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- Cost Model Assumptions
- Cost Model Results
- Costs of Increased Waste Diversion
- Operational Cost Factors
- Operational Cost Considerations
- Procuring Landfill Capacity
- Scheduling to Meet the October 2007 Compliance Date
- Questions and Answers
COST MODEL ASSUMPTIONS

- The purpose of the model is to determine the per ton cost to develop and operate a transfer station.

- The following costs are quantified:
  - Site development costs
  - Building construction costs
  - Operating costs

- Two scenarios have been evaluated:
  - Retrofit an existing building (least likely)
  - Construct a new facility (most likely)
COST MODEL ASSUMPTIONS (cont’d)

- General assumptions for both scenarios:
  - Average throughput = 30 tons per day
  - No additional costs have been assumed for:
    - Stormwater management
    - Local approval and permitting
    - Land acquisition
  - Personnel assumed to consist of supervisor / equipment operator, laborer and scalehouse clerk
  - Assumes all equipment purchased new (not leased or purchased used)
COST MODEL ASSUMPTIONS (cont'd)

SCENARIO 1: BUILDING RETROFIT

OPTION A: TOP-LOAD TRANSFER TRAILERS AT GRADE
WITHIN BUILDING

- Preliminary requirements to permit a building retrofit:
  - Building dimensions (minimum) = 60 feet deep, 60 feet wide
  - Clear-span height (minimum) = 30 feet
  - No center columns present in the building
  - Existing concrete floor with minimum thickness = 6 inches
COST MODEL ASSUMPTIONS (cont’d)

SCENARIO 1: BUILDING RETROFIT

OPTION A: TOP-LOAD TRANSFER TRAILERS AT GRADE WITHIN BUILDING

- Existing building / site features:
  - Scale and scalehouse in place and available to use by facility
  - Access door dimensions (minimum) = 24 feet high, 15 feet wide (collection vehicle access); 16 feet high, 12 feet wide (passenger vehicle access)
  - All utilities present on-site and connected to building (electric, water, telephone, gas, sanitary sewer)
  - Fencing is installed around the facility perimeter
  - No site grading or placement of gravel / pavement required
COST MODEL ASSUMPTIONS (cont’d)

SCENARIO 1: BUILDING RETROFIT
OPTION A: TOP-LOAD TRANSFER TRAILERS AT GRADE WITHIN BUILDING

- Required building modifications:
  - Tipping floor installed, minimum thickness = 6 inches reinforced concrete
  - Pushwall installed along back wall and half of side wall (90 feet), consisting of concrete gravity blocks to height of 8 feet
  - Install washwater storage tank

- Operating equipment required:
  - Front-end wheel loader
COST MODEL ASSUMPTIONS (cont'd)

SCENARIO 1: BUILDING RETROFIT
OPTION B: TRUCK-TO-TRUCK TRANSFER

- Preliminary requirements to permit a building retrofit:
  - Building dimensions (minimum) = 90 feet deep, 30 feet wide
  - Clear-span height (minimum) = 30 feet
  - No center columns present in the building
  - Access available from both ends of building
COST MODEL ASSUMPTIONS (cont'd)

SCENARIO 1: BUILDING RETROFIT
OPTION B: TRUCK-TO-TRUCK TRANSFER

- Existing building / site features:
  - Scale and scalehouse in place and available to use by facility
  - Access door dimensions (minimum) = 24 feet high, 15 feet wide (collection vehicle access)
  - All utilities present on-site and connected to building (electric, water, telephone, gas, sanitary sewer)
  - Adequate space available on-site to locate citizen drop-off area
  - Fencing is installed around the facility perimeter
  - No site grading or placement of gravel / pavement required
COST MODEL ASSUMPTIONS (cont’d)

SCENARIO 1: BUILDING RETROFIT
OPTION B: TRUCK-TO-TRUCK TRANSFER

- Required modifications:
  - Loading ramp constructed within building for collection vehicles to back to level of trailer bed (approximately 4 feet)
  - Citizen drop-off area, consisting of roll-off boxes and signs indicating operating procedures
  - Install washwater storage tank

