CITY OF BARTLETT

SOLID WASTE TRANSFER STATION

A FEASIBILITY STUDY
PREPARED BY

THE UNIVERSITY OF TENNESSEE
MUNICIPAL TECHNICAL ADVISORY SERVICE

JULY 1999

MTAS has been asked to conduct a study on the feasibility of a Solid Waste Transfer Station for the City of Bartlett.

In order to conduct this study, MTAS decided to review the following items:

I. **Current system**

II. **Proposed System**

III. **Anticipated Benefits**

IV. **Financial Analysis**

V. **Conclusions**

VI. **Appendix**

I. Current System

The City of Bartlett provides solid waste collection services to a population of approximately 36,000.

Currently, the City does not operate a transfer station, but sends its collection trucks directly to a landfill in Millington operated by BFI, Inc.. This involves twelve collection truck trips per day to the landfill at one hour and fifteen minutes per trip. The driver makes $11.00 per hour plus benefits. Solid waste collection is provided 260 days per year.

12 trips/day x 1.25 hours/trip = 15 hours/day
15 hours/day x ($11.00/hour wages + $5.50/hour benefits)
15 hours/day x $16.50/hour wages & benefits = $248.00/day wages & benefits
$248.00/day wages & benefits x 260 days/year = **$64,480.00/year wages & benefits**

So, we see that the current system without a transfer station costs $64,480.00 per year in driver wages and benefits.

The two workers who load the truck have approximately 40% down time during the transfer station trips. This would involve 40 % of the time for twelve landfill trips per day, at one hour and fifteen minutes per trip. The laborers make approximately $8.00 per hour plus benefits. Solid waste collection is provided 260 days per year.

12 trips/day x 1.25 hours/trip = 15 hours/day
15 hours/day x 2 employees = 30 employee hours/day
30 employee hours/day x 0.40 (40%) lost time = 12 lost employee hours/day
12 lost employee hours/day x 260 days/year = 3120 hours/year
3120 hours/year x $12.00/hour wages & benefits = **$37,440.00/year wages & benefits**

We see that the current system costs about $37,440.00 per year in lost laborer wages and benefits.

Current truck operating costs, based on fleet maintenance records, fuel consumption, etc., are $0.80 per truck mile. The round trip distance to the landfill is 40.2 miles.

12 trips/day x 40.2 miles/trip = 482.4 miles/day
482.4 miles/day x 260 days/year = 125,424 miles/year
125,424 miles/year x $0.80/mile = **$100,340.00/year truck operating costs**

We see that the current system costs $100,340.00 per year in truck operating costs routinely associated with driving to the landfill.

Thus, the combination of wages, benefits, and truck operating costs yields **a total annual cost of $202,260.00 per year** directly attributable to solid waste truck trips to the BFI landfill under the present system.

$ 64,480.00/year wages & benefits (driver)
$ 37,440.00/year wages and benefits (laborers)
$100,340.00/year truck operating costs

$202,260.00/year solid waste transportation to land fill (current system)

II. Proposed System

In the proposed scenario, the City would locate a transfer station on property currently owned by the City at the Wastewater Treatment Plant location.

The collection trucks would spend one half hour per trip traveling to the transfer station. That would be twelve trips per day, with collection being provided 260 days per year.

12 trips/day x 0.5 hours/trip = 6 hours/day
6 hours/day x $16.50/hour = $ 99.00/day wages and benefits
$ 99/day x 260 days/year = **$ 25,740.00/year wages and benefits**

We see that collection truck travel time to the transfer station, as opposed to the landfill, has a projected cost of $ 25,740.00 per year in wages and benefits.

Transfer trucks, rather than collection trucks, would travel from the City transfer station to the BFI landfill. This would require four transfer truck trips per day at one hour and fifteen minutes per trip. The driver makes $11.00 per hour plus benefits. Solid waste collection is provided 260 days per year.

4 trips/day x 1.25 hours/trip = 5 hours/day
5 hours/day x ($11.00/hour wages & $5.50/hour benefits)
5 hours/day x $16.50/hour wages & benefits = $82.50/day wages and benefits
$82.50/day wages & benefits x 260 days/year = **$21,450.00/year wages & benefits**

So, we see that the proposed transfer station system has a projected cost of $21,450.00 per year in driver wages and benefits.

