Houston-Galveston
Area Council

Workshop
Transfer Station Best Management Practices

March 5, 2009

R·W·BECK

Mind Powered: Insight with Impact.

Workshop Purpose

- This workshop will benefit both existing transfer station operators and those interested in developing a new transfer station.
- The workshop provides an overview of transfer station operations and some basic design considerations.

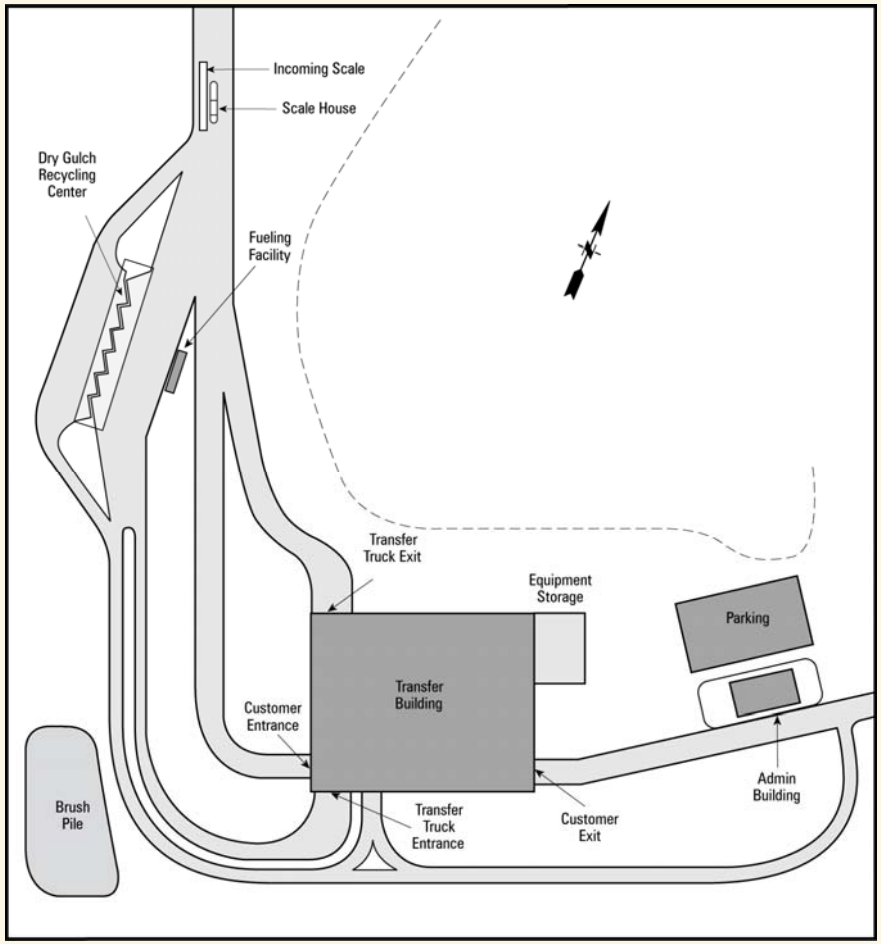
Sources for Workshop

R. W. Beck prepared this presentation based largely on trade experience and knowledge. In addition, R. W. Beck conducted primary and secondary research to complete the Workbook. A list of external sources is provided at the end of this presentation.

Workbook Organization

- Evaluating Need for Transfer Station
- Permitting and Site Selection
- Types of Transfer Stations
- Site and Facility Size
- Equipment
- Personnel
- Recycling
- Off-site Impacts
- Health and Safety
- Other Considerations
- Case Studies