- Operating equipment required:
  - Transfer trailers (2) designed for truck-to-truck transfer
  - Small wheel loader
COST MODEL ASSUMPTIONS (cont’d)

SCENARIO 2: CONSTRUCT NEW FACILITY

- Site requirements:
  - Minimum site size = approximately 1.25 acre
  - All utilities available from the property line
  - All maneuvering areas and access roads will be gravel
  - Scale and scalehouse must be constructed
  - Site is assumed to be level and require minimal grading or excavation
COST MODEL ASSUMPTIONS (cont'd)

SCENARIO 2: CONSTRUCT NEW FACILITY

- Building requirements:
  - Dimensions (minimum) = 60 feet deep, 60 feet wide
  - Clear span height (minimum) = 30 feet
  - No center columns
  - Access door dimensions (minimum) = 24 feet high, 15 feet wide (collection vehicle access); 16 feet high, 12 feet wide (passenger vehicle access)
  - Tipping floor (minimum thickness) = 12 inches reinforced concrete
COST MODEL ASSUMPTIONS (cont’d)

SCENARIO 2: CONSTRUCT NEW FACILITY

- Building requirements (cont’d):
  - Reinforced concrete pushwalls on rear and one side of building to height of 8 feet
  - Depressed back-in loading bay for transfer trailer loading, depressed to 6 feet with 7% ramp grade
  - Floor drains installed to capture washwater and deliver to storage tank
COST MODEL RESULTS

- Components of per ton transfer station cost:
  - Construction and operating cost
  - Transportation cost
  - Disposal cost
The analysis to this point calculates the cost per ton to construct and operate a transfer station.

Assumes that landfills raise current tip fees by October 2005 by the incremental cost to become Subtitle D-compliant ($17.10 – $21.54 per ton).

- Additional tip fee is placed in a reserve fund to partially finance initial capital investment for transfer station development.
- Remainder of capital investment is financed through a 15-year loan at a rate of 5%.
COST MODEL RESULTS (cont’d)

- Scenario 1: Retrofit existing building
  Option A: Top-load transfer trailers at grade on tipping floor
  - Estimated cost of $17.73 – $18.37 per ton

- Scenario 1: Retrofit existing building
  Option B: Truck-to-truck transfer
  - Estimated cost of $17.37 – $18.01 per ton

- Scenario 2: Construct new facility
  - Estimated cost of $20.69 – $23.57 per ton
Additional construction and operating costs may be incurred if:

- Preliminary building requirements are not met, in the case of a building retrofit (for example, adequate access door dimensions)

- Additional design features are desired (such as paving interior roads and vehicle maneuvering areas)

- Retrofit design results in imperfect operations due to limitations of building size, building layout, etc.
COST MODEL RESULTS (cont’d)

- Construction and operating cost summary:
  - Scenario 1 (retrofit existing building) = $17 – 18 per ton
  - Scenario 2 (construct new facility) = $21 – 24 per ton
Transportation cost:

- Factors include cost to operate transfer trailer, distance to disposal facility and payload of trailers
- Formula to calculate per ton transportation cost:

\[
\text{Cost per ton} = \frac{\text{Trailer cost / hour}}{} \times (\text{Number of hours}) \quad \left(\frac{\text{Tons per load}}{\text{}}\right)
\]
Transportation cost (cont’d):

- Estimated cost to operate a transfer trailer = $70 per hour
- Average trailer payload = 20 tons
- Example calculation (assuming a round-trip travel time of 2 hours):

\[
\text{Cost per ton} = \frac{($70/\text{hour}) \times (2 \text{ hours})}{20 \text{ tons/load}} = $7 \text{ per ton}
\]
COST MODEL RESULTS (cont’d)

Disposal cost:

- Variable based on rate negotiated during landfill capacity procurement
- Planning areas will benefit from negotiating with more than one landfill
- Cost may decrease in the future as landfills become more regional in nature
COST MODEL RESULTS (cont’d)

- Total cost to transfer haul waste may be calculated:
  \[ \text{Cost per Ton} = \text{Construction / Operation Cost} + \text{Transportation Cost} + \text{Disposal Cost} \]

- Example calculation: assuming a transportation cost of $7 per ton and disposal cost at a regional landfill of $26 per ton:
  - Scenario 1 (retrofit existing building) may result in a total cost of $50 – $51 per ton
  - Scenario 2 (construct new facility) may result in a total cost of $54 – $57 per ton
As average daily tonnage increases, per ton cost of transfer station construction and operation will decrease due to economies of scale:
Other options may include direct hauling waste to landfills or transfer stations in other planning areas:

- Construct and operate transfer station and transfer haul waste a given distance or direct haul waste a given distance

- Compare costs, assuming a cost of $80 per hour to operate a collection vehicle and an average vehicle speed of 50 mph
Other options may include direct hauling waste to landfills or transfer stations in other planning areas.

![Graph showing cost per ton vs. one-way distance (miles)]

**Notes:**
1. Assumes transfer station construction and operating cost of $21 per ton.
2. Costs are calculated based on round-trip travel distance.
Other options may include direct hauling waste to landfills or transfer stations in other planning areas (cont’d)

- Develop citizen convenience centers to serve self-haulers
- Collection vehicles direct haul to regional transfer station or landfill

Citizen Convenience Center
Regional Transfer Station
Regional Landfill
Other options may include direct hauling waste to landfills or transfer stations in other planning areas (cont’d)

- This regionalization will result in lower per ton costs because of economies of scale achieved by capturing greater tonnages
- Regionalization may have an impact on a planning area’s right to remain autonomous
Comparison to costs to develop a Subtitle D-compliant landfill

- Subtitle D-compliant landfill:
  \[
  \text{Cost per Ton} = \text{Incremental Cost per Ton} + \text{Current Tip Fee} + \text{Assessment Fee}
  \]

- Per capita assessment may be converted to a per ton assessment:
  \[
  \text{Assessment (per ton)} = (\text{Per capita fee}) \times (\text{Population}) / (\text{Total tons per year})
  \]
Comparison to costs to develop a Subtitle D-compliant landfill (cont’d)

- Incremental cost = $17.10 – $21.54 per ton

- Incremental cost calculated assuming cell construction, final cover, permitting and operating costs are based on estimates presented in Workshop #1 and are saved over an 18-month period in order to develop a sufficient cell construction reserve fund to pay for cell construction in 2007.
COST MODEL RESULTS (cont’d)

Comparison to costs to develop a Subtitle D-compliant landfill (cont’d)

- Example calculation: assuming current tip fee of $36 per ton and assessment fee of $4 per ton,

\[
\text{Cost per Ton} = \text{Incremental Cost per Ton} + \text{Current Tip Fee} + \text{Assessment Fee}
\]

\[
= $17 + $36 + $4 = $57 \text{ per ton}
\]

\[
= $22 + $36 + $4 = $62 \text{ per ton}
\]
COST MODEL RESULTS (cont’d)

- Transfer station cost:
  \[ \text{Cost per Ton} = \frac{\text{Construction / Operation Cost}}{\text{Transportation Cost} + \text{Disposal Cost}} \]

- Subtitle D-compliant landfill:
  \[ \text{Cost per Ton} = \text{Incremental Cost per Ton} + \text{Current Tip Fee} + \text{Assessment Fee} \]
COSTS OF INCREASED WASTE DIVERSION

- May increase capital and operating costs:
  - Additional storage capacity for segregated recyclables
  - Additional equipment may be desired (sorting line, baler)
  - Additional staff may be required
  - Actual cost increases must be determined on a case-by-case basis

