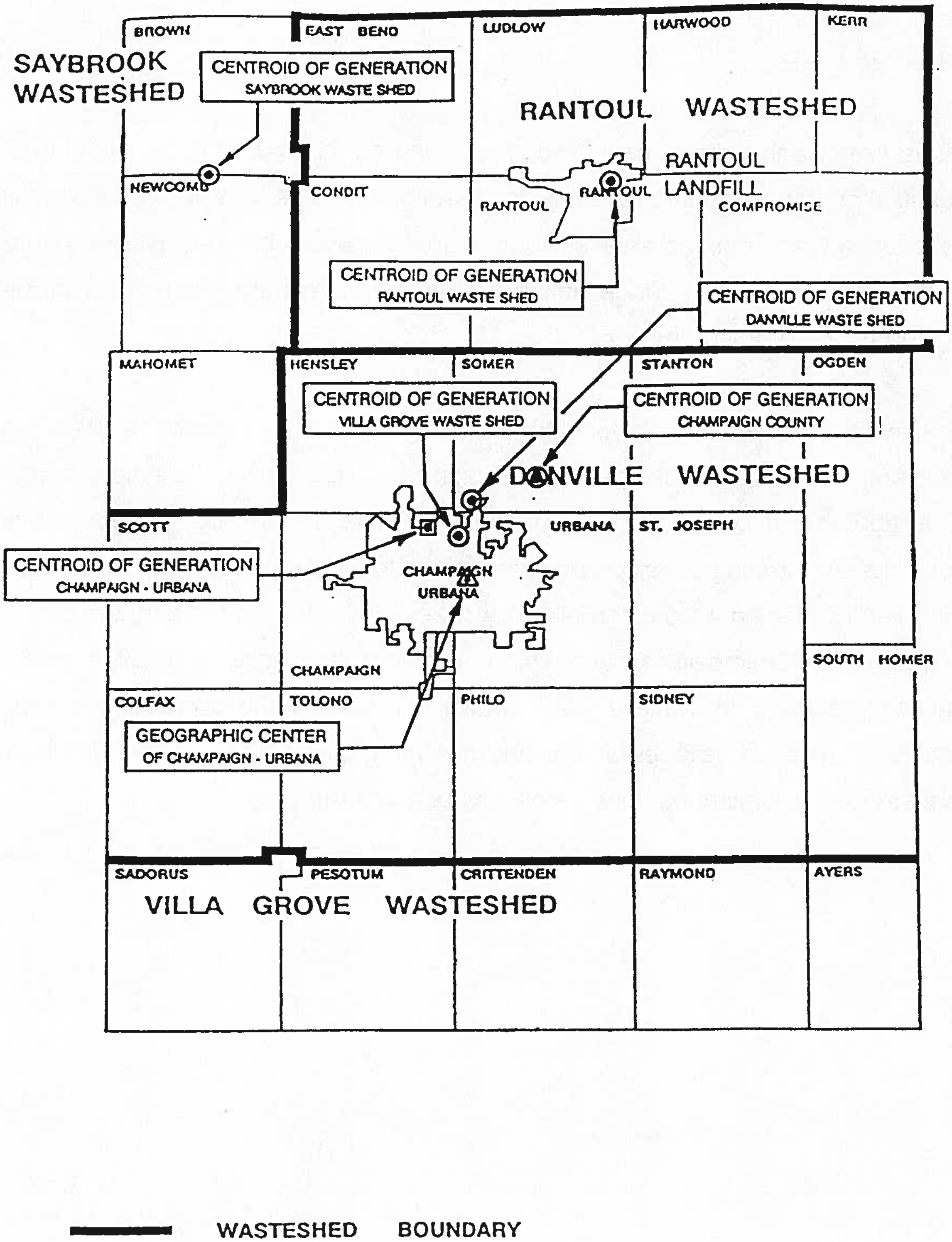

FIGURE 1

Centroid of Waste Generation
By Wasteshed in Champaign County

Compatible Land Uses

As previously mentioned, the transfer and processing of solid waste is comparable to other industrial processes, therefore, this type of facility should be located in an industrial area. By locating in an industrial area, surrounding land uses will be likely to have similar activities such as truck traffic. Since similar activities are occurring, the impact on the surrounding properties will be minimal.

Although zoning is not viewed as binding for siting regional pollution control facilities, the initial indicator of land use compatibility is zoning. Residential, commercial and institutional zoning are considered incompatible with the transfer component of the operation of the site. Zoning classifications determined to be compatible with transfer and processing facility location were established by review of the City of Urbana, the City of Champaign and the Champaign County zoning ordinances. These compatible zoning classifications are listed in Table 2. As shown in Table 2, the compatible zoning classifications allow such activities as sewage treatment plants, railroad roundhouses, heavy industry or manufacturing, junk yards and bus storage yards.

Table 2

Compatible Zoning Classifications:

Cities of Champaign and Urbana and Champaign County

Champaign:

I-2, Heavy Industrial - Manufacturing, processing, storage of industrial materials including scrap; Heavy industrial or manufacturing plant; junkyard; drive-in theatre; railroad shop or roundhouse; stone and gravel crushing, grading, washing, and loading; yard for storage of wrecked automobiles.

I-3, Restricted Light industrial - Manufacturing, processing and storage of materials less offensive than those permitted in I-2; animal hospital, blacksmith shop; bottling plants; bus storage garage or yard, creamery & milk distribution station; grain elevator; railroad freight station; ready-mix concrete plants; sewage treatment storage of gasoline, oils and solid fuels, warehouse; water treatment facility.

I-4, Restricted Heavy Industrial - Manufacturing, processing, and storage of industrial materials heavy industrial or manufacturing; brick, tile, glass, concrete and clay products manufacturer; junkyard; railroad shop or roundhouse; stone and gravel crushing, grading, washing and loading; yard for storage of wrecked automobiles.

Urbana:

AG, Agricultural - Raising animals and crops and storage and processing of same.

IN, Industrial - Manufacturing, processing and storage of industrial materials and assembly of raw and finished products

County:

I-1, Light Industrial - Manufacturing, processing and storage of industrial materials not as offensive as permitted in I-2; jewelry, silverware and plated ware manufacturing and processing, photographic supplies & equipment manufacturing; textile and apparel manufacturing;

I-2, Heavy Industrial - Manufacturing, processing and storage of industrial materials wood fabricating shop; paper and pulp manufacture; abrasives, asbestos and miscellaneous non-metallic products manufacturing; gasoline and volatile oils storage; food preparation manufacturing and processing; automobile salvage yard.

B-4, General Business District - Commercial, activities including storage wholesale and retail

AG-1, Agricultural* - Single family dwelling, agriculture, parks, roadside stands, plant nursery

AG-2, Agricultural* - Single family dwelling, agriculture, parks, commercial breeding, country clubs, and special uses not permissible in AG-1

*Public or commercial sanitary landfill is a special use in AG-1 and AG-2 in the County.

Based on the minimum regulatory requirements as outlined in the Environmental Protection Act coupled with desired local site features, a list of locational criteria were developed. This list of state requirements and locational features desired also produced a set of search restrictions. Sites that had one or more of the listed restrictions were dropped from further consideration. The exclusionary and inclusionary site criteria are in Table 3.

Based on these criteria, forty (40) potential sites for a transfer facility (and its derivative functions) have been identified. These locations are shown in Figure 2.

TABLE 3

Transfer and Processing Facility Criteria

INCLUSIONARY	EXCLUSIONARY
• Parcel should be: - 10 to 30 acres - Located along major transportation routes including railroad - Properly zoned County: I-1, I-2, AG-1, AG-2 Champaign: I-2, I-3, I-4 Urbana: IN, AG - Near the centroid of waste generation - No more than 21/2 times as deep as it is wide and uniform in shape - Utilities access	• Exclude parcels less than 1000 feet from nearest property zoned residential or residential dwelling • Exclude areas inside the 100 year flood plain • Exclude parcels with residential structures • Exclude parcels greater than 10 miles from centroid of waste generation (approximately 2 miles North of Rt. 45 and I-74) • Exclude parcels greater than 5 miles for the geographic center of Champaign-Urbana (the intersections of Wright and Springfield) • Exclude sites with multiple owners • Exclude sites with steep slopes, surface water features or environmentally sensitive areas • Exclude sites more than 1/2 mile from a State highway or major collector • Exclude sites requiring construction of at-grade rail crossing over major arterials.

Source: Material Recovery/Transfer Facility Site Identification Study, ISWDA, November, 1989.

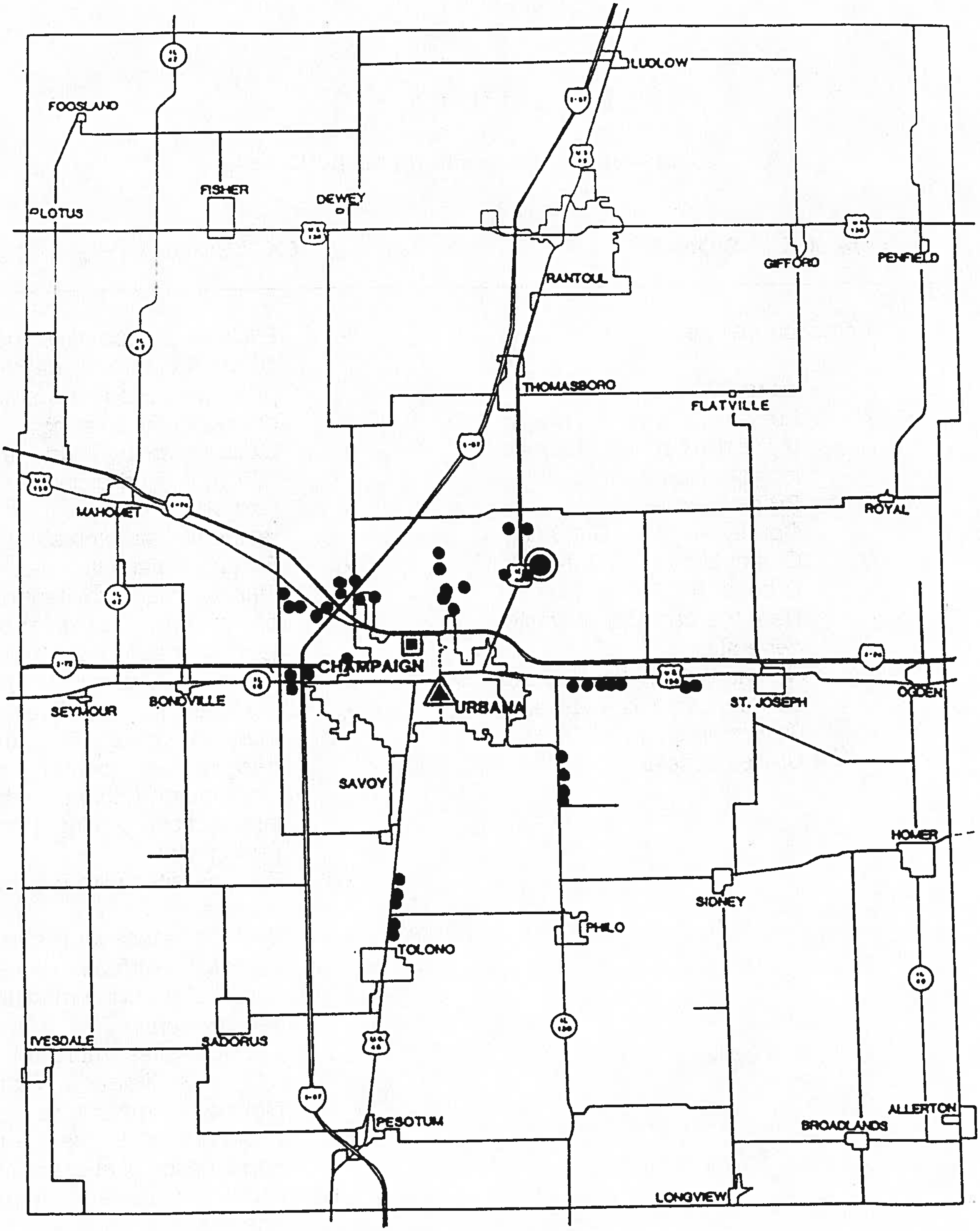

FIGURE 2

Transfer and Processing Facility Sites

Source: Material Recovery/Transfer Facility Site Identification Study; ISWDA, November, 1989

Development Timeline

The development timeline for any solid waste facility involves several phases. The first phase involves activities including selecting a site; determining the type of procurement process including ownership arrangements; developing a Request for Proposal, or RFP, (unless the municipality has sufficient in-house staff, outside assistance is usually required for facility development); distributing the RFP; reviewing the submitted bids; and negotiating and finalizing a contract and design. Some of these activities can take place simultaneously. This phase of the project for a transfer station is estimated to take 12-16 months. Dependent upon the level of prior discussions on such items as the procurement process and ownership arrangements, more or less time may be required. Similarly, dependent upon the level of detail included in the RFP, more or less time may be required.

The second phase of the project is the siting and permitting processes. This includes the local SB 172 hearing process. Once local siting approval is granted, IEPA must review the facility design and issue a development permit. If additional processing is anticipated at a transfer station, it would be beneficial to permit all the functions at once even if the development is to take place over 1-2 years. If the ihitial siting permit approved included designated areas for material recovery or composting, then another SB 172 siting hearing would not be necessary. A supplemental 90-day public review period would be required and the development permit would have to be applied for within two years. This could mean a period of 3 months in Phase II for adding material recovery or composting. If these functions were not included in the initial permit, a SB 172 hearing would be required increasing the time required in Phase II to 8-10 months. Since additional time would be needed to do waste characterization studies prior to adding any composting, this additional time was added to the composting expansion.

A concurrent activity to the siting and permitting process is financing. The development of design and operating information necessary to secure financing can be undertaken at the same time as siting. Much of the information necessary to obtain financing is also necessary for the siting process. An appeal of the SB 172 ruling will require an additional 4-6 months.

Once the siting and permitting process is complete, the third phase of the project, construction and testing begins. Site development and construction of a transfer station building will take about 4 months. Construction of the material recovery component could take an additional 13-14 months. An in-vessel composting system could require 27-35 months for construction. Construction of the various components could occur simultaneously, which would shorten the construction time.

If there is complex site preparation, such as flood proofing, this could also require additional time. Once the facility is complete, it must be tested to see if it operates as intended. In a simple transfer facility, this is not a difficult determination. However, in material recovery or composting facilities, testing can take several months. IEPA will issue an operating permit if the facility passes acceptance testing. Additional testing or shakedown time, may be required as part of the contract. After the operating permit is issued, the facility can begin operation.

In total, it can take approximately 24-32 months to develop a simple transfer station. An additional 13-15 months would be needed to add the material recovery function. The time frame that would be needed for a facility to add composting would be 27-36 months. Table 4 shows the various work items and the time needed to complete each. Figure 3 presents a timeline for the entire project.

TABLE 4

Transfer And Processing Facility Development Timetable

	Months Minimum	Months Maximum
Phase I - Facility Development		
Identify Site, Ownership Option and Develop Request for Proposal (RFP); RFP Response; Select Proposal; Contract Negotiation; Design/Permit Application Preparation	12	16
Phase II - Siting and Permits		
SB 172 Hearing	5	6
Financing*	--	--
Development Permit Submission	1	1
IEPA Development Permit Review	2	3
Part III - Construction		
Construction: Transfer Station	3	4
IEPA Operation Permit	1	2
Total for transfer station[(1)]	**24**	**32**
Construction: Material Recovery Component	12	13
IEPA Operation Permit	1	2
Additional time to add material recovery[(1)]	**13**	**15**
SB172, Development Permit Submission; IEPA Review	8	10
Construction: Composting Component	18	24
IEPA Operation Permit	1	2
Additional time to add composting[(1)]	**27**	**36**

(1) An SB 172 appeal to the Illinois Pollution Control Board would add approximately 5 months to this timetable.

* Financing is usually secured after the SB172 hearing and concurrently with the IEPA Development Permit review.

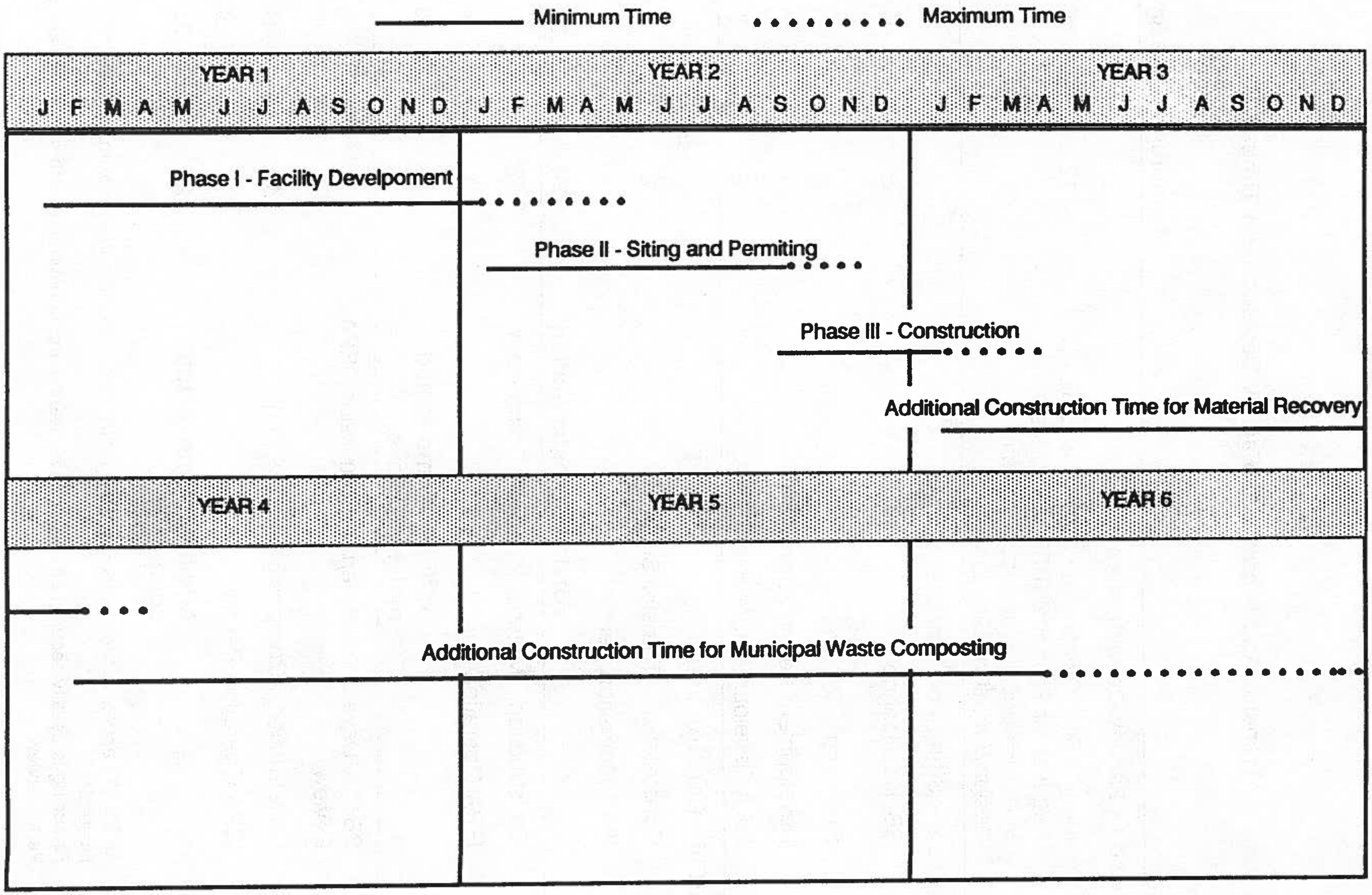

FIGURE 3

Transfer and Processing Facility Development Timeline

Development Costs

Development costs for a transfer station and the additional processing functions can be distributed among the three phases of development. One option when developing a transfer station with the processing alternatives, is that development can take a building block approach. For example, if there is an existing transfer station, a material recovery component could be added. This would alter the capital costs. A composting system could be added at an even later date. In fact, this may be preferred. In order to select the appropriate composting technology, in-depth waste stream characterization studies should be conducted, and this could take 12-24 months.

Although there are different variations of a transfer station, the initial decisions remain constant regardless of what alternative is to be developed. In general, costs in Phase I, facility development, can vary significantly. Functions affecting these costs include the use of consultants versus staff. A public body that relies solely on consultants will most likely have higher costs. As a public body moves toward reliance on its staff, the costs typically decrease. In addition, the complexity of the request for proposal will affect the costs. A simpler RFP will require less engineering review and input that an RFP which is very detailed in system configuration, equipment or throughput levels. Although the engineering costs may be avoided by issuing a simple RFP, those costs may be incurred later during review of the submitted bids.

In Phase II, siting and permitting, there are two areas in which costs are incurred. The Environmental Protection Act, Section 39.2(k) allows "a County Board or governing body of a municipality may charge applicants for siting review . . . a reasonable fee to cover reasonable and necessary costs incurred by such county or municipality in the siting review process." Currently, Champaign County Resolution 2212 sets the fee for the review of a transfer station at $2,000.00. This resolution is currently under review and it is anticipated the fee will increase. The City of Urbana is also revising their ordinance, and the proposed fee for a transfer station in the current draft is $50,000. Additional processing functions such as a material recovery function or composting would require higher applicant fees. The City of Champaign would require a fee of $2,500.00 for siting review. In Illinois the average fee paid to the SB 172 body for review of a transfer station is $50,000.

The second area of incurred costs during Phase II are applicant preparation costs. These costs are incurred when developing the necessary documentation in order to file for local siting approval. Included in these costs can be engineering review, expert witnesses, reproduction of blueprints and documents. The estimated preparation costs for a transfer station and its derivatives is approximately $100,000.

The construction phase is the most cost intensive. The building and equipment are the most costly. Land acquisition is included in phase three for this estimate, but may occur earlier. It has been included at this point because only after SB 172 approval and IEPA review is the selected site secured. Purchasing the land earlier may involve a risk. If the site is not approved, there may be a financial loss in selling the land. To avoid this situation, land is usually optioned in the development phase but not purchased until just prior to construction.

The capital cost to construct a transfer station are estimated at $4,133,200 in 1990 dollars. The building and construction costs are the largest part of the estimate. Using the estimate of 24 months to develop, by the time a transfer station was operational in 1992, the cost would be $4.5 million. (Table 5)

Adding the material recovery component increases the capital costs. The 1990 capital costs for building a transfer station with material recovery were estimated at just over $10 million. Although the building and construction costs are still the largest portion of the estimate ($4.2 million), the equipment costs are almost equal at $3.6 million. (Table 6).

The composting alternative would be added to a transfer station with material recovery. As previously mentioned, this delay would allow a detailed waste characterization study to be completed. Although there are a number of composting technologies, cost estimates were developed for an in-vessel system. An in-vessel system allows the highest degree of control of the waste, but it is the most costly system. While other systems would have lower capital cost, the operation and maintenance costs are similar. The capital costs to add an in-vessel composting system to an existing facility were $7 million in 1990. Assuming the transfer/material recovery facility opened in 1992, it would take approximately 2-3 years to conduct the waste characterization study and the 24 months to construct the composting component. The composting component would be operational by 1997 and the cost at that time was estimated at $9.9 million. Table 7 details the costs for the composting component.

TABLE 5

Transfer Station

Capital Costs in 1990 Dollars

Phase I - Facility Development		
Costs vary depending upon complexity of RFP and the use of consultants vs. staff		
Phase II - Siting and Permitting		
Siting Fees (to SB 172 Body)		$ 50,000
Siting and Permit Application Preparation		115,400
	Subtotal	$165,400
Phase III - Construction and Testing		
Land Acquisition		904,100[1]
Building/Construction Costs		1,442,100
Siting Drainage, Landscaping and Erosion Control		127,900
Equipment		1,096,400
Engineering		247,400
10% Contingency and Construction Costs		149,900
	Subtotal	$3,967,800
	TOTAL (1990 Dollars)	$4,133,200
	TOTAL (1992 Dollars)[2]	$4,556,800

(1) Based on $30,000 per acre for industrial zoned land in 1990.

(2) Estimated date of opening.

Source: Adapted from "Alternative Scenarios for Intermediate/Long Range Ultimate Solid Waste Disposal," Intergovernmental Taskforce on Solid Waste Disposal (August 1985) and; "Staff Report to the Intergovernmental Solid Waste Disposal Association of Champaign County on Future Plans for Solid Waste Disposal in Champaign County," ISWDA (December 1988).

TABLE 6

Transfer Station With Material Recovery
Capital Costs in 1990 Dollars

Phase I - Facility Development		
Costs vary depending upon complexity of RFP and the use of consultants vs. staff.		
Phase II - Siting and Permitting		
Siting Review Costs		$ 50,000
Siting Application and Permit Application Costs		115,400
	Subtotal	$ 165,400
Phase III - Construction and Testing		
Land Acquisition		904,100[1]
Building/Construction Costs		4,281,000
Siting Drainage, Landscaping, Erosion Control		127,900
Equipment		3,637,100
Engineering (including Consultants)		715,900
10% Contingency		433,800
	Subtotal	$10,099,800
	TOTAL (1990 Dollars)	$10,265,200
	TOTAL (1992 Dollars)[2]	$11,317,300

(1) Based on $30,000 per acre for industrial zoned land in 1990.

(2) Estimated date of opening.

Source: Adapted from: "Solid Waste Management Feasibility Analysis for Champaign County, City of Champaign and the City of Urbana," Brown, Vence and Associates (May 1988).

TABLE 7

In-Vessel Composting Module
Added Capital Costs in 1990 Dollars[1]

Phase I - Facility Development

Costs will vary depending upon complexity of RFP and the use of consultants vs. staff

Phase II - Siting and Permitting

Included in previous facility Siting and Permitting Costs

Phase III - Construction and Testing

Building Costs:	Reactor Building	$ 964,700
	Maturation Building	1,033,600
	Other Costs	52,900
Site Drainage, Landscaping, Erosion Control		106,200
Equipment		3,674,600
Engineering Costs		583,200
10% Contingency		641,500
	TOTAL (1990 Dollars)	$7,056,700
	TOTAL (1997 Dollars)[2]	$9,929,587

(1) These costs represent the estimated additional costs to add in-vessel composting technology to an existing transfer station with material recovery capabilities. An estimate of the entire building costs, in 1990 dollars, would be $17,321,900.

(2) The estimated date of opening.

Source: Adapted from "Solid Waste Management Feasibility Analysis for Champaign County, City of Champaign and City of Urbana," Brown, Vence and Associates (May 1988) and; "Independent Engineer's Report: Metro Solid Waste Composting Facility, Portland, Oregon," R.W. Beck and Associates (December 1989).

COMBUSTION FACILITIES

Characteristics

A combustion facility is designed to incinerate municipal solid waste with or without energy recovery. Waste may be sorted into combustible and non-combustible constituents before burning. Waste incineration may also occur without sorting. Incineration reduces combustible garbage to carbon ash before final disposal. The mass of waste can be reduced by 70-90%. With some modification to a waste incinerator, energy in the form of steam, hot water, or electricity may be recovered and sold.

There are three basic types of incinerators that produce energy: conventional refractory wall incinerators with waste heat boilers; water wall incinerators; and, modular incinerators with heat boilers. All waste incinerators have the same general features. Each has a waste receiving area or tipping floor. From the tipping floor, waste is mechanically fed into a combustion unit. Waste generally has low energy content, but by adjusting the air-fuel mixture or by adding additional fuel, waste can be fully burned. The aim of full combustion is to reduce the volume of waste while minimizing the emissions and odors. All municipal waste incinerators require air pollution control devices.

Incineration with energy recovery is the most prevalent form of incineration. The revenues from energy sales offset some of the operational costs of the facility. Without energy recovery, the costs of the facility will be substantially the same with no opportunity to reduce operating costs with energy sales. Therefore, it is projected that in the future, the majority of incineration facilities will include energy recovery.

Two basic methods of obtaining energy from municipal solid waste are currently used: refuse-derived fuel (RDF) and mass burn. RDF is a system where refuse is used to provide fuel for a plant producing energy, reducing or eliminating that plant's need for other fuels. RDF is produced in four possible forms: fluff, powder, densified pellets, or wet-dry. Typically, an RDF plant produces steam or electricity and can be designed to burn RDF exclusively or to co-fire it with another fuel such as coal or wood. RDF systems are different from mass burn technologies because they are designed to separate solid waste into combustible and non-combustible factions. This separation and the production of RDF does not necessarily have to occur at the same site as the incinerator, especially when it is intended to be co-fired in existing boilers. This function could take place at a transfer station. Mass burn incinerators, however, burn the waste as it arrives with no pre-processing.

Environmental Impacts

Combustion facilities have a number of environmental impacts associated with them. These impacts are perhaps more widely known than those associated with a transfer facility or any of its related activities. As with any combustion process, incinerators produce various types of waste by-products. These wastes are discharged through the air and water with residuals, or solids, remaining. These impacts are complex and a large body of legislation exists at the Federal and State levels regulating components of the waste by-products. Other environmental impacts associated with incinerators are noise, traffic, odor and aesthetics.

Air Emissions

The solid waste combustion process discharges various emissions into the atmosphere. The characteristics of air emissions will vary depending on the pollution control device used such as an electrostatic precipitator (ESP) or a baghouse. An ESP is the most common control device currently employed. In addition to the type of control device used, emissions from a combustion facility will vary based on several factors, including composition of refuse; combustion temperature; and, type of incinerator system.

The five air emission categories are particulates, acid gases, organic compounds, nitrogen oxides and metals. The permitting process for an incinerator involves a formal environmental impact assessment during which an air modeling will be used to estimate the actual dispersion level of air emissions.

Particulate matter of both organic and inorganic nature are emitted from incinerators during the combustion of solid waste. The bulk of inorganic particulate emissions results from the carryover of mineral matter or ash resulting from the combustion process. Organic particulates generally result from poor combustion conditions and are minimized using more complete combustion practices. Another source of particulates is fugitive dust which is emitted during the earthmoving and construction phases of development for any solid waste management facility.

Hydrogen chloride (HCL), hydrogen fluoride (HF), and sulfur oxides (SO_x) are commonly referred to as acid gases. These compounds are produced in the combustion process from sulfur, chlorine and fluorine found in the wastestream.

Chlorine and fluorine appear in wastestreams both in inorganic salts and in organic compounds. Plastics, particularly polyvinyl chloride (PVC), are potential sources of chlorine in the wastestream. The magnitude of hydrogen chloride or hydrogen fluoride emissions from combustion sources depends on their relative quantity in the fuel, which on average is small. Therefore, emission rates are usually low relative to overall emissions.

Sulfur, like chlorine, has many sources in the wastestream. Sulfur can be present in any or all of its many oxidation states. Of particular relevance to air emissions is the sulfur appearing as organic and inorganic sulfides, free sulfur and in its organic or inorganic acid forms. In each of these cases, the sulfur can be expected to appear in the flue gases as sulfur dioxide or trioxide which are considered major contributors to acid rain.

Organic emissions result from incomplete combustion in waste combustion chambers or breakdown of organic fuel in waste transportation vehicles. A common product of incomplete combustion is total hydrocarbons (THC) usually in the form of low molecular weight hydrocarbons, aldehydes and organic acids. This pollutant combines with nitrogen oxides (NO_x) to form photochemical oxidants, or smog, under warm, sunny conditions. Hydrocarbons and NO_x are precursors to ozone, a prominent constituent of smog.

Dioxin is a generic term for another family of organic compounds that can occur during incineration. Dioxins are thought to result from the pyrolysis and combustion of polyvinyl chloride plastics, chlorophenols, benzenes, and lignin and chlorine which are widespread in municipal solid waste. The formation and destruction of dioxins during incineration is complex and not completely understood at this time. Dioxins can also form in post-combustion zones, particularly from continuing thermal reactions on incandescent particles which are present in excess air-mass burn incinerators. Associated with dioxins are furans (polychlorinated dibenzo-furans, PCDF) which are less toxic. At this time, there is disagreement regarding the degree of hazard posed by dioxin and furan emissions from combustion facilities.

Nitrogen oxides (NO_x) are formed in the combustion process through fixation of atmospheric nitrogen with oxygen (thermal generation) or by the oxidation of nitrogen bound in the fuel (fuel nitrogen generation). The air quality impact of nitrogen oxides arises from their participation in atmospheric chemical reactions. These reactions produce a variety of oxygenated compounds, including ozone. NO_x is attributed to waste incinerators and to vehicles that transport wastes.

A number of metallic compounds, including mercury, lead, cadmium, zinc and nickel are sometimes emitted from waste incinerators. The quantities emitted are determined largely by three factors: the amount of each metal contained in the waste, the combustion characteristics of the furnace and the efficiency of the air pollution control system. It is generally believed that the metals are volatilized at higher temperatures in the combustion zone and later condense into particulate matter as the exhaust gasses cool. Emissions from vaporized metals can be controlled through the application of efficient particulate removal systems.

Water Products

Incinerator facilities are required to comply with federal standards regulating wastewater discharge and with state and local requirements pertaining to water use. The sources of wastewater discharge vary depending on the recovery system and the energy output. Sources of wastewater from combustion systems include equipment and facility washdown, quench water and site drainage.

Depending on the approach used at a specific facility, the clean wastewater (including blowdown, pretreatment filter backwater, and demineralizer-neutralized regenerate) could be used as water to wash down the facility. Washdown water is collected to allow large solids to settle before the water is pumped to the quench tank. The quench system is used to cool bottom ash or residue and fly ash, which is typically conveyed to the quench tank.

Water draining from ash stored at the plant site is another source of wastewater in mass burning systems. Drainage of this water can be improved by tilting the storage container. Maximum drainage of water at the plant site will reduce the amount of water that could leak during transit of the ash to a disposal site. A drain should be located near the ash/residue discharge point. Water that enters the drain should be piped to the circulation system.

Solid Products

Solids generated by incineration include bottom ash, fly ash and non-combustible material. Both the bottom ash and fly ash have the potential to contain heavy metals, such as lead. This is generated by the incineration of solid waste containing those metals, such as batteries. If this does occur, the ash produced by combustion facilities may be considered to be hazardous material. The remaining non-combustible material usually consists of metal products such as tire rims, bicycles and metal cabinets. These do not present any environmental hazards. In fact, the metals are frequently an income source for the facility since the material can be sold to a scrap dealer.

Traffic Impacts

An incinerator would serve as a focal point for the solid waste related traffic in the area. Packer trucks and private vehicles would be bringing waste to the facility for disposal in 1995. It was calculated that there would be 203 vehicles per day into and out of the facility. There would be about 98 collection vehicles and 96 private vehicles disposing of waste the first year of operation. Private vehicles would also bring recyclables to the buy back or drop-off facilities. Due to the material recovery function, there would be approximately 5 vehicles a day shipping secondary materials to market. There would also need to be about 4 vehicles per day transferring ash and residual materials to the landfill. This number would remain the same regardless of the landfill location. The total number of vehicles would increase to 217 by the year 2010. The increase is due to the increase in population and the necessary increase in collection vehicles to pick up the additional solid waste generated. The number of vehicles required to haul ash to disposal and materials to market would remain the same.

State and Federal Regulations and Criteria

The majority of State and Federal regulations or criteria for combustion facilities focus on air emissions. In Illinois, the air emissions permitting function of USEPA has been delegated to IEPA. The two agencies have promulgated air quality regulations, together with the permitting process, that define air quality standards and impose design constraints and requirements on new or modified stationary sources. The Federal Aviation Administration (FAA) also issues regulations that affect combustion facilities.

A combustion facility would be subject to the following air emission regulations.

(1) National Ambient Air Quality Standards (NAAQS): Two parts of the Clean Air Act, Sections 108 and 109, govern the establishment and revision of NAAQS. Section 108 mandated that USEPA identify pollutants that may reasonably be anticipated to endanger public health or welfare and to issue air quality criteria for them. These air quality criteria are to reflect the latest scientific information regarding all identifiable effects a pollutant may have on the public health and welfare. Section 109 of the Act directs USEPA to propose and promulgate regulations which set NAAQS for pollutants identified under section 108.

Section 107 of the 1977 Clean Air Act Amendments requires USEPA to publish the compliance status of all geographic areas with established NAAQS. Areas that meet NAAQS are referred to as attainment, and areas that do not meet the standards are termed non-attainment. Areas that have insufficient data to make a determination are unclassified but are treated as being attainment areas until proven otherwise. The designation of an area is made on a pollutant-specific basis.

The compliance status of an area is a significant consideration in the siting of a waste incinerator or waste-to energy facility, as this status will significantly affect the future permitting course and air pollution control requirements of the facility. Facilities located in attainment areas will be subject to the Prevention of Significant Deterioration (PSD) while facilities located in non-attainment areas will be subject to the more stringent Non-attainment Area (NA) and Lowest Achievable Emission Rate (LAER) requirements.

(2) Attainment Area Regulations - Prevention of Significant Deterioration (PSD) Requirements: Any major stationary source of air pollution, as defined by PSD regulations, must undergo PSD review before a permit can be issued for construction of a facility in an attainment or unclassified area. The definition of a major stationary source includes any municipal incinerator capable of handling more than 250 tons of refuse per day and which has the potential to emit 100 tons or more per year of any air pollutant regulated under the Clean Air Act. Potential to emit is based on the maximum design capacity of a facility and takes into account pollution control efficiency. In general, a proposed major source of air pollutants will be subject to PSD requirements for all regulated pollutants that the facility will emit in significant quantities.

(3) Non-attainment Area Regulation - Lowest Achievable Emissions Rate (LAER) Requirements: The location of a major new stationary source in a non=attainment area will require that a permit be obtained in accordance with the EPA Emission Offset Interpretive Ruling. The new source review of a facility located in a non-attainment area requires design for the Lowest Achievable Emissions Rate (LAER).

Both federal and state regulations define LAER as the most stringent rate of emissions based on the following:

- The lowest emission limitation that is contained in the implementation plan of any state for such class or category of stationary course, unless it is demonstrated that such limitation is not achievable;
- The most stringent emissions limitation that is achieved in practice or is achievable by such a class or category of stationary source; and
- The applicable new source performance standard.

In general, major sources are subject to review under the offset ruling only if they emit in major amounts (i.e., 100 tons per year) of the pollutant(s) for which the area is designated non-attainment.

(4) New Source Performance Standards (NSPS): NSPS establish the maximum allowable rate at which a pollutant may be emitted into the atmosphere. These standards are applicable to specific categories of sources and apply not only to new sources, but also to modified or reconstructed existing sources of air pollution. USEPA recently adopted new federal NSPS (40 CPR 60, Subpart Db) that apply specifically to "steam generating units". Municipal solid waste-fired, steam generating units are covered under these standards. The IPCB has adopted regulations limiting particulate matter emissions from new incinerators.

Any incineration facility built in Illinois and processing more than 25 tons per day (TPD) of refuse is also subject to Best Available Control Technology (BACT) requirements determined by the IEPA. BACT requirements are determined on a case-by-case basis.

The Federal Aviation Administration (FAA) must also review combustion facility plans. The FAA will then make an Air Space Determination for projects within 5,000 feet of an airport. The FAA reviews the project to determine if it will interfere with navigational aids or flights in and out of the airport. The primary concern is the stack height. Each case is reviewed independently and a hazardous or non-hazardous determination is made.

As with the transfer facility, combustion facilities are also subject to additional state criteria that is part of the permitting process as opposed to State statutes. Part of the permitting process is the requirement to file a closure and post-closure plan. For combustion facilities, the main concern is that all waste be removed from the facility (including ash) and that the facility be cleaned. The closure plan must:

> "... close the site in a manner which minimizes the need for further maintenance and controls, minimizes or eliminates the post-closure release of waste, waste constituents, leachate, contaminated rainfall, or waste decomposition products to the groundwater, surface waters, or to the atmosphere to the extent necessary to prevent threats to human health or the environment." (IEPA, DLPC, Permit type LPC-PA3)

At a combustion facility, once the waste and ash have been removed and the equipment cleaned (or removed) the issue of maintenance or controls to monitor solid waste related impacts is also removed. The IEPA will issue closure approval after inspecting the facility.

Local Criteria and Potential Sites

Local criteria for combustion facilities are usually based on operational and locational needs. These include proximity to energy market, lot size, utility access and traffic access. The concerns of access to the waste, or locating near the centroid of generation, that propel criteria for a transfer station are also applicable for combustion facilities. Many of the locational and operational criteria are also dependent upon the size of the facility.

Proximity to markets is the leading criteria. If the facility produces steam, it is best to locate as close as possible to the primary end user. This is because the steam's pressure and temperature decrease over distance. This reduction lowers the "quality" of the steam and therefore, the potential revenue. If the facility produces electricity, proximity to end users is not as critical. Previous studies done in Champaign County identified only one major long-term market: the University of Illinois. This would require the facility to produce steam in order to correspond to the University's needs. Therefore, the combustion facility should be located within one mile of the University's Abbott Power Plant.

The lot size needed for combustion facilities varies. Facilities have been constructed on small lots, (3.5 acres for a 975 TPD facility in Alexandria, VA) and if on-site residual disposal is desired, a larger lot size would be necessary. In Champaign County an estimated 5-10 acres would be required to site a combustion facility. This parcel size would be exclusive of any area required for ash disposal. The ash monofill sized to accept all the ash from the incinerator for 20 years would be 3-4 acres exclusive of site buffers. This would have approximately 383,000 cubic yards of capacity. Also included on the site is usually a by-pass trench; a landfill for material that cannot or did not burn. To meet the needs of a 350 TPD facility, a by-pass trench would be about 3 acres. This smaller landfill size can be viewed as a benefit of incineration, especially in areas where land for landfill is scarce.

It is important that incinerator facilities have access to utilities such as water and sewer lines and electricity. Water and sewer requirements are dependent upon the project, technology and vendor. For example, all electric plants which use a cooling tower or a once-through cooling system, require larger quantities of water than a steam producing plant. Even though the combustion facilities may be producing steam or electricity, it is necessary to have electrical access. Some plants may produce their own power, but in the event of a turbine outrage, access to electricity is essential to keep the plant operating. Back up power is also needed during maintenance or start up periods.

Additional criteria, such as traffic impact and nuisance issues, are based on the same issues as the criteria developed for the transfer facility.

Following these criteria and permit requirements, three potential sites were identified near the University of Illinois' Abbott Power Plant. (See Figure 4).

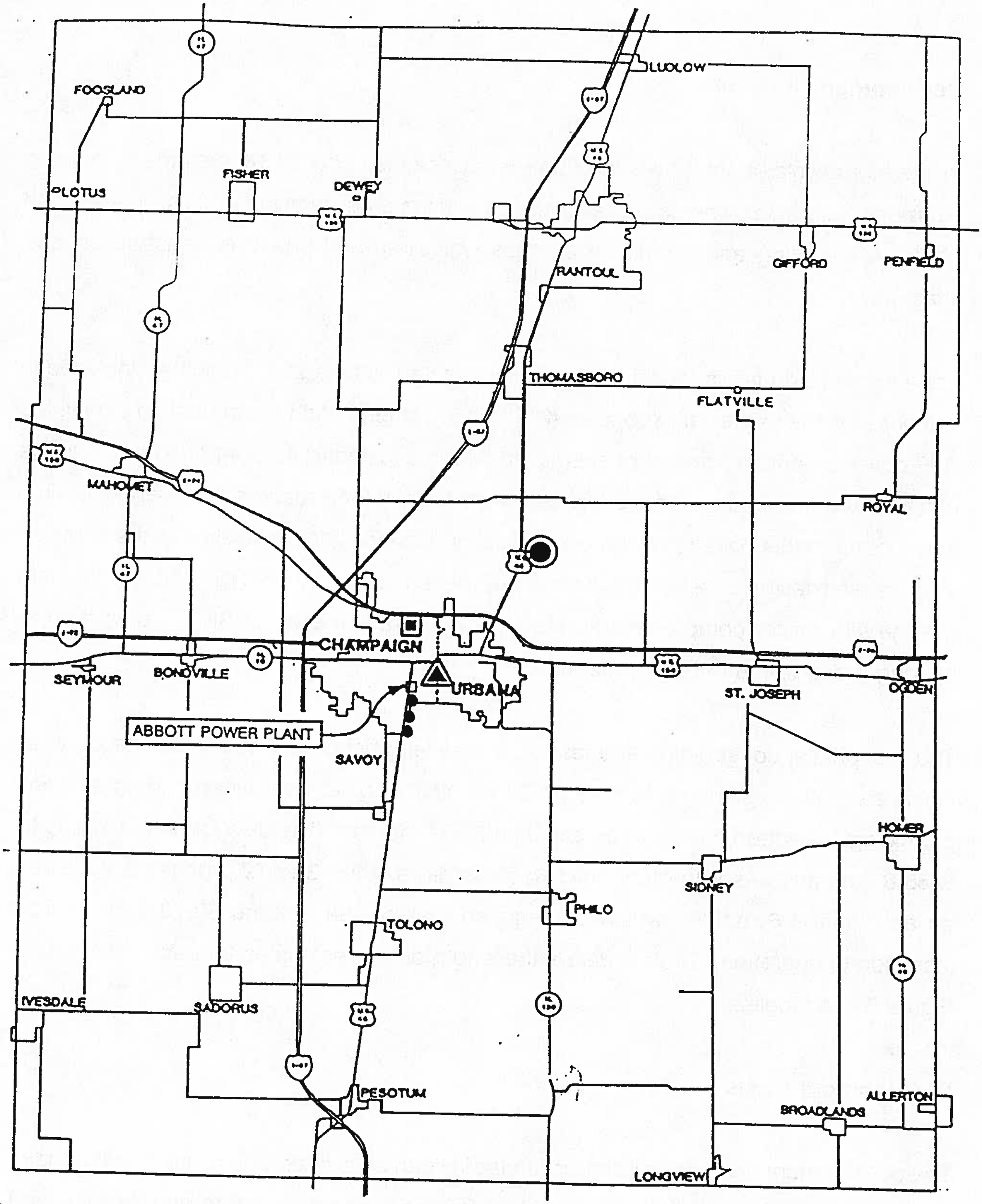

FIGURE 4

Combustion Facility Sites

Source: Waste to Energy Report for the Intergovernmental Solid Waste Disposal Association; Gresham, Brickner & Bratton, March, 1988

Development Timeline

Incinerator development moves through several phases. Phase I involves the foundation decisions regarding ownership arrangements and the procurement process. The second phase is the siting and permitting process while the third phase is construction and shakedown.

For a combustion facility, the first phase is estimated to take 21-25 months. Included in this phase is the request for proposal (RFP) development. With a combustion facility, the RFP development and review of bids could take a substantial amount of time due to the complexity of the facility. Phase II is estimated to take 8-10 months. The length of time local governments have to review a combustion facility siting application is the same as for a transfer facility or a landfill. Therefore, the length of the SB 172 process does not change with a more complex facility. However, IEPA review after the SB 172 process may be longer due to the nature of the facility.

The final phase, construction and testing, is also lengthened due to the complexity of an incinerator. It is estimated to take 21-24 months to build, and when testing and final permitting are added, phase three can take 27-31 months. The development timeline for is 56-67 months. As with other solid waste facilities, if the SB 172 process is appealed, an additional 4-6 months would be required making the timeline 60-73 months from inception to operation. Table 8 details the length of time estimated for each activity while Figure 5 is a timeline.

Development Costs

The development costs for a combustion facility can be broken down into corresponding categories to the three phases of development: development, siting and permits; and, construction and testing. Although the majority of costs are incurred during construction

TABLE 8

Combustion Facility Development Timetable

	MONTHS MINIMUM	MONTHS MAXIMUM
Phase I - Facility Development		
Ownership Option, Request for Proposal Development; RFP Response Time; Select Proposal; Energy Contract Negotiation; Design/Permit Application Preparation	21	25
Phase II - Siting and Permitting		
SB 172 Hearing	5	6
Financing*	--	--
Development Permit Submission	1	1
IEPA Development Permit Review	2	3
Phase III - Construction and Testing		
Construction	21	24
Start-up/Testing	5	6
IEPA Operation Permit	1	2
Total without appeal	**56**	**67**
Additional Time if a SB 172 Appeal Occurs	4	6
Total with appeal	**60**	**73**

* Financing is usually secured after the SB 172 hearing and concurrently during the IEPA development permit review.