Truck operating costs, projected from historical data, are estimated at $0.80 per truck mile. The round trip distance to the landfill is 40.2 miles.

4 trips/day x 40.2 miles/trip = 160.8 miles/day
160.8 miles/day x 260 days/year = 41,808 miles/year
41,808 miles/year x $0.80/mile = **$33,450.00/year truck operating costs**

We see that the proposed transfer station system has a projected cost of $33,450.00 per year in truck operating costs associated with transfer trucks shuttling between the landfill and the transfer station.

Two employees would be required at the proposed transfer station. This would require a full- time equipment operator and a seasonal laborer (half-time).

$23,000.00/ year operator salary + $11,500.00/ year seasonal employee salary + $15,000.00/ year benefits = **$49,500.00/ year transfer station employee wages & benefits**

We see that the proposed transfer station has a projected cost of $49,500.00 per year in station employee wages and benefits.

Operational costs directly associated with the transfer station, including miscellaneous, uniforms, utilities, and fuel, are projected to be $15,000.00 per year.

Transfer station operational costs = **$15,000.00/year operational costs**

Additionally, the State of Tennessee would require an annual permit fee for the transfer station of $2000.00 per year.

Annual permit fee = **$2000.00/year transfer station permit fee- State of Tennessee**

Thus, the combination of the projected wages, benefits, truck operating costs, site operational costs, and fees yields **a projected total annual cost of $121,400.00 per year** attributable to operating a transfer station.

$ 21,450.00/year wages & benefits
$ 25,740.00/year wages & benefits
$ 33,450.00/year truck operating costs
$ 49,500.00/year transfer station wages & benefits
$ 15,000.00/year transfer station operational costs
$ 2,000.00/year State permit fee

$147,140.00/year annual operating cost

III. Anticipated Benefits

There are several direct and collateral benefits associated with the City of Bartlett establishing and operating a solid waste transfer station.

The most obvious benefit is the direct yearly cost savings.

$202,260.00 (Current System: direct annual costs)
$147,140.00 (Proposed System: direct annual costs)

$ 55,120.00 per year direct cost savings (anticipated benefit of establishing transfer station)

Among the other anticipated benefits is the utilization of the transfer station for the solid waste department personnel, thus freeing up space at the public works complex for expansion of other public works functions and personnel without incurring additional expense.

Additionally, adopting the transfer station plan will lower the city's liability exposure on landfill trips. The current system places city trucks on landfill trips 3600 hours per year, while the proposed transfer station would reduce trip time to 1200 hours per year, a reduction of 2400 hours per year of highway liability exposure.

A further benefit will be lower costs for replacement equipment. As the collection trucks will no longer be trying to traverse off-road type conditions at the landfill, smaller trucks will be usable. Smaller trucks will have a lower purchase price, reducing fleet replacement costs. The smaller trucks will also generate a reduction in operation and maintenance costs, since the fuel, parts, and repair costs are less for the smaller pieces of equipment. The useful life of the collection fleet will also be extended by a reduction in annual mileage of 125,424 miles per year. The smaller trucks will also not have the exposure to damage at the landfill that the present collection trucks do. Trucks in the off road conditions at the landfill can receive tire, axle, and drive train damage; with instances like trucks being pushed out of the mire by bulldozers occurring.

The collection truck fleet will also have an approximate additional ten hours per day available for use on the collection routes rather than in transit to the landfill. This is an additional fifty hours per week, or the equivalent of more than one additional collection vehicle being placed in service; thus temporarily postponing the necessity for the addition of another collection truck to deal with the new customers due to Bartlett's growth. Currently, with 13,800 collection points, there are nine collection trucks. That is approximately 1,533 households per truck. With a growth rate of approximately 600 homes per year, that means that the purchase of an extra truck would be delayed at least 2 ½ years. That allows Bartlett to avoid the cost of a large collection truck ($140,000.00) for 2 ½ years, at which time a smaller collection truck may be purchased at a cost of $126,000.00, a savings of $14,000. Meanwhile, the city has had the use of $140,000.00 for 2 ½ years.