- Cost increases may be minimized by using available staff and capacity and performing sorting on the floor
Increased waste diversion will result in less waste being transported to landfills for disposal
- Reduced disposal costs
- Potential income resulting from resale of recyclables
OPERATIONAL COST FACTORS

- Contracting options
  - Public / private partnership for operation: contract with private operator while retaining ownership of the facility
  - Contract with regional landfill for disposal to guarantee a source of disposal capacity and control future disposal costs
Hauling distance vs. tipping fees
- Increased hauling distances will result in increased transportation costs
- Transfer trailers are more efficient and less costly than hauling waste to distant landfills in collection vehicles
- More distant landfills may have lower tip fees (larger, regional landfills), offsetting the increased transportation costs
OPERATIONAL COST FACTORS (cont’d)

- Limiting operating days and short-term waste storage
  - Reducing operating days may reduce operating costs associated with staffing and maintenance
  - Storing waste over the short-term may result in fuller loads being hauled to the landfill (Iowa DNR allows waste to be stored on-site at transfer stations for up to 48 hours, excluding national holidays and Sundays)

- Partnering with other planning areas for disposal bids
  - Economies of scale resulting from increased volume of waste to be delivered
  - Maximizes bargaining power when a larger waste stream is available
OPERATIONAL COST CONSIDERATIONS

- **Bulky items**
  - Require additional storage capacity on-site
  - May require separate handling from waste
  - Transfer trailer loads may not be as full due to greater material density
  - Potential to damage transfer trailers if top-loaded
  - Disposal costs may be cheaper than for MSW
  - May not require handling within a building

- **C&D management**
  - Options for material reuse
  - Potentially lower disposal costs at processing facilities or C&D landfills
C&D management
- Potential options for material reuse
- Potentially lower disposal costs at processing facilities or C&D landfills

Special wastes
- Not typically managed at transfer stations
- May require additional storage capacity on-site
- More efficiently hauled directly to permitted disposal site by licensed special waste hauler
Short-term waste storage during inclement weather (e.g., roads iced or landfill closed due to wind)
- Requires additional storage capacity
- Waste may be loaded into transfer trailers to provide more floor storage (if trailers are available)
PROCURING LANDFILL CAPACITY

- Guaranteed disposal capacity
- Control future disposal cost increases or stabilize disposal costs for several years through contractual agreement
- Partnering with other planning areas may result in:
  - Greater bargaining power resulting from larger waste volumes
  - Economies of scale, spreading disposal cost over greater tonnage
Potential for environmental liability can be reduced by conducting a comprehensive environmental audit of the landfill, consisting of a review of several features:

- Site geology and hydrogeology
- Historical groundwater monitoring data
- Landfill design
- Landfill operations
- Permit history
- Violation history
SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE

4 Months

Prepare Permit Application
SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE (cont’d)

- Prepare permit application:
  - Conceptual facility design
  - Develop application documents

- Permit application may be prepared in approximately 4 months
SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE (cont’d)

Prepare Permit Application

30-45 Days

Permit Application Review and Permit Issuance
SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE (cont’d)

- Permit application review:
  - Check for completeness
  - Review to determine consistency with regulations

- Permit issuance:
  - Site inspection is required
  - Construction may not commence until permit is issued

- Permit will generally be issued within 30-45 days of application submittal
SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE (cont’d)

1. Prepare Permit Application
2. Permit Application Review and Permit Issuance
3. 6 Months
4. Facility Construction
Facility construction:
- Commences after permit is issued
- Final construction drawings may be developed prior to permit issuance
- Construction may be complete within 6 months (may vary based on coincidence of permit issuance with construction season)
SCHEDULING TO MEET THE OCTOBER 2007 COMPLIANCE DATE (cont'd)

- A permit application may be filed, a permit may be issued and construction of the facility may be completed within 1 year or less.

- The regulatory timeframe is much shorter than that required for a new disposal cell, as outlined in Workshop #1.

- Additional time may be required for:
  - Site selection
  - Land acquisition
  - Local approval
  - Delayed start of construction
QUESTION & ANSWER