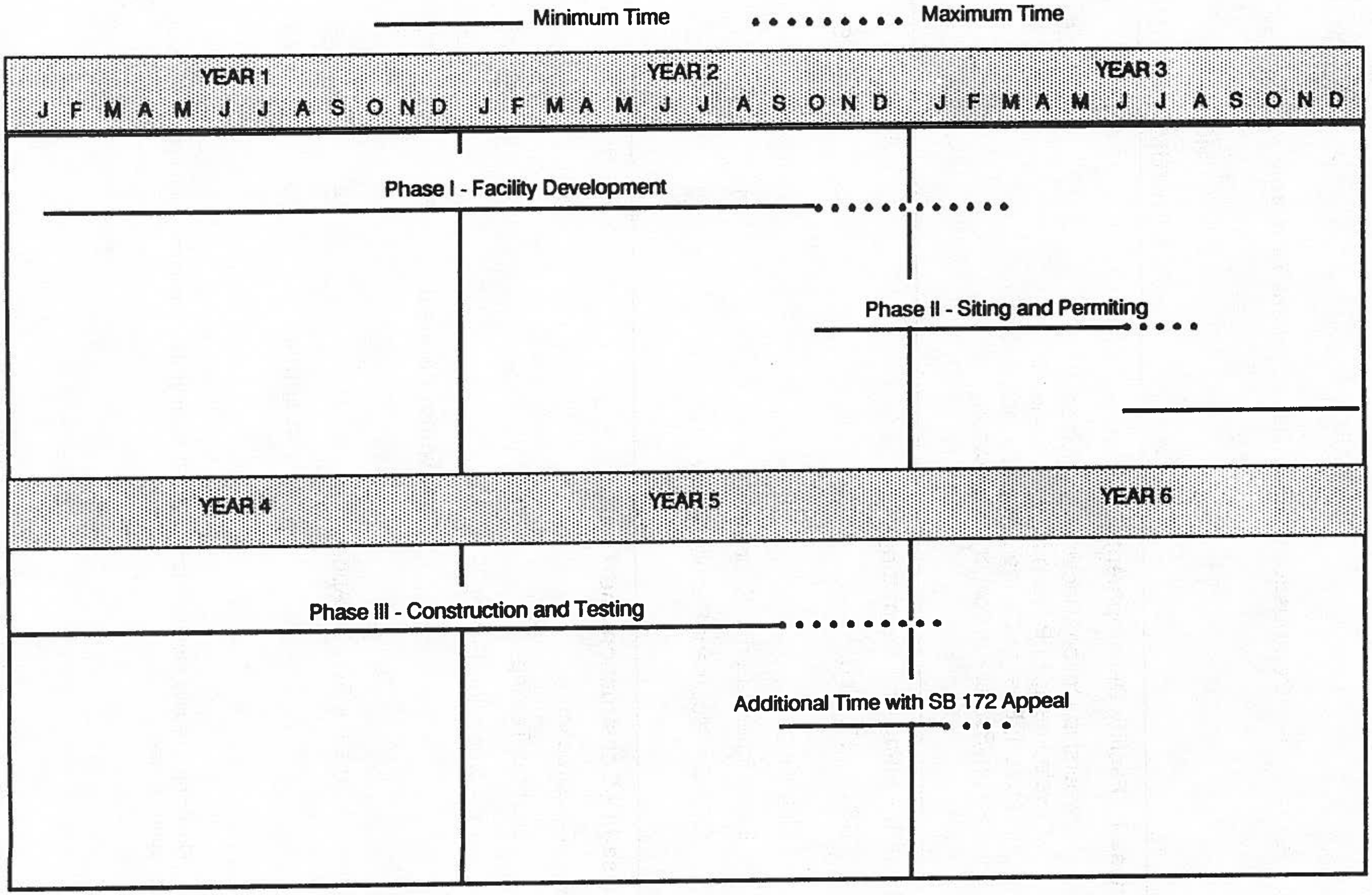

FIGURE 5

Combustion Development Timeline

and testing, there are significant amount of costs required in phase one and two. Table 9 shows the capital cost breakdown for a combustion facility in 1990 dollars.

In Phase I, an estimated $3.5 million would be necessary to develop the combustion facility design, select a vendor and undertake preliminary financial and legal work which may revolve around seeking and securing an energy market. Energy market guarantees are becoming a crucial part of any incinerator project.

The estimated costs that would be incurred during siting and permitting are estimated at $1.5 million. A number of permits are required for incinerators, primarily air emissions permits. There is a cost for obtaining them as well as a cost to develop the necessary information to file for the permits. The siting fee, which is paid to the SB 172 hearing body varies depending upon the facility. The funds are usually used to cover the costs related to the hearing process. The City of Champaign's existing ordinance requires a fee of $2,500.The current Champaign County siting ordinance places the fee at $12,000. These fees may be altered, but are used in these cost calculations. Since the fee is used to cover hearing expenses, it is non-refundable if siting is denied. The applicant may be responsible for costs above the fee paid. However, if the hearing costs do not exceed the paid fee, the applicant is often entitled to a refund of the difference.

The construction and testing phase is the most cost intensive with an estimate of $26 million. As Table 9 shows, the most significant costs incurred during construction relate to the combustion trains ($8 million) and the physical structure ($4.5 million). Air pollution equipment is the third largest cost at an estimated $2.0 million.

The total estimated combustion facility capital costs (for a facility sized for Champaign County) are $30,570,100 in 1990 dollars. This would increase to $38.9 million by the estimated date of opening in 1995. A significant amount of funds can be expended prior

TABLE 9

Combustion Facility
Capital Costs in 1990 Dollars

PHASE I - DEVELOPMENT	
Vendor Development	$ 573,300
Design	2,063,900
Financial Consultants(1)	286,600
Legal/Project Management(1)	573,300
SUBTOTAL	$3,497,100
PHASE II - SITING AND PERMITTING	
Permits	1,147,800
Siting Fee (SB 172 Body)(2)	12,000
SUBTOTAL	$1,159,800
PHASE III - CONSTRUCTION AND TESTING	
Construction Management	1,375,900
Mobilization	458,600
Temporary Utilities	114,700
Site Preparation/Utilities	1,719,900
Building	4,586,400
Scales/Cranes	860,000
Combustion Trains	8,026,200
Steam Piping	1,146,600
Electrical Switchgear	573,300
Air Pollution Control	2,063,900
Residual/Ash Handling	917,300
Initial Spare Parts	344,000
Bonds/Insurance	745,300
Start-up/Testing	802,600
10% Contingency	2,178,500
SUBTOTAL	$25,913,200
TOTAL CAPITAL COSTS (in 1990 dollars)	$30,570,100
TOTAL CAPITAL COSTS (in 1995 dollars)(3)	$38,918,515

(1) Part of these costs may rollover into Phase II work.

(2) The identified combustion facilities are located in the City of Champaign which currently has a siting fee of $2500 for any solid waste facility. Champaign County's siting fee for a combustion facility is $12,000. To provide a conservative fee, the $12,000 figure has been used.

(3) Estimated date of opening.

Source: Adapted from: "Waste to Energy Report for the Intergovernmental Solid Waste Disposal Association," Gershman, Brickner and Bratton, Inc. (March 1988).

to construction. In this estimate, almost $4.6 million are required to complete facility development and siting and permitting. Alterations or delays in the project, regardless of the reason, will escalate costs. One other cost not immediately included in this estimate is the staff time involved if a local government is the developing agency.

LANDFILL FACILITIES

Characteristics

Municipal solid waste (MSW) landfills are engineered depressions where municipal garbage is buried in as environmentally sound a manner as possible. Controls such as monitoring, gas management and daily cover are some of the requirements which differentiate a municipal solid waste sanitary landfill from a waste pile or illegal dump. Modern sanitary landfills are high-technology facilities compared to the open dumps of the past. However, landfills have caused the contamination of groundwater, surface water and air. For these reasons, careful planning, engineering, monitoring and supervision are required for landfill facility design and operation. Despite the movement to integrated solid waste management systems incorporating other technologies, such as material recovery, landfills will continue to be a necessary part of the system.

Sanitary landfilling is a controlled process whereby solid waste is reduced in volume through compaction, placed in lined cells to control the formation of leachate, and covered regularly with soil. Synthetic liners may be required. Two basic methods of sanitary landfilling exist: the trench method and the area method.

The trench method consists of spreading solid waste in an excavated trench. Soil from the excavation is used as cover material at the end of daily operation. The area method consists of waste being spread on the surface of the ground and then cover material is applied. This method is often used in quarries, strip mines ravines, valleys or other extant land depressions. This method can handle large quantities of material easily and can be used when it is not feasible to excavate a trench.

Environmental Impacts

The most prevalent impact from landfill facility development is ground or surface water contamination. However, the land disposal of municipal solid waste can impact on the air and land, as well as the water surrounding the site. Additional impacts are noise, odor, litter, traffic and perceived or real impacts on surrounding property values.

Air Quality

Emission discharges to air occur from landfill operations in the form of dust and gases resulting from waste decomposition. Dust also develops from landfill operations because it is an open air operation which involves the movement of dirt, top soil, and other material. Particulate control during landfilling operations is accomplished by water sprinkling. A tank truck sprays water over cover material before and after compaction to weight particles down and keep them from becoming airborne.

Methane gas is one of the products of the waste decomposition process. Waste decomposition occurs in stages. These stages depend on specific environmental and chemical factors such as aeration, air temperature, infiltration, and refuse composition. The first stage, aerobic decomposition, is when oxygen is consumed to produce carbon dioxide gas and other by-products. Anaerobic decomposition, the second stage, begins when the supply of oxygen has been exhausted. During the first phase of anaerobic decomposition, carbon dioxide is the principal gas generated. As anaerobic decomposition proceeds towards the second phase, the quantity of methane generated increases until the methane concentration reaches 50 to 60%. The landfill will continue to generate methane at these concentrations for 10 to 20 years, and possibly longer. A properly designed landfill can incorporate methane gas capture for energy recovery.

The generation of methane gas from a landfill is of concern because it can cause explosions or asphyxiation of either personnel or vegetation. Since methane gas is lighter than air, it will rise. Methane gas concentrations that occur underground near the landfill can change rapidly. These rapid changes in concentration are generally associated with changes in barometric pressure. No clear guidance can be provided as to the maximum distance the methane gas may move underground. The distance the gas travels will be a function of the pressures built up within the landfill and of the soil formation surrounding the landfill. A relatively porous soil extending from the ground surface to below the base of the landfill will allow gas to move horizontally and vertically to the atmosphere. However, frozen ground, wet soil conditions, or impermeable layers may restrict the upward movement of the gas and cause it to flow horizontally for greater distances.

Although the principal components of landfill gas are carbon dioxide and methane, other compounds may also be present. One compound is hydrogen sulfide, which has an obnoxious odor and adds to the asphyxiation danger. Volatile organic chemicals are also present and organic acids have been identified as the cause of extensive corrosion problems within gas collection systems and gas recovery systems.

Water Quality

The potential for the formation and migration of contaminated water, called leachate, and the potential for groundwater degradations due to leachate, are perhaps the most widely occurring environmental impacts associated with land disposal of municipal solid waste. Both the Federal and State governments regulate landfill operations to maintain water quality in water bodies surrounding landfill sites. Leachate control is the primary environmental concern when constructing and operating a landfill. The escape of leachate into water bodies can significantly degrade their quality or contaminate a drinking water supply.

Leachate is a fluid which includes metals and compounds and is formed as water passes through the landfill. It is a result of the biological breakdown of the organic waste during which the leaching of soluble metals and minerals leach or wash out of the wastes. The composition of leachate is highly varied and is dependent on the stage of decomposition and the materials contained in the landfill.

The way the waste is processed or not processed affects the leachate characteristics and quantity. Baled waste typically generates less leachate than unprocessed waste. The initial concentrations of contaminants are higher than later samples. This is in contrast to unprocessed solid waste where it has been generally found that leachate concentrations declined slowly.

The amount of leachate that will be generated within the landfill will be a function of the amount of water introduced to the landfill. Sources of water include rain water, drainage discharge, moisture in the waste, and water breaching the sides or base of the landfill from a hydrogeologic area.

Leachate can be controlled through various surface and design techniques. The best approach to managing the potentially harmful effects of leachate is to prevent its formation. This can be done by selecting a landfill site which has favorable hydrogeologic properties that bar contaminants from reaching groundwater supplies. Other sources of water include water from the waste itself or rain. This, and good surface drainage of the active area during operation, are sources of water that are temporary and can be controlled by good management practices. The control of water movement through the landfill cover and into the waste is the principal point of intervention in the limiting of leachate generation.

Construction of a daily landfill cover out of materials that are totally impermeable to water is usually not practiced. Only final cover materials aim to be totally impermeable to rainfall and other penetrating fluids. Generally, the large land area will dictate that some type of soil cover be employed.

Promoting run-off and actual evapo-transpiration will reduce the quantity of leachate. Run-off can be increased by using soil materials that have a low permeability and infiltration rate or increasing the slope. A non-vegetated soil will also have higher run-off rate, however, erosion may result. Promoting evapo-transpiration entails identifying relatively active plants that are compatible with the local climate and landfill development. The amount of evapo-transpiration that occurs will be a function of the plants' abilities to transpire water, weather, and the water holding capacity of the landfill cover soil.

The State of Illinois currently requires municipal solid waste landfills to have an in situ, or placed, and compacted ten-foot thick clay liner. The liner requirements also include the permeability guidelines. New landfills must also have a leachate collection system. These must be sized to carry the estimated flow adequately and must also be installed in such a fashion that the collection lines can be periodically cleaned if they should become clogged. The collection pipe is placed in a trench that interfaces with the liner or has been constructed within the permeable blanket over the liner. The leachate collection system usually extends completely around the entire perimeter of the landfill in order to limit any lateral flow away from the site. An interior grid is usually necessary to prevent leachate accumulating near the center of the landfill.

Collected leachate must be handled and disposed of in a manner that will not cause pollution of nearby water courses or groundwater. Options for treatment and disposal include on-site treatment, recycling of the leachate back into the landfill, or discharging of the leachate into a municipal wastewater treatment system.

Traffic Impacts

The traffic generated by a landfill in Champaign County can vary. This variation would be due to any preprocessing that occurred prior to landfilling. Different preprocessing methods will also generate different traffic levels.

If no preprocessing occurs prior to landfilling, it was estimated that there would be approximately 168 vehicles per day using the facility. This would consist primarily of packer trucks (about 98) bringing waste to be disposed. There would be about 70 private vehicles using the facility. Private vehicles include residents, contractors, and municipal vehicles as well as commercial and industrial trucks not normally associated with hauling. All material would be destined for final disposal. There would be no recycling services at the landfill. This reduces the number of estimated vehicles per day compared to facilities with drop-off and buy-back functions because residents would no longer be bringing recyclables to the facility.

If the waste was brought to a transfer station or one of its derivatives, or an incinerator, the number of trips per day would decrease. Simply compacting the waste into transfer vehicles would lower the number of vehicles per day to about 17 in 1995. This would increase to 19 by 2010. If a material recovery function was added to the transfer station, an estimated 16 vehicles per day would be needed to move material to the landfill in 1995. By 2010, 17 vehicles would be necessary. Approximately 13 vehicles would be needed if a municipal waste composting feature were added after the material recovery component. This would only increase to 14 vehicles per day in 2010. If the preprocessing technology was incineration, then only 4 vehicles per day would be necessary to transport the ash and residuals to the landfill from 1995-2010.

State and Federal Regulations and Siting Criteria

As with the previous solid waste facilities discussed, there are State and Federal regulations governing all solid waste of regional pollution control facilities which must be met. However, there may be facility specific regulations and local siting criteria to be considered. With landfills, the facility specific criteria focuses on the protection of groundwater, especially drinking water. Local criteria is also aimed primarily at protecting local water sources from potential contamination from landfill leachate.

Illinois Groundwater Protection Act (P.A. 85-863) was established to manage, protect, and preserve groundwater in Illinois. Although the Act applies to any regional pollution control facility, it is especially applicable to landfills. Guidelines in the form of potential contaminant setbacks were established. This Act lowers the risk of contamination of potable water supplies but restricts possible location of pollution control facilities in general and landfills in particular. The general requirements of the Act are:

(1) No new potential route of contamination can be placed within 200 feet of any potable water supply, and no new water supply well may be placed within 2,000 feet of a contaminant route.

(2) No well derived from fractured or highly permeable bedrock or from sand or gravel formations can be located within 400 feet of a potential contamination source or route.

(3) No new source of contamination can be placed in an aquifer recharge area or zone of influence.

These distances must be included in any landfill site identification process.

As with the previous facilities, additional criteria, not in State Statutes, can be found in the permit and design requirements. Table 10 summarizes the current and proposed State and Federal landfill regulations.

One item that does have a major impact on the owner/operator of a landfill is the post-closure requirements. Unlike other solid waste facilities, the owner/operator of a landfill site has to monitor groundwater, leachate and methane gas for 15 years after the landfill is closed. Remediation of any problems related to leachate, gas, groundwater degradation or settling of the final cover must be paid for by the owner of the site. Sections IV and V in Table 10 details the monitoring and post-closure requirements.

TABLE 10

Summary of Current and Proposed Solid Waste Regulations

	CURRENT ILLINOIS REGULATIONS	PROPOSED U.S. EPA SUBTITLE D REVISIONS	PROPOSED IPCB[1] REGULATIONS
I. LOCATION RESTRICTIONS			GENERAL STANDARDS FOR ALL LANDFILLS
	- Same as current USEPA RCRA Subtitle D. - SB 172 local Siting Approval.	- 10,000 feet from airport runway used by turbojet aircraft. - 5,000 feet from airport runway used by piston-type aircraft. - facility located in the 100-year floodplain can not restrict flow, reduce water storage capacity of floodplain, or result in washout of solid waste so as to pose a hazard to human health and the environment. - Not in wetlands unless it can be demonstrated that there is no practicable alternative with less adverse impact. - Not within 200 feet of a fault that has had displacement in Holocene time. - Not within a "seismic impact zone" unless all containment structures, including liners, leachate collection systems, and surface water control systems are designed to resist the maximum horizontal acceleration in lithified material for the site. - Not within an unstable area unless it has been demonstrated that engineering measures have been incorporated into the unit's design to ensure the stability of the structural components of the unit.	- SB 172 Local Siting Approval. - Cannot invade or diminish the scenic, recreational and fish and wildlife values for any river designated for protection under the Wild and Scenic Rivers Act. - Shall not restrict the flow of a 100-year flood, result in washout of solid waste from the 100-year flood, or reduce the temporary water storage capacity of the 100-year floodplain, unless measures are taken to provide alternate storage capacity. - Shall not pose a threat of harm or destruction to the features for which an irreplaceable historic, or archaeological site was listed under the National or Illinois Historic Preservation Act, for which a National Landmark was designated by the National Park Service or the Illinois State Preservation Officer, or for which a natural area was designated as a Dedicated Illinois Nature Preserve pursuant to the Illinois Natural Areas Preservation Act.

[1]The Illinois Pollution Control Board; adopted in August, 1990.

Source: Economic Impact Study of Landfill Regulations (R88-7), Illinois Department of Energy and Natural Resources.

TABLE 10 (Continued)

Summary of Current and Proposed Solid Waste Regulations

	CURRENT ILLINOIS REGULATIONS	PROPOSED U.S. EPA SUBTITLE D REVISIONS	PROPOSED IPCB[1] REGULATIONS
I. LOCATION RESTRICTIONS (Continued)		- Must comply with all applicable Federal rules, laws, regulations or other requirements.	- shall not jeopardize the continued existence of designated endangered species, destroy or adversely modify critical habitat for such species, or cause or contribute to the taking of endangered threatened species of plan, fish or wildlife listed under the national Endangered Species Act or the Illinois Endangered Species Protection Act. ADDITIONAL STANDARDS FOR PUTRESCIBLE AND CHEMICAL WASTE LANDFILLS - Shall not be located within a setback zone established under Section 14.2 or 14.3 of the Act. - Not within the recharge zone within 1200 feet, vertically or horizontally, of a sole-source aquifer designated by the U.S. EPA unless there is a stratum between the bottom of the waste disposal unit and the top of the aquifer that meets designated minimum requirements. - Not within 500 feet of the right-of-way of a state or interstate highway unless the facility is screened from view. - No closer than 500 feet from occupied dwellings, schools, and hospitals unless the owner grants permission. - No closer than 500 feet of any runway used by piston-type aircraft or 10,000 feet of any runway used by turbojet aircraft.

(1)The Illinois Pollution Control Board; adopted in August, 1990.

Source: Economic Impact Study of Landfill Regulations (R88-7), Illinois Department of Energy and Natural Resources.

TABLE 10 (Continued)

Summary of Current and Proposed Solid Waste Regulations

	CURRENT ILLINOIS REGULATIONS	PROPOSED U.S. EPA SUBTITLE D REVISIONS	PROPOSED IPCB[1] REGULATIONS
II. OPERATING CRITERIA A. Surface Water Drainage Control System	- No specific requirements.	- Landfill unit must contain a run-on control system to prevent flow onto active portion of the landfill during peak discharge from a 25-year storm. - Landfill unit must contain a run-off control system from the active portion of the landfill to collect and control at least the water volume from a 24-hour, 25-year storm.	- Run-off from disturbed areas from 25-year, 24-hour precipitation event discharged to waters of the State shall meet requirements of 35 Ill. Adm. Code 304. - All discharges of runoff from disturbed areas to waters of the State shall be permitted under 35 Ill. Adm. Code 309 - All treatment facilities shall be equipped with bypass outlets designed to pass the peak flow of run-off from the precipitation event. - All surface water control structures shall be operated until final cover is placed and erosional stability is provided. - All discharge structures shall prevent erosion and scouring of receiving stream channel. - Runoff from undisturbed areas shall be diverted around disturbed areas to the maximum practical extent.
B. Surface Water Requirements	- Shall not cause or threaten or allow any contaminants into the environment so as to cause or tend to cause water pollution in Illinois.	- Shall not cause a discharge of pollutants that violates any requirements of the Clean Water Act, including requirements of NPDES, Section 402. - Shall not cause a discharge of a non-point pollution that violates any requirement of an area or statewide water quality management plan approved under Section 208 or 319 of the Clean Water Act.	- Shall not violate Section 404 of the Clean Water Act. - Shall not cause a discharge of non-point pollution that violates requirements implementing an area or statewide water quality management plan approved under Section 208 of the Clean Water Act.

[1]The Illinois Pollution Control Board; adopted in August, 1990.

Source: Economic Impact Study of Landfill Regulations (R88-7), Illinois Department of Energy and Natural Resources.

TABLE 10 (Continued)

Summary of Current and Proposed Solid Waste Regulations

	CURRENT ILLINOIS REGULATIONS	PROPOSED U.S. EPA SUBTITLE D REVISIONS	PROPOSED IPCB[1] REGULATIONS
. OPERATING CRITERIA (Continued)			
C. Cover Requirements	- Daily Cover - Compacted layer of at least 6 inches of suitable material on all exposed debris at the end of each operating day. - Intermediate Cover - At the end of each operating day, in all but the final lift of the landfill, a compacted layer of at least 12 inches of suitable material shall be placed on all surfaces where no additional waste will be deposited within 60 days.	- Disposed solid waste must be covered with suitable materials at the end of each operating day, or at more frequent intervals if necessary to control fires, odors, blowing litter, and scavenging.	- A uniform layer of at least 6 inches of clean material shall be placed on all exposed waste by the end of each day or operation. - All waste which is not to be covered within 60 days by another lift of wastes or final cover, shall have a cover totaling 1 foot of clean soil material.
D. Standards for Waste Placement	- Unloading - All refuse shall be deposited into the toe of the fill or into the bottom of the trench. - Spreading and Compacting. As rapidly as refuse is deposited at the toe of the fill, all refuse shall be spread and compacted in layers within the cell, such layers not to exceed a depth of two feet.	- No specific requirements.	- Placement of wastes shall begin in the lowest possible part of the unit. - Waste disposal operations shall move from the lowest portions of the unit to the highest portions. - Waste shall be placed in a manner and rate that mass stability is provided during all phases of the operation. - Phasing of operations shall be designed to allow sequential construction, filling, and closure of discrete units or parts of units. - Waste shall be placed in a manner to facilitate the filling to final grade and minimize the operational phase of each discreet unit or parts of units. - Construction, compaction and earth moving equipment shall not operate on leachate collection piping system until a minimum off five feet of waste has been mounded over the system.

(1)The Illinois Pollution Control Board; adopted in August, 1990.

Source: Economic Impact Study of Landfill Regulations (R88-7), Illinois Department of Energy and Natural Resources.

TABLE 10 (Continued)

Summary of Current and Proposed Solid Waste Regulations

	CURRENT ILLINOIS REGULATIONS	PROPOSED U.S. EPA SUBTITLE D REVISIONS	PROPOSED IPCB[1] REGULATIONS
II. OPERATING CRITERIA (Continued)			
C. Cover Requirements	- Daily Cover - Compacted layer of at least 6 inches of suitable material on all exposed debris at the end of each operating day. - Intermediate Cover - At the end of each operating day, in all but the final lift of the landfill, a compacted layer of at least 12 inches of suitable material shall be placed on all surfaces where no additional waste will be deposited within 60 days.	- Disposed solid waste must be covered with suitable materials at the end of each operating day, or at more frequent intervals if necessary to control fires, odors, blowing litter, and scavenging.	- A uniform layer of at least 6 inches of clean material shall be placed on all exposed waste by the end of each day or operation. - All waste which is not to be covered within 60 days by another lift of wastes or final cover, shall have a cover totaling 1 foot of clean soil material.
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Source: Economic Impact Study of Landfill Regulations (R88-7), Illinois Department of Energy and Natural Resources.

TABLE 10 (Continued)

Summary of Current and Proposed Solid Waste Regulations

	CURRENT ILLINOIS REGULATIONS	PROPOSED U.S. EPA SUBTITLE D REVISIONS	PROPOSED IPCB[1] REGULATIONS
II. OPERATING CRITERIA (Continued)			
D. Standards for Waste Placement (Continued)			- Construction, compaction and earth moving equipment shall not operate directly on drainage blanket and waste disposal operations shall begin at the edge of the drainage layer by carefully pushing waste out over the drainage layer. - An initial layer of waste, a minimum of five feet, shall be placed over the entire drainage blanket as soon as possible after construction, but prior to weather conditions that may freeze the compacted earth liner.
E. Procedures to Exclude the Receipt of Hazardous Waste	- No specific requirements.	- A program must be implemented to detect and prevent disposal of hazardous waste and PCBs; the program must include, at a minimum: - Random load inspections; - Inspection of suspicious loads; - Inspection of records; - Training of facility personnel to recognize hazardous waste; and - Procedures for notifying proper authorities if hazardous waste is discovered.	- Standards for identification and management of special wastes are in addition and supplemental to 35 Ill. Adm. Code 809. - Inspection, testing or acceptance of waste by a solid waste facility shall not relieve the generator or transporter of such waste of responsibility for compliance with 35 Ill. Adm. Code 700 - 749 or 809. - Each special waste disposed at the facility, shall be accompanied by a special waste identification profile identification sheet to be retained at the facility until the end of the post closure care period. - A load checking program shall be implemented that consists of, at a minimum: - Random load inspections; - Recording of inspection results; - Training of personnel to identify hazardous wastes; and - Procedures for handling regulated hazardous waste.

[1]The Illinois Pollution Control Board; adopted in August, 1990.

Source: Economic Impact Study of Landfill Regulations (R88-7), Illinois Department of Energy and Natural Resources.

TABLE 10 (Continued)

Summary of Current and Proposed Solid Waste Regulations

	CURRENT ILLINOIS REGULATIONS	PROPOSED U.S. EPA SUBTITLE D REVISIONS	PROPOSED IPCB[1] REGULATIONS
III. DESIGN CRITERIA			
A. Performance Standards	- IEPA is aware of "state-of-the-art" design concepts. - Approval of operating permit is based how effective the entire solid waste system is at minimizing environmental and health risks. - Must meet requirements of 35 Ill. Adm. Code Sections 302.301, 302.304, 302.305.	- New units must be designed with liners, leachate collection systems, and final cover systems, as necessary to ensure that the design goal is met. - The State must establish a design goal for new units. - The unit design shall, at a minimum achieve a groundwater carcinogenic risk level with an excess lifetime cancer risk level (due to continuous lifetime exposure) within the $1x10^{-4}$ to $1x10^{-7}$ range. - The compliance boundary may be established by the state, but may not exceed 150 meters from the waste management unit boundary.	- Putrescible waste landfills must be designed with liners, leachate collection systems, gas collection system (if necessary) and final cover systems. - Chemical waste landfills must be designed with liners, leachate collection systems and final cover systems. - Inert waste landfills must be designed with final cover systems. - The unit design must ensure that groundwater quality is maintained at its present condition at the compliance boundary for 100-years after closure. - Compliance boundary is a vertical plane at the property boundary or 100 feet from the edge of the unit, whichever is less, extending from the ground surface to the bottom of the uppermost aquifer.
B. Design Period	- Operating life plus a minimum of 15 years post closure care.	- Operating life plus a minimum of 30 years post closure care.	- Inert waste landfills: Operating life plus 5 years. - Chemical and putrescible waste landfills: Operating life plus a minimum of 30 years post closure care.
C. Liner Systems	- 10-foot soil clay liner with maximum permeability of $1x10^{-7}$ cm/sec in both horizontal and vertical planes.	- Liner system required, as necessary, to meet design goal.	- Minimum of 3 foot compacted clay liner must achieve a maximum hydraulic conductivity of $1x10^{-7}$ cm/sec.
D. Leachate Collection Systems	- No specific requirements.	- Leachate collection systems required, as necessary, to meet design goal. - Leachate collection systems must be designed to operate for the entire design period.	

(1)The Illinois Pollution Control Board; adopted in August, 1990.

Source: Economic Impact Study of Landfill Regulations (R88-7), Illinois Department of Energy and Natural Resources.

TABLE 10 (Continued)

Summary of Current and Proposed Solid Waste Regulations

	CURRENT ILLINOIS REGULATIONS	PROPOSED U.S. EPA SUBTITLE D REVISIONS	PROPOSED IPCB[1] REGULATIONS
III. DESIGN CRITERIA (Continued)			
D. Leachate Collection Systems (Continued)			- Must be designed and operated as an integrated system with compacted earth liner. - Must maintain a maximum head of leachate 1 foot above the liner. - A drainage layer shall overlay the entire liner system and shall be no less than 1 foot thick and have a hydraulic conductivity equal to, or greater than 1×10^{-3} cm/sec.
E. Gas Management Systems	- Under the Illinois Environmental Protection Act, gas shall be monitored for 15 years after the site is completed or closed or such longer period as may be required by Board or federal regulation. - Whatever remedial action is necessary shall be taken to abate any gas problems which appear during such period.	- Methane gas generated by the facility may not exceed 25% of the lower explosive limit for methane in facility structures. - The concentration of methane gas may not exceed the lower explosive limit at the facility boundary. - A routine methane monitoring program must be implemented. - If methane gas levels exceed the limits indicated, all necessary steps must be taken to ensure the immediate protection of human health.	- Gas management system required for putrescible waste landfills if: - Methane at a concentration greater than 50% LEL in air, below the ground surface, at a point at or beyond the property boundary, or 100 feet from edge of unit, whichever is less. - Methane at a concentration greater than 25% LEL in air in any building on or near the facility. - Malodorous odors detected beyond the property boundary. - No gas may be discharged directly to the atmosphere. - Gas shall be treated or burned on-site prior to discharge in accordance with a permit issued pursuant to 35 Ill. Adm. Code 200-245.
F. Final Cover	- A compacted layer not less than 2 feet of suitable material.	- Units must be designed with final cover systems, as necessary, to ensure that the design goal is met.	- Inert waste landfills - a minimum of 3 feet of soil material of a quality sufficient to ensure vegetation and provide erosional stability.

(1)The Illinois Pollution Control Board; adopted in August, 1990.

Source: Economic Impact Study of Landfill Regulations (R88-7), Illinois Department of Energy and Natural Resources.

TABLE 10 (Continued)

Summary of Current and Proposed Solid Waste Regulations

	CURRENT ILLINOIS REGULATIONS	PROPOSED U.S. EPA SUBTITLE D REVISIONS	PROPOSED IPCB[1] REGULATIONS
III. DESIGN CRITERIA (Continued)			
F. Final Cover (Continued)			- Putrescible and chemical waste landfills - shall be covered with a low permeability layer overlain by a final protective layer. - Low permeability layer may either be a 3 foot compacted earth layer with a permeability of $1x10^{-7}$ cm/sec or geomembrane with the same permeability. - Final protective layer shall cover the entire low permeability layer, shall not be less than 3 feet thick, and shall be capable of supporting vegetation.
IV. MONITORING REQUIREMENTS			
A. Groundwater Monitoring	- Quarterly groundwater sampling during operating life and post closure care period.	- Consistent groundwater sampling during the active life and post closure care period to provide an accurate representation of groundwater quality at the background and downgradient wells.	- Quarterly groundwater sampling throughout the time the source constitutes a threat of contamination and for a minimum of 5 years thereafter. - Beginning 5 years after closure of a unit, or 5 years after all other potential sources of discharge no longer constitute a threat of contamination, the monitoring frequency may change on a well by well basis to an annual schedule if certain conditions exist.
B. Leachate Monitoring	- No specific requirements.	- No specific requirements.	- Leachate samples shall be collected from each unit at a frequency of once per month while the leachate management system is in operation.

(1)The Illinois Pollution Control Board; adopted in August, 1990.

Source: Economic Impact Study of Landfill Regulations (R88-7), Illinois Department of Energy and Natural Resources.

TABLE 10 (Continued)

Summary of Current and Proposed Solid Waste Regulations

	CURRENT ILLINOIS REGULATIONS	PROPOSED U.S. EPA SUBTITLE D REVISIONS	PROPOSED IPCB[(1)] REGULATIONS
IV. MONITORING REQUIREMENTS (Continued) B. Leachate Monitoring (Continued)			- Leachate shall be collected and disposed for a minimum of 5 years after closure or until the leachate does not exceed waste-water effluent standards in 35 Ill. Adm. Code 304.124, 304.125, 304.126 and does not contain a BOD concentration greater than 30 mg/l for 6 consecutive months.
C. Landfill Gas Monitoring	- No specific requirements.	- A routine methane monitoring program must be implemented. - The minimum frequency of monitoring must be quarterly.	- All gas monitoring devices and the ambient air shall be sampled monthly for the entire operating period and for a minimum of 5 years after closure. - After a minimum of 5 years after closure, the monitoring frequency may be reduced to quarterly intervals.
V. POST CLOSURE CARE	- Post closure care period of 15 years. - Post closure care must minimize the need for further maintenance and control, minimize or eliminate post closure release of waste, waste constituents, leachate, contaminated rainfall, or waste decomposition products to the groundwater, surface water or air to the extent necessary to prevent threats to human health in the environment.	- Post closure care period in two phases. - Phase 1 of the post closure care period to last a minimum of 30 years and consist of: - Maintaining integrity and effectiveness of final cover; - Maintaining and operating leachate collection system; - Groundwater monitoring; and - Maintaining and operating gas monitoring system. - Phase 2 of the post closure care period to be a length of time determined by the state and consist of: - Groundwater monitoring; and - Gas monitoring.	- Post closure care period of 5 years for inert waste landfills and 30 years for chemical and putrescible waste landfills. - For a minimum of 5 years after closure, quarterly inspections of final cover and vegetation. - 5 years after closure inspections of final cover and vegetation may be annual. - Post closure care shall consist of: - Groundwater monitoring; - Landfill gas monitoring; and - Leachate monitoring.

(1) The Illinois Pollution Control Board; adopted in August, 1990.

Source: Economic Impact Study of Landfill Regulations (R88-7), Illinois Department of Energy and Natural Resources.

TABLE 10 (Continued)

Summary of Current and Proposed Solid Waste Regulations

	CURRENT ILLINOIS REGULATIONS	PROPOSED U.S. EPA SUBTITLE D REVISIONS	PROPOSED IPCB[1] REGULATIONS
VI. FINANCIAL ASSURANCE	- Financial assurance required only for nongovernmental operators of disposal sites or indefinite storage, units. - The cost estimate and amount of financial assurance is to be updated at least on a biennial basis. - Financial assurance may be given through a combination of a trust agreement, bond-guaranteeing payment, letter of credit, insurance or self-insurance.	- Financial assurance required for all landfill owners/operators except an owner/operator who is a State/Federal government entity where debt and liabilities are those of the State or U.S. - Closure cost must be adjusted annually for inflation. - Closure cost estimate and amount of financial assurance must be increased if changes in the post closure plan or landfill conditions increase the maximum costs of post closure care. - The financial assurance mechanisms must ensure that the amount of funds ensured is sufficient to cover the costs of closure, post closure care, and corrective action for known releases.	- Financial assurance not required for the State or to any local government, provided, however, that any other persons who conduct such a waste disposal operation on a site which may be owned or operated by such a government entity must provide financial assurance for closure and post closure care of the site. - Financial assurance equal to or greater than the cost estimate must be maintained at all times. - The cost estimate in the total cost for closure and post closure monitoring and maintenance. - The cost estimate must be revised whenever a change in the closure plan or post closure care plan increases the cost estimate. - The amount of financial assurance shall always provide for at least 5 years of post closure care. - Financial assurance may be provided through a combination of a trust agreement, bond guaranteeing payment, bond guaranteeing performance, letter of credit, insurance or self-insurance.

(1)The Illinois Pollution Control Board; adopted in August, 1990.

Source: Economic Impact Study of Landfill Regulations (R88-7), Illinois Department of Energy and Natural Resources.

TABLE 10 (Continued)

Summary of Current and Proposed Solid Waste Regulations

	CURRENT ILLINOIS REGULATIONS	PROPOSED U.S. EPA SUBTITLE D REVISIONS	PROPOSED IPCB[1] REGULATIONS
VII. REMEDIAL ACTIONS	- Under Part 807 of Illinois' solid waste regulations and the Illinois Environmental Protection Act, the facility owner/operator shall take whatever remedial action necessary to abate any gas, water, or settling problems during the post closure care period. - Under the IEPA "Green Sheets," the owner/operator must implement the facility's contingency plan or remedial action if it is determined that waste constituents from the facility have entered the groundwater.	- If any constituent is detected at statistically significant levels above the Groundwater Protection Standard, the owner/operator must establish and implement: - A corrective action groundwater monitoring program; - The corrective action remedy; - Notify all persons who own the land or reside on the land that directly overlies the contaminant plume; and - Take any action deemed necessary by the State to protect human health and the environment.	- If the groundwater, impact assessment shows, after statistical analyses, a potential for exceeding groundwater standards beyond the zone of attenuation then: - The plans for the remedial action must be submitted to the IEPA within 90 days after a violation of a water quality standard is detected. - The remedial action program must be implemented within 90 days of completion of the groundwater impact assessment or within 90 days of approval of the remedial action plan.

[1] The Illinois Pollution Control Board; adopted in August, 1990.

Source: Economic Impact Study of Landfill Regulations (R88-7), Illinois Department of Energy and Natural Resources.

Local Criteria and Potential Sites

Although a landfill site operating as a regional pollution control facility must meet Federal and State mandated standards to receive an IEPA permits these requirements are not the sole determinants to identifying sites. Current regulations allow a significant amount of local responsibility in the siting process. Environmental protection, especially in the context of protecting regional groundwater resources, is the primary consideration of local siting criteria in Champaign County. In addition, parcel characteristics related to accessibility, utility service and adjacent land uses (including population density of the surrounding area) have been refined and have been included in these criteria.

Local criteria are oriented toward avoiding landfill sites that are above the "Regional Aquifer" in Champaign County. Since sand and gravel deposits conduct water more effectively than silty clay, it was determined that no landfill should be constructed above thick continuous sand and gravel deposits. In addition, local criteria were further developed to clarify what constituted acceptable potential sites for a landfill. These criteria were grouped into exclusionary and inclusionary criteria. Exclusionary criteria were used to screen individual parcels or areas. Parcels or areas which contained any of the exclusionary characteristics would not be considered further in the site identification process. Areas or parcels which remained after the exclusionary criteria, would be screened against the inclusionary criteria to identify additional parcels for consideration for on-site investigation. Table 11 lists the exclusionary and inclusionary local siting criteria.

TABLE 11

Landfill Site Identification Criteria

Exclusionary

- Exclude all areas which overlay regional aquifers[(1)]
- Exclude all areas overlaying sands and gravels as mapped with thickness greater than 5 feet and at a depth of 75 feet or greater.[(2)]
- Exclude all areas within 1000 feet from any public or industrial water supply (in-use or plugged).
- Exclude all areas within 200 feet of all other water wellheads (in-use or plugged).
- No more than 10% of the parcel may be within the 100 year floodplain. The portion of the parcel within the floodplain must be contiguous to the outer property lines. No part of the permitted area may be within the floodplain.
- Exclude all areas within 10,000 feet of currently permitted runways for jet planes.
- Exclude all areas within 5,000 feet of currently identified runways for propeller driven planes.
- Exclude all areas within 500 feet of a perennial stream.
- Exclude all areas and easements with railroads, roadways, or pipelines or transmission lines which transverse the parcel.
- Exclude all areas within 1 1/2 miles of municipal corporate limits, in or outside of the County.
- Exclude any mine and pit areas.
- Exclude all areas within 1 1/2 miles of schools.
- Exclude all public lands, except University of Illinois lands. U of I lands are to be reviewed on a case-by-case basis.
- Exclude from the permitted area 2 or more contiguous acres of woodlands.
- Exclude wetlands, including lakes and ponds.
- Exclude cemeteries.

Source: Landfill Facility Site Identification Study, ISWDA, July 1990.

(1) Defined as mapped sand and gravel thicknesses in the Glasford and Banner formations in the 25 to 100 feet category. See source document for discussion.

(2) Due to the nature of the way in which sand thickness data was mapped in the Geographic Information System of mapping, this criteria actually applies to areas mapped as having 5-25 feet of sand at a depth of 75 to 100 feet. See source document for discussion.

TABLE 11 (Continued)

Landfill Site Identification Criteria

Inclusionary	
The parcel should have:	
(1) Area;	200 acres or more of suitable land is preferred.
(2) Ownership;	Three or less owners is preferred.
(3) Parcel shape;	A regular shape is preferred.
(4) Zoning;	Industrial or agricultural zoning is preferred.
(5) LESA/Productivity Evaluation;	A lower productivity rating is preferred (to be used in conjunction with on-site investigation).
(6) Archaeological Evaluation;	The absence of any significant archaeological site is preferred.
(7) University of Illinois;	Include all properties and make determination on a case-by-case basis to exclude research areas.
(8) Threatened or Endangered Species;	Include all areas of sightings; make determination on habitat impact on a case-by-case basis.
(9) Historic Places;	Include all sites; make determination on appropriate remediation, if necessary, on a case-by-case basis.
(10) Parcel setbacks;	Measurement of setbacks is to be from the edge of the parcel, rather than from the edge of permitted area, where possible.

Source: Landfill Facility Site Identification Study, ISWDA, July 1990.

The services of the Illinois State Geological Survey (ISGS) and the Illinois Department of Energy and Natural Resources (ENR) were used to assist in identifying potential landfill sites in Champaign County. Both agencies produced maps with information on the geology or cultural characteristics of Champaign County. When the maps were completed, they were "overlaid" to identify potential sites.

The ISGS produced the geological map series for Champaign County. The maps, known as stack-unit maps, are used to portray 3-dimensional space below the surface of the ground. Each map represented a slice of the subsurface at a specific depth. The subsurface of Champaign County was mapped as 15 parallel slices (see Figure 6). Each slice shows the geologic units that occur at that depth. In order to account for the decrease of information with increasing depth, the content of the slice map varies with the depth of the slice layer. The maps were grouped into four types, Type 1, Type 2, Type 3, and Type 4. Each type had a different definition on how the slices falling within each type would be mapped and the source of the information.

The ISGS also produced other maps to aid in the site identification process. Although some of these maps were available, the ISGS had to digitize, or entered into a computer, the information so it could be used with the slice maps they produced. Examples of these base maps are terrain, bedrock geology, surface topography, soil maps, and well location maps. Using these base maps, derivative maps were developed. The derivative maps use the digitized information from the base and slice maps to create previous unmapped information. Examples of these maps are aquifer maps; sand and gravel aquifers in the Banner Formation and in the Glasford Formation; composite Banner and Glasford Aquifer thickness map and potential presence of sand and gravel maps. A complete list with a description of all the maps the ISGS developed is in Appendix 2.

The maps produced by ENR were primarily of cultural features. Using a computerized geographic information system (GIS), features such as schools, surface waters, 100-year

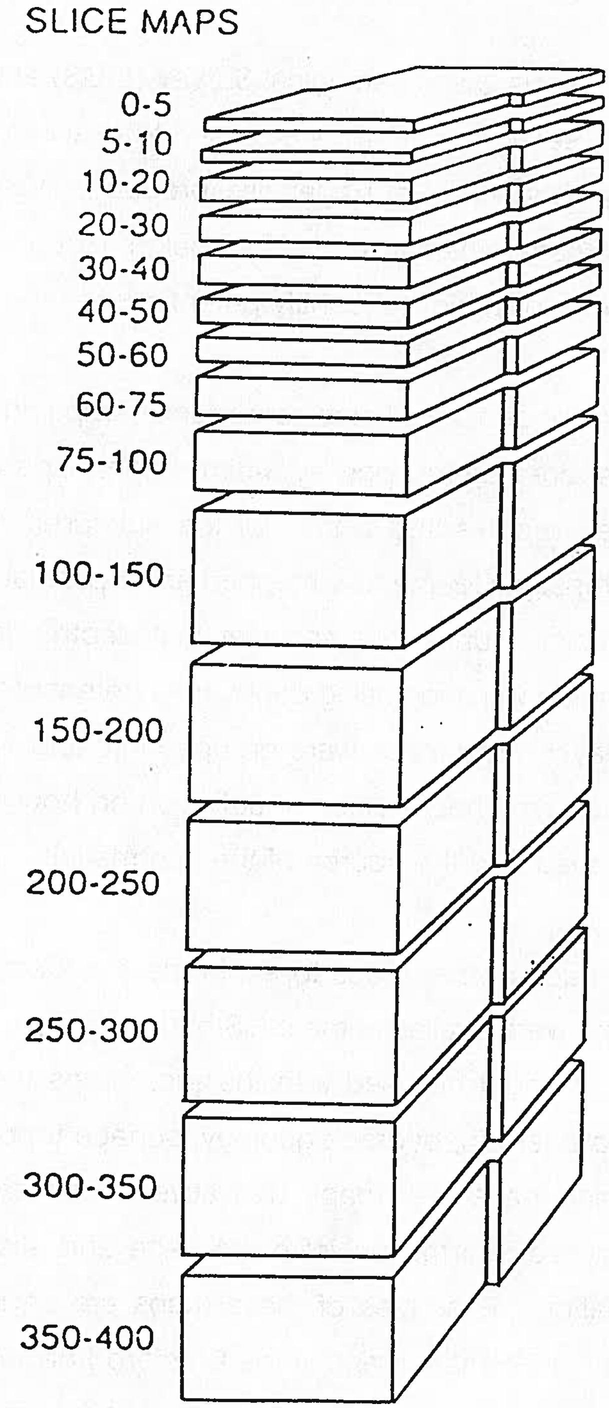

FIGURE 6

Illustration of Slice Maps

flood plain, wetlands, municipal boundaries, roads, rail lines, historic sites and cemeteries were mapped. (See Appendix 2 for complete listing). ENR also digitized a base map of the County. Since a GIS system was used, buffers could be placed around the various features. These buffers could be easily altered to show how much land was excluded from the search. The GIS system employed by ENR is compatible with the computer system used by the ISGS. Therefore, the cultural feature with appropriate buffers, can be combined with the geological maps to form suitability maps.

Thirty-three potential sites were identified through the site identification process. Figure 7 shows the locations of the sites. Additional items that will be considered when final site selection is made include distance from major access roads, density of surrounding area and water replacement options and related costs. Any site selected for landfill development must be subject to intensive on-site geological investigation to determine its appropriateness.

Development Timeline

Landfill development occurs in three phases: site investigation, siting and permitting, and construction. A landfill does not have a testing or shakedown period as do a transfer facility or a combustion facility. In fact, the post-closure requirements can be viewed as the testing phase since it will take time to determine if the structure leaks or if structural failure leading to leachate development, or other problems, will occur over time.

The first phase, facility development, again includes foundation decisions on procurement and ownership options. However, for landfills, a more intense level of site screening may be required to determine the feasibility of siting a landfill in the proposed ares. This is necessary to determine if the siting process should continue. This phase of development is estimated to take 21-27 months.

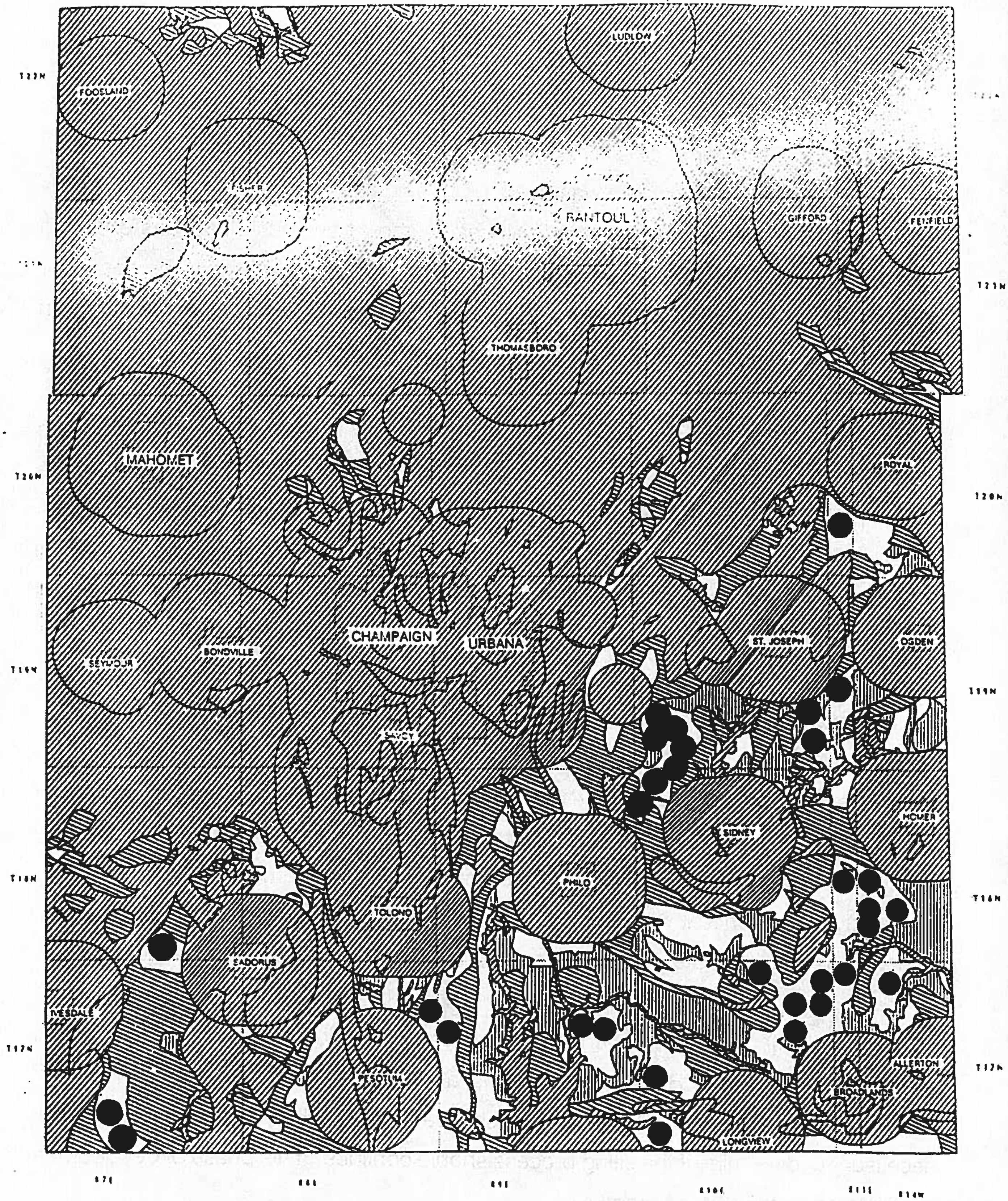

FIGURE 7

Landfill Facility Sites

Source: Landfill Facility Site Identification Study; ISWDA, July, 1990

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LEGEND FOR FIGURE 7

Considered site for landfill

Areas excluded from consideration based on Preliminary Site Identification criteria

Areas excluded with 3 or more mapped slices containing sand, based on map showing cumulative number of overlapping sands (Potential Occurrence of Sand and Gravel)

Areas excluded as 10-50 feet of estimated cumulative thickness of sand and gravel aquifers in the Glasford and Banner formations map.