Assuming that the city is able to cycle the trucks replacements at one per year, there will be a yearly savings of $14,000.00 in truck purchase cost.

Bartlett would further benefit by the reduction in damage to the infrastructure as the fleet goes to smaller collection trucks. Municipal solid waste collection trucks can be the heaviest vehicles that normally run on residential streets, etc., and do the most damage, shortening the useful life. Reducing the size of these trucks will reduce the damage to and extend the useful life of the residential streets, etc..

IV. Financial Analysis

The projected turnkey project cost for a transfer station to meet Bartlett's requirements is approximately $450,000.00.

If Bartlett financed the station for ten years at five per cent interest:

$A = \$450,000.00[.05(1+0.5)^{10} / ((1+.05)^{10}-1)]$

A= $ 58,200.00 per year for 10 years

So, if we assume that Bartlett borrows the money for the station at five per cent interest for ten years, they will pay a total of $ 58,200.00 per year for ten years.

The direct savings associated with utilizing a transfer station was $ 55,120.00 per year.

$ 55,120.00	**(Annual direct cost savings from station)**
$ 14,000.00	**(Annual truck purchase savings)**
$ 58,200.00	**(Annual principal and interest payment for station)**
$ 10,920.00	**(Annual savings after P&I payment for station)**

Note: The transfer station and equipment have a projected useful life of over twenty years, but will be paid for in ten years. Accordingly, **every year after the tenth year**, the City of Bartlett will be realizing savings of **$ 69,120.00 per year.**

These savings may be taken directly from historical data and projections, however, there are additional savings that are more difficult to estimate:

Savings on avoided construction costs for additional space at the current Public Works Facility.

Savings from risk management by reducing road exposure on trips to the landfill.

Savings (income) on the interest on the capital saved by delaying the purchase of an additional truck for 2 ½ years.

Value of heightened employee morale due to more efficient operations.

Savings from lengthened (duration unknown) truck life due to lower mileage and less exposure to off road damage at the landfill.

Savings from reduction of damages to Bartlett's street system with the introduction of smaller collection trucks.

V. Conclusions

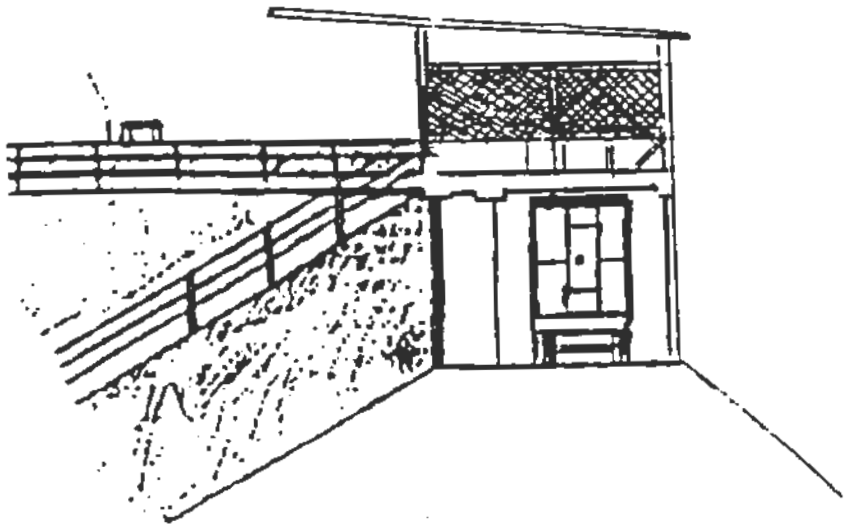
MTAS reviewed the information presented in this feasibility study to arrive at a conclusion and a recommendation regarding a Solid Waste Transfer Station for the City of Bartlett.

Based on the direct and indirect savings projected with Bartlett operating a transfer station, and the tangible and intangible benefits, MTAS recommends that the City of Bartlett pursue building and operating a Solid Waste Transfer Station.