Urban areas

Source: Landfill Site Identification Study; ISWDA, July, 1990

Map was derived from Illinois State Geological Survey data files.
The original of this illustration was completed at a scale of 1:62,5000

Phase II, siting and permitting, is estimated to take 13-16 months. Although the timeframe for completion of the SB 172 hearings remains the same, again, more time may be required for IEPA review. The final phase, construction is estimated to take 12-15 months. In total, landfill development is estimated to take 46-57 months without an SB 172 appeal and 49-63 months with a SB 172 appeal. Table 12 details the activities in each phase while Figure 8 displays a timeline.

Development Costs

Landfills are a unique solid waste facility because the total capacity is not constructed all at once. Landfills are usually developed over years, with new capacity being added as it is needed. Aside from this development approach, the entire landfill is designed prior to any construction. For Champaign County, a 64 acre landfill with 5.5 million cubic yards of capacity with an average trench depth of 30 feet below grade and a finished elevation of 65 feet would last approximately 20 years.

In Phase I, the primary costs are engineering services and land costs. Although the landfill would be 64 acres, additional land would be necessary for buffering. A 200 acre site would allow about 690 feet of buffering around the 64-acre landfill assuming the parcel and the landfill were both square in shape. Using historical data from the Champaign County Regional Planning Commission, an average of $2200 per acre was used to calculate land acquisition costs. Therefore, an estimated $440,000 would be necessary for land costs and approximately $604,000 for engineering in Phase I (exclusive of permit and design work). It is usually necessary to acquire land early in landfill development because of the various geological and hydrogeological testing that is required to determine if the site is appropriate. This may also be done through the option process where the actual purchase occurs just before construction. Engineering services include reviewing and refining geological information to determine the site's suitability for a landfill. On-site testing and actual landfill design work are often completed early in the process.

TABLE 12

Landfill Facility Development Timetable

	MONTHS	
	MINIMUM	MAXIMUM
Phase I - Facility Development		
Criteria Review, Ownership Option, GIS Screening; Identify Sites; Select Sites; Preliminary Site Investigation; Select Candidate Site; and Detailed Site Investigation	21	27
Phase II - Siting and Permits		
Permit Application	2	3
SB 172 Hearing	5	6
Financing*	--	--
Development Permit Submission	1	1
IEPA Development Permit Review	5	6
Phase III - Construction		
Construction	10	12
IEPA Operation Permit	2	3
Total without appeal	**46**	**58**
Additional time if a SB 172 Appeal Occurs	4	6
Total with appeal	**50**	**64**

* Financing is secured after the SB 172 hearing and concurrently with the IEPA development permit review.

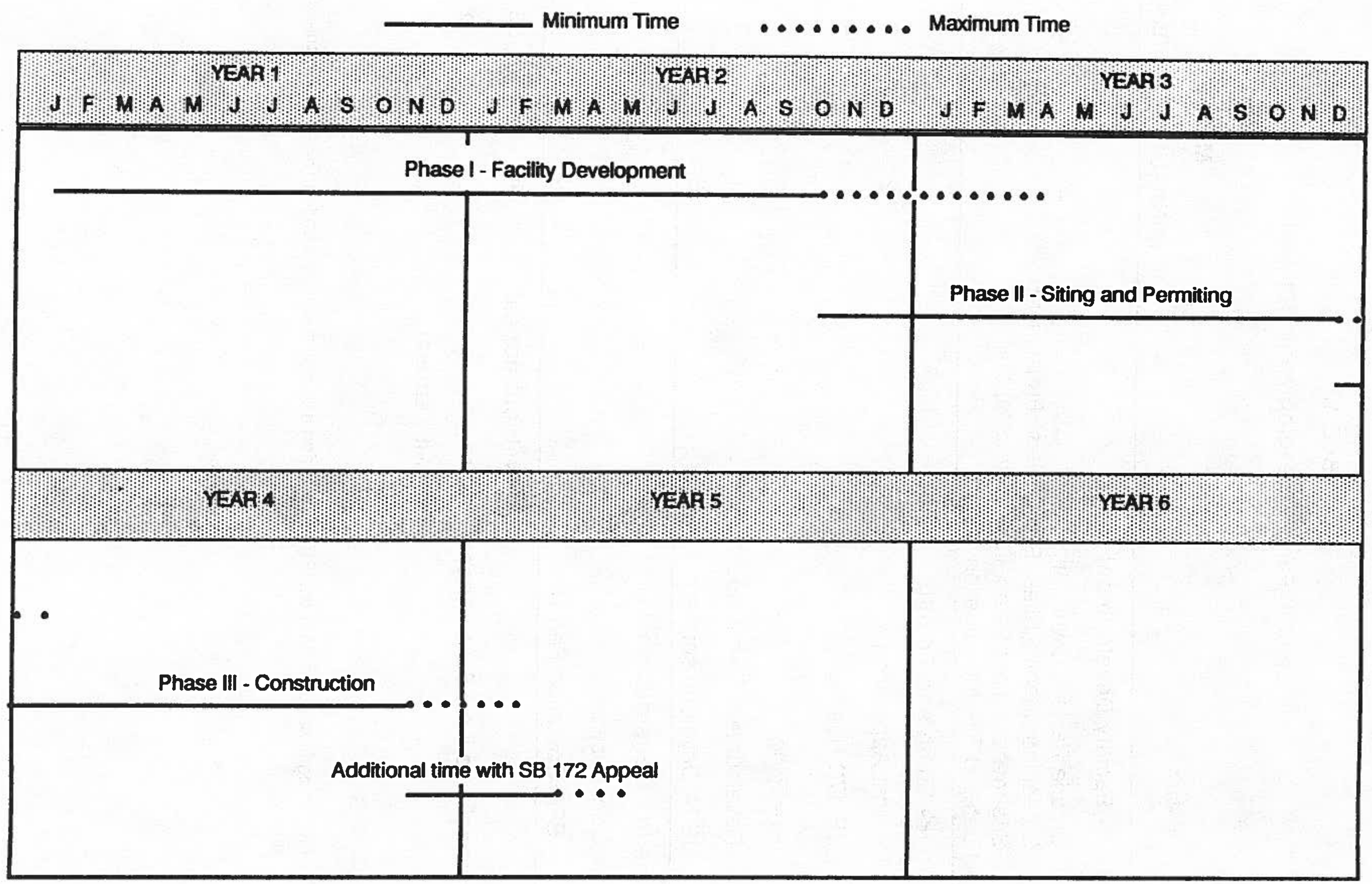

FIGURE 8

Landfill Facility Development Timeline

Costs related to the siting and permitting, Phase II, include some carryover of preliminary engineering. Costs related to permits are generally for engineering services which were included in Phase I costs. However, in total, the applicant may spend $100,000 in preparing documents related to the siting of a landfill. The other cost incurred is the siting fee. Currently, Champaign County's siting resolution calls for a $12,000 fee for a landfill. However, the resolution is under review and it is anticipated that the fee will be raised to $250,000. This is the same as the draft City of Urbana ordinance. The City of Champaign set a standard fee of $2,500 for any solid waste facility. As with the other siting fees, the money is used to offset the costs of holding the SB 172 hearing. Even if siting is denied, the expended funds are non-refundable.

The costs in Phase III, construction and operation, are spread out over the life of the landfill. As capacity is needed additional cells are constructed and opened. The majority of capital costs do occur in conjunction with the development of the first cell. The off-site roads are constructed or improved and sewer and water lines are extended to the site. If sewer and water cannot be extended to the site, a well and septic system may be installed. These off-site costs, which will service all the landfill cells, are estimated to be almost $3.5 million dollars. Additional costs that will be used with all the cells included buildings, landscaping and some on-site roads. To open the first cell will cost an estimated $10.6 million dollars. Each additional cell will cost between $1,307,300 to $1,333,000 to open. These costs include engineering, earthwork construction, and leachate and gas migration control systems. Although the cells are approximately the same size with the same features, it will cost more to open each cell due to inflation.

In total, it is estimated to cost $16.2 million to construct a landfill in Champaign County in 1990 dollars. These costs will be spread out over about 20 years as new capacity is constructed. Table 13 details the cost for developing a landfill sized for Champaign County.

TABLE 13

Landfill Facility Development Costs

Capital Costs in 1990 Dollars

PHASE I			
	Engineering Services		$ 604,800
	Land Cost (avg. $2200/acre)		440,000
		Subtotal	$1,044,000
PHASE II (Siting & Permitting)			
	Permits (including legal costs)		$ 350,000
	Siting Fee		250,000
		Subtotal	$ 600,000
PHASE III			
Off-Site:	Access, Sewer, Water		3,252,400
On-Site:	Engineering		441,000
	Earthwork Construction		2,890,900
	Leachate Collection		343,500
	Drainage System Control		738,700
	Gas Migration Control		6,600
	Landscaping		754,300
	Access Roads		159,800
	Buildings & Scale		438,800
	Utilities		60,600
	Administrative Costs		1,496,100
		Subtotal	$10,582,700
	CELL II		1,307,300
	CELL III		1,320,600
	CELL IV		1,333,000
		Subtotal	$ 3,960,900
		Subtotal Phase III	14,543,600
		Total (in 1990 Dollars)	$16,189,100
		Total in (1992 Dollars)(1)	$20,661,900

(1) Estimated date of opening.

Source: "Phase I: Preliminary Site Investigation - Landfill Design Alternatives for the Intergovernmental Solid Waste Disposal Association," RMT, Inc. (September, 1988).

SECTION FOUR: Procurement, Risk Assessment and Flow Control

The development of a successful solid waste management facility or facilities depends on a number of interrelated factors, including the legal and institutional arrangements available for development of the project and the risks and the procurement approach that the project sponsors (e.g., the municipalities) take. Most often the legal and institutional issues delay the development of these facilities rather than technological issues. This section will discuss procurement approaches, project risks, financing options, and other institutional issues involved with development of solid waste management facilities for Champaign County.

The term procurement refers to purchasing, leasing, or otherwise acquiring equipment or services for a project. A solid waste management project typically enters the procurement phase after the concept has been found viable and the project building blocks, such as waste supply and energy or material market agreements, are in place. The assignment of responsibility for engineering, design, construction, start-up, and operation among the community, contractors and engineering company will be determined by the procurement approach selected. Each approach requires different steps to complete the procurement process. A decision by the County on the selected procurement approach will be based on various factors. Four primary considerations are: (1) facility procurement and development; (2) facility ownership and operation, (3) financing alternatives and approach, and (4) risk allocation.

The procurement approaches and the procedures to implement them are described in the following subsections as well as considerations in selection of a procurement approach.

Procurement Methods

There are four methods that are used by public bodies to procure solid waste facilities. These methods are described below.

(1) Competitive Sealed Bidding: Competitive sealed bidding, also known as formal advertised bidding, is the most commonly used method for acquiring equipment, services and construction for public use. This method requires the preparation and issuance of an Invitation for Bids (IFB) containing detailed specifications and a purchase description of the desired item or service. Upon receipt of bids, the development agency determines if the item or service being offered satisfies the requirements of the IFB and if the bidder is a responsible party. Generally, no change in the submitted bids is permitted once they have been opened. Once bid evaluation is completed, an award is made solely on an objective basis to the lowest responsive bidder. This procurement method is usually used under the A/E approach.

(2) Competitive Negotiation: Competitive negotiation of procurement is generally used in situations where the item or service desired requires extensive discussions with potential bidders to determine the fairness and reasonableness of the bid. This process is generally used to create a marketplace where price is ultimately established by bargaining between the procuring agency and a number of qualified bidders. Under this procedure a Request for Proposals is used instead of an IFB. It contains general system and performance specifications and indicates the evaluation criteria to be used and the relative importance of each. Price is only one of the evaluation criteria. The contents of proposals received are not publicly disclosed and information contained in any of the proposals is not divulged to competing bidders. This procedure differs from competitive sealed bidding in two major respects. First, judgmental factors are used to determine compliance with the requirements of the RFP as well as to evaluate competitive proposals. The effect of this is that the quality of competing proposals may be compared and trade-offs made between the price and the quality of the proposals. The second difference is that discussions are permitted after the submittal of proposals. Changes in proposals may be made after they are submitted to arrive at final offers that are the most responsive to the procuring agency's needs. After negotiations, an award is made to the bidder whose proposal is most advantageous to the development agency based upon price as well as the other evaluation criteria. Negotiated procurements apply primarily to the turnkey and full-service approaches.

As noted, the heart of the negotiated procurement method is the RFP, which generally solicits bids on the basis of broader specifications than those found in an IFB. The RFP's developed for a turnkey approach are more technical than the RFP's developed for a full-service approach. The use of an RFP shifts much of the design responsibility to the contractor and allow respondents to offer a wide range of technical solutions. Following proposal evaluation, the procuring agency enters into contract negotiations with one or more firms.

(3) Two-Step Formal Advertising: The two-step formal advertising procedure was developed by the Federal government and is used in situations where the complexity of the system or service desired prevents the preparation of detailed specifications by the procuring agency.

This procedure, which incorporates features of both the competitive sealed bidding and competitive negotiation methods, involves the issuance of two solicitation documents. In step one, an RFP is issued requesting the submittal of unpriced technical proposals. The procuring agency conducts discussions separately with all respondents to ensure that their proposal is understood. Respondents are also able to change proposals to make them more responsive to the RFP. In step two, all respondents whose proposals were accepted, are then issued an IFB. Thereafter, the procedure is identical to that in competitive sealed bidding. As with the competitive sealed bidding method, an A/E firm must be retained prior to preparation of the RFP.

(4) Sole Source Negotiation: Sole source negotiation involves no competitive bidding and is used after the procuring agency has determined that there is only one source for the desired service or equipment. The procuring agency does issue an RFP. The firm does submit a proposal after which the terms and conditions of the contract are negotiated and award is made. This method is rarely used because of the number of competing vendors in the field of solid waste facilities. A modification of this method is when there is only one qualified respondent after a RFP process. In that case, a procuring agency could begin negotiation with the lone shortlisted vendor and use the RFP as a basis for negotiation.

Facility Procurement and Development

The selection of a preferred procurement and development approach will determine the ownership arrangements, financing arrangements and risk allocation among facility participants. The three basic approaches that may be used by a public agency to procure a solid waste facility and related services are:

- Architect/Engineering (A/E)
- Turnkey
- Full-service

Architect/Engineering

Traditionally, public agencies have used the A/E approach to procure public works projects such as sewer systems, roads, and schools. A number of communities have also used the A/E approach to procure solid waste management facilities.

The A/E approach involves two separate procurements: engineering services and facility construction. The selected engineering company is responsible for the design of the facility as well as the equipment and materials to be used. In addition, the selected company will prepare the specifications for the bid document, or the Invitation for Bids (IFB), which is used for procuring construction services. After receipt of bids, the public agency will select the same, or a different, engineering company to supervise construction of the solid waste facility. This supervision, or construction management, is done to ensure that the specified materials and equipment are used in the plant. Additional activities for the A/E firm include facility start-up and operating the plant through acceptance testing. Another activity could be the preparation of operating manuals. Table 14 shows the distribution of responsibility under each arrangement.

After the facility has passed the acceptance tests, the public agency assumes responsibility for the plant. Generally, the public agency will then operate the facility with its own staff. An alternative is for the agency to contract with a private company for operation.

A summary of the advantages and disadvantages with an A/E procurement follows:

Advantages

- Procurement is relatively "easy" to those in the public sector.
- The process is familiar.
- May be the lowest cost procedure.
- High degree of control is maintained throughout the project.

Disadvantages

- Substantial risk assumed by the public development agency.
- No long-term equipment performance guarantees; only standard equipment warranties for 30 days -1 year.
- Financial responsibility related to change orders assumed by public development agency.
- Cannot apply the "public competitive bid scrutiny" to potential systems or technologies; this can only be procured by turnkey or full-service methods from the vendors holding the patents.
- "System Vendors" could be excluded because of their unwillingness to allow municipal operation of their equipment package.

Turnkey

Under the turnkey approach, a single contractor has sole responsibility for the design, construction, and start-up of a facility. The procuring agency would select a turnkey contractor on the basis of the responses to a Request For Proposals (RFP). An RFP describes the type of system desired by the procuring agency. This differs from the Invitation For Bids used with the A/E approach, where the system, equipment, and materials are specifically identified.

TABLE 14
Responsibility Assignment Under Alternative Procurement Approaches

	Procurement Approaches		
Responsibility Assignments	**A/E**	**Turnkey**	**Full-Service**
Planning	PA/E	PA/C	PA/C
System design	E	C	C
Preparation and issuance of system specifications	E	C	C
Construction supervision	E	C	C
Construction	PA	C	C
Operation	PA	PA	C
Ownership	PA	PA	PA or C

Key: PA = Procuring Agency; C = Contractor; E = Engineer as agent for Procuring Agency.

The contractor is responsible for selecting the equipment and materials to be used in a facility. In addition, the contractor may design and construct the facility or subcontract part of the work. Once the facility construction is complete and passes an acceptance test, it would be turned over to the public agency. The procuring agency then becomes responsible for the facility at this point and may either operate the plant with public employees or contract with a private company for plant operation.

A modification to the turnkey approach is to include a requirement in the RFP for the contractor to operate the facility for an initial period, typically one to three years after start-up. With this method, the contractor will still have responsibility for the plant in the early years of operation when design failures are most likely to occur. The result of a modified turnkey procurement is to transfer some of the risk associated with facility problems from the procuring agency to the contractor. (This is discussed in more detail under the project risk section).

The advantages and disadvantages with turnkey procurements are summarized below:

Advantages

- Centralization of responsibility for design and construction by one party.
- Owner acceptance of the facility only after it passes acceptance testing.
- Direct use of the system contractor's experience in designing and constructing the facility.
- Shift of the initial performance risk related to facility design from the owner to the facility contractor.

Disadvantages

- Higher costs associated with vendor's increased risk assumption.
- Reduced level of control which may affect project economics.
- Long-term performance risk remains with the public agency.

Full-service

The full-service option involves complete design, construction, operation, and potential ownership by a private firm. This procurement approach has been the most prevalent method used to secure solid waste facilities but may be on the decline as a result of new tax laws; many tax benefits once available to full-service vendors have been eliminated. As in the turnkey approach, the project development agency would issue an RFP. However, the RFP and contract would be for a solid waste facility service instead of just a facility. The selected vendor is responsible for design, construction, equipment supply, start-up, testing, and subsequent operation of the facility. The full-service contractor may also own the facility and be solely responsible to the bondholders for repayment of the bond. The owner, in this case, would seek to back up this responsibility to the bondholders with long-term contracts for assured waste supply and tipping fees from participating municipalities and for the sale of energy and materials that may be recovered at the facility. The potential for transferring risk from a public agency to the contractor is highest under a full-service approach.

The full-service procurement can be modified so a public agency may own the facility rather than the private vendor. In this case, the full-service contractor would design and construct the plant and then lease it. The private operator would repay the bondholders via the public agency during the term of the lease. Under this arrangement, the plant operator may be entitled to all profits or may be required to share revenues in excess of a predetermined return on investment with the participating municipalities, where they are represented by the development authority. In such an arrangement, the lessee may or may not be considered the owner of the plant for tax purposes, because title still resides with the public agency. Alternatively, the contractor may act solely as the plant operator, without leasing, under contract to the public agency.

The advantages and disadvantages associated with the full-service approach are:

Advantages

- Contractor responsibility for the facility development.
- Facility functions are guaranteed by the contractor.
- Allows use of the system vendor's experience in the design, construction, and operation of the facility.
- Long-term performance risk is shifted from the procuring agency to the full-service contractor.

Disadvantages

- Higher costs may be associated with the project development because of the full-service contractor's assumption of long-term operational risk.
- Procuring agency may feel it has insufficient control over certain project aspects.
- Ownership (i.e., residual value) remains with the contractor at the end of the contract term.

Procurement Approach Selection

There are three procurement approaches and four procurement methods. The next step in the procurement process is to determine which approach or method will be used. However, certain procurement approaches are more compatible with one of the three methods. Once a decision is made in favor of a particular method or approach, generally, the remaining options are reduced. For example, the competitive sealed bid method is only appropriate for the A/E procurement approach. Therefore, if a procuring agency determines it must use a competitive sealed bid, then it can realistically only pursue an A/E approach.

The competitive sealed bidding process is appropriate only for the A/E procurement approach. Only in the A/E approach can the solid waste facility be broken down into self-defined, discrete components of equipment, fabrication, on-site construction and operation. One of the other processes is necessary if the procuring agency wants to use a turnkey or full-service approach. This is because the equipment and services desired cannot be exactly specified; guarantees cannot be standardized; and certain vendor equipment and technologies are proprietary to sole licensees. Successful turnkey or full-service procurement involves several criteria, including cost considerations; a careful analysis of vendor experience, technology, guarantees, and financial strength. Such factors are subjective to some degree. Therefore, the development agency must be permitted to make qualitative judgments concerning each vendor under the procurement process used. In addition, extensive negotiations are necessary for most turnkey or full-service procurements; therefore, it is doubtful whether the two-step formal advertising process could be effectively used in a turnkey or full-service procurement.

Table 15 summarizes the relationship between procurement approaches and procedures for solid waste resource recovery facilities.

TABLE 15

Procurement Approach Versus Procurement Method

	Approach		
Procedure	**Conventional A/E**	**Turnkey**	**Full-Service**
Competitive sealed bidding	Appropriate	Not Appropriate	Not appropriate
Competitive negotiation	Appropriate	Appropriate	Appropriate
Two-step formal advertising	Appropriate	Questionable	Questionable
Single-source negotiation	Appropriate	Appropriate	Appropriate

Another consideration that should be reviewed when selecting a procurement approach or method is the role of the vendor. Equipment vendors have differing corporate objectives, resources and policy constraints. Some of the vendors, primarily those without licensed or proprietary technology are likely to make realistic proposals or bids based on an A/E or turnkey approach. Such vendors are willing to supply their equipment piece by piece as specified by an A/E firm. In contrast, for marketing and control reasons, vendors with proprietary materials, recovery equipment, RDF process trains, or patented equipment favor the full-service approach. They are then able to control access to their technology, especially the operation and performance details of the facility. This helps assure the information remains proprietary. Thus, the A/E procurement approach may limit technology and vendor choices. Vendor acceptance of a turnkey approach with municipal operation is more difficult to ascertain. Such an approach may interest vendors of mass burn combustion facilities as well as the RDF facilities because a limited operations contract is included in the procurement.

If the development agency desires to avoid substantial construction and operating risks, it should consider the full-service procurement approach over the A/E approach, or even the turnkey approval. It must be recognized, however, that transferring risk to the vendor will require incremental compensation for all risks the vendor is asked to assume. This may raise the costs of the facilities selected under this approach. There may be limitations to the full-service approach as a result of the new tax laws.

The full-service approach, in theory, gives the facility vendor total control over the construction, start-up and operation of the facility. Such control permits the vendor to provide guarantees regarding project completion maximum capital costs, maximum operating and maintenance cost, and technical performance throughout the operating life of the facility. It is important to note, however, that actual receipt of such guarantees is highly dependent on the individual vendor chosen for negotiations. Some vendors are unwilling to shoulder certain risks at any price, even in a situation of full-service procurement. Such guarantees are also only as good as the financial resources pledged to satisfy the guarantees. The full-service approach, by putting the vendor in control of the facility, provides the development agency with an opportunity to obtain meaningful guarantees, however, it still does not assure such a result. Also, responsible vendors will refuse to assume certain categories of risk even under full-service procurement, such as most force majeure events, change of environmental law, and quality and quantity of solid waste supply.

The turnkey procurement can be viewed as a compromise. A turnkey contract might provide effective vendor guarantees on timely completion of the project; maximum capital cost; and satisfaction of a predetermined performance test. However, all risks relating to effective operation of the facility would be borne by the development agency and ultimately the project users.

The A/E procurement approach could potentially deliver the lowest initial capital and operating costs of all procurement approaches identified. If lowest possible cost is a more important criterion than minimization of risk, the A/E approach should be preferred. The A/E approach may also be preferred if the development agency wishes to control the construction and operation of the facility. However, the A/E approach will severely limit the ability of the development agency to share risks with private vendors. In fact, the majority of the risk will rest with the development agency. Typical performance guarantees obtained from vendors in an A/E procurement are limited to the equipment only and not the completed system. These equipment guarantees and warranties are for a specific, relatively short, period. Also, performance guarantees tied to fixed dollar damages for failure are not impossible to negotiate under an A/E procurement. Ultimate system performance and cost are the responsibility of the development agency, any additional participating local governments, and the A/E firm that designed the facility. The financing approach may be limited to general obligation debt unless extensive insurance, bonding, special reserves and other forms of financial security are provided to reduce risk to investors. Experience has shown that in A/E projects requiring substantial changes, costs were ultimately added to the facility or in some other way paid by the procuring agency and could not be absorbed by the A/E firm.

A final procurement considerations is to briefly review the estimated costs and workload for the development agency once the project moves into a procurement stage. There are three distinct time frames in assessing workload for the procuring agency: the period prior to the signing of the service contract and the sale of bonds; the period during construction; and the period during operation. The project will require substantial development agency time regardless of the procurement approach chosen. The full-service approach, because a private vendor provides the construction and operation for 20 or more years, requires the development agency to sign a service contract. However, the full-service approach promises less development agency involvement once the contract is signed and funding established than under either the A/E or the turnkey approaches.

Under the A/E approach, the development agency would have to approve all major purchases of plant and equipment and generally oversee the work being performed during the construction. In contrast, the turnkey and full-service approaches place most of the burden of this oversight function on the vendor.

In general, considering the size and complexity of a project in Champaign County, the procurement phase would require over four "work years" of effort by the development agency including consultants and advisors. The estimated time for completion of the procurement, with all contracts signed would take approximately 18 months. Financing could add another three to six months assuming "everything" needed to secure the project would be in place. Development agency costs for consultants and advisors would be about $600,000 depending upon the extent and complexity of contracts to be developed and negotiations to be completed. Legal costs will likely be the largest portion of these costs. The development agency should have its own staff, equipment, and supply costs as well as administrative and travel costs. These front end costs can be rolled into the financing for the project, and thus the development agency (or its source of funding) can be reimbursed for a substantial share of its front-end expenditures.

Ownership and Operation

There are four basic arrangements for the ownership and operations of a solid waste management facility:

Public Ownership and Operation

Under this arrangement, a public entity would own and operate the solid waste facility. However, most major solid waste management facilities currently being implemented are not publicly owned and operated. Many municipalities are unwilling or unable to accept the risks associated with owning and operating a major facility. The majority of municipalities contract for operation services or use full-service vendors to operate their facilities. Nevertheless, some solid waste facilities are owned and operated by public entities.

Public Ownership, Private Operation

Under this approach, the public sector would finance, construct, and own the facility while the operation is contracted out to a private sector entity. This approach is not unusual with major solid waste facilities, and it is being used with a much greater frequency for municipal services.

Private Ownership, Public Operation

This approach is the typical leasing structure used for many municipal services. Some other entity would be responsible for financing and owning the disposal facility and would lease the facility to a public entity to operate. The distinct advantage of this approach is that capital financing can be obtained without using publicly issued general obligation or revenue bonds.

Private Ownership and Operation

This approach would be implemented by a contractual agreement between a public entity that requires disposal services and a private entity. That entity would be fully responsible for the financing, construction, ownership, and operation of the solid waste facility. This ownership and operation arrangement represents a "full-service" approach to implementation.

Identification of ownership and operation responsibilities should be determined before a procurement approach is selected. Ultimately, the choice of one procurement approach over another will depend largely upon the municipal or county position concerning facility ownership, financing available and the allocation of risks between project participants.

Financing Alternatives

Several alternatives are available for financing solid waste management systems. The selection of financing will depend on many factors including development agency risk posture, local desires and the complexity of the project. It is often necessary to finance different components of the solid waste system in different ways. Combinations of financing arrangements may include an arrangement where a portion of the project is publicly financed while the remainder is privately financed. The goal in any financing is to structure the financing to produce a readily marketable security and, at the same time, accomplish the economic needs of all project participants. It is important that all participants have sufficient economic incentives to keep their commitments to the system.

Tax Exempt Financing

One advantage to publicly financing a solid waste facility is that the financing would be tax exempt. This type of financing is usually accomplished through the sale of bonds. There are several types of bonds that could be issued: general obligation, municipal revenue and industrial development.

(1) General Obligation Bonds - These are the simplest financing approach for solid waste project. They are the simplest to execute and offer the lowest interest rate and finance charges. General obligation (G.O.) bonds are backed by the full faith and credit of the issuing municipality or municipalities. The issuers pledges its taxing power, without limit as to rate or amount, to ensure payment of the debt rather than relying only on project revenues.

With general obligation financing, the capital market evaluates the credit worthiness of the local government issuing the bonds and does not specifically evaluate the technical and marketing risk of the particular project. For a community with a favorable rating, the financial community does not examine G.O. bonds as closely as other financing instruments. Thus, securing financing without a fully finalized certain project would be possible. However, the municipality may be required by law to secure voter approval for the bond issue and therefore, the project may come under close public scrutiny. If a municipality is at or near its legal debt limit or has a poor credit rating, G.O. bonds may not be a viable option for a project.

The credit rating of the county, municipality or group of municipalities and counties determines the salability and price of the bonds. The rating agencies will examine debt limits, local economy and revenue base and past bond repayment history in assigning a rating. Investors are generally willing to accept a lower return on a higher rated bond. These bonds are typically intermediate- to long-term securities maturing in ten to twenty years. The long maturity schedule compared to the useful life of a project may work against this form of financing. In addition, in Illinois, non-home rule entities' expenditures are limited to annual appropriations unless specifically allowed by the State. This, too, can be a problem for long-term commitments.

Typically, G.O. bond are offered through a competitive sale to bidders. A competitive bid solicitation is used to invite investment banking houses and commercial banks to make sealed bids for the right to purchase and resell the bonds. The bidder offering the lowest net interest rate obtains the right to place the bonds with its customers or purchase them for their own account.

Interest rates on G.O. bonds vary according to the credit rating of the jurisdiction issuing the bonds, as well as the availability of money in the capital market. But typically, G.O. bonds carry the lowest coupon (interest) rate of any financial instrument and, also, have a low effective interest rate compared to other long-term debt instruments. The interest rate is low because investor risk is minimal since the issuer has pledge guarantees made by the municipality's or County's tax-collecting capacity.

G.O. bond financing is a good option if the governmental entities are willing to take the risk of added expense if something goes wrong with the project. Some risks may be mitigated through contracts with process vendors which provide certain performance guarantees and backup commitments. However, it places the primary risk on the taxpayers.

Advantages

- Market acceptability;
- Ease of implementation;
- Full control of facility for the issuer;
- Lower cost, because of (1)lower interest rates, (2) no capitalized interest, and (3) no debt service reserve fund; and
- Rewards can remain with the public user.

Disadvantages

- Legal requirements preceding issuance;
- Loss of debt-issuance capacity;
- Impact on credit rating of issuer;
- Cannot be used with private ownership;
- Policy issue-should full faith and credit bonds support a self-sustaining project; and
- Risks fall largely on the taxpayers.

(2) Municipal Revenue Bonds - The use of municipal revenue bonds in project financing shifts the security from the taxing power of the issuing entity to the revenues from the project users (tipping fees), the sale of materials and/or energy products and the interest income from reserve funds. Municipal revenue bonds are long-term obligations typically issued by a municipality or quasi-public agency such as an authority. The bonds are tax-exempt under the IRS code. Typically, voter approval is not required and municipal debt limitations do not apply, since revenue bonds are not backed by the taxing power of a municipality. The issuing entity usually covenants to fix and collect rates for services provided by the project sufficient to pay operating expense, bond principal and interest and all other payments that may be specified in the trust document. Additionally, revenue bond financing usually requires a debt service coverage of 1.1 to 1.5 times the bond principal and interest requirements, the creation of various reserve and contingency funds and a certain insurance as additional security for the bondholders. Revenue bonds usually yield an interest rate of 50 "basis" points[1] (0.5 percent) or more above rates for

[1] 100 basis points equals one percent (i.e., 1 percent).

G.O. bond financing. Furthermore, they come under very close scrutiny by the investment community since they are not secured by the taxing power of a municipality or county.

Project financing obtained with revenue bonds usually require a "take or pay" energy purchase contract, a "put or pay" solid waste disposal agreement, a guarantee of the facility operating performance, provision for force majeure events, and various types and customary levels of insurance. Significant additions to total capitalization are incurred as reserve funds, interest during construction and issuance costs.

Revenue bonds are usually offered through a negotiated underwriting with one or more investment banking underwriters rather than being sold competitively. A negotiated offering differs from a competitive offering in that the issuer negotiates with one underwriter to determine what profit the underwriter will make. Negotiated interest rates are generally higher than competitive interest rates. However, some of these extra costs are offset by the free advice the investment banker provides during examination of the project and preparation of the revenue bond circular and official statement.

Revenue bonds are generally issued with maturities ranging up to 30 years. In order to issue revenue bonds, the governing body of a municipality (or authority) must adopt a bond resolution specifying the application of bond proceeds to the construction of the project, creating a lien on revenues of the project, and setting forth the rights of the bondholders and obligations of the issuer.

A revenue bond circular and official statement summarize for prospective purchasers of the bond the necessary information about the project. The documents may take several months to prepare and will contain a great deal of information about the project's technical and economic feasibility. Usually, the local government will hire a consultant to confirm the investment banker's estimates of costs and revenues. The preparation of the documents describing the project and the investment opportunity makes the transaction costs of issuing revenue bonds higher than that of a G.O. bond.

Referendums are not necessary to approve issuance of a revenue bond. Decisions may be made directly by home rule municipalities or county boards. Since a project is not backed by the taxing power of a city or county, revenue bonds are not constrained by a city's or county's current debt ceiling.

Occasionally, municipalities will pledge tax revenues as additional security. While the issuing entity still primarily relies on project revenues to pay debt service, the "full faith and credit" guarantee of the municipality allows the bonds to be considered as G.O. The bonds then sell at a lower interest rate, typically with greater market acceptance. This approach is used to provide added security to the project in order to enhance its financeability.

The issuing entity, whether a county, municipality or municipal authority, must have the ability to "control" the wastestream and to engage in long-term contracts with private collectors and/or other municipalities to ensure sufficient waste quantities and, thus, revenues to the project. In addition, for waste-to-energy facilities, firm, long-term contracts usually of "take or pay" nature, whereby one or more market agrees to purchase a minimum quantity of facility product and pay a minimum amount for it (whether they use it or not), may be needed before the financing can be completed. These contracts are usually congruent with the life of the bonds.

Advantages

- No balance sheet impact;
- Fewer pre-issuance legal requirements;
- Local government may retain control over operations of the facility;
- Ability to allocate risks; and
- Public user may retain some rewards

Disadvantages

- Implementation takes longer, and transaction must be structured to meet market requirements;
- Typically higher interest rates and need to capitalize construction period interest; and
- No utilization of tax benefits.

(3) Industrial Development Revenue Bonds (IDB) - IDB's are a form of revenue bonds issued through an agency acting on behalf of a municipality or group of municipalities and a private industry or other commercial entity. The issuer is usually a state-designated agency. IDB's, like other revenue bonds, are supported solely by the revenues generated from the project. The major distinction between IDB's and other municipal revenue bonds is that they are not tax-exempt unless they qualify for special exemptions. Under Section 103(b)(4)(E) of the Internal Revenue Code, solid waste disposal facilities are one of the special activities exemptions and, thus, interest income on IDB's issued to finance such projects is exempt from federal income tax.

It is important to note that the U.S. Treasury regulations specify that "solid waste" to be processed or disposed in a facility that is financed with tax-exempt IDB's must be "valueless" at the place it is located. Thus, if anyone is willing to purchase the solid waste at any price, it does not qualify as solid waste. Usually, in most IDB financings, an advertisement is placed in local media to ensure that no party is willing to purchase the unprocessed municipal solid waste. There are other IRS requirements that must be met as well.

In a typical project financed through IDB's, the local government(s) issuing the bond technically owns the facility and the equipment and lends the bond proceeds to a private contractor for facility construction. The actual financing structure and repayment of the bond issue is executed through a lease arrangement, an installment sale, or a loan where the payments are fixed in amounts sufficient to pay bond principal and interest as well as some additional amount as a safety factor. The operation and maintenance expenses are usually the obligation of the facility contractor.

The issuance of IDB's may be linked with equity from the private contractor. This can lower the amount of bonded debt needed for the project and strengthen the commitment of the private party in the project. IDB financing combined with private equity usually permits the private firm or joint venture to gain the benefits of lower cost tax-exempt financing as well as other tax benefits including accelerated depreciation, investment tax credit and interest or rental deductions through constructive tax ownership. In return, the municipality(ies) can achieve a lower cost for disposal of solid waste, as the private contractor is able to pass along a portion of the tax savings in the form of a reduced tipping fee.

IDB's are closely scrutinized by the investment community and require several security features to be marketable. The credit rating of the private industry involved in the project is very important as are the corporate guarantees. Interest rates may be over 100 basis points (i.e., 1 percent) higher than for a comparably rated G.O. bond. Significant additions to total capitalization are incurred through reserve funds, interest during construction, underwriter's spread and other transaction costs.

IDB's may be used in conjunction with other private investment arrangements such as leveraged leasing. Normally, the maximum amount of bond issue permitted for IDB's is $10 million; however, under a special exemption, municipal solid waste projects have no capital expenditure limits.

There are other Federal Acts that influence the financing of solid waste projects with IDB's. These include the treatment of certain tax benefits when projects are financed with IDB's, the amount of tax-exempt IDB's, that can be issued within a particular state in any given year, the amount of funds any one company can obtain through IDB's and the depreciation schedule used.

Advantages

- Lower capital costs borne by revenue bonds resulting in lower debt service; and
- Risks, by law, must be borne almost entirely by private sector.

Disadvantages

- Private ownership precludes State grant money;
- Complexity increases time necessary for implementation;
- IRS revenue ruling may be required;
- Rewards passed to private parties; and
- Public user would have to buy facility at fair market value upon bond retirement.

In Champaign County, it will be necessary to review legislative developments with tax counsel and bond underwriters when considering the financing and ownership structure for a potential project. The tax laws have changed many times in the last several years.

Impact of Financing Costs on Total Project Costs

The total cost of a project and, therefore, the size of the bond issue will obviously vary depending on the financing alternative ultimately selected. Sizing a bond issue is an involved process, the starting point of which is the determination of facility construction costs and any other associated costs, such as, land costs, previous debts for feasibility studies and incentive programs which may be recovered from the bond proceeds. To these costs must be added the costs of issuance, including underwriting fees, bond counsel fees, rating agency fees, printing and engraving costs, trustee fees, independent engineering fees and accounting fees. In addition, in a revenue bond issue for a solid waste project, it is customary to fund various reserves from the bond proceeds such as a debt service reserve fund, a capitalized interest fund, and a contingency fund.

An adjustment to the bond issue size must be made to reflect interest earnings during the construction period on the debt service reserve fund, the capitalized interest fund and the construction fund. These adjustments are a function of the reinvestment interest rate in the market and projected drawdown schedule on the construction fund.

Based on the factors discussed above, the size of the bond issue can be derived. Many of these factors, including interest rates on the bonds, interest earnings available on investments, and drawdown schedule, require information that can only be determined and brought together near the date of the bond sale. Construction cost of a project for a revenue bond issue may constitute 70 percent of the final issue size after allowing for reserve funds, issuance costs, capitalized interest and other adjustments.

The financing of a solid waste project involves a number of key participants other than the principals to the transaction (i.e., the County or City and private companies). These include:

1) Bond Counsel: In a public financing, the bond counsel generally will not serve as the attorney for any specified party, instead, the counsel will act as "special counsel" for the transaction itself. The objective of the bond counsel in this capacity is to render a legal

opinion regarding the securities to be issued rather than to represent any special interests related to the financing.

The counsel will issue an opinion that will cover certain basic issues that are repeated in most financings and follow an established form. The opinion should state that the bonds and the proceedings authorizing their issuance have been reviewed and that their issuance is legal, binding upon the issuer and in conformance with proper governmental proceedings. Government documents verifying the authorization will generally include items such as the minutes of public body meetings, certificates of fact prepared by public officers or agencies, and resolution of the issuing body granting it the statutory authority to issue the bonds.

The legal opinion will also state whether the interest on the bonds is to be exempt from income taxes, states the basis for the exemption and make a reference to all the related statutes. The counsel's opinion will also state if the principal and interest on the bonds are to be paid from specifically designated funds. The primary objective of the bond counsel's opinion, however, is to give an unqualified approving opinion as to the validity of the bonds and their exemption from federal income tax. The opinion is conditioned, upon the subsequent sale, execution and delivery of the bonds in conformity with the law. In addition to rendering a legal opinion, the bond counsel may be called upon by the issuer (who is usually the retaining party) to prepare certain necessary documents in connection with the bond issuance, and to advise the issuer with respect to financing requirements.

2) Underwriter: An underwriter purchases the bonds from an issuer with the intent to distribute the bonds to investors. The underwriter may purchase the bonds as the highest bidder at competitive bidding or in a private negotiated purchase. By paying the agreed price, the underwriter hopes to make a profit later by selling the bonds to an investor at a higher price than was originally paid to the issuer.

The underwriter's role in any financing goes far beyond a basic structuring of the issue. The underwriter will play a major part in developing the financing strategy and in participating in contract negotiations. The underwriter tries to keep the risks to the investor to a minimum so as to assure a market for the bonds at the most attractive interest rates for the project.

The bonds are then sold by the underwriter to insurance companies, banks, bond funds or individuals. Issues can be sold at "public sale," while, in some instances, bonds will be either privately placed or sold on a limited distribution basis. Underwriters also can maintain an active secondary market for the bonds which helps to assure the investor of liquidity.

3) Financial Advisor: A financial advisor can be hired by any of the principals. An issuing body will generally hire a financial advisor to review the financing structure and to advise and comment on it relative to the pricing of the bond issue. The financial advisor's involvement is most important in the planning stages of a financing where coordination and direction are developed. The financial advisor can also be helpful to the issuer in choosing the proper market in which to issue the bonds or in selecting the type of debt instrument which is most suited to the issuer's requirements. Because timing of any bond issue is critical, the financial advisor is similarly useful to an issuer when positioning for market entry. Financial advisors generally do not underwrite the bonds but they are responsible to the party they represent to the extent stated in their contract and outlined by the scope of work.

4) Independent Consulting Engineer: When a facility is ready to be financed on a revenue bond basis, an independent consulting engineer is typically hired by the underwriter to review the project's technical and economic feasibility. On the basis of this review, the engineer prepares a report which certifies the project's feasibility relative to the proposed financing. The report is then included in the Official Statement in the form of an opinion along with necessary supportive information. For any revenue bond financed project, an engineer's opinion is essential to the effective sale of the bonds and in obtaining a reasonable cost of debt to the issuer. The independent consulting engineer does not play a role in the design or construction of the facility but is limited instead to reviewing the project and providing an opinion as to its technical and economic feasibility.

5) Rating Agencies: The sheer size of today's public market for corporate and municipal debt has created the need for an independent and objective means of evaluating new bond issues. Independent rating agencies have therefore developed to help investors by providing an easily recognizable set of symbols (i.e., A, B, C) which grade, on the same scale, a wide range of bond issue types.

The two major rating agencies are Moody's and Standard and Poor's. They rate the bonds as to investment quality. Bonds carrying the same rating, however, are not claimed to be of absolutely equal quality. In a broad sense, they are alike in position, but since there are only nine rating classes, the rating symbols cannot reflect the fine differences that actually exist.

Ratings are obtained from the rating agency by a presentation of all relevant documents on the project financing by the investment banker. If the financing is complex or the security features uncertain, a formal presentation will be made by the investment bankers stressing the project's unique aspects. This procedure ensures that the best possible rating will be obtained. Ratings can significantly affect the marketability and price of a given bond, so securing the highest rating possible is vitally important to any issuer.

6) Trustee: The trustee is usually a commercial bank which performs the functions defined in the trust indenture. Generally, the trustee's role is to receive a distribute bond proceeds in accordance with established legal principals. This procedure is an important aspect of the security of the transaction.

The trustee is generally responsible for the investment of monies in the various funds which secure the bonds and in promptly paying the principal and interest payments on the bonds. The trustee is also responsible for seeing that the investor's interest are protected in the case of default in any of the contractual obligations related to the bond issue.

There are a number of other items that must be considered when financing a solid waste facility. These items include State requirement regarding the sale of bonds, tax considerations, maximum interest rates, debt limitations, referendum requirements, and State statutes regarding issuing authority. In Champaign County, under the Agreement which formed the ISWDA in July, 1986, there is a concern about the powers home-rule municipalities have versus the powers the non-home-rule County has. Each of these concerns is affected by the type of financing method selected. Regulations regarding what political subdivision may issue G.O. bonds can be different which political subdivisions may issue revenue bonds.

General obligation bonds can be issued by home-rule and non-home rule municipalities. However, the non-home rule municipalities can only issue a G.O. bond after a referendum vote. Currently, non-home rule municipalities are not allowed to issue G.O. bonds for solid waste systems. Only home rule municipalities do not have a limit on the amount of the G.O. bonds issued. Non-home rule municipalities can only issue G.O. bonds equal to or less than 8.625% of the equalized or assessed value of taxable property. The county's debt ceiling is 5.75% of the equalized or access value of taxable property. Districts are limited to o.5% of the taxable property within the district. Municipal Joint Action Agencies are not permitted to issue G.O. bonds.

Revenue bonds can be issued by counties; home-rule municipalities; districts; and Municipal Joint Action Agencies. Revenue bonds cannot be issued by non-home rule municipalities for solid waste systems; a service charge can be assessed instead. In general, the bond must be payable from the project revenues. Districts can issue revenue bonds with a maximum due date of 20 years. Revenue bonds do not count toward debt limitations.

Only home-rule municipalities can issue variable rate demand bonds or private activity bonds. The private activity bonds issuance has a limit equal to $150 times their population based on allocation from the State pursuant to the IRS code.

Another concern is the debt limit of any municipal corporation issuing bonds. Generally, no revenue bond would be included within the debt limitations imposed upon municipal corporations since revenue bonds do not have a claim upon the general taxing authority of the issuing body. G.O. bonds, on the other hand, are unlimited obligations of the municipal corporation and will be included in any calculation required to limit aggregate indebtedness. The State sets the levels of indebtedness a political subdivision can commit itself. Any non-home rule municipality considering issuing a G.O. bond for a solid waste facility would need to carefully review the possibility of future bond issues as well as any current indebtedness. A sizeable issue could tie up non-home rule county's bond power up to 20 years (or the length of the bond). Table 16 summarizes bond limitations and capacities for the member governments of the ISWDA.

TABLE 16

BONDING CONSIDERATIONS

Jurisdiction	Bond Limitation	Outstanding Bonds	Remaining Bond Capacity	Potential Future Bonds
Champaign County[1]	$39 million	$3.1 million[2]	$35.9 million	Jail Expansion
City of Champaign[3]	N.A.	$9.3 million[4]	N.A.	Campus Parking, Main Street
City of Urbana[5]	N.A.	$3.8 million[6]	N.A.	University Ave (TIF) Parking Deck (TIF)

N.A. = Not Applicable since home-rule unit.

1 Source: Personal communication with Laurel Prussing, County Auditor. September 4, 1990. (As of November 30, 1989).
2 Includes capital leases
3 Source: Personal communication with Richard Schnur, City of Champaign Comptroller, August 31, 1990.
4 General Obligation Bonds only.
5 Source: Personal communication with Ron Eldridge, City of Urbana Comptroller, August 31, 1990.
6 Although these bonds were issued as G.O. Bonds, they will be repaid through Tax Increment Financing District funding.

Project Risk and Risk Management

Risk is inherent in any undertaking, particularly a large capital project such as a solid waste facility. An understanding of the types of risk typically associated with solid waste facilities is an important part in the management of these risks. The nature and degree of risk will vary depending on the stage in a project's lifecycle. Facility failure can occur during construction or acceptance testing. Other areas of risk revolve around recovered material revenues, either from energy or recyclable sales, and tip fee revenues.

The level of risk that the different parties will bear in the development of a solid waste facility must depend on decisions made with regard to ownership and operations. These decisions influence the procurement approach and financing method. The risks that vendors must consider and assume should be viewed carefully by communities and are major factors when determining the selection of developers for potential solid waste facilities. The ability of a vendor to accept certain risks is directly related to the parent company guarantees backing the performance of the developer. A clear understanding of risks and their implications is necessary for project development. Table 17 lists some typical risks associated with facility development.

Construction and Acceptance Testing

Solid waste projects can encounter delays once a final procurement has been made, regardless of the procurement approach. Delays, such as construction delays, can result in greatly increased costs and a much different economic scenario for the project than had been forecast. Cost overruns, mismanagement, inflation, use of construction cost escalation formula or even a force majeure situation, are always risks. These risks can be reduced or managed to a large extent through sound contracts, performance bonds, and other controls. A fixed price construction contract can also minimize the economic impact of such risks.

TABLE 17

Risks During Various Phases of Solid Waste Facility Implementation

- <u>Risks in Construction Phase</u>

Miscalculation by contractor
Changes in cost of materials, equipment, or labor
New legislation requiring changes
Energy purchaser-imposed changes after design agreement (combustion facilities)
Material purchaser imposed changes after design agreement (material recovery and compost facilities)
Subcontractor failure
Force majeure
Cost to operator from delay in revenue
Energy buyer required to buy elsewhere (combustion facilities)
Material buyers choose to buy elsewhere (material recovery and compost facilities)
Interest expenses vary from projections
Labor disputes at facility
Natural catastrophe
Explosion or sabotage
Increase in insurance cost
Changes in legislation
Poor management

- <u>Risks in Start-up Phase</u>

Facility fails to meet performance standards
Design error
Faulty construction
Natural causes destroy all or part of project
Force majeure causes delay
Changes in legislation

- <u>Risks in Operation Phase</u>

Waste-Stream-Related Risks
- Municipalities or haulers fail to deliver sufficient quantities
- Too much waste delivered
- Facility fails to accept
- Refuse haulers' strikes or stoppages
- Waste fails to meet minimum Btu standards (combustion facilities)
- Material fails to meet minimum market specification (material recovery and compost facilities)
- Dangerous materials in waste
- Other changes in waste composition
- Leakage of waste to other disposal options
- Waste composition inappropriate for selected technology

Operations & Maintenance Risks
- Underestimation of labor, materials
- Understatement of transport and disposal costs
- Increases in taxes
- Technical failure
- Depreciation schedule varies from projections
- Changes in legislation
- Price for recovered material varies from projections
- Price for energy varies from projections
- Adverse changes in energy purchaser's financial condition (combustion facilities)
- Adverse changes in materials markets (material recovery and compost facilities)

Various risks are associated with project financing, such as fluctuating interest rates, bond interest rates that are higher than estimated, or simply difficulty in meeting the requirements for financing.

Changes in laws and regulations relating to construction specifications could also occur and these could increase the cost of the project and possibly delay the project. Lack of adequate insurance on the project, insufficient warranties, consequential and incidental damages due to a contractor's or subcontractor's failure to perform, lack of follow-through on parent company guarantees or lack of parent company guarantees can also pose potential risks. Also, challenges such as patent infringement might cause unexpected costs and delays.

Operations

Once the facility is built, there is a risk that it may be unable to meet equipment throughput tests, air pollution control or other environmental safeguards or part of the acceptance tests. These deficiencies may include the failure to produce minimum energy outputs, failure to demonstrate consistent performance at design throughput over a set time period or failure to recover specified material amounts. This often raises issues concerning the validity of the tests, the language in the acceptance criteria, or who performs and interprets the tests. Projects have been held up for long periods of time when acceptance tests could not be met at the end of the construction period. Litigation could be required to resolve the problem of who is responsible for certain costs associated with facility is performance failure. Several parties could be involved, including the project development agency, the system vendor(s), the designer(s), the general contractor and various subcontractors.

Permit delays could also impede the project. One or more permits may be required depending on the type of facility. Permit requirements will also vary with project's site location. Therefore, it is important to establish the facility site or sites as soon as possible so that the permit needs can be fully understood in the early stages of the project planning.

Other risks that can occur once the facility is operating include: O&M costs higher than projected; quality and quantity of products different from expectations; insufficient solid waste or waste composition (including ash residue quality) significantly different from estimates; unscheduled outages or excessive downtime; inflation; force majeure situations; and regulatory changes. Perhaps one of the greatest risks once the system is accepted and in operation concerns the system's reliability and performance. In a waste-to-energy plant, for example, it is important to ensure that key equipment performance risks related to superheater tube life, grate life, turbine downtime, boiler efficiencies, ash quality, and air pollution control equipment efficiency are minimized through proper warranties, performance guarantees or other safeguards. Some vendors will only provide certain guarantees when they actually operate the system or install specific components. A significant operational risk is a failure to train and/or hire dedicated plant personnel. Operational risks could certainly be amplified without such persons operating and managing the project.

Cost escalation due to inflation is always a risk. In many projects, certain cost increases are tied to standard indexes such as the Consumer Price Index (CPI), Wage and Price Index (WPI) or a combination of these or other indexes. There is always a risk of inflation lagging or leading these indexes. In such cases, the project users or the private operator would suffer depending on which direction inflation was heading compared to the index being used. Normally, indexes are used to reduce or eliminate this problem, but they may not track rapid changes in inflation. It is important to examine historical data and current trends when negotiating any contracts involving cost adjustment indexes and ensure that the index is appropriate for the areas of cost adjustment where it is to be applied.

Changes in the characteristics of the solid waste delivered to a solid waste facility can have an impact on operation. The composition changes can lower the fraction or quality of combustibles or recoverable materials. This would reduce the revenue potential per ton of input or increase the unprocessible wastes to be landfilled and thus increase the net cost of operations. An alteration in the wastestream could also cause downtime on material specific equipment.

Reductions in waste quantity received can adversely affect the economics of a solid waste facility. One effect would be to increase the costs to process each ton of waste because of the fixed costs associated with facilities and equipment would be spread across fewer tons. Another effect would be to decrease total annual revenues in terms of the tip fee as well as energy revenue or material sales revenue because there would be less waste with which to produce energy or recover recyclables. Long-term contracts for delivery of waste on a "put or pay" basis ensure either waste delivery or payment for the waste that was not delivered. These may be required by private operators in exchange for assuming the greater risk.

Attention must also be given to the timing of development or expansion of current landfills that would serve as residue and bypass waste sites. Any significant delay could create a disposal problem and increase costs for disposal. This should be considered in the development of an agreement for disposal of residue/bypass waste at an existing landfill or a new landfill, should that option be available.

Revenues

Further consideration must be given to structuring a revenue sharing agreement, in the case of private operation between the development agency and the operator. Insufficient revenues could give an operator the right to terminate or delay operations. Furthermore, in relation to markets, the markets' economic condition or future demands may adversely change. Revenue from the facility, either from tip fees or sales of energy or recyclables, are another area of risk. Careful consideration must be given to both areas when selecting the procurement approach.

An architect/engineer (A/E) approach places the responsibility for this risk on the development agency. There is a slight chance that the A/E firm could be partially responsible if depressed revenues can be traced to design errors. Similarly, there is a slight chance equipment manufacturers or supplies could be held responsible if the equipment does not function as presented. However, these problems may only be covered by equipment guarantees or warranties.

Under a public private partnership arrangement, there is an opportunity to split the revenue risks between development agency and the private sector. The nature of this split can vary and is usually detailed in a contract. These shared risks can take the form of a municipality or development agency guaranteeing a certain amount of solid waste, or tip fees, in return for recovery rates, or sales revenue. Other arrangements can be made, however, in general, the more risk the private sector is requested to take, the higher the end cost of the facility.

Only under a full-service approach does the opportunity to shift all revenue related risks to the private sector arise. However, even under this type of procurement, the private sector will look for some type of reimbursement for assuming the increase risks. As previously mentioned, there may be some risks the private sector will not assume at any cost.

The various areas of risks and how they vary between procurement approaches are shown in Table 18 and 19.

TABLE 18

Assignment of Major Risk Under Alternative Procurement Approaches

Factor	Procurement Method & Ownership[1]			
	A/E Public Owned & Operated [2]	Turnkey Public Owned & Operated	Full-Service Public Owned & Operated	Full-Service Vendor Owned & Operated
TECHNOLOGY				
Reliability	Public/Vendor	Contractor/Vendor	Contractor/Vendor	Vendor
Performance	Public/Vendor	Contractor/Vendor	Contractor/Vendor	Vendor
Environmental	Public/Vendor	Contractor/Vendor	Contractor/Vendor	Vendor
CONSTRUCTION				
Acceptance	Public	Contractor	Contractor	Vendor
Contractor default	Public	Public	Public	Public
Cost overruns	Public/Contractor[3]	Contractor	Contractor	Contractor
Force majeure	Public	Public	Public	Public/Vendor
Delay	Public	Contractor	Contractor	Vendor
Completion	Public/Contractor[3]	Public/Contractor[3]	Contractor	Vendor
Site	Public	Public	Public/Contractor[3]	Vendor/Public[3]
Inflation	Public/Contractor[3]	Public/Contractor[3]	Public/Vendor	Public/Vendor
WASTESTREAM				
Quality	Public	Public	Public	Public
Quantity	Public	Public	Public	Public
Length of commitment	Public	Public	Public	Public
Cost	Public	Public	Public	Public
Residue	Public	Public	Public	Public/Vendor

(1) It should be that a fifth procurement exists between the last two full service options, that it, a full service public owned and private operated procurement. Risk allocation under this procurement approach is dependent on the nature of project solicitation and subject to negotiation.

(2) It is possible to contract operations to the public sector with a major negotiated shift of risks to the public sector typically paid for by a management fee and percentage share of total energy or material revenues.

(3) Predominant risk could be shifted through contract negotiations.

Note: A contractor does not operate facilities or supply proprietary equipment or systems as a vendor will.

TABLE 18 (Continued)

Assignment of Major Risk Under Alternative Procurement Approaches

	Procurement Method & Ownership			
Factor	**A/E Public Owned & Operated**	**Turnkey Public Owned & Operated**	**Full-Service Public Owned & Operated**	**Full-Service Vendor Owned & Operated**
O & M				
Reliability	Public	Public	Contractor/Vendor	Vendor
Performance	Public	Public	Contractor/Vendor	Vendor
Legislation	Public	Public	Public	Public
Economics	Public	Public	Public/Contractor	Public/Vendor
Force majeure	Public	Public	Public	Public
Operators default	Public	Public	Public	Public
Environmental	Public	Public	Public	Public
ENERGY MARKETS				
Quality of product	Public	Public	Public	Public
Quantity	Public	Public	Public/Contractor	Public/Vendor
Term	Public	Public	Public	Public
Price	Public	Public	Public	Public
Customer Reliability	Public	Public	Public	Public
Legislation	Public	Public	Public	Public
MATERIALS MARKETS				
Quality of product	Public	Public	Public	Public
Quantity	Public	Public	Public/Contractor	Public/Vendor
Term	Public	Public	Public	Public
Price	Public	Public	Public	Public
Customer Reliability	Public	Public	Public	Public
Legislation	Public	Public	Public	Public

Material Markets.

Flow Control

Flow control is the term applied to municipalities' control over the final disposal of waste generated within its jurisdiction. Flow control is a regulatory measure that is necessary to consider during facility selection. As previously discussed, the flow of waste to a facility will impact on the facility performance. Municipalities must consider if they are willing to enact such regulatory measures as part of the decision-making process. Flow control is a fairly new regulatory action available to municipalities and there are some legal issues that are still being clarified.

Historically, municipalities have exercised a wide range of control over solid waste produced within its boundaries. If a municipality provided collection service, then it could decide where that waste was disposed. The degree of control decreases where contracts for franchise arrangements are employed while very little control exists in areas that rely on the free market system. The municipalities are usually unable to require private waste haulers to use a specific facility.

However, most solid waste facilities require a minimum amount of waste per year to insure material recovery rates, to meet levels of energy output and to maintain minimum tip fee income. This dependency is recognized by the bond market and therefore, flow control is usually required in order to secure financing for the project. There are several methods of flow control. Flow control can be obtained through contracts, economic flow control, ordinances or state action.

As previously mentioned, when a municipality controls the collection of solid waste, it can control where that waste is disposed. If a facility is developed to service an area with more than one municipality, if all the participating municipalities provide collection, then a contract could enforce flow control. Each participating municipality would sign a contract with the facility's operator stating that all the waste they collected will be brought to that facility. These municipal contracts often include a "put-or-pay" clause. This requires any municipality that does not provide a preset minimum amount of waste, to make a cash payment. This payment, in effect, offsets any lost tipping fee. It may also offset any downtime the facility encounters due to insufficient waste. Dependent upon the size of facility, two or three contracts may be sufficient to guarantee a minimum quantity of waste. However, in other cases, there may be 20 or more individual contracts.

Another version of the contract flow control is the execution of contracts between the operator and private haulers. In areas where the free market system operates, the facility's operator could attempt to obtain individual contracts with private haulers to guarantee the minimum waste levels. However, this may require some economic incentives.

Another option of contract flow control is franchising or contracting for collection services. A municipality may not want to own the equipment or have the collection staff on its payroll, however, it does want to provide collection service. In that case, municipalities may contract out collection services to a private hauler. Part of the contract would require any waste collected as part of the contract to be disposed of at a specified facility. A similar arrangement can be part of a franchise system. Under a franchise arrangement, the municipality usually divides its jurisdiction into sections and then allows different haulers to collect within each area. Prices, usually in the form of caps, can be part of the agreements. It may be possible to require the waste be disposed of at a specific facility as well. Franchises may be subject to voter approval and other constitutional and statutory limitations.

Economic flow control is a situation where a facility operator provides economic incentives for haulers to use the facility. This is usually done by keeping tipping fees lower than the nearest competitors. Additional incentives, such as variable rates on different types of waste may also be part of the economic incentive offered. Economic flow control cannot be enforced through any legal means.

Flow control can also be obtained through local ordinances. However, since the Supreme Court ruled, in 1978, that antitrust laws apply to units of government, there have been a number of lawsuits brought against governments that enact flow control ordinances. Through these lawsuits, a body of case law which pertains to the flow control issue and local ordinances is slowly evolving.

Town of Hallie v. City of Eau Claire, 700 F.2d 376 (7th Cir. 1983) is the most recent and important case bearing on the flow control question. In Hallie, the 7th Circuit Court concluded that a municipality that engages in anticompetitive activity while performing traditional local functions is entitled to "state action" antitrust immunity, even though the activity is not actively supervised by the state. However, the court noted that the municipality must be acting pursuant to a clearly articulated and affirmatively expressed state police -- in this case, the development of sewage treatment systems -- to displace competition. A March 27, 1985 Supreme Court decision on Hallie eliminates the "active supervision" test and relaxes the standard for the "state action" requirement. Justice Brennan, expressing the opinion of the unanimous court stated:

> "We conclude that the actions of the City of Eau Claire in this case are exempt from the Sherman Act. They were taken pursuant to a clearly articulated state policy to replace competition in the provision of sewerage services with regulation. We further hold that active state supervision is not a prerequisite to exemption from the antitrust laws where the actor is a municipality rather than a private party."
>
> U.S. 105 S.Ct. 1713, 1721, 85 L.Ed. 2d 24, 34, (1985)

In the Hybud Equipment Corp. v. City of Akron, 1983-1 Trade Cases 65,356 (N.D. Ohio, April 6, 1983) case, a flow control ordinance was challenged as violating federal antitrust law and the commerce clause of the federal Constitution. It was also alleged by materials recyclers that the ordinance interfered with their ability to recover recyclables from the wastestream and thus denied them due process and constituted the taking of property without compensation. After a seven year battle in the courts, the Akron ordinance was upheld. The city is now amending the ordinance to better reflect the interest of the recycling community, but is not required to do so. The Akron case was decided upon on the basis of "fairly implied" authority rather than "specific detailed legislative authorization." Several Court of Appeals cases have adopted this standard:

> "If the challenged restraints are reasonably related to an agency's express powers and reasonably designed to promote the state aims within a designated field of regulation, they can be found to result from a 'clearly and affirmatively expressed state policy' to displace competition such that the state action exemption is met."
>
> (1984-2 Trade Cases 66, 162 at 66,512 6th Cir., 1984)

The Central Iowa Refuse Systems, Inc. v. Des Moines Metropolitan Solid Waste Agency Nos. 83-1039 and 83-1107 (8th Cir., August 26, 1983) case is another example of the "fairly implied" standard, as is the A-1 Carting v. City of Albuquerque, Case No. 83-0718-JB (U.S., D.C., N. Mex., 1989) case. A-1 Carting challenged a long-standing city monopoly of refuse collection and supporting bond covenants. In neither case did the court require state supervision.

A recent federal statute, the Local Government Antitrust Act of 1984 (P.L. 98-54), provides municipalities with partial protection from antitrust problems by removing some of the incentives for plaintiffs to institute antitrust suits. The Act does not exempt local governments from antitrust law restrictions, but does prevent the recovery against them of all damages, attorneys fees or court costs. Antitrust plaintiffs are limited to injunctive relief; however, it should be noted that an injunction can cause costly delays in project financing or interrupt the waste flow to an operating plant.

In sum, based on the Hallie Supreme Court decision and the Local Government Antitrust Act, communities wishing to pass flow control ordinances must only meet a liberal interpretation of the "state action" requirement, and are no longer liable for severe monetary penalties under the Sherman Act. They are, however, still open to injunctions under antitrust laws, and may be challenged on state and federal Constitutional grounds.

The State of Illinois has adopted solid waste legislation which appears to clearly articulate solid waste management, including flow control, as state policy. On September 25, 1985, P.A. 84-963 (formerly H.B. 2022), "The Local Solid Waste Disposal Act (as amended)", was signed into law. On the previous day, September 24, 1985, P.A. 84-794, as amended (formerly S.B. 734), which amends Section 11-19-5 of the Illinois Municipal Code and complements P.A. 84-963, was signed into law. These laws constitute the most significant pieces of solid waste legislation to be adopted related to flow control in the State of Illinois.

P.A. 84-963 (The Local Solid Waste Disposal Act) permits municipalities, counties and Municipal Joint Action Agencies created under Section 3.2 of the Intergovernmental Cooperation Act (Ill. Rev. Stat. (1983) ch. 127, par. 741 et seq.), acting alone or in cooperation, to prepare and implement solid waste management plans for disposal of solid waste[1] generated within their jurisdictions.[2] The Act became effective on January 1, 1986. Section 6 of the Act specifically addresses flow control issues:

> "In accordance with the provisions set forth in Section 11-19-7 of the Illinois Municipal code and Section 25.11a of "An Act to revise the law in relation to counties", approved March 31, 1874, as amended, units of local government may provide by ordinance, license, contract or other means that the methods of disposal of solid waste shall be the exclusive methods of disposal to be allowed within their respective jurisdictions, notwithstanding the fact that competition may be displaced or that such ordinance, license, contract or other measure may have an anti-competitive effect."

In addition, Section 8 of the Act amends Ill. Rev. Stat. (1983) ch. 34, par. 417, by addition of the following:

> "In order to secure repayment of revenue bonds issued to finance regional pollution control facilities, to further this State's policies and purposes, to

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[1]"Solid Waste" is defined in Section 2 of the Act; material intended or collected to be recycled is excluded.

[2]"Jurisdiction" is defined in Section 2 of the Act. Note the jurisdiction of a county extends only to unincorporated areas.

> advance the public purposes served by resource recovery, and to authorize the implementation of those solid waste management policies counties deem in the public interest, any county which has prepared a solid waste management plan or is a signatory to a plan providing for the management of solid waste generated by more than one county or municipality, shall have the authority to require by ordinance, license, contract or other means that all or any portion of solid waste, garbage, refuse and ashes generated within the unincorporated areas of a county be delivered to a regional pollution control facility designated by the county board or a transfer station serving such facility for treatment or disposal of such materia. Such ordinance, license, contract or other means may be utilized by a county to ensure a constant flow of solid waste to the facility notwithstanding the fact that competition may be displaced or that such measures have an anti-competitive effect. A county may contract with private industry to operate the designated facility and may enter into contracts with private firms or local governments for the delivery of waste to the facility. Signatories to a solid waste management plan shall have the right of first access to the capacity of the facility notwithstanding such contracts with private firms or other units of local government."

and Section 7 of the Act amends Section 11-19-7 of the Illinois Municipal Code (Ill. Rev. Stat. (1983) ch. 24, par. 11-19-7) in pertinent part, as follows:

> ". . . (f) If the contracting parties so desire, an undertaking that they will provide by ordinance, license, contract or other means that the methods of disposal employed within any municipality with more than 130,000 but less than 2,000,000 population, or within any municipality which is a signatory to a plan providing for the management of solid waste generated by more than one municipality or county, shall be the exclusive method of disposal to be allowed within their respective jurisdictions, notwithstanding the fact that competition may be displaced or that such ordinance or agreement may have an anti-competitive effect. . . ."

All three of these sections contain clear expressions of a state policy to assure flow control in connection with solid waste disposal projects, despite the anti-competitive effects, which would appear to meet the requirements of Hallie v. Eau Claire.

The Act also extends the maximum term of municipal contracts for the collection or final disposition of garbage, refuse and ashes to 30 years. In addition, counties are given the power to furnish facilities for the disposal of solid waste by "other appropriate technologies" in addition to sanitary landfill methods.

The Act may create potential contracts clause problems in Section 8 by requiring that signatories to a solid waste management plan be given the "right of first access to the capacity of the facility notwithstanding contracts with private firms of other units of local government."

P.A. 84-794 amends Section 11-19-5 of the Illinois Municipal Code (Ill Rev. Stat. (1983) ch. 24, par. 11-19-5) by extending the power to enact flow control ordinances to all municipalities regardless of their population and eliminating the potentially unconstitutional provision regarding population limits noted in Section 7 of the Act.

Another recent amendment to Article II of the West Frankfort Civic Center Law, P.A. 85-0014, included waste management activities. Powers granted in this act to governments units include the authority to control and regulate the disposal of waste within the borders of the county. The county is authorized to prepare a solid waste management plan. The county board is further authorized:

> "to adopt any procedures necessary to implement any such plan and to provide by ordinance, license, contract or other means that the methods of disposal of solid waste shall be the exclusive methods of disposal to be allowed anywhere within the borders of the county, notwithstanding the fact that competition may be displaced or that such ordinance, license, contract or other measure may have an anti-competitive effect. Notwithstanding the above granted authority the county shall not have the authority to control or regulate the collection of the waste within the corporate boundaries of any municipality."

Although untested in courts at this time, this law appears to give county governments the ability to control the flow of waste within their boundaries. Although a county may not control or regulate waste collection in municipalities, they may control where the waste is ultimately disposed and if intermediate processes such as recycling, reuse, or incineration must be implemented. In unincorporated county jurisdictions, collection may also be controlled or regulated along with hauling, processing, intermediate and final disposal destination, and other waste management activities.

The Local Solid Waste Disposal Act and P.A. 84-794 appear to adequately meet the state policy requirements of Hallie v. Eau Claire, in that the assurance of flow control to solid waste disposal projects by municipalities and counties is clearly expressed. Therefore, control of solid waste to a solid waste facility, whether a materials recovery facility or waste-to-energy plant, can be mandated. However, the structure of the Act should be examined carefully as it may create new problems unrelated to flow control, including contract clause questions and jurisdictional and siting issues. In addition, it should be noted that in Illinois, the question of state supervision of these activities may also be an issue.

One final method to obtain flow control is through state legislation specifically empowering the local jurisdiction to compel delivery of municipal solid waste to specified sites. Such state legislation may be followed up by a local ordinance, but very clear "state action" in regard to flow control is needed to deter antitrust litigation. The Pinellas County, Florida project is a good example of this approach. Section 4 of the Pinellas County Solid Waste Disposal and Resource Recovery Act (Chapter 75-487 of the Laws of Florida, as amended by Chapter 78-604) gives Pinellas County the power:

> "(3) To compel the inhabitants, persons, firms, corporations, municipalities,political subdivisions or other public agencies or bodies located within the territorial boundaries of the County to use such system for solid waste disposal."

The Act further authorized the County:

> "(4) To prohibit by ordinance the operation of maintenance of solid waste disposal systems or facilities by any person, firm, corporation, municipality, political subdivision, state agency, or public or private body within the territorial boundaries of Pinellas County, except as operated or maintained by agreement with the County or by license or permit from the County in a manner authorized by this act."

The County proceeded cautiously, bringing a friendly suit against the municipalities and some haulers in the County. The Circuit Court decision on the case held that the only challenge to the law would be on constitutional grounds. The act itself removes some possibility of suit on such grounds by exempting recyclable materials from the flow control powers:

> "(c) Nothing herein shall be construed to prohibit or limit private waste collectors from extracting from the waste they collect any materials that may have value to such collectors for purposes of recycling, reuse, or resale."
>
> Section 4 (12) (c)

Delaware and Rhode Island give such powers to their statewide Solid Waste Authorities. Similar legislation supporting solid waste facilities has been introduced in such states as Virginia and New York.

As discussed above, there are a number of alternate methods to obtain flow control. Items such as bonding requirements, area competition and type of collection services should be considered while selecting what type of flow control will be enacted. Additional consideration should be given to possible exceptions that may need to be included in a flow control ordinance. An example would be a municipality that currently operates their own solid waste facility and serves the surrounding unincorporated area. With the development of any solid waste facility, whether public or private, it is likely some type of flow control will be necessary.

SECTION FIVE: System Costs

In determining what type of solid waste facility or set of facilities is appropriate for Champaign County, the cost of the entire system should be reviewed. A system consists of the facility capital costs; operation and maintenance costs; transportation and transfer costs; and, disposal fees. Also included are costs related to recycling and other municipal expenditures for current solid waste management. The facility selection should be made in the context of the current and proposed solid waste programs, activities and other facilities. A decision should not be based on the capital cost of the facility alone. How the facility is configured with other activities and the economics of that configuration should be examined. This section will outline eleven system configurations, along with the estimated system costs for each, applicable to Champaign County.

The eleven scenarios that will be discussed are:

Solid Waste Management System Scenarios

Scenario #1 No action; Champaign County waste landfilled in Vermilion County through 2010; no expanded curbside programs.

Scenario #2 No action; Champaign County waste landfilled in Vermilion County through 1995; beginning in 1996, all Champaign County waste landfilled in Coles County; no expanded curbside programs.

Scenario #3 Transfer station built in Champaign County and opens in 1992; all waste transferred to Vermilion County through 1995; beginning in 1996, all waste transferred to Coles County; no expanded curbside programs.

Scenario #4 Transfer station with material recovery component built in Champaign County and opens in 1992; all waste transferred to Vermilion County through 1995; beginning in 1996, all waste transferred to Coles County; expanded curbside program implemented in 1992.

Scenario #5a Transfer station with material recovery and in-vessel composting components built in Champaign County; all waste transferred to

Vermilion County through 1995; beginning in 1996, all waste transferred to Coles County. Transfer station with material recovery opens in 1992; in-vessel composting operation starts in 1997; expanded curbside programs implemented in 1992.

Scenario #5b Transfer station with material recovery and in-vessel composting components built in Champaign County; all waste disposed at a Champaign County landfill; transfer station with material recovery opens in 1992; composting operation starts in 1997; landfill opens in 1995; expanded curbside program implemented in 1992.

Scenario #6 Transfer station with material recovery component built in Champaign County; all waste disposed of in Champaign County landfill; transfer station with material recovery opens in 1992; landfill opens in 1995; expanded curbside program implemented in 1992.

Scenario #7 Material recovery facility built at the same site as the Champaign County landfill; all waste disposed of at Champaign County landfill; both facilities opens in 1995; expanded curbside program implemented in 1995.

Scenario #8 Combustion facility built in Champaign County; ash and residuals transferred to Coles County; incinerator opens in 1995; expanded curbside programs implemented in 1995.

Scenario #9 Combustion facility built in Champaign County; ash and residuals disposed of in Champaign County landfill; both facilities open in 1995; expanded curbside programs implemented in 1995.

Scenario #10 Landfill built in Champaign County; opens in 1995; no expanded curbside programs.

These eleven scenarios do not represent every possible configuration of collection and disposal options. They are intended to offer a range of system costs while addressing State and local goals and accommodating earlier recommendations made in this plan. In developing the system costs for each scenario, there were a number of common assumptions as well as assumptions made for each individual scenario.

Assumptions

In developing the scenarios, there were certain assumptions that remained constant throughout all eleven scenarios. These assumptions consist of baseline information on such items as population and waste generation. Baseline data was developed for the following:

- population growth rates and distribution
- waste generation and growth rates
- current waste disposal sites by township
- transportation costs (includes collection vehicle transport cost to processing or disposal facilities and/or transfer vehicle cost from processing facilities to disposal)
- landfill capacity and closure dates
- recycling base rates and growth rates for public and private sector.
- trip generation

Appendix 1 details these assumptions, as well as assumptions unique to individual scenarios.

Collection Costs

Collection costs were not included in any of the scenarios. This is due primarily to three reasons. The first reason is that there is a wide range in the cost to collect residential, commercial, industrial and construction/demolition waste. It may take two people on a packer truck all day to make enough residential stops to fill the truck. However, it would take one person one stop to collect an equivalent amount on a commercial route. This divergence of costs would be difficult to summarize for inclusion in the system costs. The second reason the collection costs are not included is that within each collection type - residential, commercial, etc. - the costs should be fairly consistent. That is, all residential haulers incur approximately the same costs to collect equal amounts of solid waste. The final reason is, this cost would be the same regardless of where the fully loaded vehicle tipped. All the system costs would simply be increased by a constant number. In these analyses, instead of attempting to determine what that number would be, it has been eliminated from the costs.

The scenarios were developed to provide several pieces of information; the major ones were:

1) System costs per ton,
2) Tip fee per ton, and
3) Waste disposition by service sector (public, private or other) and technology option (landfilled, incinerated, recycled or composted)

The first two cost items are related. The tip fee is included as part of the system costs. The tip fee is intended to provide an estimate of the actual fee a hauler would pay to dispose of their load at the primary facility in each scenario. Scenarios #1 and #2 have average tip fees. These tip fees are not intended to represent any one landfill. In both scenarios, there are several landfills used for final disposal through 1995. The tip fee is a blended average of all the landfills' fees and is intended to provide a point of comparison.

The system costs were calculated by adding the transportation costs to the tip fee. These are the costs incurred, by haulers, to get a fully loaded vehicles, after collection, to the primary facility. Again collection costs were not included. However, the costs of driving a full packer truck 10 miles versus 70 miles roundtrip to a disposal site can be, and was, calculated and included in the system costs.

Recycling Programs

Recycling services are offered by the public, private and non-profit sectors in Champaign County. To account for increases in recycling, the cost and quantity of material from the recommended curbside expansions was included in scenarios that provided for increased processing capacity. The private and non-profit sectors' recycling efforts were allowed natural growth. However, by increasing the public sector recycling activities, a more even distribution of services between the public and private sectors is achieved.

In the scenarios that offer expanded processing capacity and expanded curbside, it was estimated an additional 20% of the wastestream could be recovered. This 20% includes the material generated through the expanded curbside as well as the material recovered from the mixed wastestream. A large increase by the private or non-profit sectors will increase the proportion of the 20% available that they receive.

In summary, the expanded curbside recommendations were:

1) Urbana should add HDPE to their curbside collection;
2) Urbana and Champaign should add buildings with 5-9 units to the curbside collection routes, with a target participation rate of 30%; and,
3) Urbana and Champaign should add paperboard/cardboard to their curbside collection.

Also included was a recommendation to maintain voluntary programs and to raise participation levels among the currently eligible households into the 45-55% level. A more detailed description of these recommendations can be found in Part III.

The estimated quantity of material and the associated costs increases were incorporated into Scenarios #4, #5a, #5b, #6, #7, #8, and #9. There was no expanded curbside included in Scenarios #1, #2, #3 and #10. Instead, these scenarios include current recycling costs and quantities. No expansion was included in these scenarios because no additional processing capacity was developed. There would be no place to take the additional material from an expanded curbside program. The scenarios that included expanded curbside featured additional processing capacity which could handle the extra material.

Energy and Environmental Costs

The energy and environmental costs associated with each scenario are included in the system costs. There are two items in each scenarios' analysis that accommodate the energy and environmental costs; the operation and maintenance (O&M) and the transportation figures.

Energy Costs

The energy costs associated with solid waste facilities take two primary forms; the energy needs of the facility and the energy required to move solid waste (and recyclables) to and from the facility. Energy costs required to operate the facility, and all the equipment, are part of the O&M costs. The O&M costs, in turn, influence the tip fee and system costs. No attempt was made to rate the energy efficiency of each facility type.

The second area of energy costs revolve around transportation. These costs are accounted for in two ways. The first is the transport costs. As discussed previously, transport costs are the costs to a hauler to move a fully loaded vehicle to the facility to tip. This does not include any costs for collection. These costs vary depending upon the type of service and the individual haulers. However, within each type of service, the costs should remain fairly consistent or the inefficient hauler could not stay in business under the current free market hauling system. The energy required by the haulers to bring waste to the facility is accounted for in the analysis.

Energy costs for transferring the waste to final disposal are accounted for under transfer costs. This includes operation and maintenance for the transfer trailers. This cost is reflected in the tip fee.

Environmental Costs

Environmental costs were integrated into the capital costs for each solid waste facility when the costs could be identified. The identified costs include such items as pollution control technology at the combustion facility and the landfill. Post-closure care for a transfer station involves maintenance of the facility for 1 year. If no activity was taking place there, this cost would be minimal. The pollution control technologies associated with an incinerator included a baghouse and an electrostatic precipitator (ESP). The estimated costs for air pollution control equipment was just over $2 million. With a landfill, the necessary pollution control technology costs include leachate and gas monitoring equipment as well as substantial post-closure costs. The estimated cost for these activities were $1,082,200 for leachate and drainage systems, $6,600 for gas migration equipment and $5.5 million for closure and post-closure, long-term care requirements.

The eleven scenarios can be divided into the following four categories based on the location of the final disposal site. Those categories are:

No-Action With Out-of-County Disposal	Expanded Processing* with Out-of-County Disposal	Expanded Processing* with In-County Disposal	No Action with In-County Disposal
Scenario #1	Scenario #3	Scenario #5b	Scenario #10
Scenario #2	Scenario #4	Scenario #6	
	Scenario #5a	Scenario #7	
	Scenario #8	Scenario #9	

* Processing can include expanded source separated recovery, or mixed waste recovery, composting or incineration for energy recovery.

The no-action with out-of-county disposal category is basically a baseline to compare the other options against. If nothing is done to alter the current collection and disposal system, the no-action scenarios with out-of-county disposal illustrate the costs and waste distributions associated with that action. The expanded processing with out-of-county disposal scenarios use the same landfills as the out-of-county no-action scenarios, but some type of facility is developed in Champaign County. These facilities range from a transfer station to an incinerator. The facilities, except for the transfer station alone, also provide additional processing capacity. This additional capacity allows expansion of recycling programs, especially the municipally sponsored curbside program. Despite the development of a facility, these scenarios will continue to rely on private, out-of-county landfills for final disposal. The next category, expanded processing with in-county disposal, includes development of a landfill in Champaign County in all the scenarios as well as some other type of facility. This breaks the reliance on out-of-county disposal. The final category, no-action with in-county disposal, estimates the costs associated with development of a landfill only in Champaign County. There is no additional recycling because no additional processing capacity is developed.

No-Action with Out-of-County Disposal

Scenario #1	No action; Champaign County waste landfilled in Vermilion County through 2010; no expanded curbside programs;
Scenario #2	No action; Champaign County waste landfilled in Vermilion County through 1995; beginning in 1996, all Champaign County waste landfilled in Coles County; no expanded curbside programs.

The no-action scenarios are intended to model the future costs and distribution of solid waste generated in Champaign County if the current collection and disposal system is unaltered. The two scenarios differ only in the location of the landfill used for final disposal. These scenarios are to be used as a baseline for comparisons with all other scenarios.

System Costs and Tip Fees

Under the no-action scenarios, the tip fees calculated are a blended average of the tip fees charged at all the landfills used in the scenarios. They are not intended to represent any one landfill's fee schedule. Both no action scenarios begin at about $24.00 per ton (1990) to transport and dispose of one ton of solid waste which includes a tip fee of $13.00. All of the waste would be transported to Vermilion County. In Scenario #1, where the waste is disposed of in Vermilion County through 2010, the system costs steadily rises to $190 per ton with an estimated tip fee of $114.00 per ton.

In Scenario #2, the cost per ton follows the costs in Scenario #1 until 1996. That is when the Vermilion County facility closes and the waste must then be transferred to Coles County. This closing date was determined by using the reported remaining capacity for the Vermillion County landfill from the IEPA's 1989 Annual Available Disposal Capacity Report. In addition, it was calculated that if all Champaign County's Waste was disposed of in Vermillion County, the landfill would close in nine years. (See Part I for detailed discussion). This closure could also model a "lock-out." This is when a landfill operator, public or private, prohibits the importation and disposal of waste from a particular geographic area. Under current conditions, this represents what the costs would be of not having access to the "nearest" landfill. Instead of an estimated system cost of $73.00 per ton, the estimated cost is $95.00 per ton. This is due to the increased distance the waste must be transferred. Under Scenario #2, costs continue to be higher throughout the planning period. In 2010, the estimated system cost per ton is $243.00 to dispose of solid waste in Coles County.

Waste Distribution

If no changes are made to the current waste disposal system, the distribution of waste will also remain unchanged. The distribution of waste for both scenarios is the same; the only difference is where the waste is transported. By maintaining the current level of recycling in both the public and private sectors, the percent of waste recycled will remain at about 30%. Conversely, approximately 70% of Champaign County's solid waste will be landfilled through 2010. There is no reduction in landfill dependence.

Figure 9 and Figure 10 illustrate the system costs per ton and the tip fee for each no action, out-of-county disposal scenarios. Accompanying each cost figure is a graph illustrating the waste distribution under each scenario.

Expanded Processing with Out-of-County Disposal

Scenario #3	Transfer station built in Champaign County and open in 1992; All waste transferred to Vermilion County through 1995; beginning in 1996, all waste transferred to Coles County; no expanded curbside programs.
Scenario #4	Transfer station with material recovery component built in Champaign County and facility opens in 1992; all waste transferred to Vermilion County through 1995; beginning in 1996, all waste transferred to Coles County; expanded curbside program implemented in 1992.
Scenario #5a	Transfer station with material recovery and in-vessel composting components built in Champaign County; all waste transferred to

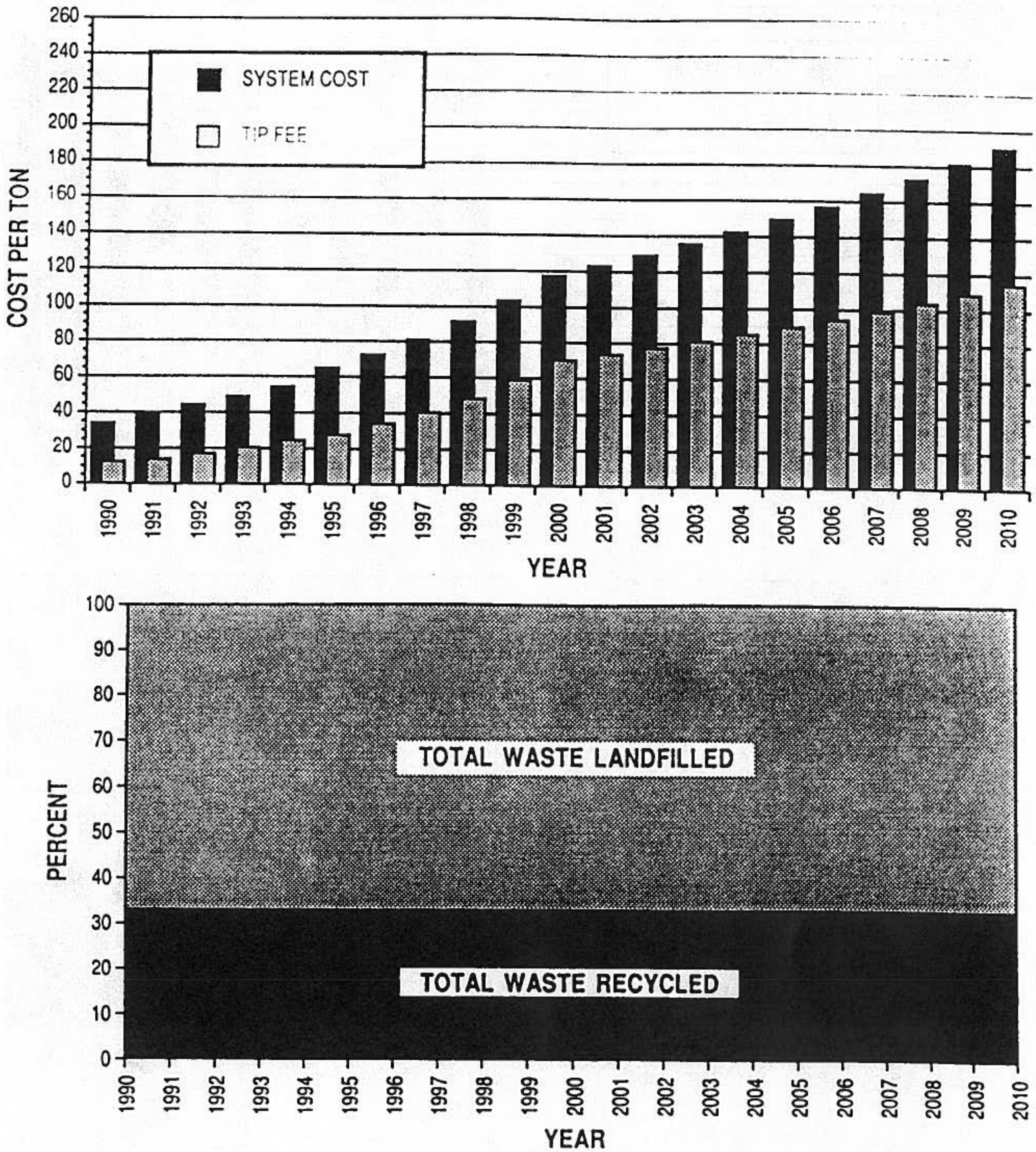


FIGURE 9

System Cost, Tip Fee and
Waste Distribution
Scenario #1

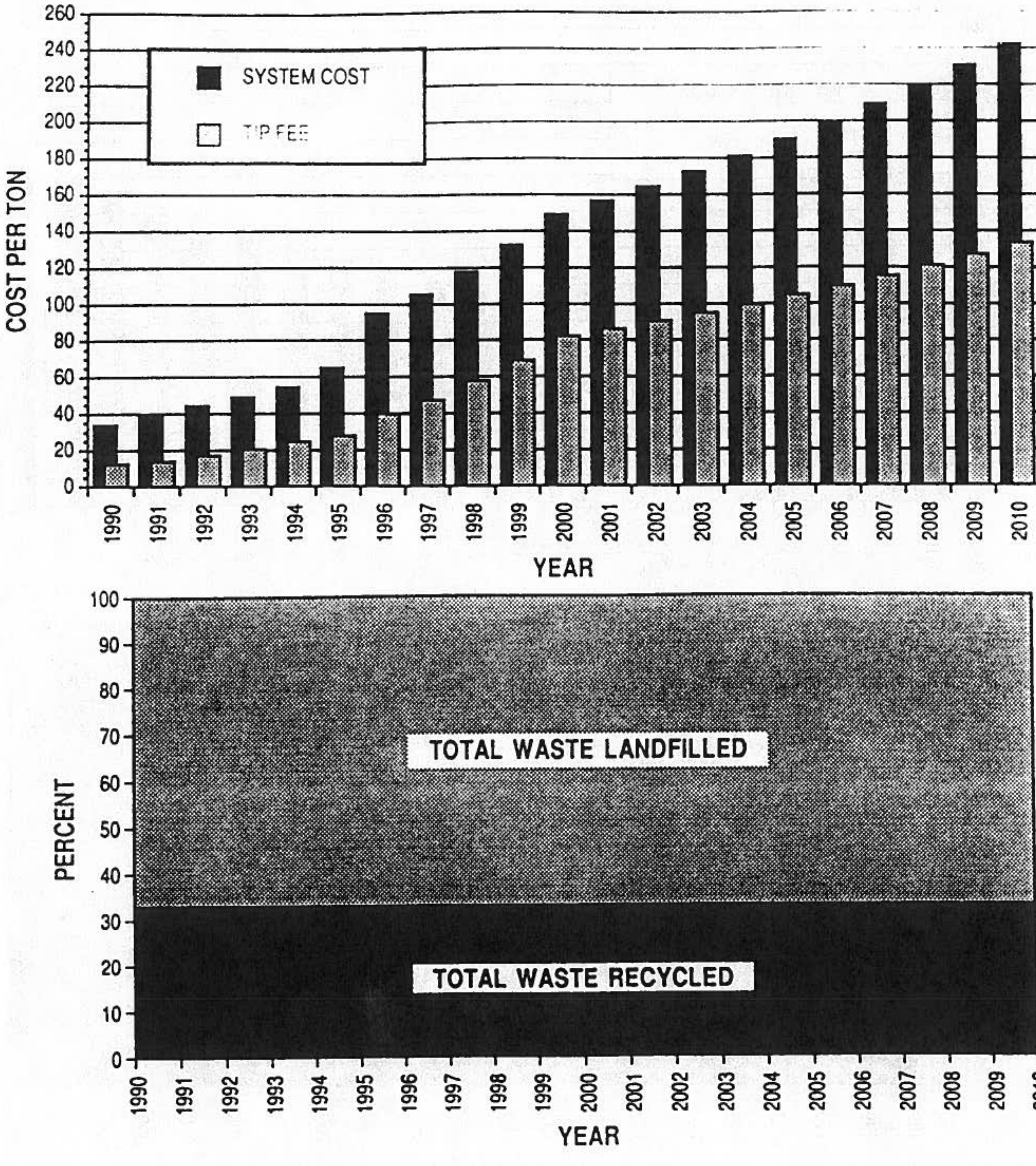


FIGURE 10

System Cost, Tip Fee and
Waste Distribution
Scenario #2

	Vermilion County through 1995; beginning in 1996, all waste transferred to Coles County. Transfer station with material recovery open in 1992; In-vessel composting operation starts in 1997; expanded curbside programs implemented in 1992.
Scenario #8	Combustion facility built in Champaign County; ash and residuals transferred to Coles County; Incinerator opens in 1995; expanded curbside programs implemented in 1995.

The out-of-county disposal scenarios all use private landfills located outside of Champaign County. There is some type of facility developed in Champaign County in each scenario. This facility development affects the handling of solid waste. Individual packer trucks are no longer making the trip to an out-of-county landfill. This facility development also becomes the location where the haulers pay a tip fee. The tip fees calculated are intended to estimate the tip fee a hauler would pay at each type of facility.

System Costs and Tip Fees

Scenario #3 includes the construction of a transfer facility in Champaign County. It would be open in 1992. The first year of operation would have an estimated system cost of $53.00 per ton; the tip fee would be about $47.00 per ton. These costs increase through 2010 until the system cost is $241.00 per ton and the tip fee is $221.00 per ton (Figure 11). One of the major cost increases is due to a projected closing of Vermilion County's landfill in 1995. Beginning in 1996, as in Scenario #2, the waste must be transferred to Coles County.

The next scenario, #4, adds a material recovery component to the transfer station. Because of this addition, the expanded curbside programs are implemented in 1992 when the facility opens. In 1992, the estimated system costs is $57.00 per ton including a $51.00 per ton tip fee. As shown in Figure 12, the costs increase to $192 per ton for the system costs and $172.00 per ton for the tip fee by 2010. The increase is less than the transfer station because there is less waste to transfer to final disposal because of the recycling and recovery activities.