VI. Appendix

Transfer Station

Transfer station systems can be sized to fit any tonnage generated by the waste shed of the county. These systems can be as simple as a point where a small collector deposits a load into an open top trailer on a two-level lot to a system with major recycling on the front end, balers, conveyers, or has an integrated distribution system (rail, truck, barge). Some transfer stations aren't under a shelter, while others have an opened-ended shelter over the dump pit or the open-top trailer, and others have a building with a tipping area and a recycling area. Building height is important. Some of the building designs not only require a 25-foot clearance for the tip area but also require the doors to the tipping area to be 25 feet. The tipping floor should be sized considering waste stream storage needs during breakdowns, routing, schedules, and the transportation system.



The two-level floor system is used with open-top trailers (walking floor or hydraulic cylinder eject) and dump pits (whether a walking floor pit or a hydraulic cylinder eject pit or a charge conveyer) for balers (recyclables or MSW) or compactors (roll-off or transfer trailers). A transfer station system being, built with increasing frequency in several areas of the United States, is a system containing a two-floor level building and using open-top walking floor trailers for transportation. This system has a tipping floor with an elevation higher than the open top trailer (13' 8"). With the tip floor level being slightly higher than the open top trailer, refuse is pushed into the trailer by a rubber tired wheel loader or a backhoe. The refuse is dumped and/or pushed into a hole in the floor with a trailer under it or into a chute over the trailer.

Two-Level Transfer Station

The two-floor level transfer station is gaining popularity because costs for the building, equipment, technology, and transportation are less expensive. The building costs are less because: (1) less tip floor area is needed (trailers can be yarded), (2) simple design and minimal utility (electric, water, sewer) requirements give a lower cost per square foot to construct, and (3) basic building has minimal operational cost (maintenance, insurance, etc.). Only one piece of equipment is required on the tipping floor. The wheel loader or backhoe are types of equipment that are in abundance (service, parts, selection, competitive pricing are available). Simple building, equipment, and material flow (standard operational procedures) require less labor and/or manpower cost per ton of MSW.

Open top walking floor trailers can easily be loaded to legal road weight limits and more easily comply with bridge weight standards. These trailers have the highest legal payload potential. They have the lowest cost per ton of MSW for capital outlay and day to day cost. This trailer, with a hydraulic closer for the top, costs approximately $35,000.

Several transfer stations use a compactor system, where the refuse is dumped into a pit. The pit will usually have a walking floor or hydraulic push cylinder to charge the compactor box. The MSW is then compacted into a heavy boxed trailer. One type of trailer used in this system is a 75-cubic-yard hydraulic cylinder eject. These trailers have a higher tare weight and a shorter axle span than the open top walking floor trailer. There are walking floor trailers available for use with a compactor. Small transfer stations may use a compactor with roll-off containers to transport the refuse.

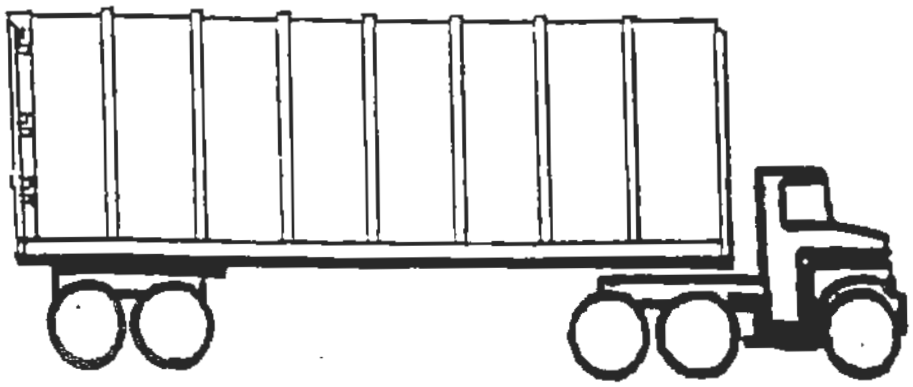
MSW balers are also used in transfer stations. Baled waste can be transported in and on several different types of trailers or trucks. It can be hauled on a flat bed (trailer or truck), a standard box trailer, walking floor trailer, or in a train boxcar. These bales are wire tied and range from 3 to 4 feet in height and width and are 4 to 5 feet long.