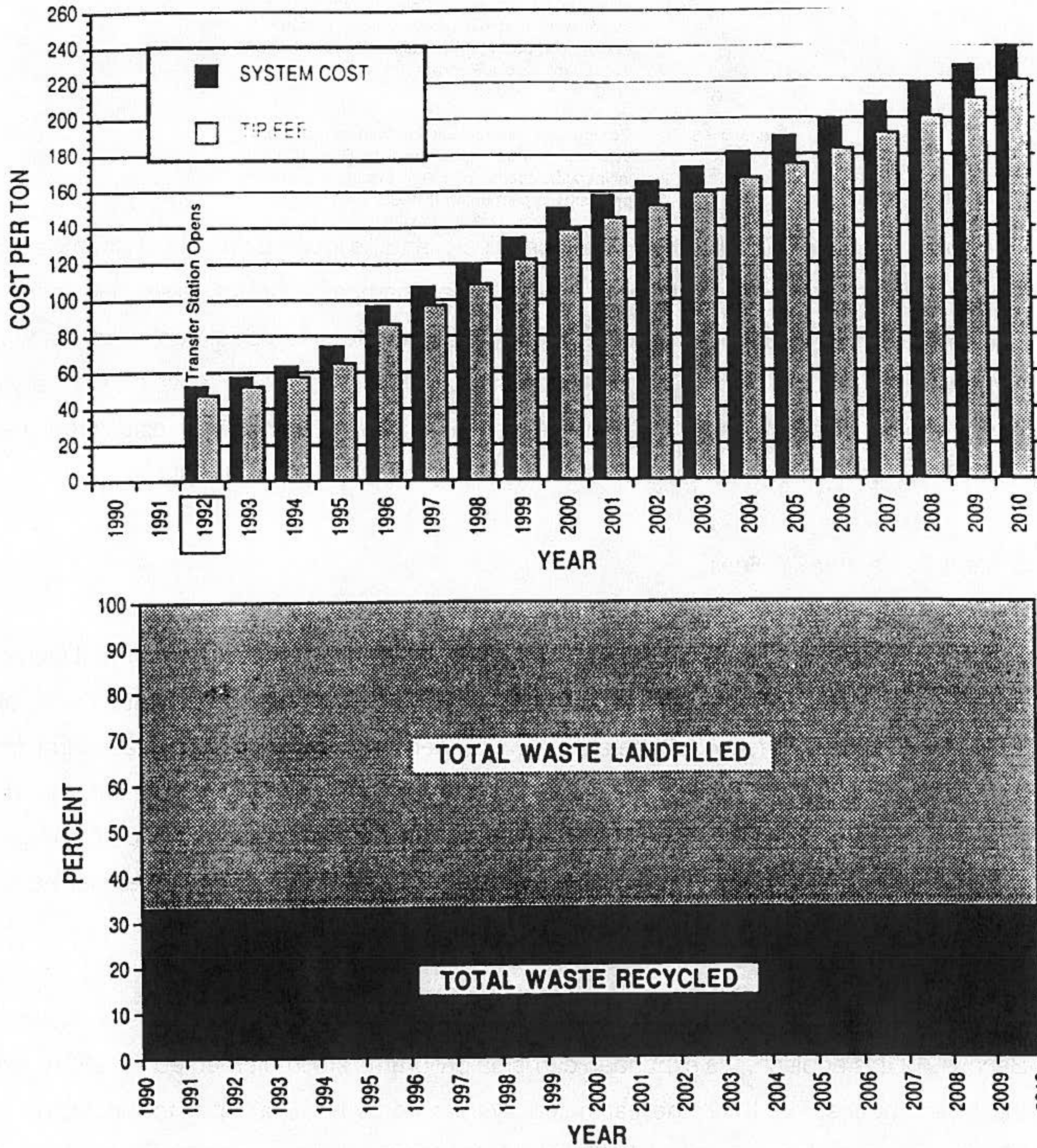


FIGURE 11

System Cost, Tip Fee and
Waste Distribution
Scenario #3

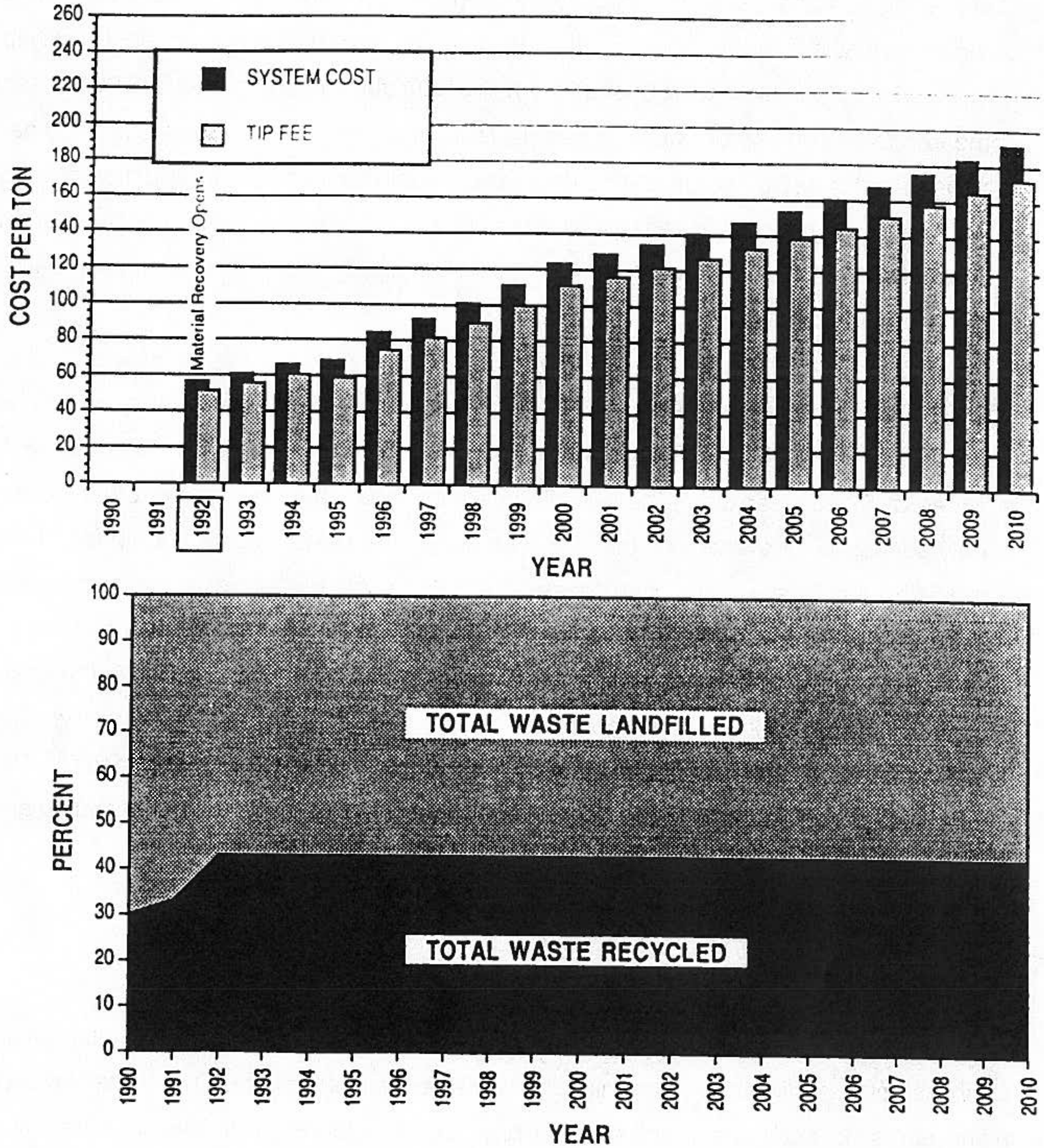


FIGURE 12

System Cost, Tip Fee and
Waste Distribution
Scenario #4

Composting is added after the material recovery in Scenario #5a. The composting component would become operational in 1997. Prior to that, the system costs and tip fees would be the same and in Scenario #4. In 1997, the system cost is $88.00 per ton compared to $92.00 per ton with just material recovery. The tip fees would be $77.00 per ton compared to $82.00 per ton. This decrease is again caused by the reduction of solid waste that has to be transported to final disposal. By 2010, with composting, the system cost was estimated to be $204.00 per ton which include a tip fee estimated to be $184.00 per ton (Figure 13).

The final out-of-county scenario is #8; the combustion facility. This facility would be operational in 1995. The first year system costs were calculated to be $87.00 per ton with a tip fee of $78.00 per ton. These estimates are higher than any of the other out-of-county scenarios. However, by the next year, 1996, the system costs and tip fee at the combustion facility are lower than those at a transfer station alone; a system cost of $90.00 per ton at the incinerator versus $97.00 per ton at the transfer station. The tip fees have a similar difference; $80.00 per ton versus $87.00 per ton. By 1998, the costs at the incinerator are lower than those at a transfer station with material recovery. The costs are lower at the incinerator by 1999 than those at a facility with composting. The lower costs are attributable to the decrease in waste being transferred out-of-county and therefore, lower transfer costs (Figure 14).

Waste Distribution

The four out-of-county disposal scenarios each have a different waste stream distribution. Each distribution is illustrated in conjunction with the cost information. The transfer station alone offers no additional processing of any kind and therefore the waste distribution remains at the 30/70 split between recycling and landfilling found in the no-action scenarios. With the addition of material recovery, the distribution changes. The percent of waste recycled increases to 43% and the percent of waste landfilled drops to 57%. This distribution remains constant through 2010.

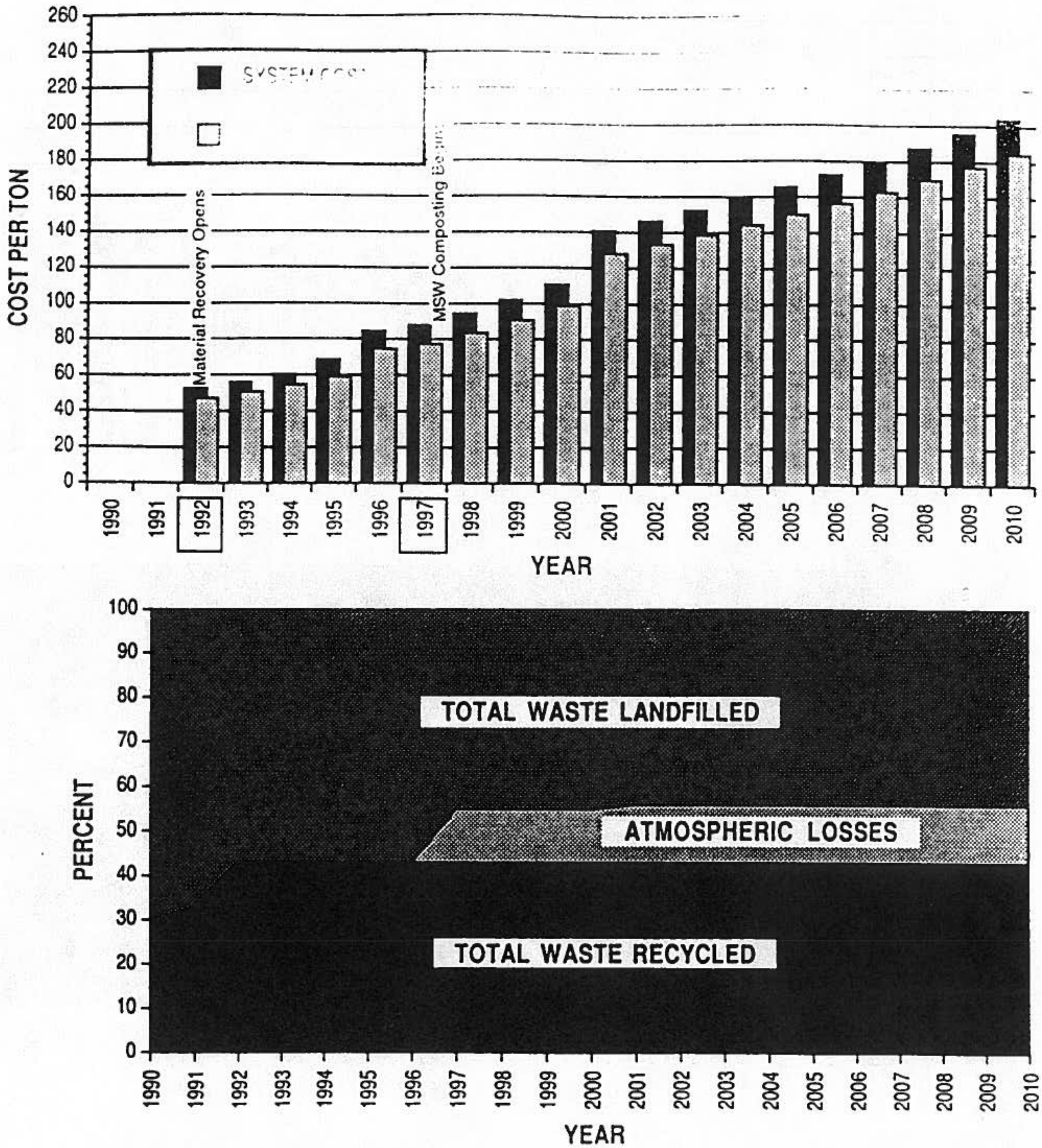
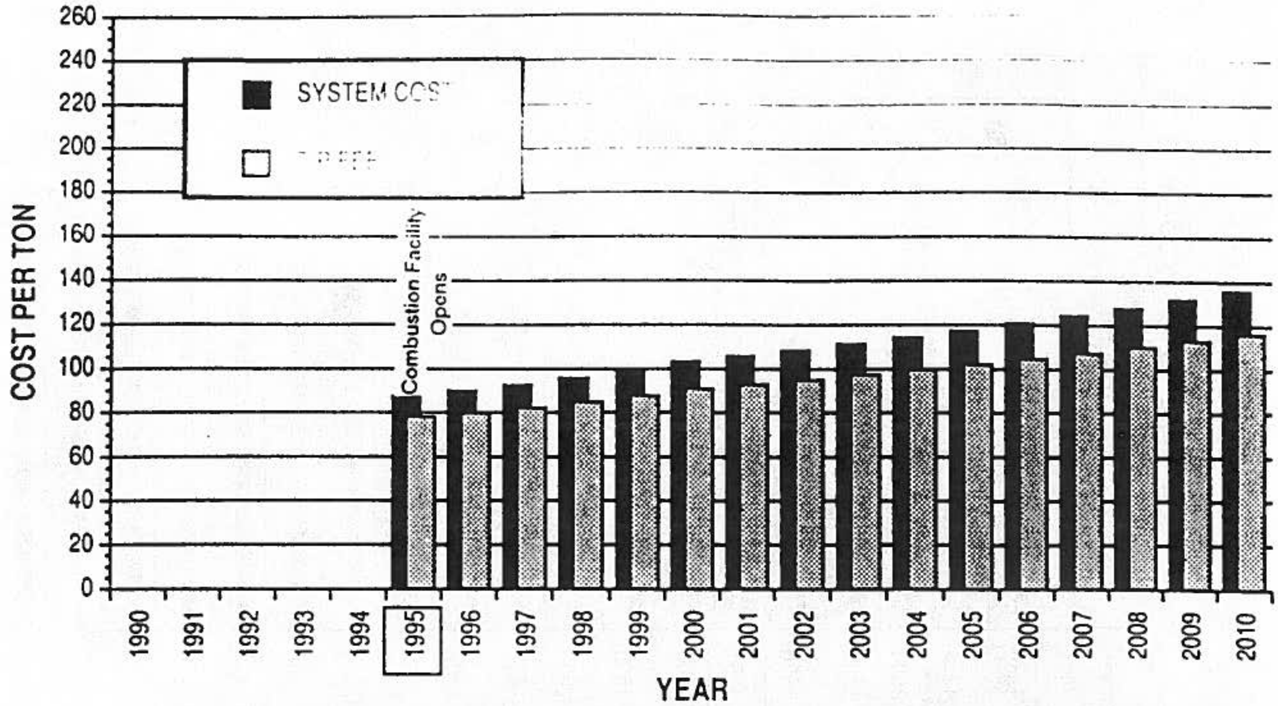


FIGURE 13

System Cost, Tip Fee and
Waste Distribution
Scenario #5a



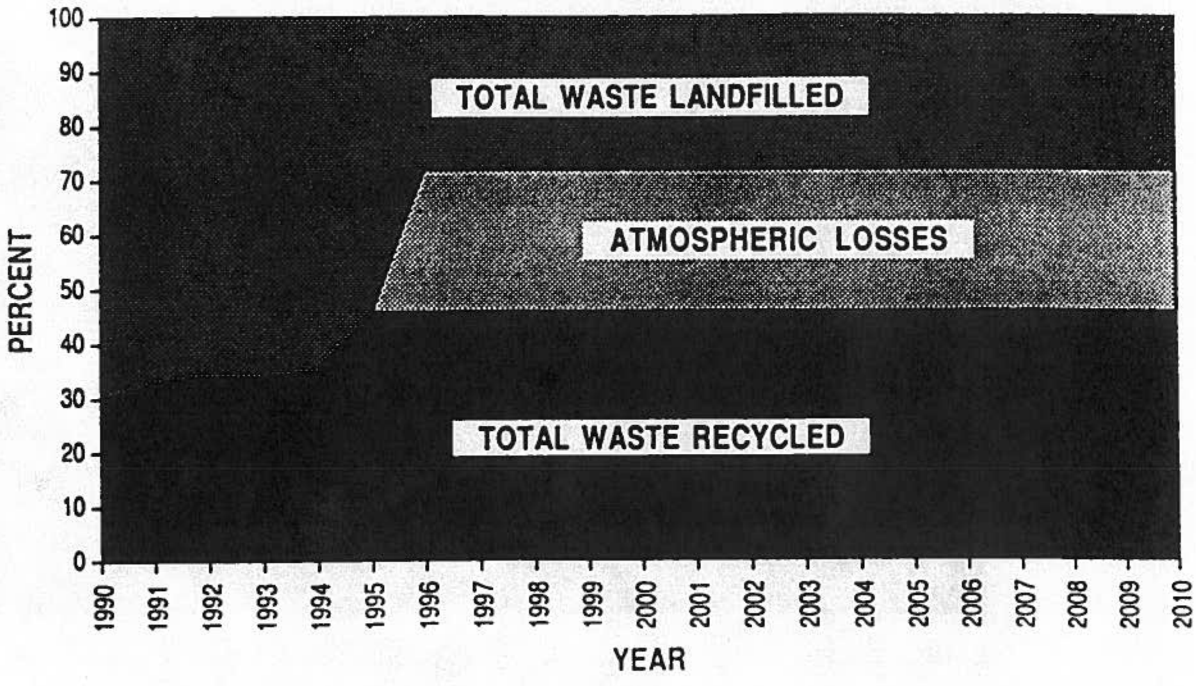


FIGURE 14

System Cost, Tip Fee and
Waste Distribution
Scenario #8

When composting is added, the distribution changes again. Besides just recycled or landfilled, a percent of the wastestream is also lost to the atmosphere. In composting, this is usually from evaporation of liquids, primarily water and carbon dioxide. This was estimated at about 12% of the wastestream. Approximately 43% of the wastestream is recycled and 45% is then landfilled. This distribution remains constant through 2010.

Under the incineration scenario, the atmospheric loss percent increases to 26%. This is now in the form of water vapor, acid gases, metals, organics and particulate matter. The recycling rate remains at about 46% while 28% of the wastestream would be landfilled. As with other scenarios, this distribution would remain constant through 2010.

Expanded Processing with In-County Disposal

Scenario #5b	Transfer station with material recovery and in-vessel composting components built in Champaign County; all waste disposed at a Champaign County landfill; Transfer station with material recovery opens 1992; composting operation starts in 1997; landfill opens in 1995; expanded curbside program implemented in 1992.
Scenario #6	Transfer station with material recovery component built in Champaign County; all waste disposed of in Champaign County landfill; Transfer station with material recovery opens in 1992; landfill opens in 1995; expanded curbside program implemented in 1992.
Scenario #7	Material recovery facility built at the same site as the Champaign County landfill; all waste disposed of at Champaign County Landfill; both facilities opens in 1995; expanded curbside program implemented in 1995.
Scenario #9	Combustion facility built in Champaign County; ash and residuals disposed of in Champaign County Landfill; both facilities open in 1995; expanded curbside programs implemented in 1995.

The four scenarios all include the development of a landfill in Champaign County and the development of some other type of processing facility. All of these costs rise through 2010.

System Costs and Tip Fees

The first in-county scenario is a transfer station with material recovery (#6). The costs between 1992 and 1995 are the same as Scenario #4 because the waste would be disposed out-of-county. In 1995, the Champaign County landfill would open. The system costs were estimated at $83.00 per ton with a tip fee of $74.00 per ton. By 2010, the system costs were calculated at $132.00 per ton while the tip fee would be $113.00 per ton (Figure 15).

The next scenario places a material recovery component at the landfill (#7). Both facilities would open in 1995. The system cost estimate for this scenario, shown in Figure 16, was $86.00 per ton with a tip fee of $64.00 per ton. Although the system cost is higher than scenario #4, the tip fee is lower. This is because individual packer trucks are transporting the waste to the facility. This inefficiency is reflected in the higher system cost. However, since there is no need to provide transfer services, a lower tipping fee can be charged. The highest costs are $141.00 per ton for system costs in 2010 with a $94.00 per ton tip fee.

The composting scenario, #5b, costs follow Scenario #6 until 1997. Once the composting component is functional, the costs diverge. The first year system cost estimates for the composting scenario were $97.00 per ton; the tip fee was estimated at $86.00 per ton. This compares to $88.00 per ton for system costs at the material recovery facility with a $77.00 per ton tip fee. Over the planning period, both the system costs and tip fee estimates for the composting scenario remain higher than the estimates for a facility with material recovery. By 2010, the system cost at the composting facility reach $141.00 per ton with a tip fee of $121.00 per ton (Figure 17) However, if the material recovery facility was on the same site as the landfill, the system costs for the composting facility drop slightly below the system costs for a material recovery facility at the landfill. The tip fees, however, at the compost site remain higher. This reflects the effect of the transfer costs.

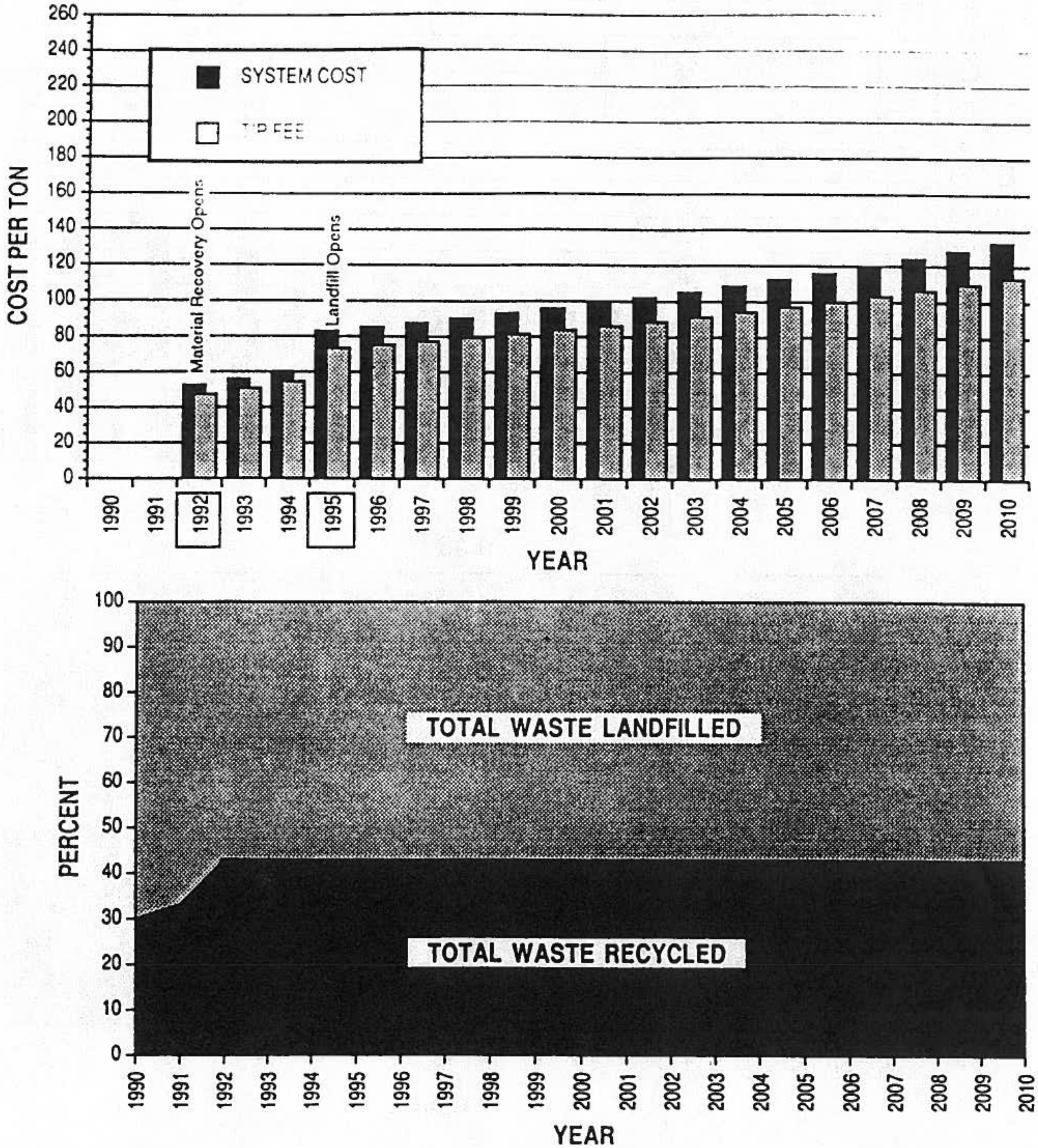


FIGURE 15

System Cost, Tip Fee and
Waste Distribution
Scenario #6

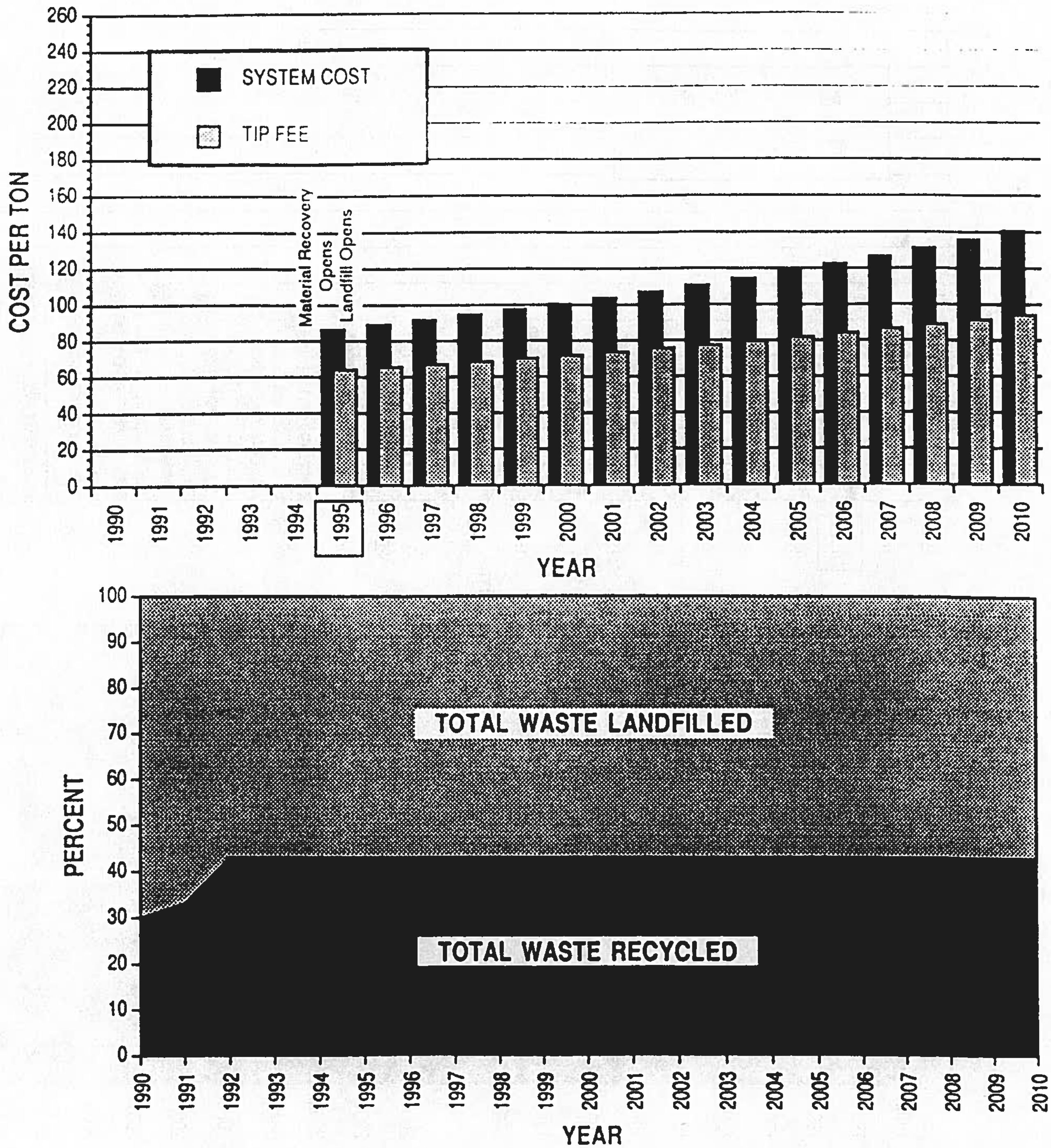


FIGURE 16

System Cost, Tip Fee and Waste Distribution
Scenario #7

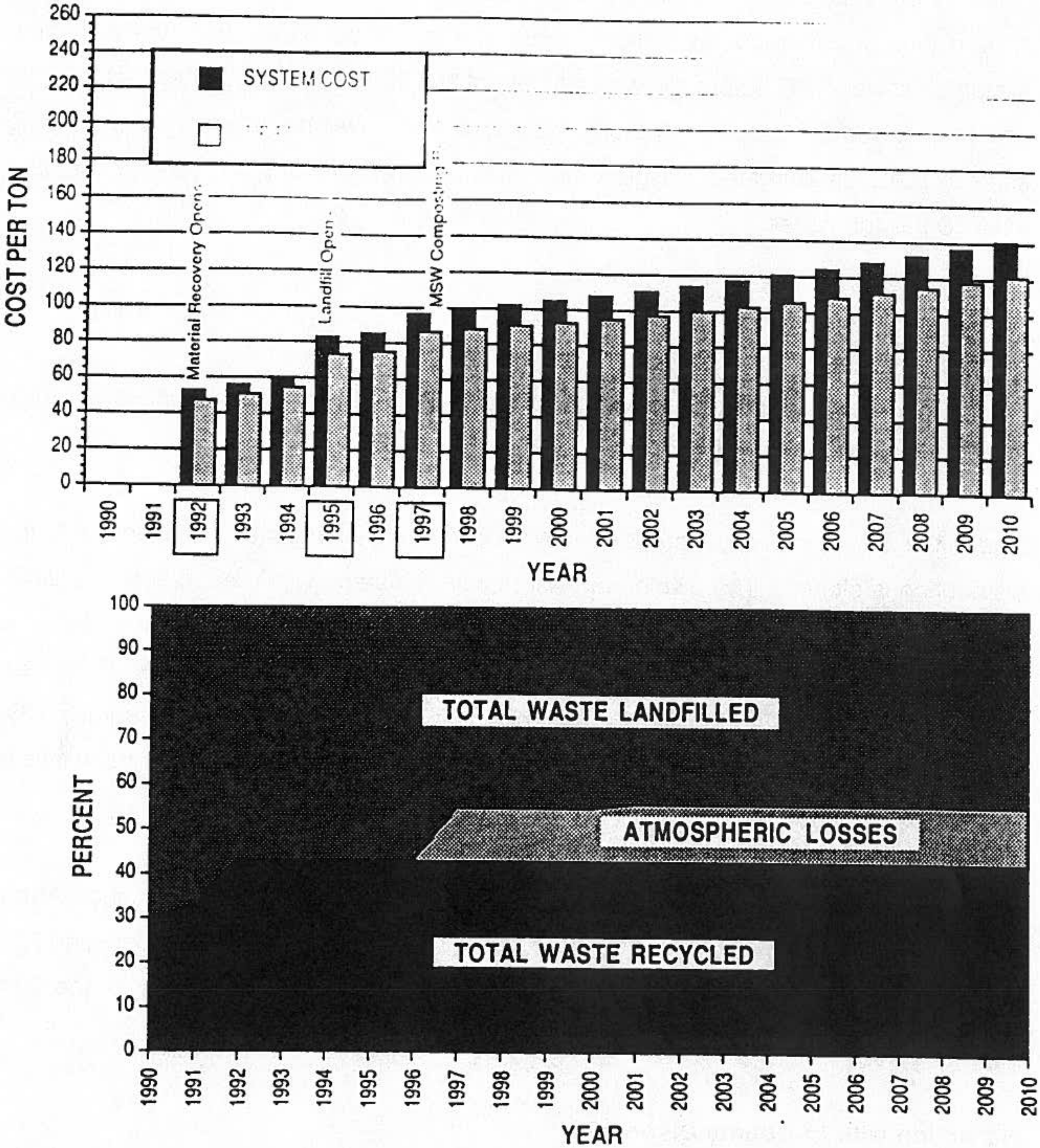


FIGURE 17

System Cost, Tip Fee and
Waste Distribution
Scenario #5b

In Scenario #9, a combustion facility with in-county disposal has the highest system costs and tip fees of any in-county option. When the facility opens in 1995, the estimated system cost was $107.00 per ton with a tip fee of $97.00 per ton. Both the system costs and tip fees remain above the other in-county options over the planning period. The costs in 2010, as illustrated in Figure 18, reach $155.00 per ton for system costs and $136.00 per ton tip fee.

Waste Distribution

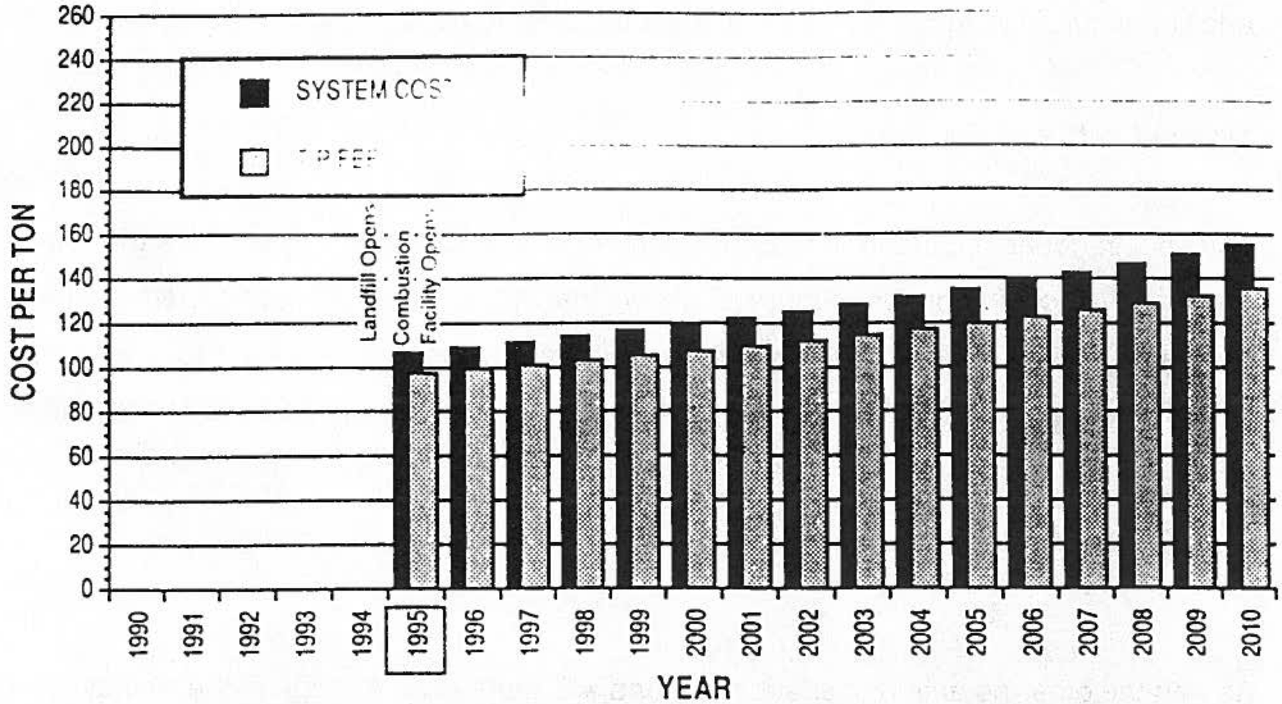
The four in-county scenarios discussed include some type of waste processing which alters the baseline waste distribution.

Under the scenarios that incorporate expanded material recovery, #6 and #7, the distribution is altered. The distribution will remain the same within each scenario since the only difference between them is the location of the facility. Once the facility is operating, approximately 43% of the wastestream would be recycled and 57% landfilled. When composting is added to the material recovery, the distribution becomes 43% recycled, 12% lost to the atmosphere and 45% landfilled. Again, the atmospheric loss is primarily water evaporation.

The option with the least dependence upon landfills is the combustion scenario. About 46% of the wastestream would be recycled, 26% distributed into the atmosphere and 28% landfilled. Particulates, gas and water vapor are the major components of the 26% atmospheric losses.

No Action with In-County Disposal

Scenario #10	**Landfill build in Champaign County; open in 1995; no expanded curbside programs.**



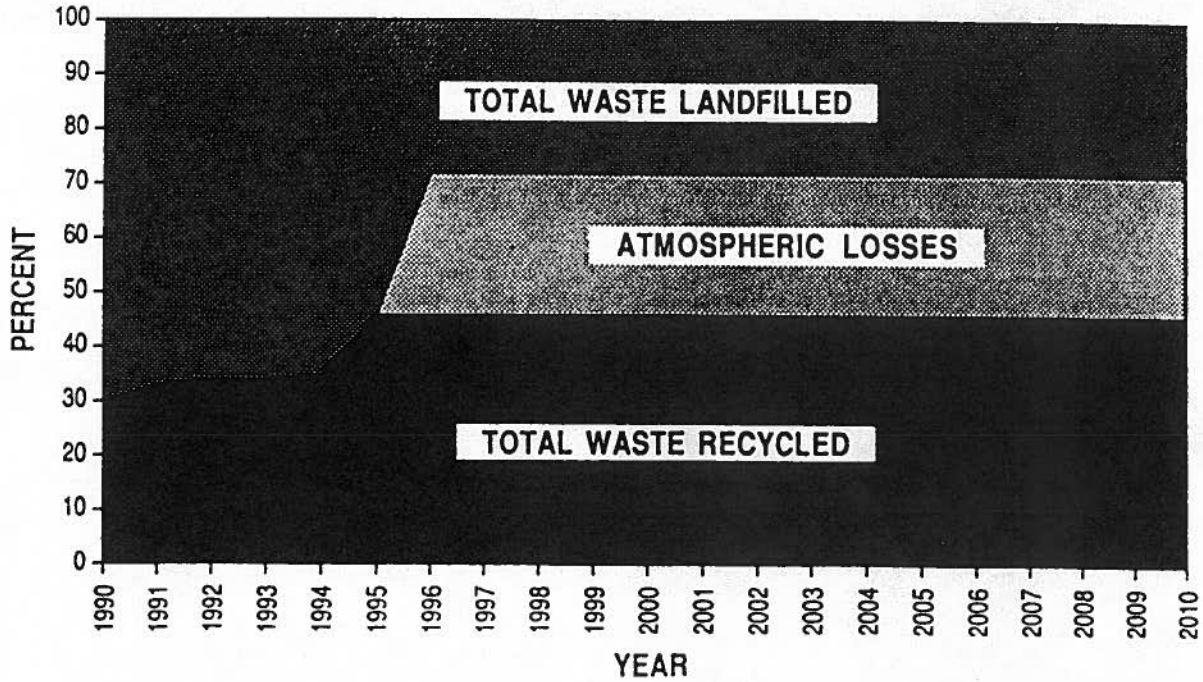


FIGURE 18

System Cost, Tip Fee and
Waste Distribution
Scenario #9

In Scenario #10, the only local activity is to develop a landfill. There would be no additional curbside recycling since no new processing capacity would be constructed.

System Costs and Tip Fees

The final in-county scenario is the development of a landfill only. This offers the lowest cost of any in-county option. Figure 19 shows that in 1995, the first year system cost was estimated at $64.00 per ton and the tip fee was estimated at $42.00 per ton. By 2010, the costs increase to $108.00 per ton for the system costs and $61.00 per ton for the tip fee.

Waste Distribution

As with the other no action scenarios, #1 and #2, there is no change in the wastestream distribution in Scenario #10. From 1995 through 2010. The approximate distribution would remain 30% recycled and 70% landfilled.

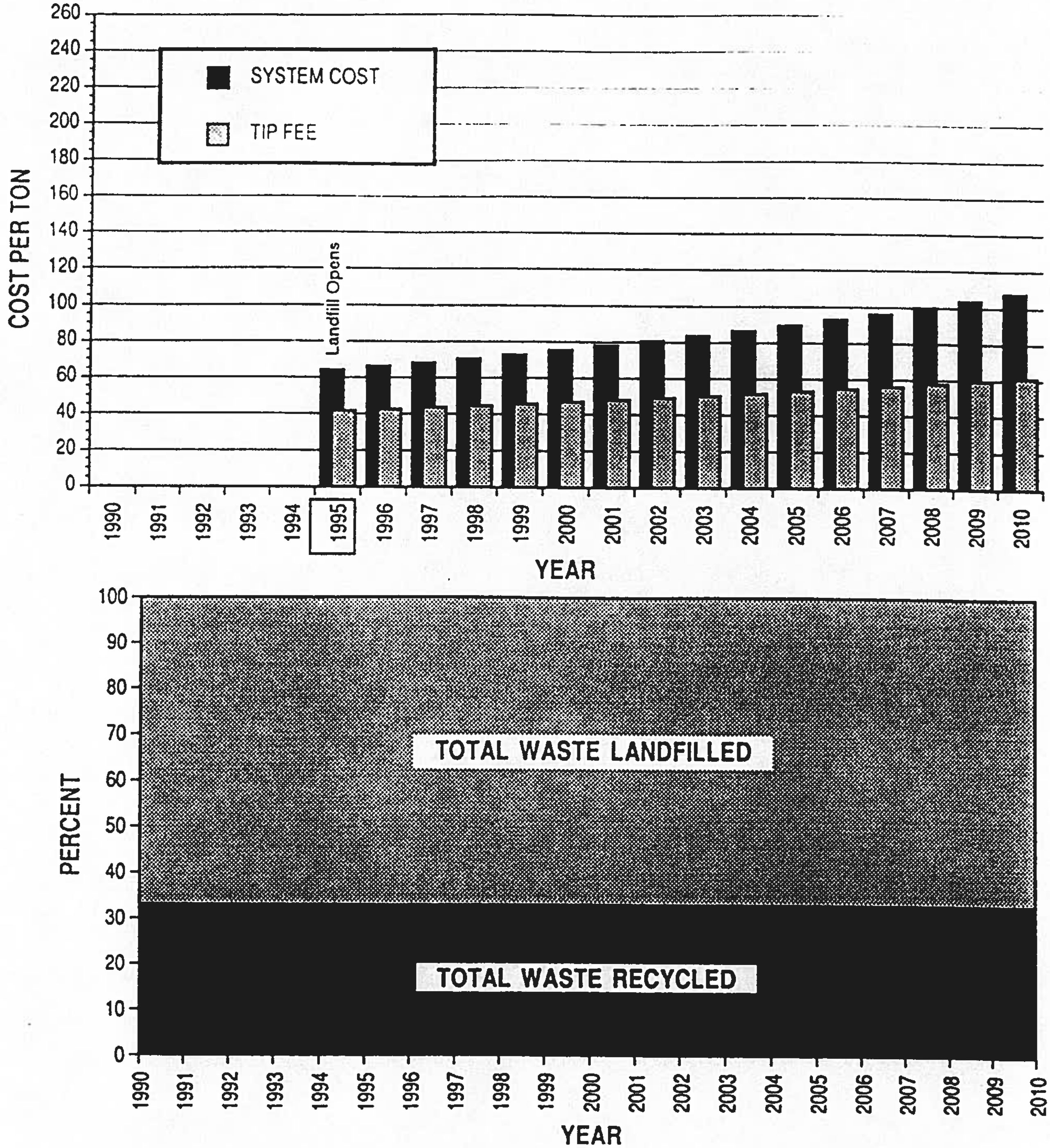


FIGURE 19

System Cost, Tip Fee and
Waste Distribution
Scenario #10

SECTION SIX: Recommendations

Selection of a solid waste facility is dependent upon a number of factors. As mentioned at the beginning of the system costs section, it is important to select a facility - or choose to build a facility - in the context of the entire solid waste management system. Other factors that influence facility selection are the preferred ownership and financing arrangements and risk allocation. Even the preferred financing arrangement can influence the facility selection process. Each municipality has its own set of priorities and these will dictate in what order the decisions are made. It is important for the decision-makers to remember throughout the process that each decision affects the decisions they can make regarding other issues. These decisions should be made in light of existing local goals. There may also be State laws or regulations that influence the selection process.

The following are local solid waste goals as stated in The Agreement and General Plan for Development of Solid Waste Disposal Facilities and Programs and the Creation of the Intergovernmental Solid Waste Disposal Association dated July 1986 (revised, 1990):

1. "That materials and energy (in optimum proportions) be recovered from the solid waste stream to the maximum extent possible."

2. "That the need for agricultural land for solid waste disposal be minimized (to accommodate only the irreducible remainder of solid waste otherwise disposed of)."

3. "That the recovery of energy and materials from solid waste and the disposal of the irreducible remainder be accomplished by (the) use of environmentally sound technologies."

4. "That the implementation of the long-range plan for the disposal of solid waste be based on obtaining as great a control of the waste stream as is practically and legally possible."

5. "That incentives be given preference over regulatory actions in devising implementation strategies."

6. "That if multiple technologies are called for in the plan or implementation process, these technologies shall be integrated to the maximum extent possible."

Each of these goals and objectives affect the decision-making process for the selection of a facility for Champaign County.

Although these local goals were established first, the State hierarchy, as set forth in the Solid Waste Management Act, also deserves consideration. The State hierarchy is:

1) volume reduction at the source;
2) recycling and reuse;
3) combustion for energy recovery;
4) combustion for volume reduction;
5) disposal in landfill facilities.

State and local goals are compatible; both the State and local goals view the recovery of materials and/or energy as being preferential to landfilling. Although the State hierarchy does not detail items such as local control of the wastestream, other State actions specifically empower local units of government to do so. These changes in State statutes were reviewed under the flow control section of Section Four. Similarly, although the State does not implicitly state that technologies should be integrated as much as possible, the requirements of the Solid Waste Planning and Recycling Act is an indication that the State encourages such integration. By requiring plans and review of facility options, the State is encouraging counties to develop integrated solid waste management systems.

Public Input in the Decision-Making Process

Solid waste management goals established by local officials are intended to reflect the concerns of the population of the area the officials represent. There are numerous ways elected officials receive input from their constituency. As a way to verify local goals, an assessment of local views on solid waste issues was conducted. The Public on Solid Waste Disposal Issues: Champaign County Household Survey of November 1988 (the Household Survey) was a telephone survey of 1,125 urban, suburban and rural households in Champaign County. The survey was conducted and analyzed by the Survey Research Laboratory at the University of Illinois. The survey covered a wide range of questions related to solid waste issues including a number of policy and priority questions. Some of these questions are directly related to the issues of ownership arrangement, risk allocation, financing and other facility related issues.

One set of questions focused on where the responsibility for solid waste management should fall. Specifically, if the provision of services should be undertaken by the public or private sectors. According to 52% of the respondents, primary responsibility for "providing landfills for household trash" belongs to the local governments. Both "local government and private individuals and companies" should be responsible for the disposal services for according to 40% of the respondents, while only 9% felt that the responsibility should lie solely with the private sector. The idea that one joint waste disposal program should be pursued, as opposed to each municipality pursuing their own program, was favored by 80% of the respondents.

The survey also asked a series of questions related to program priorities. Each respondent was asked to give the specific programs a high, average, or low priority. The public gave a high priority to the separate collection and safe disposal of household hazardous wastes (80%). The next program to receive the most high priority responses was the collection and recycling of all newspaper, cans, bottles and plastics (53%). When asked what priority incineration should be given, 46% said a high priority.

When asked about the location and control of future landfills, 90% of the respondents favored locating the landfill in Champaign County under local government control. The other option, of using landfills outside the County which are outside of local government control, was selected by 10% of the respondents. However, nearly 9% of the total sample said "don't know."

Policy and goals are typically devised under some constraints on what is permissible. In solid waste management, if certain constraints are held by the majority of the people, then those constraints will impact facility selection. The survey asked respondents to rate four issues as very important, somewhat important, or not at all important. The most strongly favored policy constraint is avoiding water pollution with 94% of the total countywide sample saying this is a very important issue. The next most strongly favored policy constraint is avoiding air pollution with 84% countywide saying this is very important. Minimizing the amount of farm land used for waste disposal was declared very important by 60% of the respondents. It is interesting to note that of respondents saying they lived on farms, 78% gave minimizing farm land a high priority, 17% said it was somewhat important and 5% said it was not at all important. This follows the distribution of the countywide sample. The final policy issue was minimizing the cost to households for their waste disposal. Less than half the respondents, 42%, said that this was very important. However, 53% said it was somewhat important and only 6% said it was not at all important.

The results of the Household Survey appear to indicate that the residents of Champaign County feel that a joint, local government effort should be responsible for solid waste disposal programs, especially landfills. The survey also reinforced the need to emphasize the environmental consequences of potential solid waste facilities when making siting decisions. Significant public response to questions such as would you favor a landfill in Champaign County under local government control (90%) and does the primary responsibility for providing landfills fall to local government (52%) help define the ownership arrangements. In general, the responses from the Household Survey seem to reinforce the local goals as well as the State hierarchy.

Community Impacts

Throughout the discussion in this part of the Champaign County Solid Waste Management Plan, the impacts for various facilities has been addressed. However, these impacts have been addressed from the standpoint of generic environmental impacts. Generally speaking, there is a growing acknowledgement that an integrated approach to solid waste management, which emphasizes increasing reliance on recycling and resource recovery and minimal reliance on landfilling is the overall "preferred approach."

However, the immediate reality of this preferred approach requires solid waste management facilities to accomplish those ends. The act of implementation for any facility or series of facilities will have environmental impacts which may supersede the abstract identification of air, land or water quality effects; these can be called community impacts and are inclusive of an array of effects, perceived or real, from proposed facilities.

The term community impacts can apply to public institutions as well as individual property owners. For example, a municipality in which a proposed solid waste management facility is to be located may see increased road usage, and increased requirements for fire protection and increased demand for utility services. These would be impacts on the service provision structure of the institution (i.e., municipality). Beyond this are the impacts on adjacent property owners. Impacts to adjacent property owners can be impacts related to facility operation; perceived impacts to property values; degradation of environmental factors such as groundwater quality; and, future land uses after the useful life of the solid waste facility.

In general, public institutions can more directly deal with these impacts than potentially impacted property owners. For example, the cost of increased utility and protective services or loss of tax revenues from taking land off the tax roles for publicly sponsored solid waste facilities can be quantified. The impact on any loss of property value to an individual property owner or the potential for being perceived as being forced to "bear the burden of solving the solid waste problem" due to their property location is less easily quantified. Consequently, the impact to public institutions is different than those impacts to individual property owners. As a result, approaches to mitigating and compensating individuals and institutions can vary as well. The types of impacts are illustrated in Table 19.

TABLE 19

Potential Impacts of Solid Waste Management Facilities
To Public Institutions and Private Property Owners

IMPACT	FACILITY TYPE		
Public Institutions	**Transfer and waste processing**	**Combustion**	**Landfill**
• Increased Road Maintenance	X	X	X
• Increased Utility Service Requirements	X	X	X
• Increased Demand for Police and Fire Services	X	X	X
• Groundwater Pollution			X
• Air Pollution		X	
• Surface Water Pollution/Drainage			X
• Loss of Tax Base	X	X	X
• Random Dumping	X	X	X
• Post Closure Care			X
• Community Burden	X	X	X
Private Property Owners			
• Increased Road Usage	X	X	X
• Litter/Dust	X	X	X
• Odor			X
• Noise	X	X	X
• Increased Vectors	X	X	X
• Groundwater Pollution			X
• Air Pollution		X	
• Surface Water Pollution/Drainage			X
• Explosion/Spills	X	X	
• Loss of Property Value	X	X	X
• Neighborhood Burden	X	X	X
• Post Closure Care			X

Many of the neighbors' identified risks are related to design and operation issues. Litter is a good example; neighbors of solid waste facilities are fearful of litter blowing onto their property. The are concerned because of the unsightly appearance and of the additional work and expense required to remove the litter. Although the operator has said litter will be picked up at least once a day, the neighbors do not necessarily trust that this will occur. Consequently, additional steps are needed to reassure the neighbors that the litter will be picked up and that there will not be any increased work or cost to them.

To reassure the neighbors, a mitigation and compensation program could be developed. Mitigation efforts are specific actions, outlined in advance, that will be followed to prevent or rectify a specific occurrence. Compensation is the act of paying, either before or after the impact has occurred, for the effect of that occurrence. Mitigation is generally preferred since it deals directly with the problem and attempts to prevent it from happening. Compensation is often made because the impact cannot be prevented and therefore, payment is needed to offset losses. However, often a combination of both mitigation and compensatory measures are established to address a particular risk. A number of mitigation measures have been established through state regulatory agencies. These include both design factors and operation standards. These have been included as part of the facility descriptions.

Although regulatory agencies require certain operation and design standards, neighbors and public institutions are often critical of the enforcement measures. Complaints usually revolve around the length of time taken to correct deficiencies. The implementation agency should consider how to augment State or Federal regulations as part of their mitigation and compensation package. This could take the form of a review committee consisting of neutral third parties.

When developing any solid waste facility, it is important to identify the risks that the public institutions and the neighbors are concerned about. Then, through negotiations, attempt to develop a series of mitigation and compensation measures to reassure the concerned party. As previously mentioned, the impacts associated with the different solid waste facilities vary as due the impacts affecting different parties. The impact of a particular facility can even vary dependent upon the site.

Because of the variations, it is necessary to tailor mitigation and compensation measures to each case. However, similar steps can be taken. Increasing the frequency of monitoring and ease of public access to reports are examples of measures that could be taken. Providing a single point for filing complaints and obtaining follow-up information could be another mitigation measure.

Compensation could be made directly to an individual or institution or into an escrow account. The escrow account can be handled by a third party and be used to make payments in the event mitigation measures fail or are not satisfactory. In either case, direct payment or escrow, it is advisable to include a review function. This periodic review would allow adjustment of the payment. The initial amount is frequently set prior to the opening of the facility and therefore before the actual risk or impact has occurred. By reviewing the payment throughout the life of the facility, adjustments can be made to match the actual level of loss associated with the risk. This could increase the payment to accommodate inflation and/or greater levels of loss or it could decrease the payment if the risk or impact is less than anticipated or is non-existent.

System Environmental Impacts

A summary of the facilities discussed in Section Three in terms of the State and local goals and objectives is needed to assist in the selection process. Environmental impacts have become one of the major concerns with solid waste facilities. Table 20 summarizes the generic environmental impacts associated with the facilities reviewed.

TABLE 20

Environmental Impact Evaluation
By Facility Type

ALTERNATIVE	AIR	SURFACE WATER	GROUND-WATER	LAND	WORKER HEALTH AND SAFETY	PUBLIC HEALTH AND SAFETY
TRANSFER FACILITY	No Impact	No Impact	No Impact	Requires disposal of all materials received	Small Risk -- Possible Occupational hazards such as fire or explosion or hazardous waste spills.	Little Impact -- Possible impacts related to nuisance items such as traffic, litter, odor and noise.
with Material Recovery	No Impact	No Impact		Requires disposal of residual material		
with Municipal Waste Composting	Little Impact Odor possible	Little Impact Leaching from compost piles possible		Requires disposal of residual material, but compost may be beneficial		
COMBUSTION WITH ENERGY RECOVERY	Possible toxic and particulate emissions including acid gases, dioxin Furans, organic compounds and metallic emissions.	May require treatment of quench water and collection and treatment of run-off.	No Impact	Requires Disposal of non-combustible material, fly and bottom ash - ash may contain heavy metals or other hazardous materials	Small Risk -- Possible occupational hazards such as fire, explosions or hazardous waste spills - noise also a possible risk	Risk -- Due to the possible release of toxic air emissions other possible impacts related to nuisance issues such as traffic, litter, and odor
Modular Incineration W/Stream Production						
Mass Burn Incineration W/Stream Production						
LANDFILL	Little Impact from dust and possible gas releases	Possible risk from run-off or leachate	Risk from leaching	Limits uses of land after closure to primarily open space or recreational uses.	Low-risk related to occupational hazards	Risk -- Due to the possible release of contaminants into ground and/or surface waters supplies. Other risks due to nuisance issues such as traffic, odor, vectors, and litter
Municipal Waste Landfills						
Ash Monofill						

As demonstrated by the local goals, as well as the responses in the Household Survey, environmental impacts are a major concern in terms of solid waste facilities. To respond to this concern, a conservative approach was taken when summarizing the environmental impacts. If an impact was possible, it was considered an impact. Therefore, it was assumed that air emissions from incinerators and leachate from landfills will occur. There was the possibility that there was a "neutral" impact. This would occur if the facility had an impact, but that impact was similar to impacts from other industrial facilities. This would include traffic impacts, noise, and odor problems. A neutral status was also given to impacts that, although specific to the solid waste facility, could be viewed as beneficial. Examples of this would be the mulch created during composting of waste. Although it may have beneficial uses, it is usually landfilled. Similarly, although the land use for closed landfills is limited to the development of open space or recreational areas, this could be considered a positive impact, especially in rapidly growing urban areas.

Several factors could affect the type of environmental impacts found at a facility. The best example is with the transfer facility with composting. Transfer facilities that include composting were given impacts in the air and surface water category because of the possible impact from odor and leaching for the compost piles. If a totally in-vessel system was used, then there would be little potential for impact and the transfer facility with composting would have as few environmental impacts as the transfer station alone or with material recovery. With regards to incineration, two types of combustion were reviewed. However, they have similar environmental impacts. Both of the combustion options impact on air, surface water and land. The final facility type reviewed was landfilling. This facility type impacted in every category. Four of the impacts were neutral while the remainder were negative. Under this analysis, the transfer facility (alone or with a material recovery component) exhibits the fewest environmental impacts.

Another set of local and state goals revolve around material recovery and reduction of reliance on landfilling. This goal is restated in the desire to reduce the need to use agricultural land for solid waste disposal. In the Association Agreement, a goal is the recovery of materials and energy in optimum proportion from the wastestream. This phrase seems to echo the State hierarchy of recycling then combustion for energy recovery and/or volume reduction. Using that interpretation, it appears desirable to remove recyclables from the wastestream prior to any additional processing such as composting or even incineration. Prescreening of the wastestream usually enhances the other processes such as composting and incineration. Removal of plastics and household hazardous wastes is beneficial to both processing systems. Since it is difficult to define optimum proportions, at this point a simple hierarchy will be established. A facility that recovers materials is preferable to one that recovers neither materials or energy and a facility that recovers materials, energy and provides for volume reduction is preferable over one that recovers materials only without volume reduction. Therefore, incinerators are preferred over material recovery (with or without composting) facilities and material recovery facilities are preferred over transfer facilities or landfills.

Table 21 summarizes the distribution of the wastestream for the different scenarios. The final distribution can be one of three categories: recycled, atmospheric loss, or landfilled. The waste distribution is actually determined by the major processing facility, or lack of one. Figure 20 illustrates the waste distribution for the material recovery, municipal waste composting and combustion facilities. There is also a no-action option which illustrates the distribution when no additional processing is developed. These illustrations also show the relative reliance of each system on landfilling.

The recycled category includes all recycling activities by the non-profit, institutional private and public sector; municipal solid waste and yardwaste composting. These activities can take place on- or off-site. Curbside routes and yardwaste collection are examples of off-site recycling. Municipal waste material recovery, municipal solid waste composting and incineration for energy recovery would all have on-site recycling activities, including the processing of source separated material. The recycled percentage in Table 21 represents the amount of waste in Champaign County that is recycled at any point prior to final disposal. Figure 20 has illustrations of recycling by sector under each processing option.

TABLE 21

Waste Distribution Summary
By Scenario, at Estimated Base Recycling Levels

Scenario	**Percent of Total Wastestream (by weight)**		
	Recycled[(1)]	**Atmospheric Loss[(2)]**	**Landfilled[(3)]**
No Action - Out-of-County Disposal			
Scenario #1	32	0	68
Scenario #2	32	0	68
Expanded Processing with Out-of-County Disposal			
Scenario #3	32	0	68
Scenario #4	43	0	57
Scenario #5a	43	13	44
Scenario #8	46	26	28
Expanded Processing with In-County Disposal			
Scenario #5b	43	13	44
Scenario #6	43	0	57
Scenario #7	43	0	57
Scenario #9	46	26	28
No-Action - In-County Disposal			
Scenario #10	32	0	68

(1) Recycled percentage includes yardwaste, private sector programs, municipal programs (including recommended expansions), other non-profit and direct institutional programs, as well as, additional mixed waste recovery at the facility. Collection is provided by public, private, non-profit and institutional vehicles.

(2) Atmospheric loss percentage includes solid waste mass loss due to the composting or incineration process.

(3) Landfilled percentage includes non-processible residuals, compost products, ash and by-pass material.

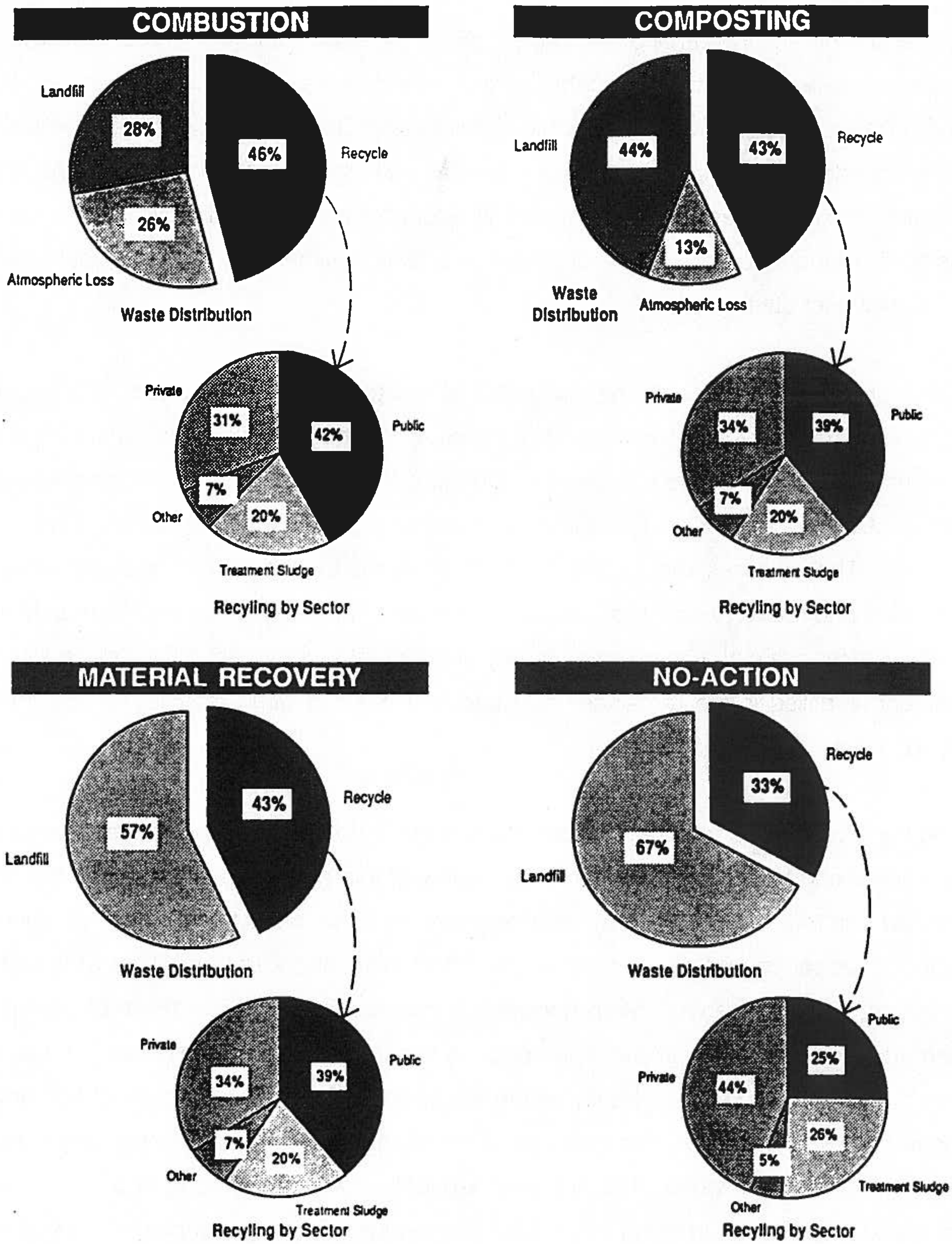


FIGURE 20

Waste Distribution and Recycling
By Sector
By Processing Option

Under the no-action scenario, the private sector is responsible for 44% of all recycling collections and processing; the public sector only 25% of collections and processing. If the private sector reduces its recycling activities, the County could easily fall below the State mandated goal of 25% recycling. However, with material recovery and composting facilities, the public sector's recycling activity accounts for 39% of all recycling; the private sector is responsible for 34%. A decrease in activity in either side will not jeopardize the 25% minimum state goal.

Atmospheric loss represents the dissipation of waste into the atmosphere. This occurs at two facility types: composting and incineration. Through these processes, part of the wastestream is distributed into the air. During composting, this loss is primarily water vapor. During incineration, the loss is in the form of gases, water vapor and particulate matter. These losses reduce the amount of waste that must be landfilled, after all recycling and recovery activities. As Table 21 shows, this loss can be approximately 26% of the wastestream at a combustion facility and 13% at a composting facility. Finally, the percent landfilled is the remainder of waste that has not been recycled or lost to the atmosphere.

Another local goal is to obtain as great a degree of control over the wastestream as is practically and legally possible. An initial review of this goal seems to point to the need for flow control. However, it may be interpreted as some other form of control, such as actual physical control of the solid waste. This type of control could be obtained by processing and screening. Preprocessing and screening allows removal of potentially harmful materials, such as batteries, prior to processing or final disposal. Under this interpretation, the preferred facility would incorporate the highest degree of scrutiny of incoming waste possible. For example, direct dumping in a landfill allows very minimal review of the tipped waste. The operator can look at what is dumped and may be able to spend some time removing large, obvious items such as appliances with capacitors (which may contain PCB's). However, limited personnel, regulations, and working conditions make observation difficult. When waste is placed on conveyors to be preprocessed for material recovery at a transfer facility or an incinerator, the opportunity to review the waste is increased. The conveyored waste is usually thinly spread which allows personnel an opportunity to more thoroughly review the materials. Also, the chance that all the waste will pass an inspector increases. This inspection allows household hazardous wastes, such as small batteries, and other potentially hazardous materials to be removed along with the large appliances and tires. Therefore, a material recovery function at any facility would be preferable to direct dumping into transfer trucks, a mass burn incinerator or a landfill.

System Costs

Since the cost figures developed in Section Five are estimates, it is important not only to focus on the immediate costs but also to look at cost trends for the future. Table 22 shows the system costs for all eleven scenarios for selected years. The years, 1992, 1995 and 1997, represent the time various facilities were projected to be operational. The years 2000, 2005 and 2010 are intended to show trends. In Table 22, the scenarios are grouped in the four categories established in Section Five: No-action with out-of-county disposal; expanded processing with out-of-county disposal; expanded processing with in-county disposal; and, no-action with in-county disposal. The shaded boxes identify the five lowest cost scenarios for each year. Figure 21 illustrates the costs for the out-of-county scenarios for all the years from 1990-2010 and Figure 22 does the same for the in-county disposal options.

Once the facilities have been evaluated individually, it is necessary to review the system costs. By reviewing the system costs, the economic impact of each facility within a system with other solid waste management programs and facilities can be evaluated. In Section Five, System Costs, the lowest cost system with in-county disposal was consistently Scenario #10, the landfill after 1995. The lowest cost system with out-of-county disposal varied; prior to the year 2000, it was the transfer station with material recovery and composting, after 2000, it was the combustion facility.

TABLE 22

System Cost Comparisons

By Scenario for Selected Years

SCENARIO		1992	1995	1997	2000	2005	2010
No-Action - Out-of-County Disposal							
Scenario #1	No-Action; Vermilion County Disposal	44.34	65.17	81.30	117.18	149.37	190.41
Scenario #2	No-Action; Vermilion & Coles County Disposal	44.34	65.17	105.47	149.26	190.31	242.67
Expanded Processing with Out-of-County Disposal							
Scenario #3	Transfer Station	52.70	74.39	107.35	150.48	190.16	240.70
Scenario #4	Transfer Station with Material Recovery	56.62	68.49	92.11	123.32	153.52	191.94
Scenario #5a	Transfer Station with Material Recovery and MSW composting	52.48	68.49	87.90	110.74	165.54	204.14
Scenario #8	Combustion Facility		87.40	92.64	103.03	117.34	135.72
Expanded Processing with In-County Disposal							
Scenario #5b	Transfer Station with Material Recovery and MSW composting	52.48	83.03	96.78	104.68	120.67	140.91
Scenario #6	Transfer Station with Material Recovery	52.48	83.03	87.81	95.89	112.21	132.83
Scenario #7	Material Recovery at Landfill		86.57	91.77	100.55	118.29	140.73
Scenario #9	Combustion Facility		106.91	111.49	119.29	135.13	155.25
No-Action - In-County Disposal							
Scenario #10	Landfill		64.28	68.46	75.52	89.81	107.91

Shaded boxes represent the five lowest cost scenarios for selected years.

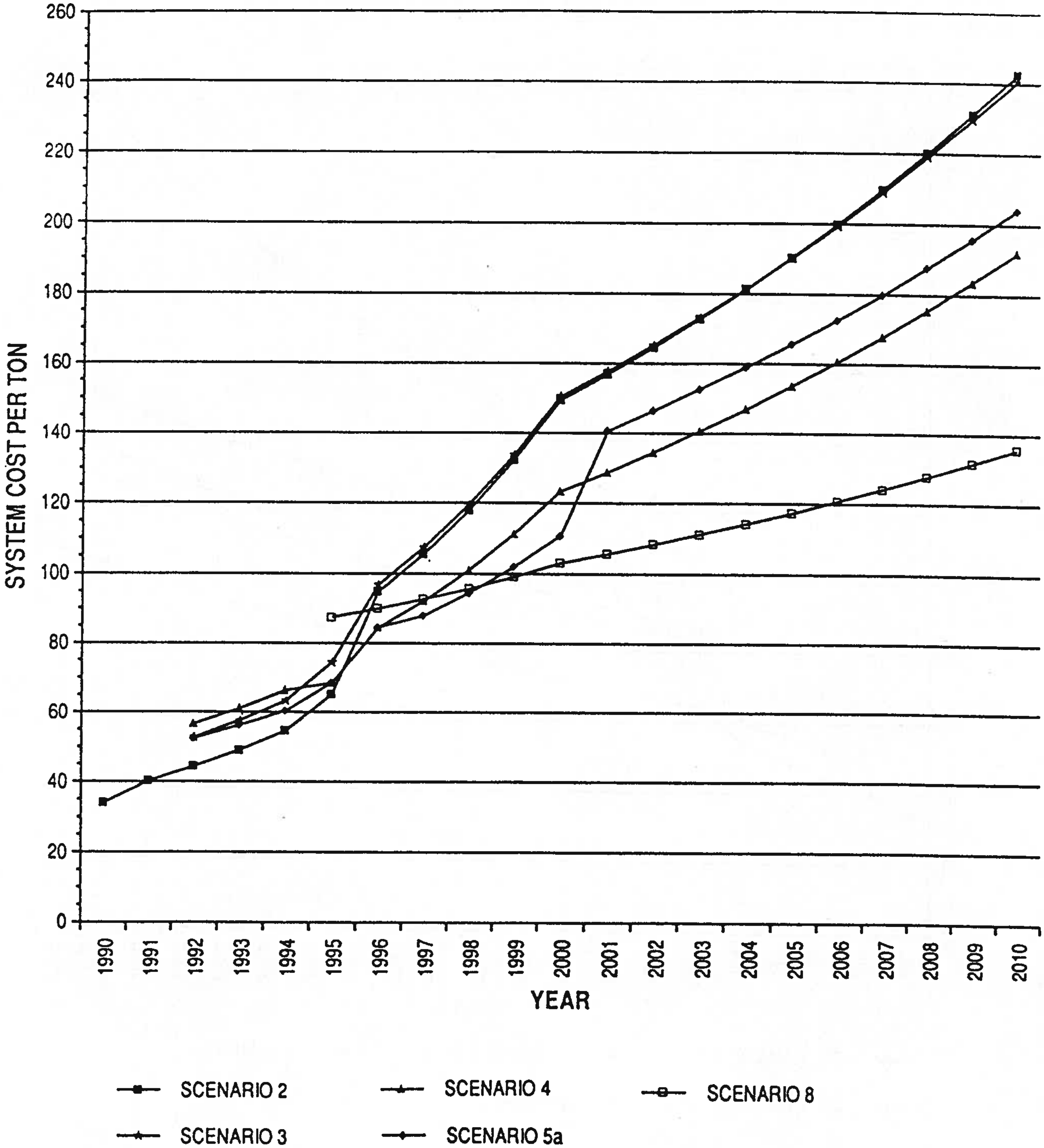


FIGURE 21

System Cost Comparisons for Scenarios with Out-of-County Disposal

Scenario #2: No-Action (baseline)
Scenario #3: Transfer facility only
Scenario #4: Transfer station with material recovery
Scenario #5a: Transfer station with material recovery and MSW composting
Scenario # 8: Combustion facility

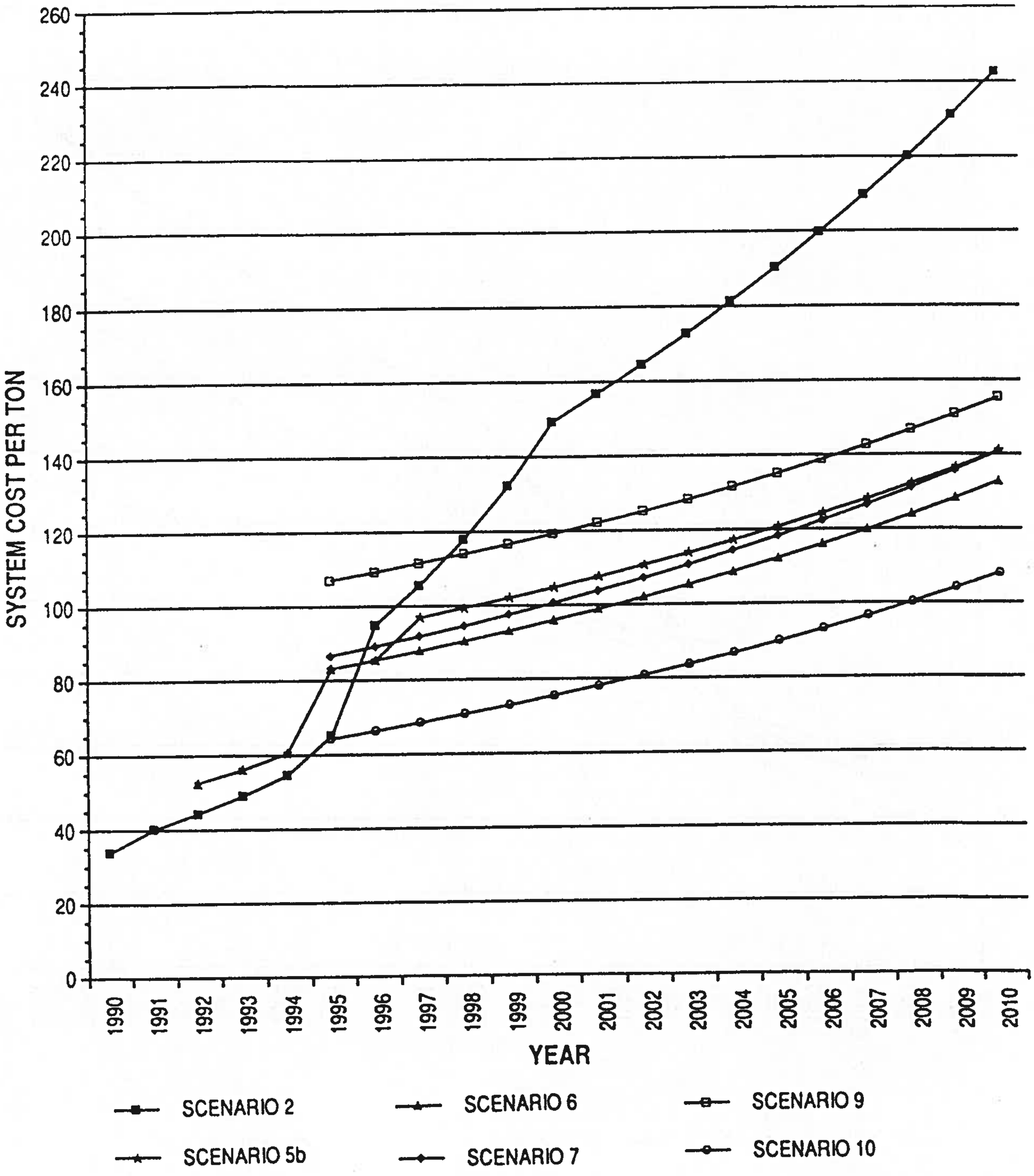


FIGURE 22

System Cost Comparisons for Scenarios with In-County Disposal

Scenario #2: No-Action (baseline)
Scenario #5b: Transfer station with material recovery and MSW composting
Scenario #6: Transfer station with material recovery
Scenario #7: Material recovery facility at the landfill
Scenario #9: Combustion facility
Scenario #10: Landfill only

Several trends can be identified from this table. The first is that the scenarios with in-county disposal become the lower cost scenarios over time; the scenarios with out-of-county disposal become more expensive over time. Other trends can be identified by the number of times a particular scenario is rated as one of the five least costly. The landfill alone appears in the five least costly systems every year it is open; it is the least costly option. However, the transfer station with material recovery, regardless of location, becomes a lower cost option from 1997 to 2010. Beginning in 2005, the scenario with composting also becomes one of the five least costly. An incinerator with out-of-county disposal also becomes a lower cost scenario after 2000.

With the out-of-county options, there is a trend toward the scenario that transfers the least waste to be one of the lower cost scenarios. Over time, the scenarios that offer no expanded recovery (Scenarios #1, #2 and #3) become the most costly options. When there is some level of additional recovery (Scenarios #4 and #5a), the costs for out-of-county disposal are reduced. Scenario #8, the incinerator, which offers the highest processing also becomes the least costly out-of-county disposal option by 2005.

Certain scenarios are never identified as a lower cost option. The transfer station with out-of-county disposal (Scenario #3) and the combustion facility with in-county disposal (Scenario #8) are consistently higher cost systems.

Facility and System Recommendations

The selection or recommendation of a solid waste management system must not be made on cost alone. There must be a balance between the different goals, of which cost is just one. Recovery rates, environmental impacts and community impacts are some of the other facets that should be considered in the selection process. The recommendation is an attempt to select the facility or system with the least environmental impact, best recovery rates and least cost. Other concerns, as previously discussed, include control of the waste stream and flexibility. To meet the local and State goals, it is recommended

1) **The solid waste management system described in Scenario #5b should be developed.** This system features the development of two solid waste facilities in Champaign County: a transfer station with a material recovery component with expansion into composting and an in-county landfill. This arrangement offers the most attractive balance between state and local goals; minimizes environmental impacts; obtains a high degree of recovery; establishes a high degree of local control; reduces reliance on landfills; provides reasonable capital and system costs; and, allows for equity in facility placement. The development of an in-county landfill will only occur if an appropriate site is identified.

2) **Development of the dual solid waste facilities minimizes environmental impacts.** A transfer station with material recovery offers the least environmental impacts when compared to other solid waste facilities. Placing the material recovery facility near the generators reduces the influx of vehicles into the rural areas and is lower cost in terms of energy consumption. Although landfills have the possibility of environmental impacts, no solid waste technology available eliminates the need for landfills. Since there will be residual material that will have to be landfilled, by siting the facility in Champaign County, using the criteria discussed, it is possible to minimize those potential impacts.

The current disposal method sends material out of the County to landfills that may be improperly sited or operated. Therefore, Champaign County waste is contributing to any environmental problems that arise at those landfills. Continuing to ship waste out-of-county would be contradictory to local goals which attempt to minimize environmental impacts. By developing the extensive geological information, it appears that there are geologically suitable sites for landfill development in the County. In addition, these impacts would be restricted to groundwater and/or surface water. Conversely, the incinerator based volume reduction with material recovery options have impacts on air as well as water resources. Consequently, compost based volume reduction with material recovery can allow for more complete remediation in that only one, instead of two, environmental medium is potentially subject to impact.

3) **Development of dual facilities can minimize operating impacts of each.** The Champaign-Urbana area is at the center of the transportation system for the County as well as the center of solid waste generation. Placement of the transfer station with material recovery in this area allows access to the interstate highway, other federal-state highways and the rail system. This is desirable for access to material markets. The processing facility should be highly accessible to generators of solid waste and to the users of the recycling services that it will provide. A remote landfill does not

provide a high degree of access for users or to markets and encourages traffic flow into the rural area. In addition, a restricted access landfill facility provides a mechanism for a number of operating concerns:

a) Restrictions of haul routes. With the transfer station with material recovery in the urbanized areas, shipment of non-processible/non-recoverable residue will be by transfer trailer. Due to weight limits, transfer trailers will be restricted to designated routes. Their weight can be monitored by the scales at the facility, thus limiting the likelihood of intentional or unintentional overloading of packer vehicles.

b) Reduced landfill operating costs. The potential for reduced landfill costs for operation and maintenance exists under a dual approach. The only access to the landfill and the only vehicles to use the landfill, will be dispatched from the transfer station or those specifically authorized access. This will significantly reduce the number of collection trucks and private vehicles which would drive to the site. An overall reduction in the number of trucks and other vehicles can result in a smaller working face on the landfill. A smaller working face makes litter control easier and may also result in better compaction in the landfill, thus increasing volume reduction.

c) Reduced road maintenance costs. The dual facilities allow an overall reduction in road miles traveled related to disposal. Packer trucks and private vehicles will have a shorter distance to the transfer station located in Champaign-Urbana. The transfer trailers would be restricted to load rated state routes.

4) **A transfer station with a material recovery component will allow recovery rates to increase.** Additional processing capacity will allow the curbside programs to expand into more units and collect additional materials. In addition, the system will act as a backstop to remove recyclable or reusable material from the mixed waste stream. This material may be in the mixed waste stream for a variety of reasons including lack of recycling services, lack of knowledge regarding available recycling services, or deliberate avoidance of using recycling services.

A transfer station with material recovery may also offer the County the ability to offer various types of recycling services. Currently, the recycling processing center is designed to accept material in a limited presorted fashion. A new facility could be designed with the ability to accept recyclables in various states such as three material pre-sorted; commingled pre-sorted; commingled combined with mixed waste (Bag-it system); and, from various vehicles. This will allow recycling services to be tailored to the population's needs and not the facilities requirements. Increased participation rates should reflect this flexibility which allows the recycling system to be designed for the convenience of a particular population. It may also be possible to allow a wider variety of individuals to offer recycling services utilizing existing equipment.

The minimally larger increase in recycling rates estimated to be obtained at an incinerator do not appear to be justified in light of the additional environmental impacts caused by an incinerator. To obtain landfilling rates comparable to those at an incinerator, it is recommended that a municipal solid waste composting component be added in the future. The atmospheric losses associated with this technology are primarily water vapor, which do not have the potential environmental impacts as the gases and particulate matter released by an incinerator.

5) **Development of the dual facilities will allow a high degree of control over the type of waste landfilled.** Another way to minimize the environmental impacts at the landfill is to prescreen the waste. A transfer station with a material recovery component allows prescreening of the waste at two points. The first is as the hauler arrives. Visual inspection of the waste can take place as the hauler is tipping. If unacceptable wastes are identified they can be rejected and the hauler would be required to remove them. The second point where waste would be screened is on the conveyor system. Just as the system is designed to remove recyclable or reusable material, it could be designed to remove hazardous or unacceptable material. In most cases the material will be household hazardous wastes or batteries. By not permitting unscreened waste into the landfill, the chance that hazardous material is landfilled is decreased. This, in turn, can reduce the possibility of highly contaminated leachate.

6) **A transfer station with material recovery offers an integrated and flexible starting point for downstream large scale volume reduction solid waste technologies.** Preprocessing the waste stream is necessary for municipal solid waste composting and is desirable for incineration. In fact, it may become mandatory prior to incineration. Development of a transfer facility with material recovery will allow expansion into either of these technologies in the future. The composting of municipal solid waste is a proven technology in Europe, but has not yet developed an operational history in the United States. The development of a material recovery and transfer facility will allow for an incremental implementation of such technology as it is demonstrated in the United States. In either a "burn or no-burn" approach, as solid waste technologies become more complex and

advanced, these technologies will require preprocessing. This facility will allow integration with future solid waste facilities either on- or off-site.

7) **Development of an in-county landfill will secure future disposal for the residents of Champaign County.** With the diminishing landfill capacity in the East Central Region, it is anticipated that landfill space will become a scarce resource. As a scarce resource, the fees for using it will rise as will the demand for it. It seems more likely that landfill operators may be interested in forming exclusive contracts with various parties and locking out other users. Those that do not develop exclusive contracts will be able to charge even higher rates for the accessibility. New landfills may well be constructed with predetermined markets or users and therefore be less accessible to individual haulers. As available landfills diminish, it is likely that the remaining facilities are farther away from Champaign County. This will increase costs simply due to the distance necessary to have the waste disposed of. This facility is intended solely for the use of Champaign County residents. Waste generated outside the County will not be accepted. All waste will pass through the Material Recovery/Transfer Facility unless prohibited by permit or through previous arrangements made with the ISWDA Board.

8) **Development of a transfer station with material recovery and an in-county landfill offers one of the lowest costs solid waste systems.** Over the length of the planning period, Scenario #6 had one of the lowest system cost estimates of the eleven. The options with lower costs - a landfill does not meet State and local goals for recovery rates or reduction on landfilling reliance. Even with the addition of composting, this approach provides a low cost system with one of the highest recycling rates.

9) **Equity in facility placement.** Geological screening of Champaign County has indicated that appropriate sites for landfill development may be found in the rural, southeast portion of the County. Yet the source of solid waste generation and demand for recycling services exists in the urbanized center of the County. It would appear that, based on the criteria used and cost estimates provided, two separate facilities allow the function of each to be optimized. That is, a landfill sited in an appropriate geologic setting and a processing facility sited in the appropriate setting in relation to waste generation and recycling demand.

Ownership, Operation and Procurement

The recommendations of the ownership, operation and procurement arrangements are interrelated. As discussed in Section 4, these alternatives are interdependent; selection of one often dictates the next option. Due to this, similar arguments are used when discussing these recommendations. Ownership of primary municipal solid waste facilities in Champaign County should be by local government. There are several reasons including the level of control that can be exercised; liability issues; responsiveness; and, cost financing.

1) **Local government will retain the highest degree of control over the solid waste facilities if they own the facilities.** By owning the facilities, local government can determine the major characteristics of the facilities. This can include operation hours, truck routes, mitigation and compensation methods and acceptable waste. For example, trucks may be routed to avoid residential areas or county roads and hazardous, special waste or imported waste can be prohibited from the facility. This type of control is more difficult to obtain and enforce when the facilities are privately owned.

2) **Local government offers the highest degree of responsiveness to public concerns regarding solid waste facilities.** In general, government frames its goals around the protection of the general health, safety and welfare of the citizens it represents. Government meetings are open and allow for public input; government officials are willing to listen to their constituents. This basic premise is a vehicle for public input into the issues surrounding solid waste facilities. This is different than a private business that is basically responsible to its owners or stockholders. A business will sometimes try to accommodate the public's concerns, yet it is ultimately responsible to the stockholders.

   For example, public concerns regarding siting can be introduced at the beginning of the process when a government agency is developing the siting criteria. With a private firm, there may be no opportunity for the public to introduce their concerns until late in the siting process, perhaps at the official siting hearing.

   The question with local government siting becomes one revolving around public participation. However, public participation, or lack of it, is an issue at all levels of government; it is not a concern exclusive to solid waste issues. Even if there is a limited amount of public input, the opportunity does exist. Further, since the government's role is to protect the health, safety and welfare of the populace, there exists a different motivating factor or goal than with a private business.

3) **By owning the solid waste facilities, local governments will be able to control characteristics of the facilities that impact their future liability.** Local governments can control such items as type of waste accepted if they own the facility. By monitoring what type of waste is allowed through the system, local government is also monitoring their future liability. This selective approach can eliminate know hazardous wastes from the facilities and ultimately the landfill. In turn, this could reduce the chance of hazardous leachate emanating from the landfill. This could reduce the occurrence of future costs related to provision of new water sources, relocation or neighbors, or clean-up costs.

4) **Local government ownership of solid waste facilities conforms with the public perception.** In the Household Survey, 90% said that local government should own the county landfill. Although the survey just asked about the landfill, the large percentage could indicate the public's approval of local government owning any solid waste facility. Many of the same concerns that have been discussed above are likely to have motivated the responses in the Household Survey. Those same concerns, perhaps on a smaller scale, exist for any solid waste facility.

5) **Local government should consider developing a public/private partnership for the operation of the solid waste facilities.** Alternate private service delivery with traditional public oversight allows municipalities to tap the efficiency and expertise that can be found in private business. Provision of solid waste management service is a good example of this trend. By contracting, the local government agency retains ultimate authority on operations. Contracting to a private firm also distributes the risk associated with operating the facility. The financial risks of operating the facility are not borne by the local government alone. However, since the landfill is more sensitive to environmental impacts due to mismanagement, it may be advantageous to local government and the citizens to incorporate operations in, as a local government function.

Implementing Agency

As part of the State requirements under PA 85-1198, the Solid waste Planning and Recycling Act, an implementing agency must be designated. The agency would be responsible for implementing the recommendations in the Solid Waste Management Plan. Since a key item in the plan is the development of a system of solid waste facilities, the agency must also be responsible for the development and operation of those facilities. To implement the recommendations in the plan, an intergovernmental agency is desirable. This approach will allow the broadest county representation. It will also allow multiple points for public input. Public input can be given to the member government bodies as well as the implementing agency's board. An intergovernmental arrangement will offer a check and balance system.

1) **ISWDA should be the implementing agency because it is the only local government agency or department with the sole purpose of solid waste management and services.** Since it was established in July, 1986, the ISWDA has been devoted to the issue of solid waste management in Champaign County. The Association has been engaged in a number of activities related to solid waste management, including the development of the Solid Waste Management Plan. Since solid waste management service is a utility function of increasing complexity, it is desirable that a central institutional be responsible to oversee, implement or coordinate solid waste management activities.

2) **As a Municipal Joint Action Agency, ISWDA has the independent powers necessary to develop and manage the recommended solid waste facilities.** Under State Statute, a Municipal Joint Action Agency has the following powers, which may include, but need not be limited to, the following:

   (i) Sue or be sued;

   (ii) Apply for and accept gifts, grants or loans of funds or property or financial or other aid from any public agency or private entity;

   (iii) Acquire, hold, sell, lease as lessor or lessee, lend, transfer or dispose of such real or personal property including intangible property, or interests therein, as it deems appropriate in the exercise of its powers, to provide for the use thereof by any member upon such terms and conditions and with such fees or charges as it shall determine, and to mortgage, pledge or otherwise grant security interests to such property;

(iv) Make and execute all contracts and other instruments necessary or convenient to the exercise of its power;

(v) Adopt, amend and repeal ordinances, resolutions, rules and regulations with respect to its powers and functions and not inconsistent with the Intergovernmental Cooperation Act;

(vi) Provide for the insurance, including self insurance, of any property or operations of the Municipal Joint Action Agency or its members, directors, officers and employees, against any risk or hazard, and to indemnify its members, directors, officers and employees therefrom;

(vii) Appoint, retain and employ officers, agents, independent contractors and employees to carry out its powers and functions hereunder;

(viii) Make and execute any contract with the federal, state, or a unit of local government or any person relating to a waste project, including contracts which require:

(1) The contracting party pay the Agency a fixed amount for the collection, processing and disposal of a stated amount of municipal waste (whether or not the stated amount of waste is collected or disposed of), or pay all or a portion of the capital and operating expenses of a waste project;
(2) The contracting party make exclusive use of a waste project for collecting, processing or disposing of all or any portion of municipal waste over which the party has control;
(3) The abandonment, restriction, or prohibition on completion or construction of competing waste projects by the contracting party;
(4) Specific provisions with respect to the collection, processing, transportation, storage and disposal of municipal waste;
(5) Payment of fees and charges with respect to a waste project;

(ix) Enter into contracts which provide for compensation to areas affected by an Agency waste project;

(x) Enter into contracts with the host community controlling location, use, operation, maintenance and closing of the waste project;

(xi) Create reserves for the purpose of planning, constructing, reconstructing, acquiring, owning, managing, insuring, leasing, equipping, extending, improving, operating, maintaining, repairing, and closing waste projects;

(xii) Create, develop and implement plans for closing and re-use of sites on which waste projects are located, which plans may provide for various uses, including but not limited to, residential, recreational, commercial, office and industrial uses;

(xiii) Prepare, submit and administer plans, and to participate in intergovernmental agreements, pursuant to the Local Solid Waste Disposal Act (Chapter 127, 743.2).

This statutory charge provides the necessary authority to implement all the objectives of state and local solid waste management goals.

3) **Local municipal recycling programs should continue under the direction of the member governments until such time as ISWDA can consolidate services.** Curbside programs and the County drop-off programs are currently incorporated into member governments' activities. This should continue until the recommended curbside expansions can be implemented. At that time, it would be appropriate to implement the recommendation to consolidate municipal recycling services under ISWDA (provided the proper staffing and financing levels are in place). Until that time, member governments are responsible for developing provisions for compliance such as incentives and penalties as long as thy are consistent with this plan. Once ISWDA has consolidated recycling services, the provisions for compliance should be reviewed.

(4) **It is recommended that the ISWDA, in conjunction with its member governments, should establish a panel to review alternative funding for solid waste management in Champaign County.** Currently, funding for all solid waste activities are going to be included in the tip fee at the recommended material recovery/transfer facility. It may be more appropriate to fund some activities in an alternative manner. There are three areas that will be supported by the tip fee: administration, recycling and educational services, and processing/disposal facilities. However, administration and service costs may be funded through an alternate

source, thereby lowering the tip fee. The tip fee would then only cover debt service and operating costs of necessary solid waste facilities.

Specific examples of services that may be funded from other sources are the Small Quantity Generator program and the recycling programs. The SQG program is aimed at a very specific group of businesses. Since those businesses will be participating in the program and will benefit the most from the program, it seems appropriate that they should be responsible for the majority costs. For recycling, the plan does not recommended that municipal programs be developed to service 10+ apartment buildings. There are also areas of the County that, due to their rural location, will not be able to justify curbside recycling services. Therefore, it may be appropriate to identify specific entities that do have access to municipal recycling services and obtain funding from those entities for those recycling programs.

The panel should convene within six months of the plan's adoption. The panel should develop a report that reviews, at a minimum, the following options:

1) Property tax assessments;
2) Township funding;
3) Member government direct funding;
4) Creation of special solid waste district with taxing authority; and,
5) Sales tax assessment.

Combinations of funding sources may also be reviewed. Active involvement of member government's Councils or Boards is also recommended to obtain their input. The member government staff appointed to the panel should have a thorough understanding of municipal financing and alternatives. The panel should present a preliminary report to the ISWDA Board six months after their first meeting. The final report should be completed within one year of the first meeting.

Flow Control

As stated in Section 4, regardless of the facility or owner (public vs. private), some type of flow control is necessary to insure the financing of the facility. If the owner of the facility does not have an adequate waste flow, then it would be difficult to remain operational and meet debt service payments. The type of flow control is what will vary.

In Champaign County with local government owning the facility, legal flow control should be implemented.

1) **Flow control is necessary to acquire revenue bonds for financing.** Local governments must issue bonds for the construction of such capital improvement projects. Local governments must be able to secure the bonds in some fashion. As discussed, a general obligation bond is secured by the taxing authority of a government. If the bond cannot be repaid through the anticipated channels (e.g., tax increment financing funds) then the municipality must increase taxes to make the payments. However, a solid waste facility will be collecting tip fees and thereby generating revenues. So, it is possible to issue revenue bonds. However, since the revenue is generated by incoming waste, the bond market will require some "proof" that the appropriate amount of waste will be arriving at the facility. If the developer was a private firm that also collected waste, a review of their client records may be sufficient. Another option would be contracts with certain haulers. However, in Champaign County, there are approximately 45 independent haulers. The number is changing, too, due to mergers or buyouts. Clients are free to change haulers at any time. If only select haulers sign a contract to use the facility, and had to raise their prices, customers could simply switch to a hauler, not involved with the facility, that currently has lower prices. The waste flow would be lost and revenue uncertain.

2) **Flow control is participation regulation which will bring the highest number of people into the recommended solid waste management system.** Once a preferred solid waste management system has been identified and implemented by local government, it is beneficial to the local government and the citizens that everyone in the County participate. The preferred system was selected to achieve a set of goals and if the majority of residents do not participate, those goals may not be achieved.

Economic flow control would also be very difficult to employ at the current time. Under the current economic conditions in Illinois, landfilling will remain the "cheapest" solid waste management option for the next 5-10 years. If local officials and the public feels it is important to offer something more than landfilling, the cost of solid waste disposal will rise. Even with the increase in transportation costs to distant landfills, these additional services will raise the overall system cost for solid waste above the "just landfill" option. The trend will be to continue to use the least costly method of disposal; "just landfill it." To encourage solid waste management approaches to change, the tip fee must be comparable for the services rendered. However, the difference between the "just landfill" costs and the expanded material recovery costs will have to be subsidized or recovered in some manner. This could mean higher property taxes under non-revenue bond financing.

The only available means to assure a flow of waste to the facility currently is legal flow control. In the future, there may be a chance that the tip fees would be comparable to landfilling. However, this is not certain. Allowing continued use of out-of-county facilities which may not meet the local standards for recovery rates, screening, siting or a number of other issues, would be contrary to local goals.

3) **Flow control can assist in lowering the County and municipalities liability in the future at out-of-county disposal sites.** One of the benefits of an in-county, municipally owned facility is the reduction or removal of liability related to out-of-county facilities. If the investment is made in an in-county facility, allowing waste to be disposed of out-of-county would negate the reduction in liability.

4) **Flow control would be enacted by the member governments.** The ISWDA has the authority to request member governments to enact flow control. This authority stems from the Association's status as a municipal joint action agency and is stated in the Agreement that formed the Association.

It is recommended that the member governments enact flow control through two avenues. The first would be by ordinance or resolution. The second would be through the licensing structure. Currently, Champaign and Urbana license haulers. As part of that license, there would be a requirement to use the facilities designated in the ordinance. Not using the facilities would be a violation for which license would be revoked.

The County currently does not have a licensing structure for haulers operating in unincorporated areas. A licensing structure would need to be developed and incorporate the requirement to use the designated facilities.

The fees for the licenses would be determined by the member governments.

5) **Flow Control should be enacted immediately after the adoption of the Solid Waste Management Plan.** As of October, 1990, flow control has not been adopted by any municipality or county in Illinois. It is reasonable to assume that there could be a legal challenge of the ordinance and/or licensing requirements. It would be beneficial to resolve any legal challenge prior to the opening of any solid waste facility.

Financing

Solid waste facilities may be one of the largest capital projects a municipality undertakes. Therefore, the financing method is equally significant. As reviewed in Section 4, there are a number of financing methods available, all which carry varying degrees of risk. Each alternative also has advantages and disadvantages. In Champaign County, solid waste facilities should be financed with revenue bonds.

1) **Revenue bonds should be used because solid waste facilities are revenue generating activities.** It is questionable if it would be possible to issue general obligation bonds (G.O.) due to the recommendation that operation of the facility be contracted to a private firm. It is also questionable to use G.O. bonds to finance a self-supporting project. G.O. bonds are generally intended to pay for capital improvements to infrastructures that do no generate revenue (i.e., streets, curbs, sidewalks).

2) **Revenue bonds minimize the impact on the debt limit of the non-home rule municipalities and counties.** Revenue bonds are not credited toward the County's debt limit. Therefore, the funding capacity for other projects will remain available.

3) **Revenue bonds have the potential to obtain the lowest possible interest rate.** Although revenue bonds tend to have slightly higher interest rates than general obligation bonds, there is an opportunity to lower the rate. By adding the backing of the full faith and credit of a municipality(ies), the interest rates may be mid-way between the general obligation bond and a typical revenue bond. This backing may also assist in selling the bonds. If the bonds are sold competitively, the backing and credit ratings of the participating municipalities should allow the bonds to be viewed favorably by the investment community. By acquiring the lowest interest rate possible, the cost savings can be passed on to the users through lower tip fees or the savings could be used to finance additional programs such as household hazardous waste collections.

4) **Revenue bonds allow the participating municipalities to distribute the project risks.** Under a general obligation bond, all the project risks rest with the taxpayer. As with contracting for operation, due to the complexity of these facilities, local governments amy prefer allocating part of the risk

to a private firm. The contract could require repayment of the bond by the private firm, if they fail to operate the facility properly.

5) **Revenue bonds allow the development of true pricing for solid waste; the development of a user fee.** If a $15 million dollar facility is needed to handle solid waste in an area, that cost should be reflected in the cost to dispose of the waste. Revenue bonds will allow the full cost of the facility and any ancillary programs, such as recycling programs, to be reflected in the cost of solid waste management. Under a general obligation bond, the repayment may simply become incorporated into the general property tax fees. Property owners will not realize what the true cost of waste disposal is. In other words, revenue based solid waste financing allows for an administratively workable system of user based fees.

APPENDIX 1

System Costs: *Technical Disucssions on Development of Cost Estimates, Capital Costs, and Traffic Counts*

PROJECTION OF SYSTEM AND TIP FEE COSTS

General

Calendar Year 1988 was used as a base year for calculation purposes. The project period is 1990-2010.