One of the newest transfer systems on the market is the untied densified baler (dial-a-weight wireless baler). Refuse is directly dumped into the hopper, the operator inputs the weight desired, a single bale is then formed to meet desired weight while not exceeding a width of six feet or a height of seven feet. This system transfers the bale from the baler to a trailer in three minutes. Bales can be loaded in lighter weight trailers to maximize payload. This system can also load roll-off containers and requires less land area than most systems. The smallest such baler can bale up to 28 tons per hour. The larger baler production rate is 100 tons per hour.

When designing a transfer station system, consider front-end recycling. Some transfer stations have storage areas both inside and outside for recycled material. Recyclables are placed into a set-aside area or placed into a bulk storage bunker until a full load can be collected. Recycle drop-off centers are located at some transfer stations. Most vendors of transfer station equipment have different types of recycle equipment.

Transfer Trailers

Transfer trailers used for MSW refuse are varied in type and style. The type of trailer being requested is the open-top walking floor. Open top walking floor trailers are most often used at transfer stations where MSW is pushed through a chute or an opening in the floor into the top of the trailer. These trailers have the cubic yard capacity to net loads at legal weights. This type of trailer has a lighter tare weight than the hydraulic cylinder eject trailer. This type of trailer also has the longest axle span; therefore, it is easier to comply with the bridge weight regulations. Utilizing this type of transfer station and trailers is very often the lower cost (capital and operational) and the least technical system to operate. Open top walking floor trailers are available in 125 cubic yards, but the 100-cubic-yard trailer is widely used.



Open-top walking floor are trailers which can be top loaded and have a hydraulic operated slated floor that will self unload. These trailers have a hydraulic top closer as an option. A wet kit is required on the tractor to operate the top and the walking floor. Walking floor trailers are easily used with compactors, bales, large dial-a-weight wireless bales, or the open-top loading system. Bales, large dial-a-weight wireless bale systems, or extrusion systems aren't generally used in Tennessee because of the trailer/truck gross weight limit of 80,000 pounds. The design and construction of this type of trailers allows tares weights as low as 12,000 pounds for a trailer designed for use with a pre-load vault, to 18,000 pounds for top loading, and 20,000 pounds for a closed top compactor compatible trailers.

Hydraulic cylinder eject trailers have options. Some of these trailers load from the top while others attach to a large compactor. Some of the top-loaded hydraulic cylinder eject trailers are self-contained with their own motor and hydraulic systems built into the trailer. Most of the compactor loaded hydraulic cylinder eject trailers require tractors with wet kits. A very popular size trailer is 75 cubic yards. The tare weights of these trailers are higher than the walking floor trailer. The densities for these trailers per cubic yard are higher than the open top walking floor trailers.

Based on the State of Tennessee's legal road weight, these trailers' maximum weight of 80,000 pounds less their heavy tare weight with tractor of 48,000 pounds equals a legal net weight of 32,000 pounds, while a tandem axle roll-off truck can gross weight 66,000 pounds less a 34,000-pounds tare weight equaling a legal net weight of 32,000 pounds.

Roll-off trailers are available to transport roll-off containers. These trailers have advantages over the straight framed truck on bridge weights and legal road weights. Some of the large compactors can pack household MSW into a 42-cubic-yard container with a net weight of 36,000 pounds. If this container was

on a conventional tandem axle straight frame truck which has a tare weight of 34,000 pounds, the gross weight of the truck would be 70,000 pounds. This would be 4,000 pounds over weight under Tennessee's weight law or 18,500 pounds over the Federal Bridge Law.

Baled waste may be transported on a flat bed trailer with good tarp procedures. The trailer is low cost but the baling equipment cost need to be considered. If the baled waste is going to a balefill, a baler can be effective in a transfer station. Baled waste can be transported in a conventional enclosed trailer.

Tractor trailer rigs require a more skilled driver to back the rig onto the working face of a landfill. Rear eject (walking floor or hydraulic cylinder ram) trailers are more stable unloading on an uneven landfill surface and are less likely to turn over than conventional tilt dumps. Tractor trailers do the best job of weight distribution for protection of bridges, culverts, and roads.