Population Distribution Assumptions:

1) Base 1988 population was 173,177, distributed as follows:

- City of Champaign is 59,332.
- City of Urbana is 36,772.
- City of Rantoul is 20,942.
- Champaign Township is 7,500.
- Urbana Township is 9,009.
- Mahomet Township is 7,949.
- Remaining County Population is 31,637.

2) Population distribution in County does not change from 1988 to 2015.

3) Population growth is assumed to be uniform at 0.2% per year.

Waste Generation Rates:

1) Urban rate of residential/commercial waste generation is 0.516929 tons per capita-year in 1988 (2.83249 lbs per capita-day) excluding recycled material.

2) The urban rate applies to the City of Champaign, City of Rantoul, City of Urbana, Champaign Township and Urbana Township.

3) The rural rate of residential/commercial waste generation is 0.441739 tons per capita-year in 1988 (2.42049 lbs per capita-day) excluding recycled material. (Rural Rate is 85.45% of the Urban Rate).

4) The rural rate applies to Mahomet Township and the remaining population of 31,637.

5) The rate of construction/demolition/industrial waste generation is 0.149565 tons per capita-year in 1988 (0.874329 lbs per capita-day) excluding recycled materials and clean fill.

6) The construction/demolition/industrial waste generation applies to City of Champaign, City of Rantoul, City of Urbana, Champaign Township, Mahomet Township and Urbana Township.

7) The growth rate of residential/commercial waste, per capita is 0.6% per year. Per capita growth for construction/demolition/industrial waste is assumed zero.

8) Generated yardwaste is diverted to the yardwaste site at a rate of 31% prior to 1991. Beginning in 1991, 57% of generated yardwaste is assumed diverted to the yardwaste site. The remainder is counted as landfilled but may actually be backyard compost.

9) Some treatment plant sludge is presently landfilled at the Rantoul Landfill. This practice is assumed to continue even after the Rantoul Landfill closes.

Waste Distribution Assumptions:

1) The waste generated in the City of Rantoul and the Townships of Compromise, Condit, East Bend, Harwood, Kerr, Ludlow and Rantoul (Rantoul Wasteshed) is assumed disposed at Rantoul Landfill until Rantoul Landfill closes.

2) The waste generated in the townships of Brown and Newcomb (Saybrook Wasteshed) is assumed disposed at Saybrook Landfill until Saybrook Landfill closes. (At the closure of Saybrook Landfill, waste from Saybrook Wasteshed goes to Vermilion County Landfill).

3) The waste generated in the townships of Ayers, Crittenden, Pesotum, Raymond, and Sadorus (Villa Grove Wasteshed) is disposed at Villa Grove Landfill until Villa Grove Landfill closes.

4) At the closure of Villa Grove Landfill the waste from Villa Grove Wasteshed goes to Vermilion County.

5) Sixty percent of the waste generated in the Cities of Champaign and Urbana and the townships of Colfax, Hensley, Mahomet, Philo, St. Joseph, Scott, Sidney, Somer, Stanton, Tolono, and Urbana is disposed in Vermilion County.

6) All of the waste generated in the townships of Ogden and South Homer is disposed in Vermilion County.

7) Forty percent of the waste generated in the Cities of Champaign and Urbana and the townships of Colfax, Hensley, Mahomet, Philo, St. Joseph,

Scott, Sidney, Somer, Stanton, Tolono, and Urbana is disposed in Villa Grove Landfill.

Landfill Capacity and Closure Dates:

1) Cubic yards of remaining capacity in 1989 reported by the IEPA used for estimating closure for all the landfills except Villa Grove Landfill.

2) The remaining capacity of Villa Grove Landfill in 1988 was used for estimating closure. The IEPA suspected an error in the 1989 reported capacity.

3) The IEPA reported 1989 yards received is the average yardage received per year from 1989 to closure.

4) The waste from Saybrook Wasteshed in Champaign County is disposed at Vermilion County after projected closure of Saybrook Landfill in 1990.

5) The waste from Villa Grove Wasteshed in Champaign County is disposed at Vermilion County after projected closure of Villa Grove Landfill in 1991.

6) The waste from Rantoul Wasteshed in Champaign County is disposed at Vermilion County after projected closure of Rantoul Landfill in 1994.

7) The waste from Champaign County is disposed in Coles County Landfill after projected closure of Vermilion County Landfill in 1996, in one scenario studied. In another scenario, Vermilion County Landfill remains open through 2010.

8) Gate yard density is 750 lbs per cubic yard (2.66 cubic yards per ton).

9) In-place fill density is 1000 lbs per cubic yard, due to landfill compaction.

Recycling Base Rates:

1) 149,893 tons of residential, commercial, construction/demolition (excluding clean fill) and non-hazardous industrial wastes are generated in 1988 (excludes treatment plant sludges).

2) 11,427 tons in 1988 (7.6%) are recycled by public funded and non-profit programs including 5523 tons of recovered yardwaste.

3) Expanded public collection programs are fully implemented by 1996 with a 65% participation rate. All towns and villages in the County are serviced by

curbside programs. The in-town drop-off sites are also included as a public program. After 1996, the program tonnages increase at 0.8012% per year, same as residential/commercial waste fraction.

4) Private recycling collects and processes 9040 tons of residential/commercial fraction and 20,306 tons of construction/demolition and industrial fractions in 1988. The growth of the privately recycled construction/demolition and industrial fractions is 0.2% per year. The growth of the privately recycled and processed residential/commercial fraction is 0.8012% per year.

5) All other nonprofit processing and direct institutional recycling collects 2674 tons in 1988, 2604 tons in 1989, 3398 tons in 1990, 3947 tons in 1991, 4504 tons in 1992, 5067 tons in 1993, 5638 tons in 1994, 5920 tons in 1995. After 1995 all other recycling increases at 0.8012% per year, same as residential/commercial waste fraction.

6) A material recovery facility provides processing capacity for an additional 20% (14.6% of the 1988 waste stream before discounting public and private recycling) of the remaining waste stream after discounting private recycling and processing. Delivery of material (either as mixed waste or source separated) is accomplished by public, private, non-profit or institutional collection vehicles.

7) Preprocessing prior to incineration collects an additional 25% of the remaining wastestream after discounting private recycling and processing. Delivery or material (either as mixed waste or source separated) is accomplished by public, private, non-profit or institutional collection vehicles.

8) In the no-action scenarios, the cost for supporting public recycling programs, excluding collection costs, is $317,200 in 1990 (inflated at 5% per year). These costs include material processing and education.

9) In the material recovery scenarios, expanded curbside support is $553,951 in 1992 inflated at 5% per year. After 1992, processing costs are included in the operating costs of the material recovery/transfer facility. Expanded curbside support reflects collection costs.

<u>No-Action (Scenarios #1 and #2)</u>

1) Transport costs are $0.35 per ton-mile for collection vehicles in 1988; $0.20 per ton-mile for transfer vehicles.

2) Total transport costs for collection vehicles from a township is the round trip miles to disposal times the tons per year times $0.35 per ton-mile.

3) Inflation is 5% per year from 1988 to 2010.

4) The 1989 tipping fees were obtained from the landfill operators over the telephones as follows: Rantoul Landfill, $5.50 per cubic yard; Vermilion County Landfill, $4.25 per cubic yard; Villa Grove Landfill, $5.00 per cubic yard; McLean County Landfill, $4.40 per cubic yard; Coles County Landfill $5.00 per cubic yard.

5) The tipping fees are projected at 20% per year from 1988 to 2000, based on an increase of tipping fees from 1986 to 1989 provided by area operators. This rate of increase is due to added compliance costs of undercapitalized landfills operating prior to the 1990 Illinois Pollution Control Board new post closure care requirements.

6) Tipping fees are projected to increase at 5% per year after 2000. It is assumed that the currently operating landfills will be fully capitalized and operated in such a fashion as to meet 1990 post closure care requirements.

Transfer Facility Without Material Recovery (Scenario #3):

1) Round trip distance between facility and the landfill in Vermilion County is 68 miles. Round trip distance between facility and Coles County Landfill is 98 miles.

2) Cost of transfer is $0.20 per ton-mile in 1988. Inflation is 5% per year from 1988 through 2010.

3) Facility begins accepting waste in 1992.

4) Rantoul Landfill closes at the end of 1994. Rantoul wasteshed wastes are accepted for transfer beginning of 1995.

5) No mass reduction of material occurs.

6) Capital costs are amortized over 20 years at 7.5% APR. Overall capital cost in 1992 is $4,556,800.

7) Disposal costs calculated based on no-action scenario costs.

Material Recovery/Transfer Facility with Out-of-County Disposal (Scenario #4):

1) Disposal at Vermilion County Landfill from MR/TF opening in 1992 to projected closure of Vermilion County Landfill in 1996.

2) Disposal at Coles County Landfill from 1996 through 2010.

3) Transfer cost is $0.20 per ton-mile in 1988. Inflation is 5% per year from 1988 through 2010.

4) Transport cost by collection vehicle is $0.35 per ton-mile in 1988. Inflation is 5% per year from 1988 through 2010.

5) Round trip distance from MR/TF to Coles County Landfill is 98 miles.

6) Round trip distance from MR/TF to Vermilion County Landfill is 68 miles.

7) Capital Costs amortized over 20 years at 7.5% APR. Overall cost of the MR/TF is estimated at $11,317,000 in 1992.

8) Disposal costs calculated based on no-action scenario costs.

Transfer/Material Recovery and Composting Facility, Wastes Transferred to Disposal Out-of-County (Scenario #5a):

1) Round trip distance between the facility and the landfill in Vermilion County is 68 miles. Round trip distance between the facility and the landfill in Coles County is 98 miles.

2) The landfill in Vermilion County closes at the end of 1995. Wastes are transferred to the landfill in Coles County beginning in 1996.

3) Cost of transfer is $0.20 per ton-mile in 1988. Inflation is 5% per year from 1988 through 2010.

4) Compostable material is assumed to be 42.68% of the residential/commercial fraction received at the facility prior to removal of recyclables or yardwaste. Yardwaste is sent to the yardwaste facility. Compostable materials are reduced to 35% by mass or 21.34% of the received residential/commercial fraction is converted to gases and lost to the atmosphere.

5) No compostable material from the industrial or construction/demolition fraction is assumed.

6) Municipal waste compost product is a recycled material. However, for calculation of system costs and tip fees, it is assumed there is no market for the compost, so all composted material is transferred out-of-county for disposal.

7) Composting is done in-vessel with a residency time of 2 weeks. After in-vessel composting, material is stabilized after 3 weeks in a fully enclosed maturation building before transfer to disposal.

8) Capital cost of the composting module is estimated at $9,929,600 in 1997. Capital cost of the MR/TF is estimated at $11,317,000 in 1992.

9) Disposal costs calculated based on no-action scenario costs.

Transfer/Material Recovery and Composting Facility with an In-county Landfill (Scenario #5b):

1) Round trip distance between the facility and the in-county landfill is 46 miles.

2) Cost of transfer is $0.20 per ton-mile in 1988. Inflation is 5% per year from 1988 through 2010.

3) Transfer and material recovery capability begins in 1992. In-county landfill begins accepting waste in 1995. Composting module is added in 1997. Wastes are shipped to the Vermilion County Landfill from 1992 through 1994.

4) Compostable material is assumed to comprise 42.68% of the residential/commercial waste fraction received at the facility prior to removal of any recyclable material or yard waste. Yardwaste is transferred to the yardwaste facility. Compostable material is reduced to 35% by mass or 21.34% of the received residential/commercial fraction is converted to gases and lost to the atmosphere.

5) No compostable material from the industrial or construction/demolition fraction is assumed.

6) Municipal waste compost product is a recycled material. However, for calculation of system costs and tip fees, it is assumed there is no market for the compost, so all compost is transferred to disposal at the in-county landfill.

7) Composting is done in-vessel with an in-vessel residency time of 2 weeks. After in-vessel composting, material is transferred to a fully enclosed maturation building where the material is stabilized after 3 weeks before transfer to disposal.

8) Capital cost of the composting module is estimated at $9,929,600 in 1997. Capital costs of MR/TF and landfill are same as the MR/TF and landfill located separately.

9) Disposal costs calculated based on in-county landfill scenario.

Material Recovery/Transfer Facility with Champaign County Landfill (Scenario #6):

1) Costs of transporting recycled materials equals revenue generated from sales. No additional value is assigned to recyclable material revenue to lower operation and maintenance costs.

2) Round trip distance between MR/TF and Champaign County Landfill is 46 miles.

3) Cost of transfer is $0.20 per ton-mile in 1988. Inflation is 5% per year from 1988 through 2010.

4) MR/TF begins accepting waste in 1992.

5) Landfill begins accepting waste in 1995.

6) Rantoul Landfill continues to accept waste through 1994. Rantoul Wasteshed wastes are transported to the MRF beginning 1995.

7) Recycling at the MR/TF reduces landfilled tonnage by an additional 20%. Other recycling continues at the same rate as assumed for the "No Action Scenario."

8) Capital costs amortized over 20 years at 7.5% APR. Overall cost of the MR/TF is estimated at $11,317,000 in 1992. Capital cost of the Champaign County Landfill is estimated at $20,662,000 in 1995.

9) Disposal cost calculated based on in-county landfill scenario.

Landfill and Material Recovery Facility on Same Site (Scenario #7):

1) Landfill and material recovery facility are located together and begin operations in 1995.

2) Recovery from the expanded source separated and mixed waste is 20% by mass.

3) Transport cost by collection vehicle is $0.35 per ton-mile in 1988. Inflation is 5% per year form 1988 through 2010.

4) Capital cost of the combined landfill and MRF is $31,457,000 in 1995. Capital cost is amortized at 7.5% APR over 20 years.

5) Disposal cost calculated based on in-county landfill scenario.

Waste to Energy Facility With An In-county Ash-Fill (Scenario #8):

1) Same as for waste to energy facility without an in-county ash-fill except as follows:

2) Ash and by-pass materials landfilled at a small ash monofill and by pass landfill developed in Champaign County 46 miles round trip from WTEF.

3) Capital cost amortized over 20 years at 7.5% APR. Cost of ash monofill is estimated $7,073,500 in 1995, (total capital costs are $57,226,000 including material recovery component, waste to energy facility and Ashfill).

Waste To Energy Facility Without an In-county Ash-Fill (Scenario #9):

1) Public funding of recycled material processing continues at the same rate as in 1989. Inflation is 5% per year from 1988 through 2010.

2) Transport to the waste to energy facility is in collection vehicles at $0.35 per ton-mile in 1988. Inflation is 5% per year from 1988 through 2010.

3) Material recovery, required by statute, is 25% of the delivered tonnage (tonnage remaining after present public and private recycling). Revenues from sale of steam to University of Illinois used to offset, in part, operation and maintenance costs.

4) By-pass material is 5% of the delivered tonnage.

5) Ash and by-pass material is transferred to Coles County Landfill for disposal.

6) Stack gasses (atmospheric losses) account for 78.75% of the incinerated material.

7) Capital costs amortized over 20 years at 7.5% APR. Cost of the waste to energy facility (including MRF component) is estimated at $54,987,000 in 1995.

8) Disposal costs calculated based on no-action scenario costs.

Champaign County Landfill Only (Scenario #10):

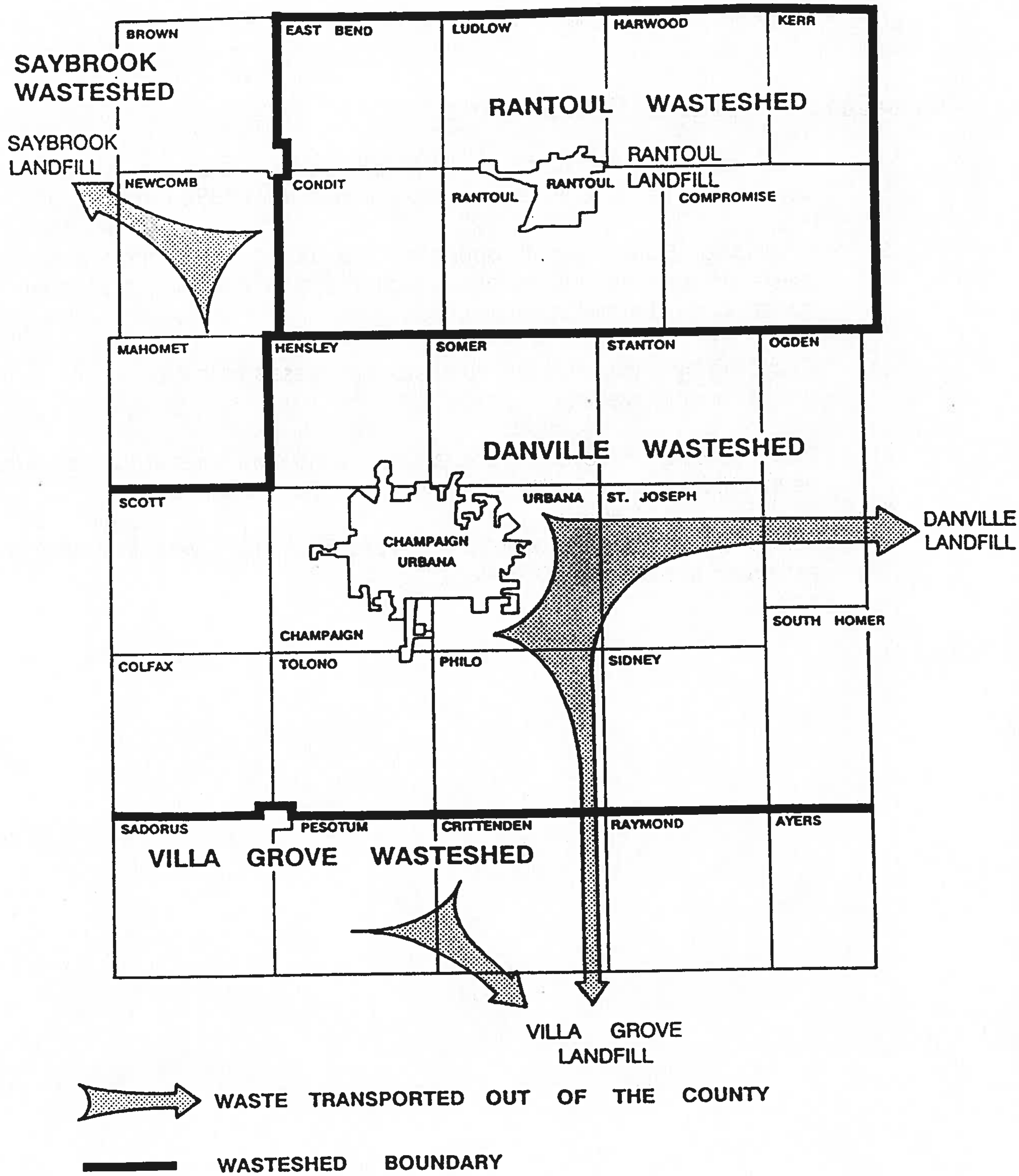
1) Waste is transported to the landfill in collection vehicles at a cost of $0.35 per ton-mile in 1988. Inflation is 5% per year from 1988 through 2010.

2) Champaign County Landfill opens in 1995 and accepts all non-hazardous waste from the entire county except recycled materials and clean fill construction/demolition wastes.

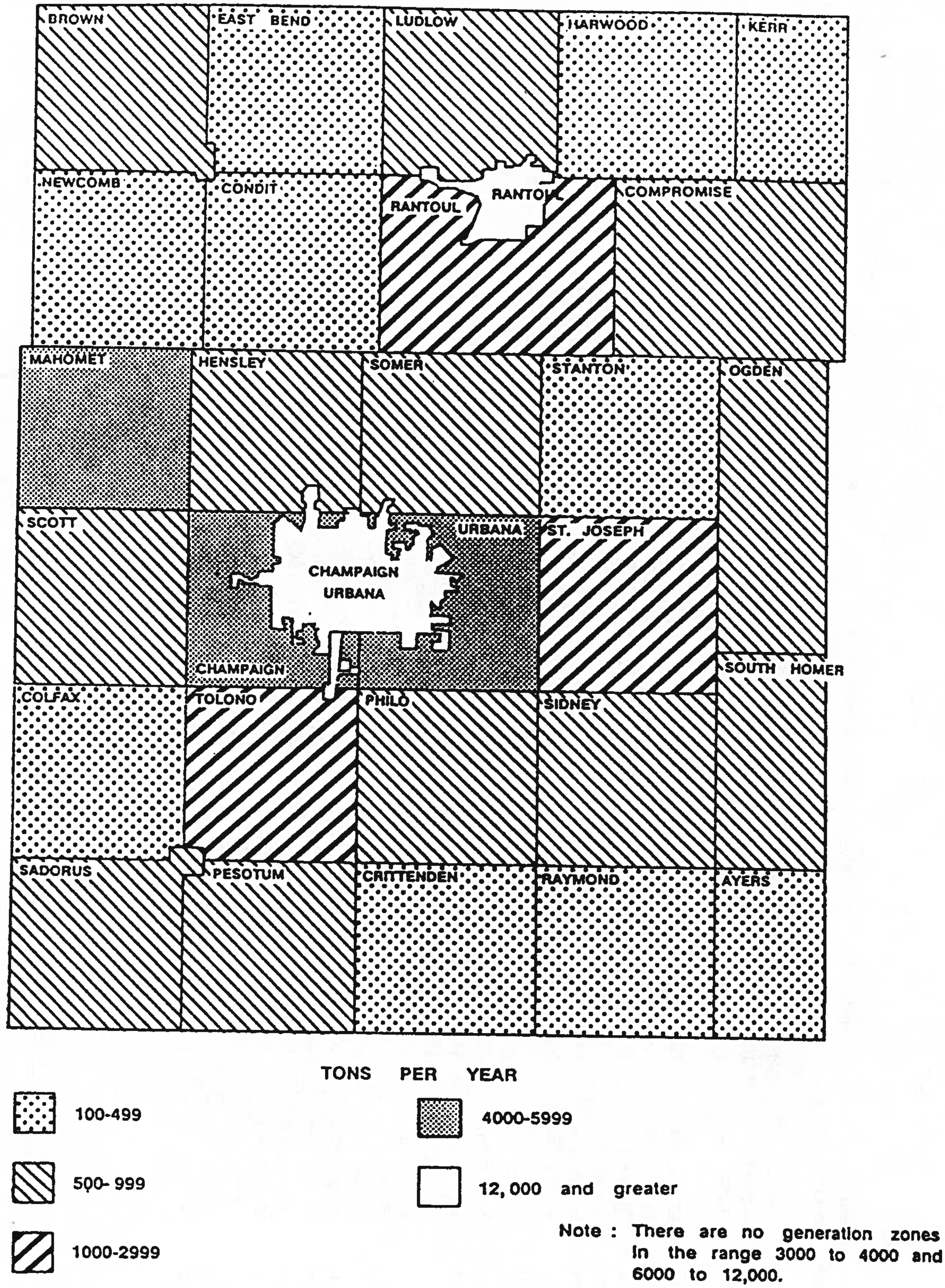
3) Recycling by public and private sectors increases at the same rate as the growth of solid waste.

4) Public funding of recycled material processing continues at the same rate as in 1989. Inflation is 5% per year from 1988 through 2010.

5) Capital costs amortized over 20 years at 7.5% APR. Overall capital cost is estimated at $20,662,000 in 1995.



Estimated Wastesheds
1988



Estimated Distribution of Residential and Commercial Waste: 1988

SCENARIO #1: No action; Champaign County waste landfilled in Vermilion County through 2010; no expanded curbside programs.

YEAR	TOTAL TIP FEE COSTS	TOTAL TRANSPORT COSTS	PUBLIC RECYCLING COSTS	TOTAL SYSTEM COSTS	TIP FEE PER TON	SYSTEM COST PER TON
1990	$1,386,410	$2,052,694	$317,200	$3,756,304	$12.57	$33.96
1991	$1,585,207	$2,559,498	$333,060	$4,477,765	$14.07	$40.21
1992	$1,915,164	$2,705,714	$349,713	$4,970,591	$17.29	$44.34
1993	$2,312,609	$2,860,299	$367,199	$5,540,107	$20.61	$49.08
1994	$2,794,515	$3,023,734	$385,559	$6,203,807	$24.57	$54.59
1995	$3,227,882	$3,823,166	$404,837	$7,455,885	$28.02	$65.17
1996	$3,897,989	$4,041,696	$425,078	$8,364,764	$34.13	$72.62
1997	$4,710,082	$4,272,742	$446,332	$9,429,155	$40.65	$81.30
1998	$5,688,779	$4,517,021	$468,649	$10,674,448	$48.45	$91.42
1999	$6,875,013	$4,775,292	$492,081	$12,142,387	$58.88	$103.29
2000	$8,304,483	$5,048,359	$516,685	$13,869,528	$70.31	$117.18
2001	$8,780,757	$5,337,071	$542,520	$14,660,348	$73.81	$123.02
2002	$9,282,406	$5,642,326	$569,646	$15,494,377	$77.48	$129.13
2003	$9,813,115	$5,965,073	$598,128	$16,376,316	$81.33	$135.55
2004	$10,373,422	$6,306,316	$628,034	$17,307,772	$85.37	$142.29
2005	$10,967,137	$6,667,117	$659,436	$18,293,690	$89.62	$149.37
2006	$11,594,881	$7,048,600	$692,408	$19,335,888	$94.08	$156.80
2007	$12,257,282	$7,451,950	$727,028	$20,436,261	$98.75	$164.59
2008	$12,958,313	$7,878,426	$763,380	$21,600,119	$103.67	$172.78
2009	$13,702,047	$8,329,354	$801,549	$22,832,950	$108.83	$181.39
2010	$14,485,902	$8,806,138	$841,626	$24,133,666	$114.25	$190.41

SCENARIO #2: No action; Champaign County waste landfilled in Vermilion County through 1995; beginning in 1996, all Champaign County waste landfilled in Coles County; no expanded curbside programs.

YEAR	TOTAL TIP FEE COSTS	TOTAL TRANSPORT COSTS	PUBLIC RECYCLING COSTS	TOTAL SYSTEM COSTS	TIP FEE PER TON	SYSTEM COST PER TON
1990	$1,386,410	$2,052,694	$317,200	$3,756,304	$12.57	$33.96
1991	$1,585,207	$2,559,498	$333,060	$4,477,765	$14.07	$40.21
1992	$1,915,164	$2,705,714	$349,713	$4,970,591	$17.29	$44.34
1993	$2,312,609	$2,860,299	$367,199	$5,540,107	$20.61	$49.08
1994	$2,794,515	$3,023,734	$385,559	$6,203,807	$24.57	$54.59
1995	$3,227,882	$3,823,166	$404,837	$7,455,885	$27.59	$65.17
1996	$4,586,024	$5,907,221	$425,078	$10,918,323	$39.81	$94.79
1997	$5,540,731	$6,244,887	$446,332	$12,231,951	$47.46	$105.47
1998	$6,694,225	$6,601,892	$468,649	$13,764,766	$57.76	$117.88
1999	$8,087,903	$6,979,346	$492,081	$15,559,330	$68.82	$132.35
2000	$9,771,789	$7,378,421	$516,685	$17,666,895	$82.09	$149.26
2001	$10,331,607	$7,800,359	$542,520	$18,674,486	$86.17	$156.70
2002	$10,920,662	$8,246,472	$569,646	$19,736,780	$90.47	$164.49
2003	$11,546,353	$8,718,148	$598,128	$20,862,629	$94.98	$172.69
2004	$12,206,120	$9,216,852	$628,034	$22,051,007	$99.70	$181.28
2005	$12,903,854	$9,744,138	$659,436	$23,307,429	$104.67	$190.31
2006	$13,643,546	$10,301,647	$692,408	$24,637,600	$109.88	$199.79
2007	$14,422,663	$10,891,112	$727,028	$26,040,804	$115.35	$209.73
2008	$15,248,598	$11,514,370	$763,380	$27,526,348	$121.10	$220.18
2009	$16,122,222	$12,173,361	$801,549	$29,097,132	$127.14	$231.16
2010	$17,044,418	$12,870,137	$841,626	$30,756,181	$133.47	$242.67

SCENARIO #3: Transfer station built in Champaign County and opens in 1992; all waste transferred to Vermilion County through 1995; beginning in 1996, all waste transferred to Coles County; no expanded curbside programs.

YEAR	TOTAL TRANSPORT COSTS	CAPITAL DEBT SERVICE	OPERATIONS & MAINTENANCE	PUBLIC RECYCLING PROGRAM COSTS	TOTAL TRANSFER COSTS	TOTAL TIP FEE COSTS	TOTAL SYSTEM COSTS	TIP FEE PER TON	SYSTEM COST PER TON
1990	$0	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1991	$0	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1992	$576,683	$446,988	$1,004,008	$349,713	$1,558,559	$1,538,676	$5,908,573	$47.56	$52.70
1993	$609,752	$446,988	$1,054,209	$367,199	$1,647,575	$1,857,909	$6,499,093	$52.18	$57.58
1994	$644,719	$446,988	$1,106,919	$385,559	$1,741,685	$2,245,119	$7,184,640	$57.55	$63.22
1995	$1,078,993	$446,988	$1,162,265	$404,837	$2,189,412	$3,227,882	$8,510,376	$64.95	$74.39
1996	$1,140,837	$446,988	$1,220,378	$425,079	$3,335,653	$4,586,050	$11,154,985	$86.94	$96.84
1997	$1,206,233	$446,988	$1,281,397	$446,333	$3,526,303	$5,541,999	$12,449,253	$96.94	$107.35
1998	$1,275,383	$446,988	$1,345,467	$468,649	$3,727,871	$6,694,511	$13,958,870	$108.62	$119.55
1999	$1,348,505	$446,988	$1,412,740	$492,082	$3,940,984	$8,088,249	$15,729,548	$122.33	$133.80
2000	$1,425,826	$446,988	$1,483,377	$516,686	$4,166,303	$9,772,207	$17,811,386	$138.43	$150.48
2001	$1,507,588	$446,988	$1,557,546	$542,520	$4,404,528	$10,331,609	$18,790,780	$145.02	$157.67
2002	$1,594,047	$446,988	$1,635,424	$569,646	$4,656,402	$10,920,664	$19,823,170	$151.92	$165.21
2003	$1,685,472	$446,988	$1,717,195	$598,128	$4,922,706	$11,546,355	$20,916,845	$159.18	$173.14
2004	$1,782,150	$446,988	$1,803,054	$628,035	$5,204,270	$12,206,123	$22,070,620	$166.79	$181.44
2005	$1,884,383	$446,988	$1,893,207	$659,437	$5,501,969	$12,903,857	$23,289,840	$174.78	$190.16
2006	$1,992,490	$446,988	$1,987,867	$692,408	$5,816,729	$13,643,548	$24,580,031	$183.17	$199.33
2007	$2,106,810	$446,988	$2,087,261	$727,029	$6,149,530	$14,422,666	$25,940,283	$191.95	$208.92
2008	$2,227,699	$446,988	$2,191,624	$763,380	$6,501,407	$15,248,601	$27,379,700	$201.19	$219.01
2009	$2,355,537	$446,988	$2,301,205	$801,549	$6,873,457	$16,122,225	$28,900,961	$210.89	$229.60
2010	$2,490,723	$446,988	$2,416,265	$841,627	$7,266,837	$17,044,421	$30,506,861	$221.05	$240.70

System Costs and Tip Fees
Expanded Processing with Out-of-County Disposal

SCENARIO #4: Transfer station with material recovery component built in Champaign County and opens in 1992; all waste transferred to Vermilion County through 1995; beginning in 1996, all waste transferred to Coles County; expanded curbside program implemented in 1992.

YEAR	TOTAL TRANSPORT COSTS	CAPITAL DEBT SERVICE	OPERATIONS & MAINTENANCE	PUBLIC RECYCLING PROGRAM COSTS*	TOTAL TRANSFER COSTS	TOTAL TIP FEE COSTS	TOTAL SYSTEM COSTS	TIP FEE PER TON	SYSTEM COST PER TON
1990	$0	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1991	$0	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1992	$576,683	$1,110,166	$1,084,232	$553,951	$1,068,967	$1,519,192	$6,347,136	$51.47	$56.62
1993	$609,752	$1,110,166	$1,138,443	$581,649	$1,120,695	$1,821,614	$6,897,780	$55.71	$61.11
1994	$644,719	$1,110,166	$1,195,365	$610,731	$1,174,714	$2,181,162	$7,530,509	$60.59	$66.27
1995	$1,078,993	$1,110,166	$1,255,134	$641,268	$1,515,610	$2,234,487	$7,835,657	$59.06	$68.49
1996	$1,140,837	$1,110,166	$1,317,890	$673,331	$2,308,661	$3,174,083	$9,724,968	$74.52	$84.43
1997	$1,206,233	$1,110,166	$1,383,785	$706,997	$2,440,161	$3,835,001	$10,682,342	$81.71	$92.11
1998	$1,275,383	$1,110,166	$1,452,974	$742,347	$2,579,167	$4,631,670	$11,791,707	$90.06	$100.99
1999	$1,348,505	$1,110,166	$1,525,623	$779,465	$2,726,109	$5,594,913	$13,084,779	$99.83	$111.30
2000	$1,425,826	$1,110,166	$1,601,904	$818,438	$2,881,441	$6,758,522	$14,596,296	$111.27	$123.32
2001	$1,507,588	$1,110,166	$1,681,999	$859,360	$3,045,642	$7,144,102	$15,348,857	$116.14	$128.79
2002	$1,594,047	$1,110,166	$1,766,099	$902,328	$3,219,221	$7,550,045	$16,141,905	$121.24	$134.53
2003	$1,685,472	$1,110,166	$1,854,404	$947,444	$3,402,714	$7,981,170	$16,981,370	$126.61	$140.56
2004	$1,782,150	$1,110,166	$1,947,124	$994,816	$3,596,687	$8,435,693	$17,866,637	$132.23	$146.88
2005	$1,884,383	$1,110,166	$2,044,480	$1,044,557	$3,801,742	$8,916,292	$18,801,620	$138.13	$153.52
2006	$1,992,490	$1,110,166	$2,146,704	$1,096,785	$4,018,512	$9,425,709	$19,790,367	$144.33	$160.49
2007	$2,106,810	$1,110,166	$2,254,040	$1,151,624	$4,247,669	$9,962,182	$20,832,490	$150.82	$167.78
2008	$2,227,699	$1,110,166	$2,366,742	$1,209,206	$4,489,920	$10,530,802	$21,934,534	$157.63	$175.45
2009	$2,355,537	$1,110,166	$2,485,079	$1,269,666	$4,746,016	$11,132,154	$23,098,617	$164.79	$183.50
2010	$2,490,723	$1,110,166	$2,609,333	$1,333,149	$5,016,750	$11,766,832	$24,326,952	$172.29	$191.94

* includes expanded curbside recycling programs

SCENARIO #5a: Transfer station built with material recovery and in-vessel composting components built in Champaign County; all waste transferred to Vermilion County through 1995; beginning in 1996, all waste transferred to Coles County. Transfer station with material recovery opens in 1992; in-vessel composting operation starts in 1997; expanded curbside programs implemented in 1992.

YEAR	TOTAL TRANSPORT COSTS	CAPITAL DEBT SERVICE	OPERATIONS & MAINTENANCE	PUBLIC RECYCLING PROGRAM COSTS*	TOTAL TRANSFER COSTS	TOTAL TIP FEE COSTS	TOTAL SYSTEM COSTS	TIP FEE PER TON	SYSTEM COST PER TON
1990	$0	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1991	$0	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1992	$576,683	$1,110,166	$1,084,232	$553,951	$1,068,967	$1,055,330	$5,883,274	$47.33	$52.48
1993	$609,752	$1,110,166	$1,138,443	$581,649	$1,120,695	$1,263,766	$6,339,933	$50.77	$56.17
1994	$644,719	$1,110,166	$1,195,365	$610,731	$1,174,714	$1,514,266	$6,863,613	$54.73	$60.40
1995	$1,078,993	$1,110,166	$1,255,134	$641,268	$1,515,611	$2,234,487	$7,835,658	$59.06	$68.49
1996	$1,140,837	$1,110,166	$1,317,890	$673,331	$2,308,662	$3,174,083	$9,724,969	$74.52	$84.43
1997	$1,206,233	$2,084,181	$1,920,855	$706,997	$1,662,556	$2,612,903	$10,193,724	$77.50	$87.90
1998	$1,275,383	$2,084,181	$2,016,897	$742,347	$1,756,140	$3,153,678	$11,028,626	$83.53	$94.45
1999	$1,348,505	$2,084,181	$2,117,742	$779,465	$1,855,007	$3,807,112	$11,992,011	$90.54	$102.01
2000	$1,425,826	$2,084,181	$2,223,629	$818,438	$1,959,455	$4,595,972	$13,107,502	$98.69	$110.74
2001	$1,507,588	$2,084,181	$2,334,811	$859,360	$2,069,801	$7,907,631	$16,763,372	$128.01	$140.66
2002	$1,594,047	$2,084,181	$2,451,551	$902,328	$2,186,379	$8,353,388	$17,571,873	$133.16	$146.44
2003	$1,685,472	$2,084,181	$2,574,129	$947,444	$2,309,540	$8,823,945	$18,424,711	$138.56	$152.51
2004	$1,782,150	$2,084,181	$2,702,835	$994,816	$2,439,659	$9,321,235	$19,324,877	$144.22	$158.87
2005	$1,884,383	$2,084,181	$2,837,977	$1,044,557	$2,577,129	$9,845,703	$20,273,930	$150.15	$165.54
2006	$1,992,490	$2,084,181	$2,979,876	$1,096,785	$2,722,366	$10,400,878	$21,276,576	$156.38	$172.54
2007	$2,106,810	$2,084,181	$3,128,870	$1,151,624	$2,875,811	$10,987,273	$22,334,569	$162.91	$179.88
2008	$2,227,699	$2,084,181	$3,285,313	$1,209,206	$3,037,929	$11,606,969	$23,451,296	$169.77	$187.59
2009	$2,355,537	$2,084,181	$3,449,579	$1,269,666	$3,209,210	$12,260,520	$24,628,693	$176.94	$195.66
2010	$2,490,723	$2,084,181	$3,622,058	$1,333,149	$3,390,175	$12,953,222	$25,873,509	$184.49	$204.14

* includes expanded curbside recycling programs

SCENARIO #8: Combustion facility built in Champaign County; ash and residuals transferred to Coles County incinerator opens in 1995; expanded curbside programs implemented in 1995.

YEAR	TOTAL TRANSPORT COSTS	CAPITAL DEBT SERVICE	PUBLIC RECYCLING PROGRAM COSTS*	OPERATION AND MAINTENANCE	ENERGY REVENUE	TOTAL TRANSFER COSTS	TOTAL TIP FEE COSTS	TOTAL SYSTEM COSTS	TIP FEE PER TON	SYSTEM COST PER TON
1990	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1991	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1992	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1993	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1994	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
1995	$1,078,993	$4,886,104	$779,465	$3,986,833	($1,835,325)	$554,872	$548,008	$9,998,950	$77.96	$87.40
1996	$1,140,837	$4,886,104	$818,438	$4,186,175	($1,927,091)	$586,491	$662,082	$10,353,036	$79.97	$89.88
1997	$1,206,233	$4,886,104	$859,360	$4,395,484	($2,023,445)	$619,916	$799,978	$10,743,628	$82.24	$92.64
1998	$1,275,383	$4,886,104	$902,328	$4,615,258	($2,124,618)	$655,250	$966,205	$11,175,909	$84.79	$95.71
1999	$1,348,505	$4,886,104	$947,444	$4,846,021	($2,230,849)	$692,602	$1,167,196	$11,657,023	$87.69	$99.16
2000	$1,425,826	$4,886,104	$994,816	$5,088,322	($2,342,391)	$732,088	$1,410,006	$12,194,771	$90.98	$103.03
2001	$1,507,588	$4,886,104	$1,044,557	$5,342,738	($2,459,511)	$773,830	$1,490,512	$12,585,819	$92.96	$105.61
2002	$1,594,047	$4,886,104	$1,096,785	$5,609,875	($2,582,486)	$817,956	$1,575,274	$12,997,555	$95.04	$108.32
2003	$1,685,472	$4,886,104	$1,151,624	$5,890,369	($2,711,610)	$864,605	$1,665,298	$13,431,861	$97.23	$111.18
2004	$1,782,150	$4,886,104	$1,209,206	$6,184,887	($2,847,191)	$913,919	$1,760,211	$13,889,286	$99.53	$114.18
2005	$1,884,383	$4,886,104	$1,269,666	$6,494,131	($2,989,551)	$966,052	$1,860,573	$14,371,359	$101.96	$117.34
2006	$1,992,490	$4,886,104	$1,333,149	$6,818,838	($3,139,028)	$1,021,165	$1,966,957	$14,879,675	$104.51	$120.66
2007	$2,106,810	$4,886,104	$1,399,807	$7,159,780	($3,295,979)	$1,079,429	$2,078,996	$15,414,946	$107.18	$124.15
2008	$2,227,699	$4,886,104	$1,469,797	$7,517,769	($3,460,778)	$1,141,024	$2,197,753	$15,979,368	$110.00	$127.82
2009	$2,355,537	$4,886,104	$1,543,287	$7,893,657	($3,633,817)	$1,206,141	$2,323,351	$16,574,260	$112.96	$131.67
2010	$2,490,723	$4,886,104	$1,620,451	$8,288,340	($3,815,508)	$1,274,982	$2,455,916	$17,201,007	$116.06	$135.72

* includes expanded curbside programs

System Costs and Tip Fees
Expanded Processing with In-County Disposal

SCENARIO #5b: Transfer station with material recovery and in-vessel composting components built in Champaign County; all waste disposed at a Champaign County landfill; transfer station with material recovery opens in 1992; composting operaton starts in 1997; landfill opens in 1995; expanded curbside program implemented in 1992.

YEAR	TOTAL TRANSPORT COSTS	CAPITAL DEBT SERVICE	OPERATIONS & MAINTENANCE	PUBLIC RECYCLING PROGRAM COSTS*	TOTAL TRANSFER COSTS	TOTAL SYSTEM COSTS	TIP FEE PER TON	SYSTEM COST PER TON
1990	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1991	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1992	$576,683	$1,110,166	$1,084,232	$553,951	$1,068,967	$5,883,274	$47.33	$52.48
1993	$609,752	$1,110,166	$1,138,443	$581,649	$1,120,695	$6,339,932	$50.77	$56.17
1994	$644,719	$1,110,166	$1,195,365	$610,731	$1,174,714	$6,863,613	$54.73	$60.40
1995	$1,078,993	$3,136,391	$3,617,624	$641,268	$1,025,266	$9,499,541	$73.60	$83.03
1996	$1,140,837	$3,136,391	$3,798,505	$673,331	$1,083,657	$9,832,722	$75.46	$85.36
1997	$1,206,233	$4,110,406	$4,419,700	$706,997	$780,383	$11,223,719	$86.38	$96.78
1998	$1,275,383	$4,110,406	$4,640,685	$742,347	$824,311	$11,593,132	$88.36	$99.29
1999	$1,348,505	$4,110,406	$4,872,719	$779,465	$870,718	$11,981,812	$90.45	$101.92
2000	$1,425,826	$4,110,406	$5,116,355	$818,438	$919,744	$12,390,769	$92.64	$104.68
2001	$1,507,588	$4,110,406	$5,372,173	$859,360	$971,539	$12,821,066	$94.93	$107.58
2002	$1,594,047	$4,110,406	$5,640,782	$902,328	$1,026,259	$13,273,821	$97.34	$110.62
2003	$1,685,472	$4,110,406	$5,922,821	$947,444	$1,084,070	$13,750,213	$99.86	$113.82
2004	$1,782,150	$4,110,406	$6,218,962	$994,816	$1,145,146	$14,251,480	$102.51	$117.16
2005	$1,884,383	$4,110,406	$6,529,910	$1,044,557	$1,209,673	$14,778,929	$105.28	$120.67
2006	$1,992,490	$4,110,406	$6,856,405	$1,096,785	$1,277,845	$15,333,932	$108.19	$124.35
2007	$2,106,810	$4,110,406	$7,199,226	$1,151,624	$1,349,870	$15,917,936	$111.23	$128.20
2008	$2,227,699	$4,110,406	$7,559,187	$1,209,206	$1,425,966	$16,532,464	$114.42	$132.24
2009	$2,355,537	$4,110,406	$7,937,146	$1,269,666	$1,506,364	$17,179,119	$117.76	$136.48
2010	$2,490,723	$4,110,406	$8,334,003	$1,333,149	$1,591,307	$17,859,588	$121.26	$140.91

* includes expanded curbside recycling programs

SCENARIO #6: Transfer station with material recovery component built in Champaign County; all waste disposed of in Champaign County landfill; transfer station with material recovery opens in 1992; landfill opens in 1995; expanded curbside program implemented in 1992.

YEAR	TOTAL TRANSPORT COSTS	CAPITAL DEBT SERVICE	OPERATIONS & MAINTENANCE	PUBLIC RECYCLING PROGRAM COSTS*	TOTAL TRANSFER COSTS	TOTAL SYSTEM COSTS	TIP FEE PER TON	SYSTEM COST PER TON
1990	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1991	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1992	$576,683	$1,110,166	$1,084,232	$553,951	$1,068,967	$5,883,274	$47.33	$52.48
1993	$609,752	$1,110,166	$1,138,443	$581,649	$1,120,695	$6,339,932	$50.77	$56.17
1994	$644,719	$1,110,166	$1,195,365	$610,731	$1,174,714	$6,863,613	$54.73	$60.40
1995	$1,078,993	$3,136,391	$3,617,624	$641,268	$1,025,266	$9,499,541	$73.60	$83.03
1996	$1,140,837	$3,136,391	$3,798,505	$673,331	$1,083,657	$9,832,722	$75.46	$85.36
1997	$1,206,233	$3,136,391	$3,988,431	$706,997	$1,145,382	$10,183,433	$77.41	$87.81
1998	$1,275,383	$3,136,391	$4,187,852	$742,347	$1,210,629	$10,552,603	$79.45	$90.37
1999	$1,348,505	$3,136,391	$4,397,245	$779,465	$1,279,602	$10,941,207	$81.60	$93.07
2000	$1,425,826	$3,136,391	$4,617,107	$818,438	$1,352,513	$11,350,275	$83.85	$95.89
2001	$1,507,588	$3,136,391	$4,847,962	$859,360	$1,429,587	$11,780,888	$86.20	$98.85
2002	$1,594,047	$3,136,391	$5,090,361	$902,328	$1,511,063	$12,234,189	$88.68	$101.96
2003	$1,685,472	$3,136,391	$5,344,879	$947,444	$1,597,192	$12,711,378	$91.27	$105.22
2004	$1,782,150	$3,136,391	$5,612,123	$994,816	$1,688,241	$13,213,721	$93.98	$108.63
2005	$1,884,383	$3,136,391	$5,892,729	$1,044,557	$1,784,491	$13,742,551	$96.82	$112.21
2006	$1,992,490	$3,136,391	$6,187,365	$1,096,785	$1,886,241	$14,299,272	$99.80	$115.96
2007	$2,106,810	$3,136,391	$6,496,733	$1,151,624	$1,993,804	$14,885,362	$102.92	$119.89
2008	$2,227,699	$3,136,391	$6,821,570	$1,209,206	$2,107,514	$15,502,379	$106.18	$124.00
2009	$2,355,537	$3,136,391	$7,162,649	$1,269,666	$2,227,722	$16,151,964	$109.60	$128.32
2010	$2,490,723	$3,136,391	$7,520,781	$1,333,149	$2,354,801	$16,835,845	$113.18	$132.83

* includes expanded curbside recycling programs

SCENARIO #7: Material recovery facility built at the same site as the Champaign County landfill; all waste disposed of at Champaign County landfill; both facilities open in 1995; expanded curbside program implemented in 1995,

YEAR	TOTAL TRANSPORT COSTS	CAPITAL DEBT SERVICE	OPERATIONS & MAINTENANCE	PUBLIC RECYCLING PROGRAM COSTS*	TOTAL SYSTEM COSTS	TIP FEE PER TON	SYSTEM COST PER TON
1990	$0	$0	$0	$0	$0	$0.00	$0.00
1991	$0	$0	$0	$0	$0	$0.00	$0.00
1992	$0	$0	$0	$0	$0	$0.00	$0.00
1993	$0	$0	$0	$0	$0	$0.00	$0.00
1994	$0	$0	$0	$0	$0	$0.00	$0.00
1995	$2,560,813	$3,085,157	$3,617,655	$641,268	$9,904,893	$64.19	$86.57
1996	$2,707,174	$3,085,157	$3,798,538	$673,331	$10,264,200	$65.61	$89.11
1997	$2,861,917	$3,085,157	$3,988,465	$706,997	$10,642,536	$67.09	$91.77
1998	$3,025,521	$3,085,157	$4,187,888	$742,347	$11,040,914	$68.65	$94.56
1999	$3,198,497	$3,085,157	$4,397,282	$779,465	$11,460,401	$70.28	$97.48
2000	$3,381,381	$3,085,157	$4,617,147	$818,438	$11,902,122	$71.99	$100.55
2001	$3,574,741	$3,085,157	$4,848,004	$859,360	$12,367,262	$73.78	$103.77
2002	$3,779,181	$3,085,157	$5,090,404	$902,328	$12,857,070	$75.66	$107.15
2003	$3,995,334	$3,085,157	$5,344,924	$947,444	$13,372,859	$77.62	$110.69
2004	$4,223,874	$3,085,157	$5,612,171	$994,816	$13,916,018	$79.68	$114.40
2005	$4,465,511	$3,085,157	$5,892,779	$1,044,557	$14,488,004	$81.83	$118.29
2006	$4,720,998	$3,085,157	$6,187,418	$1,096,785	$15,090,358	$84.09	$122.37
2007	$4,991,129	$3,085,157	$6,496,789	$1,151,624	$15,724,699	$86.45	$126.65
2008	$5,276,746	$3,085,157	$6,821,628	$1,209,206	$16,392,737	$88.92	$131.13
2009	$5,578,737	$3,085,157	$7,162,710	$1,269,666	$17,096,270	$91.50	$135.82
2010	$5,898,044	$3,085,157	$7,520,845	$1,333,149	$17,837,196	$94.20	$140.73

* includes expanded curbside recycling programs

SCENARIO #9: Combustion facility built in Champaign County; ash and residuals disposed of in Champaign County landfill; 9/14/90
both facilities open in 1995; expanded curbside programs implemented in 1995.

YEAR	TOTAL TRANSPORT COSTS	CAPITAL DEBT SERVICE	PUBLIC RECYCLING PROGRAM COSTS*	OPERATION AND MAINTENANCE	ENERGY REVENUE	TOTAL TRANSFER COSTS	TOTAL SYSTEM COSTS	TIP FEE PER TON	SYSTEM COST PER TON
1990	$0	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1991	$0	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1992	$0	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1993	$0	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1994	$0	$0	$0	$0	$0	$0	$0	$0.00	$0.00
1995	$1,078,993	$5,612,781	$779,465	$6,335,002	($1,835,325)	$260,450	$12,231,366	$97.48	$106.91
1996	$1,140,837	$5,612,781	$818,438	$6,651,753	($1,927,091)	$275,292	$12,572,010	$99.24	$109.14
1997	$1,206,233	$5,612,781	$859,360	$6,984,340	($2,023,445)	$290,981	$12,930,249	$101.09	$111.49
1998	$1,275,383	$5,612,781	$902,328	$7,333,557	($2,124,618)	$307,566	$13,306,998	$103.04	$113.96
1999	$1,348,505	$5,612,781	$947,444	$7,700,235	($2,230,849)	$325,099	$13,703,216	$105.09	$116.56
2000	$1,425,826	$5,612,781	$994,816	$8,085,247	($2,342,391)	$343,633	$14,119,913	$107.25	$119.29
2001	$1,507,588	$5,612,781	$1,044,557	$8,489,509	($2,459,511)	$363,226	$14,558,151	$109.51	$122.16
2002	$1,594,047	$5,612,781	$1,096,785	$8,913,985	($2,582,486)	$383,939	$15,019,051	$111.88	$125.17
2003	$1,685,472	$5,612,781	$1,151,624	$9,359,684	($2,711,610)	$405,835	$15,503,786	$114.38	$128.33
2004	$1,782,150	$5,612,781	$1,209,206	$9,827,668	($2,847,191)	$428,983	$16,013,597	$117.00	$131.65
2005	$1,884,383	$5,612,781	$1,269,666	$10,319,052	($2,989,551)	$453,453	$16,549,784	$119.74	$135.13
2006	$1,992,490	$5,612,781	$1,333,149	$10,835,004	($3,139,028)	$479,322	$17,113,719	$122.62	$138.78
2007	$2,106,810	$5,612,781	$1,399,807	$11,376,754	($3,295,979)	$506,671	$17,706,843	$125.64	$142.61
2008	$2,227,699	$5,612,781	$1,469,797	$11,945,592	($3,460,778)	$535,583	$18,330,674	$128.81	$146.63
2009	$2,355,537	$5,612,781	$1,543,287	$12,542,872	($3,633,817)	$566,148	$18,986,807	$132.12	$150.84
2010	$2,490,723	$5,612,781	$1,620,451	$13,170,015	($3,815,508)	$598,461	$19,676,923	$135.60	$155.25

* includes expanded curbside recycling programs

System Costs and Tip Fees
No-Action, In-County Disposal

SCENARIO #10: Landfill built in Champaign County; opens in 1995; no expanded curbside programs.

YEAR	TOTAL TRANSPORT COSTS	CAPITAL DEBT SERVICE	OPERATIONS & MAINTENANCE	PUBLIC RECYCLING PROGRAM COSTS*	TOTAL SYSTEM COSTS	TIP FEE PER TON	SYSTEM COST PER TON
1990	$0	$0	$0	$0	$0	$0.00	$0.00
1991	$0	$0	$0	$0	$0	$0.00	$0.00
1992	$0	$0	$0	$0	$0	$0.00	$0.00
1993	$0	$0	$0	$0	$0	$0.00	$0.00
1994	$0	$0	$0	$0	$0	$0.00	$0.00
1995	$2,560,813	$2,026,192	$2,362,522	$404,837	$7,354,363	$41.90	$64.28
1996	$2,707,174	$2,026,192	$2,480,648	$425,079	$7,639,092	$42.82	$66.32
1997	$2,861,917	$2,026,192	$2,604,680	$446,333	$7,939,121	$43.78	$68.46
1998	$3,025,521	$2,026,192	$2,734,914	$468,649	$8,255,277	$44.79	$70.70
1999	$3,198,497	$2,026,192	$2,871,660	$492,082	$8,588,430	$45.85	$73.05
2000	$3,381,381	$2,026,192	$3,015,243	$516,686	$8,939,501	$46.96	$75.52
2001	$3,574,741	$2,026,192	$3,166,005	$542,520	$9,309,458	$48.12	$78.12
2002	$3,779,181	$2,026,192	$3,324,305	$569,646	$9,699,324	$49.34	$80.83
2003	$3,995,334	$2,026,192	$3,490,520	$598,128	$10,110,175	$50.61	$83.69
2004	$4,223,874	$2,026,192	$3,665,046	$628,035	$10,543,147	$51.95	$86.68
2005	$4,465,511	$2,026,192	$3,848,299	$659,437	$10,999,438	$53.35	$89.81
2006	$4,720,998	$2,026,192	$4,040,714	$692,408	$11,480,312	$54.81	$93.10
2007	$4,991,129	$2,026,192	$4,242,749	$727,029	$11,987,099	$56.35	$96.54
2008	$5,276,746	$2,026,192	$4,454,887	$763,380	$12,521,205	$57.95	$100.16
2009	$5,578,737	$2,026,192	$4,677,631	$801,549	$13,084,110	$59.63	$103.94
2010	$5,898,044	$2,026,192	$4,911,513	$841,627	$13,677,376	$61.38	$107.91

Waste Distribution

DISTRIBUTION OF WASTE IN SCENARIOS #1, #2, #3 AND #10, IN TONS

YEAR	OTHER* RECYCLED RESIDENTIAL/ COMMERCIAL	PUBLICLY RECYCLED YARDWASTES	PUBLICLY RECYCLED RESIDENTIAL/ COMMERCIAL	PRIVATELY RECYCLED RESIDENTIAL/ COMMERCIAL	PRIVATELY RECYCLED INDUSTRIAL/ CONSTRUCTION/ DEMOLITION	RECYCLED TREATMENT PLANT SLUDGE	LANDFILLED RESIDENTIAL/ COMMERCIAL	LANDFILLED INDUSTRIAL/ CONSTRUCTION/ DEMOLITION	CLEAN FILL CONSTRUCTION/ DEMOLITION
1990	3159	5612	3588	9185	20387	18826	75029	22669	28471
1991	3184	10200	3617	9259	20428	18864	75630	22715	28527
1992	3210	10282	3646	9333	20469	18901	76236	22760	28585
1993	3236	10364	3675	9408	20510	18939	76847	22806	28642
1994	3261	10447	3704	9483	20551	18977	77462	22851	28699
1995	3288	10531	3734	9559	20592	19015	78083	22897	28756
1996	3314	10615	3764	9636	20633	19053	78709	22943	28814
1997	3340	10700	3794	9713	20674	19091	79339	22989	28872
1998	3367	10786	3825	9791	20716	19129	79975	23035	28929
1999	3394	10873	3855	9869	20757	19168	80616	23081	28987
2000	3421	10960	3886	9948	20799	19206	81262	23127	29045
2001	3449	11047	3917	10028	20840	19244	81913	23173	29103
2002	3476	11136	3949	10109	20882	19283	82569	23219	29161
2003	3504	11225	3980	10190	20924	19321	83230	23266	29220
2004	3532	11315	4012	10271	20966	19360	83897	23312	29278
2005	3561	11406	4044	10353	21008	19399	84569	23359	29337
2006	3589	11497	4077	10436	21050	19438	85247	23406	29395
2007	3618	11589	4109	10520	21092	19477	85930	23453	29454
2008	3647	11682	4142	10604	21134	19515	86618	23500	29513
2009	3676	11776	4175	10689	21176	19554	87312	23547	29572
2010	3706	11870	4209	10775	21218	19594	88012	23594	29631

* Other recycling is non-profit or direct institutional recycling

Distribution of Waste in Scenarios #1, #2, #3 and #10, in tons - CONTINUED

LANDFILLED TREATMENT PLANT SLUDGE	UNRECLAIMED YARDWASTES	TOTAL WASTE GENERATED IN CHAMPAIGN CO.	PERCENT OF TOTAL WASTE RECYCLED	TOTAL WASTE RECYCLED	PERCENT OF TOTAL WASTE LANDFILLED	TOTAL WASTE LANDFILLED
811	12156	199894	30%	60758	70%	139136
813	7711	200948	33%	65552	67%	135396
814	7772	202008	33%	65841	67%	136167
816	7835	203077	33%	66132	67%	136945
818	7897	204152	33%	66425	67%	137728
819	7961	205235	33%	66719	67%	138516
821	8024	206326	32%	67016	68%	139311
823	8089	207425	32%	67314	68%	140111
824	8154	208531	32%	67614	68%	140917
826	8219	209645	32%	67916	68%	141728
828	8285	210766	32%	68220	68%	142546
829	8351	211896	32%	68526	68%	143369
831	8418	213033	32%	68835	68%	144199
833	8485	214179	32%	69145	68%	145034
834	8553	215332	32%	69457	68%	145876
836	8622	216494	32%	69771	68%	146723
838	8691	217664	32%	70087	68%	147577
839	8761	218842	32%	70405	68%	148437
841	8831	220028	32%	70725	68%	149303
843	8902	221223	32%	71047	68%	150175
844	8973	222426	32%	71372	68%	151054

DISTRIBUTION OF WASTE IN SCENARIOS #4, #6 AND #7, IN TONS

YEAR	OTHER* RECYCLED RESIDENTIAL/ COMMERCIAL	PUBLICILY RECYCLED YARDWASTES	PUBLICLY RECYCLED RESIDENTIAL/ COMMERCIAL	PRIVATELY RECYCLED RESIDENTIAL/ COMMERCIAL	PRIVATELY RECYCLED INDUSTRIAL/ CONSTRUCTION/ DEMOLITION	RECYCLED TREATMENT PLANT SLUDGE	EXPANDED** RECOVERED RESIDENTIAL/ COMMERCIAL	EXPANDED** RECOVERED INDUSTRIAL/ CONSTRUCTION/ DEMOLITION	LANDFILLED RESIDENTIAL/ COMMERCIAL	LANDFILLED INDUSTRIAL/ CONSTRUCTION/ DEMOLITION
1990	3159	5612	3588	9185	20387	18826	0	0	75029	22669
1991	3772	10200	4284	9259	20428	18864	0	0	74375	22715
1992	4504	10282	5677	9333	20469	18901	12193	4552	60718	18208
1993	5068	10364	6531	9408	20510	18939	11482	4561	60676	18245
1994	5639	10447	7427	9483	20551	18977	10730	4570	60632	18281
1995	5920	10531	8369	9559	20592	19015	9934	4579	60882	18318
1996	5967	10615	9357	9636	20633	19053	9092	4589	61370	18354
1997	6015	10700	9825	9713	20674	19091	8772	4598	61862	18391
1998	6063	10786	10316	9791	20716	19129	8430	4607	62357	18428
1999	6112	10873	10832	9869	20757	19168	8064	4616	62857	18465
2000	6161	10960	11374	9948	20799	19206	7674	4625	63360	18502
2001	6210	11047	11942	10028	20840	19244	7258	4635	63868	18539
2002	6260	11136	12540	10109	20882	19283	6815	4644	64380	18576
2003	6310	11225	13167	10190	20924	19321	6343	4653	64896	18613
2004	6361	11315	13825	10271	20966	19360	5841	4662	65416	18650
2005	6412	11406	14516	10353	21008	19399	5307	4672	65940	18687
2006	6463	11497	15242	10436	21050	19438	4740	4681	66468	18725
2007	6515	11589	16004	10520	21092	19477	4138	4691	67000	18762
2008	6567	11682	16804	10604	21134	19515	3499	4700	67537	18800
2009	6620	11776	17644	10689	21176	19554	2822	4709	68078	18837
2010	6673	11870	18527	10775	21218	19594	2103	4719	68624	18875

* Other recyling is non-profit or direct institutional recycling

** Expanded recovery represents additional recovery achieved through additional source separation and/or municipal waste processing. Processing capacity is provided by the public sector while collection can be from private, public or other services.

Distribution of Waste in Scenarios #4, #6 and #7,in Tons - Continued

CLEAN FILL CONSTRUCTION/ DEMOLITION	LANDFILLED TREATMENT PLANT SLUDGE	UNRECLAIMED YARDWASTES	TOTAL WASTE GENERATED IN CHAMPAIGN CO.	PERCENT OF TOTAL WASTE RECYCLED	TOTAL WASTE RECYCLED	PERCENT OF TOTAL WASTE LANDFILLED	TOTAL WASTE LANDFILLED
28471	811	12156	189728	33%	62748	67%	126980
28527	813	7711	195228	35%	68798	65%	126430
28585	814	7772	196228	42%	83351	58%	112877
28642	816	7835	197235	43%	84295	57%	112940
28699	818	7897	198249	43%	85249	57%	113000
28756	819	7961	199270	43%	85915	57%	113355
28814	821	8024	200298	43%	86350	57%	113948
28872	823	8089	201333	43%	86788	57%	114544
28929	824	8154	202375	43%	87230	57%	115145
28987	826	8219	203425	43%	87674	57%	115751
29045	828	8285	204482	43%	88121	57%	116360
29103	829	8351	205546	43%	88572	57%	116974
29161	831	8418	206617	43%	89026	57%	117592
29220	833	8485	207696	43%	89482	57%	118214
29278	834	8553	208783	43%	89942	57%	118840
29337	836	8622	209877	43%	90405	57%	119471
29395	838	8691	210979	43%	90872	57%	120107
29454	839	8761	212088	43%	91341	57%	120747
29513	841	8831	213205	43%	91814	57%	121391
29572	843	8902	214330	43%	92290	57%	122040
29631	844	8973	215463	43%	92770	57%	122693

DISTRIBUTION OF WASTE IN SCENARIOS #5A AND #5B, IN TONS

YEAR	OTHER* RECYCLED RESIDENTIAL/ COMMERCIAL	PUBLICLY RECYCLED YARDWASTES	PUBLICLY RECYCLED RESIDENTIAL/ COMMERCIAL	PRIVATELY RECYCLED RESIDENTIAL/ COMMERCIAL	PRIVATELY RECYCLED INDUSTRIAL/ CONSTRUCTION/ DEMOLITION	RECYCLED TREATMENT PLANT SLUDGE	EXPANDED** RECOVERED RESIDENTIAL/ COMMERCIAL	EXPANDED** RECOVERED INDUSTRIAL/ CONSTRUCTION/ DEMOLITION	LANDFILLED RESIDENTIAL/ COMMERCIAL	LANDFILLED INDUSTRIAL/ CONSTRUCTION/ DEMOLITION
1990	3159	5612	3588	9185	20387	18826	0	0	75029	22669
1991	3772	10200	4284	9259	20428	18864	0	0	74375	22715
1992	4504	10282	5677	9333	20469	18901	12193	4552	60718	18208
1993	5068	10364	6531	9408	20510	18939	11482	4561	60676	18245
1994	5639	10447	7427	9483	20551	18977	10730	4570	60632	18281
1995	5920	10531	8369	9559	20592	19015	9934	4579	60882	18318
1996	5967	10615	9357	9636	20633	19053	9092	4589	61370	18354
1997	6015	10700	9825	9713	20674	19091	8772	4598	36288	18391
1998	6063	10786	10316	9791	20716	19129	8430	4607	36578	18428
1999	6112	10873	10832	9869	20757	19168	8064	4616	36871	18465
2000	6161	10960	11374	9948	20799	19206	7674	4625	37167	18502
2001	6210	11047	11942	10028	20840	19244	7258	4635	37465	18539
2002	6260	11136	12540	10109	20882	19283	6815	4644	37765	18576
2003	6310	11225	13167	10190	20924	19321	6343	4653	38067	18613
2004	6361	11315	13825	10271	20966	19360	5841	4662	38372	18650
2005	6412	11406	14516	10353	21008	19399	5307	4672	38680	18687
2006	6463	11497	15242	10436	21050	19438	4740	4681	38990	18725
2007	6515	11589	16004	10520	21092	19477	4138	4691	39302	18762
2008	6567	11682	16804	10604	21134	19515	3499	4700	39617	18800
2009	6620	11776	17644	10689	21176	19554	2822	4709	39934	18837
2010	6673	11870	18527	10775	21218	19594	2103	4719	40254	18875

* Other recycling is non-profit or direct institutional recycling

** Expanded recovery represents additional recovery achieved through additional source separation and/or municipal waste processing.
Processing capacity is provided by the public sector while collection can be from private, public or other services.

*** Includes product from municipal waste composting.

Distribution of Waste in Scenarios #5a and #5b, in Tons - Continued

CLEAN FILL CONSTRUCTION/ DEMOLITION	LANDFILLED TREATMENT PLANT SLUDGE	UNRECLAIMED YARDWASTES	MSW COMPOST	ATMOSPHERIC LOSSES	PERCENT OF TOTAL WASTE: ATMOSPHERIC LOSSES	TOTAL WASTE GENERATED IN CHAMPAIGN CO.	PERCENT OF TOTAL WASTE: RECYCLED	TOTAL WASTE RECYCLED***	PERCENT OF TOTAL WASTE: LANDFILLED
28471	811	12156	0	0	0%	199894	30%	60758	70%
28527	813	7711	0	0	0%	200948	33%	66807	67%
28585	814	7772	0	0	0%	202008	43%	85911	57%
28642	816	7835	0	0	0%	203077	43%	86863	57%
28699	818	7897	0	0	0%	204152	43%	87825	57%
28756	819	7961	0	0	0%	205235	43%	88499	57%
28814	821	8024	0	0	0%	206326	43%	88943	57%
28872	823	8089	19844	25574	12%	207425	53%	109233	35%
28929	824	8154	20003	25779	12%	208531	53%	109842	35%
28987	826	8219	20163	25985	12%	209645	53%	110454	35%
29045	828	8285	20325	26194	12%	210766	53%	111072	35%
29103	829	8351	20488	26404	12%	211896	53%	111693	35%
29161	831	8418	20652	26615	12%	213033	53%	112319	35%
29220	833	8485	20817	26828	13%	214179	53%	112950	35%
29278	834	8553	20984	27043	13%	215332	53%	113585	35%
29337	836	8622	21152	27260	13%	216494	53%	114224	35%
29395	838	8691	21322	27478	13%	217664	53%	114869	35%
29454	839	8761	21492	27699	13%	218842	53%	115517	35%
29513	841	8831	21665	27920	13%	220028	53%	116171	35%
29572	843	8902	21838	28144	13%	221223	53%	116829	34%
29631	844	8973	22013	28370	13%	222426	53%	117492	34%

Distribution of Waste in Scenarios #5a and #5b, in Tons - Continued

TOTAL WASTE LANDFILLED
139136
134141
116097
116213
116327
116736
117383
72617
72910
73205
73501
73799
74099
74400
74704
75009
75317
75626
75937
76250
76564

DISTRIBUTION OF WASTE IN SCENARIOS #8 AND #9, IN TONS

YEAR	OTHER* RECYCLED RESIDENTIAL/ COMMERCIAL	PUBLICLY RECYCLED YARDWASTES	PUBLICLY RECYCLED RESIDENTIAL/ COMMERCIAL	PRIVATELY RECYCLED RESIDENTIAL/ COMMERCIAL	PRIVATELY RECYCLED INDUSTRIAL/ CONSTRUCTION/ DEMOLITION	RECYCLED TREATMENT PLANT SLUDGE	EXPANDED** RECOVERED RESIDENTIAL/ COMMERCIAL	EXPANDED** RECOVERED INDUSTRIAL/ CONSTRUCTION/ DEMOLITION	INCINERATOR ASH RESIDUE	LANDFILLED BY-PASS RESIDUE
1990	3159	5612	3588	9185	20387	18826	0	0	0	97698
1991	3772	10200	4284	9259	20428	18864	0	0	0	97090
1992	4504	10282	5677	9333	20469	18901	0	0	0	95671
1993	5068	10364	6531	9408	20510	18939	0	0	0	94964
1994	5639	10447	7427	9483	20551	18977	0	0	0	94213
1995	5920	10531	8369	9559	20592	19015	14509	5724	14399	5720
1996	5967	10615	9357	9636	20633	19053	13704	5736	14494	5759
1997	6015	10700	9825	9713	20674	19091	13421	5747	14589	5799
1998	6063	10786	10316	9791	20716	19129	13116	5759	14686	5838
1999	6112	10873	10832	9869	20757	19168	12788	5770	14783	5878
2000	6161	10960	11374	9948	20799	19206	12436	5782	14880	5918
2001	6210	11047	11942	10028	20840	19244	12058	5793	14979	5959
2002	6260	11136	12540	10109	20882	19283	11653	5805	15078	5999
2003	6310	11225	13167	10190	20924	19321	11220	5816	15178	6041
2004	6361	11315	13825	10271	20966	19360	10757	5828	15279	6082
2005	6412	11406	14516	10353	21008	19399	10263	5840	15381	6124
2006	6463	11497	15242	10436	21050	19438	9735	5851	15483	6166
2007	6515	11589	16004	10520	21092	19477	9173	5863	15586	6208
2008	6567	11682	16804	10604	21134	19515	8575	5875	15690	6251
2009	6620	11776	17644	10689	21176	19554	7938	5887	15795	6294
2010	6673	11870	18527	10775	21218	19594	7261	5898	15900	6337

* Other recycling is non-profit or direct institutional recycling.

** Expanded recovery represents additional recovery achieved through additional source separation and/or municipal waste processing.

Processing capacity is provided by the public sector while collection can be from private, public or other services.

Distribution of Waste in Scenarios #8 and #9, in Tons - Continued

CLEAN FILL CONSTRUCTION/ DEMOLITION	TREATMENT PLANT SLUDGE LANDFILLED	UNRECLAIMED YARDWASTES	INCINERATION ATMOSPHERIC LOSSES	PERCENT OF TOTAL WASTE: ATMOSPHERIC LOSSES	TOTAL WASTE GENERATED IN CHAMPAIGN CO.	PERCENT OF TOTAL WASTE: RECYCLED	TOTAL WASTE RECYCLED	PERCENT OF TOTAL WASTE: LANDFILLED	TOTAL WASTE LANDFILLED
28471	811	12156	0	0%	201884	31%	62748	63%	126980
28527	813	7711	0	0%	202939	34%	68798	62%	126430
28585	814	7772	0	0%	204000	35%	71158	61%	125070
28642	816	7835	0	0%	205070	36%	72813	61%	124422
28699	818	7897	0	0%	206146	36%	74519	60%	123730
28756	819	7961	53360	26%	207231	44%	90491	27%	55419
28814	821	8024	53712	26%	208322	44%	90963	27%	55624
28872	823	8089	54066	26%	209422	44%	91438	27%	55829
28929	824	8154	54423	26%	210529	44%	91916	27%	56036
28987	826	8219	54783	26%	211644	44%	92398	27%	56244
29045	828	8285	55145	26%	212766	44%	92883	27%	56453
29103	829	8351	55510	26%	213897	44%	93372	26%	56663
29161	831	8418	55878	26%	215035	44%	93864	26%	56875
29220	833	8485	56249	26%	216182	44%	94360	26%	57088
29278	834	8553	56622	26%	217336	44%	94859	26%	57302
29337	836	8622	56999	26%	218499	44%	95361	26%	57517
29395	838	8691	57378	26%	219670	44%	95867	26%	57733
29454	839	8761	57760	26%	220849	44%	96377	26%	57951
29513	841	8831	58145	26%	222036	44%	96890	26%	58170
29572	843	8902	58533	26%	223232	44%	97407	26%	58390
29631	844	8973	58924	26%	224436	44%	97927	26%	58611

Traffic Counts

VEHICLE COUNT ESTIMATES

For scenarios assuming a transfer facility in any combination the location of the proposed facility is assumed located in the Champaign/Urbana metropolitan area. Collection vehicles transporting wastes from the point of collection to the transfer facility are assumed to carry 4 tons per load. Average capacity, as of 1989, according to the official records of licensed haulers int he Champaign/Urbana area (both cities require that all collection vehicles be licensed to collect waste) is 7 tons per vehicle. This represents the recapitalization of most area licensed haulers to accommodate long distance hauler (nearest landfill was 20 miles, next nearest 35 miles one way). Since it may be more economical to recapitalize for smaller vehicles, such as the system used during years when the Urbana landfill was operating, the average capacity of vehicles in 1985 was used, based on the Long Range Solid Waste Management Plan prepared for the Intergovernmental Task Force on Solid Waste.

Collection vehicle count estimates are based on the amount of tonnage expected at the facility. The daily tonnage divided by the average load per vehicle is the number of vehicles required to bring the daily tonnage to the facility.

Transfer vehicles remove the daily tonnage received from the facility and transfer it to disposal. The capacity of a transfer trailer is assumed 20 tons. The daily tonnage for removal depends on the scenario. When the materials are processed by a mass reduction technology, i.e., composting or incineration, some of the weight of incoming material is to the atmosphere. In scenarios recovering material, the material is assumed shipped to market in 20 ton capacity vehicles.

Some private vehicles were using the Urbana Landfill prior to closure. "Private" in this instance is used to describe any vehicle not licensed to collect solid wastes. It may include vehicles owned by private citizen, non-permitted commerce, industry, contractor, State, Federal, County, City, village, utility or University of Illinois. This definition was used for any scenarios at which the public would be granted access for disposal of unprocessed solid waste. Facilities assuming acceptance of source separated recyclable materials used an estimate of private vehicles count based on utilization of CRC's drop-off and buy-back facility. An estimated 370 vehicles per week used the drop-off and buy-back at CRC's processing facility in 1989.

Collection vehicle estimates for the years 1992 through 1994 is based on all materials generated in Champaign County except for materials generated int the Rantoul Wasteshed (Townships of Compromise, Condit, East Bend, Harwood, Kerr, Ludlow and Rantoul). Also deducted are materials recovered by private and other recycling and cleanfill construction/demolition wastes. After 1994, all material generated in Rantoul Wasteshed is accepted at all studied facilities.

Transfer vehicle count was determined by the amount of material to be moved from the facility to disposal. For the transfer facility no material recovery or mass reduction is assumed, therefore, the weight brought in is the weight taken out. Transfer vehicles carry 4 to 5 times the weight of collection vehicles and, therefore, are fewer by a factor of a quarter to a fifth.

The material recovery/transfer facility reduces the quantity of material for landfilling by 20% (recovered and sent to market). Therefore, the estimate of transfer vehicles is separated into transfer to disposal and transfer to market.

Composting was added to the material recovery/transfer facility scenarios forming a new set of material recovery/transfer/composting scenarios. The amount of material brought to the facility was assumed unaffected by additional processing. Transfer of material to market was equally considered unaffected because composting would only done on materials otherwise disposed in landfills for mass reduction. The composting facility is assumed on-line by 1997, therefore the vehicle count for the material recovery/transfer/composting facility for 1992 through 1994 is the same as for the material recovery/transfer facility. Also the same formula that estimates the transfer vehicle counts for the material recovery/transfer/composting facility for the years 1995 through 1996 is the same as for the material recovery/transfer facility of those same years.

The residential/commercial fraction is assumed reduced to 58.65925% of its weight by combined recycling and composting activity. The industrial/construction/demolition fraction is reduced to 80% of its weight by recycling but compost material is assumed to not be found in it.

The waste to energy scenarios assume that the facility is constructed near the University of Illinois and is operational by 1995. The facility is assumed to preprocess the incoming material into three streams, recyclable materials, by-pass materials and fuel. Recyclable materials are assumed to be 25% of the weight of incoming material (to comply with proposed legislation). By-pass materials are unsuitable for incineration and are assumed to be 5% of the weight of incoming material. The remaining 70% is incinerated leaving 14.875% by weight of the in-coming waste as ash. By-pass materials and ash are carried be the same waste transfer vehicles. The number of transfer vehicles to market is larger for these scenarios because of the requirement for greater recyclable material recovery.

VEHICLE COUNT COMPARISONS FOR ALL SCENARIOS
Total vehicle trips per day.

YEAR	SCENARIO #3	SCENARIOS #4 and #6	SCENARIO #5	SCENARIO #7	SCENARIOS #8 and #9	SCENARIO #10
1990	0	0	0	0	0	0
1991	0	0	0	0	0	0
1992	168	194	194	0	0	0
1993	170	195	195	0	0	0
1994	171	196	196	0	0	0
1995	185	214	214	198	203	168
1996	186	216	216	199	205	169
1997	186	216	213	200	205	169
1998	187	217	214	201	206	170
1999	189	218	215	202	207	172
2000	189	218	215	203	207	172
2001	191	219	216	204	208	173
2002	192	221	218	205	210	174
2003	193	223	219	206	211	175
2004	193	223	219	207	211	175
2005	194	224	220	208	212	176
2006	196	225	222	209	213	178
2007	196	226	223	209	214	178
2008	197	227	224	210	215	179
2009	199	228	225	211	216	180
2010	200	229	226	212	217	181

VEHICLE COUNTS FOR SCENARIO #3
Vehicles per day.

YEAR	Collection Vehicles	Transfer To Disposal	Transfer To Market	Private Vehicles	Total Vehicles
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	82	16	0	70	168
1993	83	17	0	70	170
1994	84	17	0	70	171
1995	98	17	0	70	185
1996	99	17	0	70	186
1997	99	17	0	70	186
1998	100	17	0	70	187
1999	101	17	0	71	189
2000	101	17	0	71	189
2001	102	18	0	71	191
2002	103	18	0	71	192
2003	104	18	0	71	193
2004	104	18	0	71	193
2005	105	18	0	71	194
2006	106	18	0	72	196
2007	106	18	0	72	196
2008	107	18	0	72	197
2009	108	19	0	72	199
2010	109	19	0	72	200

This table shows vehicles per day. To obtain trips per day, multiply by 2.

VEHICLE COUNTS FOR SCENARIOS #4 AND #6
Vehicles per day.

YEAR	Collection Vehicles	Transfer To Disposal	Transfer To Market	Private* Vehicles	Total Vehicles
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	82	13	3	96	194
1993	83	13	3	96	195
1994	84	13	3	96	196
1995	98	16	4	96	214
1996	99	16	4	97	216
1997	99	16	4	97	216
1998	100	16	4	97	217
1999	101	16	4	97	218
2000	101	16	4	97	218
2001	102	16	4	97	219
2002	103	16	4	98	221
2003	104	17	4	98	223
2004	104	17	4	98	223
2005	105	17	4	98	224
2006	106	17	4	98	225
2007	106	17	4	99	226
2008	107	17	4	99	227
2009	108	17	4	99	228
2010	109	17	4	99	229

This table shows vehicles per day. To obtain trips per day, multiply by 2.
* Private vehicles includes customers of the proposed citizen drop-off and buy-back facilities.

VEHICLE COUNTS FOR SCENARIO #5A AND #5B
Vehicles per day

YEAR	Collection Vehicles	Transfer To Disposal	Transfer To Market	Private* Vehicles	Total Vehicles
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	82	13	3	96	194
1993	83	13	3	96	195
1994	84	13	3	96	196
1995	98	16	4	96	214
1996	99	16	4	97	216
1997	99	13	4	97	213
1998	100	13	4	97	214
1999	101	13	4	97	215
2000	101	13	4	97	215
2001	102	13	4	97	216
2002	103	13	4	98	218
2003	104	13	4	98	219
2004	104	13	4	98	219
2005	105	13	4	98	220
2006	106	14	4	98	222
2007	106	14	4	99	223
2008	107	14	4	99	224
2009	108	14	4	99	225
2010	109	14	4	99	226

This table shows vehicles per day. To obtain trips per day, multiply by 2

* Private vehicles includes customers of the proposed citizen drop-off and buy-back facilities.

VEHICLE COUNTS FOR SCENARIO #7
Vehicles per day.

YEAR	Collection Vehicles	Transfer To Disposal	Transfer To Market	Private Vehicles	Total Vehicles
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	98	0	4	96	198
1996	99	0	4	97	199
1997	99	0	4	97	200
1998	100	0	4	97	201
1999	101	0	4	97	202
2000	101	0	4	97	203
2001	102	0	4	97	204
2002	103	0	4	98	205
2003	104	0	4	98	206
2004	104	0	4	98	207
2005	105	0	4	98	208
2006	106	0	4	98	209
2007	106	0	4	99	209
2008	107	0	4	99	210
2009	108	0	4	99	211
2010	109	0	4	99	212

This table shows vehicles per day. To obtain trips per day, multiply by 2.

VEHICLE COUNTS FOR SCENARIOS #8 AND #9
Vehicle trips per day

YEAR	Collection Vehicles	Transfer To Disposal	Transfer To Market	Private* Vehicles	Total Vehicles
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	98	4	5	96	203
1996	99	4	5	97	205
1997	99	4	5	97	205
1998	100	4	5	97	206
1999	101	4	5	97	207
2000	101	4	5	97	207
2001	102	4	5	97	208
2002	103	4	5	98	210
2003	104	4	5	98	211
2004	104	4	5	98	211
2005	105	4	5	98	212
2006	106	4	5	98	213
2007	106	4	5	99	214
2008	107	4	5	99	215
2009	108	4	5	99	216
2010	109	4	5	99	217

This table shows vehicles per day. To obtain trips per day, multiply by 2

* Private vehicles includes customers of the proposed citizen drop-off and buy-back facilities.

VEHICLE COUNTS FOR SCENARIO #10
Vehicles per day.

YEAR	Collection Vehicles	Transfer To Disposal	Transfer To Market	Private Vehicles	Total Vehicles
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	0	0	0	0
1993	0	0	0	0	0
1994	0	0	0	0	0
1995	98	0	0	70	168
1996	99	0	0	70	169
1997	99	0	0	70	169
1998	100	0	0	70	170
1999	101	0	0	71	172
2000	101	0	0	71	172
2001	102	0	0	71	173
2002	103	0	0	71	174
2003	104	0	0	71	175
2004	104	0	0	71	175
2005	105	0	0	71	176
2006	106	0	0	72	178
2007	106	0	0	72	178
2008	107	0	0	72	179
2009	108	0	0	72	180
2010	109	0	0	72	181

This table shows vehicles per day. To obtain trips per day, multiply by 2.

APPENDIX 2

Map Descriptions

BASIC MAPS

Geologic maps, like all maps, are 2-dimensional representations, but unlike most other maps are used to portray 3-dimensional space below the surface of the ground. To overcome some of the difficulties of picturing 3-D space, geologists at the ISGS develop maps called stack-unit maps (Kempton, 1980). These solve some of the problems of mapping complex subsurface geology by using a stack symbol to show the sequence of stratigraphic units that are encountered to a specific depth below the surface. However, stack-unit maps tend to be complex; difficult to read and use; do not adequately represent lithologic variation; and, do not explicitly carry enough depth or thickness information.

Consequently, the ISGS developed a hybrid-type stack-unit map for Champaign County. This map, produced with the assistance of the computer, represents the subsurface as a "stack" of ground-surface-parallel intervals or slices. Each slice shows the stratigraphic and lithologic units that occur within a given depth range below the ground surface. For example, the 100-150-foot slice shows those units that occur between 100 and 150 feet below the surface. Because the depths of the top and bottom of a slice are fixed, each slice map explicitly carries the depths and thicknesses of the units mapped within it to the resolution of the slice thickness.

The well databases were used to produce work maps showing the lithology and stratigraphy within depth slices. These work maps were in turn used by the ISGS to produce fifteen separate slice maps. These hand-drawn maps were digitized and, collectively, showed both the areal distribution of geologic units and their arrangement from the ground surface to a total depth of 400 feet. They were based in part on previous mapping by Anderson (1960), Fraser and Steinmetz (1971), Kempton, Morse and Visocky (1982), Wickham (1976, 1979), and USDA (1976).

In order to account for the decrease of well information with increasing depth, the content of the slice map varies with the depth of a slice layer. Consequently, the Champaign County maps were grouped into four types, as listed below:

Type 1: Slice 0 to 5 feet -- This map was reformatted from the 1:15,840 digital soil series map of the county. Its legend lists the sequence of lithologies occurring in the slice; stratigraphic nomenclature is not utilized. See detailed discussion below under Surficial Geologic Material Map.

Type 2: Slices 5-10 and 10-20 feet -- Maps of Type 2 were prepared from soil information and well logs. Each polygon was coded with up to two stratigraphic units (at the formation or member level) and the lithology of each. Maps were compiled at 1:62,500. Lithologic subdivisions were based on a four-fold subdivision of the drift materials which were differentiated from bedrock. Well sorted coarse drift was indicated by the symbol "DCS"; coarse with a fine component was indicated by the symbol "DCF"; fine drift with a coarse component was indicated by the symbol "DFC"; and fine drift with no coarse component was indicated by the symbol "DFN". No sand unit in this depth range was considered too thin to map.

Type 3: Slices 20-30, 30-40, 40-50, 50-60, and 60-75 feet -- Type 3 slice maps were similar to Type 2 except they contain codes for a single stratigraphic unit at the formation level. Areas where contacts between formations (such as Wedron over Glasford) occur within the slice were coded differently than areas where the entire slice is a single formation. Lithologic codes and procedures were the same as described for Type 2 slices.

Type 4: Slices 75-100, 100-150, 150-200, 200-250, 250-300, 300-350, and 350-400 feet -- Type 4 slice maps contained codes for a single formation or formation contact, as above. Sands thinner than 5 feet were not mapped, but four different lithologic units were distinguished: (1) bedrock in the entire slice; (2) fine drift containing no sands 5 feet or greater in thickness indicated by the symbol "DFN"; (3) fine drift containing sand unit(s)

5 feet or greater in thickness indicated by "DCF"; and (4) coarse drift (sand and/or gravel) throughout the entire slice interval, indicated by "DCS". For simplicity in coding, no distinction between well sorted and coarse drift and coarse drift with fine component was made.

Various Maps were used or created during the ISGS's mapping efforts for Champaign County. Below is a summary of the maps used by the ISGS.

Surface Topography -- A computer representation of the surface topography of the county was developed by the ISGS from elevation information on 1:62,500 scale topographic maps. Locations and elevations of section corners were digitized and contoured.

Drift Thickness Map -- A map of the thickness of glacial drift was produced by the ISGS using computer methods that determine the difference between the digital surface topography and bedrock topography maps. Drift in Champaign County ranges from about 75 feet to 400 feet thick.

Bedrock Topography Map -- Well records in the ISGS stratigraphic database were used to produce a map of the bedrock topography using a computer contouring program. This map defines the limits of bedrock valleys and differentiates them from broad bedrock uplands in the southern part of the county. The location of the Pesotum Bedrock Valley to the west of Pesotum, Illinois follows the mapping of Kempton et al (in preparation).

Bedrock Geology Map -- The bedrock geology map was produced by the ISGS from a digital version of the statewide 1:500,000 scale map by Willman (1967). Well data for the county do not sufficiently penetrate bedrock to allow revision of the map.

Terrain Map -- The terrain map showed the areal extent and crest location of glacial moraines and other ridge-shaped landforms identified by ISGS geologists from 1:24,000 topographic maps, recompiled and digitized for this project at 1:62,500. This follows closely the moraine delineation and names established by Willman and Frye (1970), but includes delineations by Leighton (1961), and modifications suggested by Hooten (1972), and Wickham (1976). These features tend to be groundwater divides in the local groundwater flow system and are underlain by thick sequences of Wisconsinan drift as is revealed on the slice maps.

Faults Maps -- The faults map showed the best available mapping (1:500,000 scale) of geologic structures in the county digitized for this project by the ISGS from a new unpublished map by Nelson (in preparation). The major feature on the map, an elongated arch (called the La Salle Anticlinal Belt), crosses through Champaign County from north to south. Although some faults are associated with it, no active faults are known in Champaign County.

Soil Map -- The soil map was digitized for this project by the ISGS from 1:15,840 scale paper maps from the Champaign County Soil Survey by the U.S. Department of Agriculture (USDA) (1976). Separate map sheets for 144 map areas were digitized and paneled together into 7.5 minute quadrangle areas. Map symbols, containing soil name, slope, and erosion class were entered as attributes, allowing derivation of maps based on those characteristics.

100-Year Floodplain -- The 100-Year floodplain map was digitized from 1:24,000 scale 100-year floodplain maps prepared for the National Flood Insurance Program and obtained in digital form for this project from the ISWS.

Wetlands -- The wetlands map includes areas mapped as wetlands by the National Wetlands Inventory. Features were originally digitized by the Illinois Natural History Survey (INHS) at a scale of 1:24,000 and are shown as polygons unless their area is less than .25 of an acre, and they were shown as points.

Surface Water Bodies Map -- The surface water bodies map was digitized for this project by the ISWS from 1:24,000 scale 7.5 minute USGS topographic maps and consists of streams, lakes, ponds.

Well Location Map -- The well location map was created for Champaign County by the ISGS from the digital well data files of the ISGS and ISWS. It shows the locations of those wells for which the ISGS has records of the geologic units encountered during drilling. These wells were used for the subsurface geologic mapping. Of the 3,200 wells shown on the map, approximately 2,800 had useful descriptions and 900 of those were interpreted in detail by ISGS geologists. On the average, this provided about one reference well per square mile for the County.

Several other well maps were produced by the ISGS for this project. A series of well maps showing the lithologic and stratigraphic units at slice interval depths were produced as work maps during slice map preparation. Other well maps showed: (1) the locations of all wells in the county, or (2) the locations of private, public and industrial water wells.

Water well location maps produced for Champaign County show all the water well data from the ISGS and the ISWS. Although this approach may lead to multiple locations for a few wells, if location discrepancies are present between ISGS and ISWS files, it produces the best map of water well locations possible at the present time.

On some maps, private water wells were buffered 200 feet and public and industrial wells 1,000 feet to show set back regulations.

Cross-sections -- Six east-west cross-sections were constructed from the highest quality well records and were used as references during the stratigraphic interpretation of other poorer quality well records. They are available for examination at the ISGS. A diagrammatic, cross-section was constructed from the slice maps along a line from Mahomet, northwest of Champaign, to Longview, in the southeast part of the County. It shows the distribution of stratigraphic and lithologic units from an area of thick glacial deposits containing thick sands (northwest) to an area of thin deposits containing thin discontinuous sands (southeast).

DERIVATIVE MAPS

Many of the important screening products are not basic data maps, but derivatives produced from the basic mapping. Derivative maps are generated by digital processing of basic map information to produce a substantially different product.

Aquifer Maps -- Several aquifer maps were derived by the ISGS from the lithologic and stratigraphic information contained in the slice maps. For the purpose of this study, aquifers were defined as sand and gravel deposits 5 feet or greater in thickness, and major aquifers were those deposits 25 feet or greater in thickness. The 5 foot threshold is consistent with definitions of Kempton, Morse and Visocky (1984) in their study of sand and gravel aquifers in east-central Illinois.

Sand and Gravel in the Banner Formation -- The Banner sand thickness map was derived by selecting those areas from the slice that are mapped as Banner Formation and contain codes for sands greater than 5 feet thick or codes for sands as thick as the entire slice interval. The map shows the approximate total thickness of sand in the Banner Formation determined by adding together the approximate thicknesses from each of the slice layers. Because sands mapped in each slice containing the Banner may range from a minimum of 5 feet to a maximum thickness of 25 or 50 feet, the map illustrates the range of total sand thicknesses for different areas. Exact thickness were not mappable from present data. This map includes the lower part of the Glasford Formation in some areas.

The thickest sand areas shown on the map of sands and gravels in the Banner Formation follow a trend from the west central part of Champaign County, northeastward to the central northern part. This trend follows the axis of the buried Mahomet-Teays bedrock valley. The sand units mapped in this thick-sand region belong predominantly to the Mahomet Sand Member of the Banner Formation. Elsewhere, the total thickness of sand and gravel in the Banner is less, the thinnest sands being in the southern and southeastern parts of the county.

Sand and Gravel in the Glasford Formation -- The Glasford sand thickness map was produced from the slice maps using the same procedures as the Banner map. The map showed the approximate total thickness of sand in the Glasford Formation as a cumulative total of the approximate sand thicknesses from each of the slice layers. This map included the lower part of the overlying Wedron Formation in some areas.

Unlike the Banner, the Glasford Formation sands are generally thinner, but somewhat more widespread. The Glasford sands do not appear to be channelized in a major valley, but occur as widespread sheet sands throughout the county. The thickest of these are in the north-central, northeastern, and southwestern parts of the county. Elsewhere, the total thickness of sand and gravel in the Glasford is less, the thinnest sands tending to be in the eastern and southeastern parts of the county.

Composite Banner and Glasford Sand and Gravel Thickness Map -- The composite thickness map shows the total thickness of sand and gravel in the Banner and Glasford Formations. This map was derived by the same methods used to produce the separate Banner and Glasford thickness maps from the slice maps. However, the composite map better identifies the major regional aquifers in Champaign county as those areas where the greatest cumulative thickness of sand and gravel occur. The areas of thinnest sands, those least likely to contain important drift aquifers, are in the southeastern part of the county.

Sand and Gravel in the Wedron Formation -- The presence of sand and gravel in the Wedron Formation was mapped form the slice maps. Two separate maps were prepared, one showing those Wedron sands greater than 5 feet thick below a depth of

75 feet, and the other showing all sands in the Wedron. These maps identify the coarse deposits in the Wedron, which tend to be thinner and less continuous than those in the older (lower) Glasford and Banner Formations. Surficial sands in the Henry and Cahokia Formations are included on the map. These are generally thin except along the major streams and in some limited areas along glacial moraines.

Potential Presence of Sand and Gravel -- Derived from the slice maps this map identifies beds of sand of any thickness. The map ranks areas from lowest to highest potential of containing sand and gravel. The lowest potential areas are those where no sand was mapped on the slice maps; likelihood of finding sand in the subsurface increases as the number of slices in which sand was mapped increases. This map does not distinguish between significant, thick, regional sand units and insignificant, thin, local sands.

Surficial Geologic Materials Map -- The surficial geologic material map was derived by digital reclassification of the soil map according to the soil parent materials. Each soil series mapped by the U.S. Soil Conservation Service occurs in a specific set of geologic materials. The soil, being a weathering and alteration product of preexisting deposits, is derived from these geologic "parent" materials. The digital soil map, which contains all the soil boundaries and soil types as attributes of each area, can be reclassified as a parent materials or shallow geologic materials map simply by correlating each soil to its parent material and digitally reformatting the map. The resulting map shows the geologic materials that occur from the ground surface to a depth of about 5 feet, the limit of soil mapping.

Some soils in Champaign County, notably Drummer Silt Loam, have ambiguous parent materials in their lower horizons. This uncertainty is carried onto the surficial geologic materials map as the "loess over till or sand or gravel" unit. However, the association of this unit with adjacent soils whose parent materials are certain is a good indicator of the Drummer parent material in most areas (i.e., Drummer surrounded by loess over till units is also likely to be a loess over till soil).

Surficial Sand and Gravel Map -- Also derived from the soil map, the surficial sand and gravel deposits map shows those soils that contain coarse material in their profile. In addition, alluvial soils along stream courses are shown.

Mines, Pits, and Disturbed Land Map -- This map showed the locations of all significant gravel pits, two mine shafts, and areas where construction activities (interstate highway interchanges, landfills, grading for airport construction, and other disturbed areas) have significantly disturbed the natural geologic materials. The information shown on this map was prepared from disturbed lands and gravel pits mapped on the county soil survey map (USDA, 1976), and was supplemented with data from USGS topographic maps (15 and 7.5 minute series), and from Anderson's (1960) 1:62,500-scale sand and gravel resources map.

Slope Map -- The slope map was derived directly from the county digital soil map, using slope codes from soil map units. The slope classification used is that of the USDA (1976). There is some overlap of slope categories in the USDA usage. For example, an "A" slope in certain soils may include areas of 0 to 3 percent slope, whereas a "B" slope in another map unit may include 2 to 5 percent slopes. Nevertheless, the map depicts the approximate slope variation of the county, identifying steeper slope areas along streams and glacial moraines.

SUITABILITY MAPS

Derivative and cultural features maps were combined to form suitability maps. The overall suitability map was produced by overlaying various geologic and cultural features maps prepared by either ISGS or ORAP at the request of the ISWDA. It is within areas outlined by the composite suitability map that the ISWDA staff began the process of site identification.

Base Map -- The base map contains location references, including: (1) township lines of the Public Land Survey, (2) city limits, (3) major roads, and (4) railroads.

Water Supply Protection -- The Water Supply Protection map shows the private, public and industrial water supply wells known to occur in Champaign County. Locations were derived from the combined files of the State Geological and State Water Surveys. Public and Industrial water wells were buffered with a 1,000 foot set-back and private wells with a 200 foot set-back.

Aircraft Safety -- The Airport Safety map shows the locations of airports and landing strips in the county. Airports servicing jet traffic were buffered with a 10,000 foot set-back distance; those serving only propeller aircraft were buffered with a 5,000 foot set-back. This included those runways used for agricultural as well as general aviation purposes.

Land-Use Plans -- The Land-Use Plan map shows urban areas, the 1.5 mile extraterritorial jurisdiction area (1.5 mile buffer around each town), land owned by the University of Illinois, historical places with a 0.5 mile buffer, and cemeteries.

Environmentally Sensitive Areas -- The Environmentally Sensitive Areas map shows streams, rivers, lakes, wetlands, the 100-year floodplain, and Forest Preserve District land.

Composite Suitability Map -- The Composite Suitability map combined the following maps:

(1) Water Supply Protection -- public, industrial and private water supply wells, with buffers;

(2) Aircraft Safety -- airports, landing strips with 10,000 and 5,000 foot buffers;

(3) Land-Use Plans -- municipal boundaries with 1.5 mile buffer, schools, University of Illinois owned land, historical places with a 0.5 mile buffer, and cemeteries;

(4) Environmentally Sensitive Areas -- wetlands, lakes, rivers, streams, forest preserves, and flood plains;

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