Example Transfer Station Layout



Evaluating Need for Transfer Station

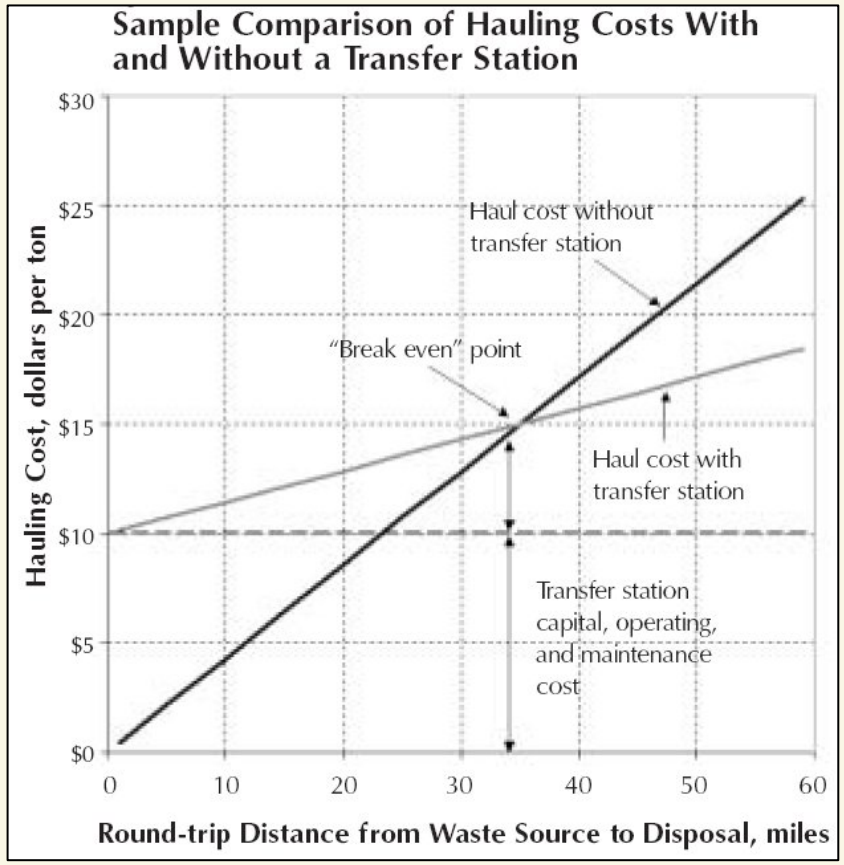
Evaluating Need for Transfer Station

Direct haul to landfill vs. long haul via transfer station

- When a city or entity face hauling waste "longer" distances, a transfer station may be a viable option.
- Transfer station costs should be less than the cost of hauling to the landfill directly with collection vehicles (direct haul).
- By using a transfer station, collection vehicles spend less time driving to/from the disposal site and more time on route. Therefore fewer collection vehicles need to be purchased.
- A common "rule of thumb" R. W. Beck uses based on experience with other transfer stations is that a transfer station begins becoming feasible when the travel distance to the landfill is 20-30 miles or more (one way).

Evaluating Need for Transfer Station
(Continued)

- Factors that affect financial feasibility include:
  - Disposal Cost
  - Distance/travel time to landfill
  - Fuel Costs
  - Annual tonnage hauled
  - Payload of transfer trailers vs. collection vehicles



Source: U.S. EPA's Waste Transfer Stations: A Manual for Decision Making

Evaluating Need for Transfer Station
(Continued)

Why Consider a Transfer Station?

- Provides flexibility of disposal location.
- May be less expensive alternative to hauling long distance to landfill.
- Turnaround times for collection vehicles typically shorter.
- Typically less wear and tear on collection vehicles.
- Can serve as citizens collection station.
- Can provide processing point for recyclables or other materials.

Permitting and Site Selection

Permitting Overview

- The time required to site and permit a transfer station can vary considerably depending on where the site is located, potential neighbors, etc.
- R. W. Beck would recommend to anyone planning a transfer station to allow ample time for these activities.
- All transfer stations must be permitted, registered, or notification must be provided.
- TCEQ Chapter 330, Subchapter A provides permitting overview.
- TCEQ Chapter 330, Subchapter M provides location restrictions and some counties have siting ordinances.

Permitting Overview
(continued)

- Only notification is required for "low-volume" transfer station.
  - Storage capacity of 40 cubic yards (household waste) and located in an unincorporated area.
- A transfer station can be registered if it meets following criteria:
  - Municipality with population < 50,000;
  - County with population < 85,000;
  - Facility that transfer < 125 tons per day; OR
  - Located within permitted boundaries of Type I or IV landfill.

Permitting Overview
(continued)

- Transfer stations that cannot meet requirements for notification or registration must be permitted.
- Primary difference between permitting and registration is that the registration application is not subject to a hearing request or the administrative completeness determinations of TCEQ Chapter 281.

Site Selection

Factors to Consider when Choosing a site:

- Proximity to waste collection routes
- Distance to landfill
- Visual impacts
- Site zoning, design and size requirements
- Site ordinances
- Proximity to utility tie-ins
- Site topography and geometry
- Site access (e.g., type of roadway, line of sight distances)
- Co-location with another facility (e.g., closed landfill)

Site Selection
(Continued)

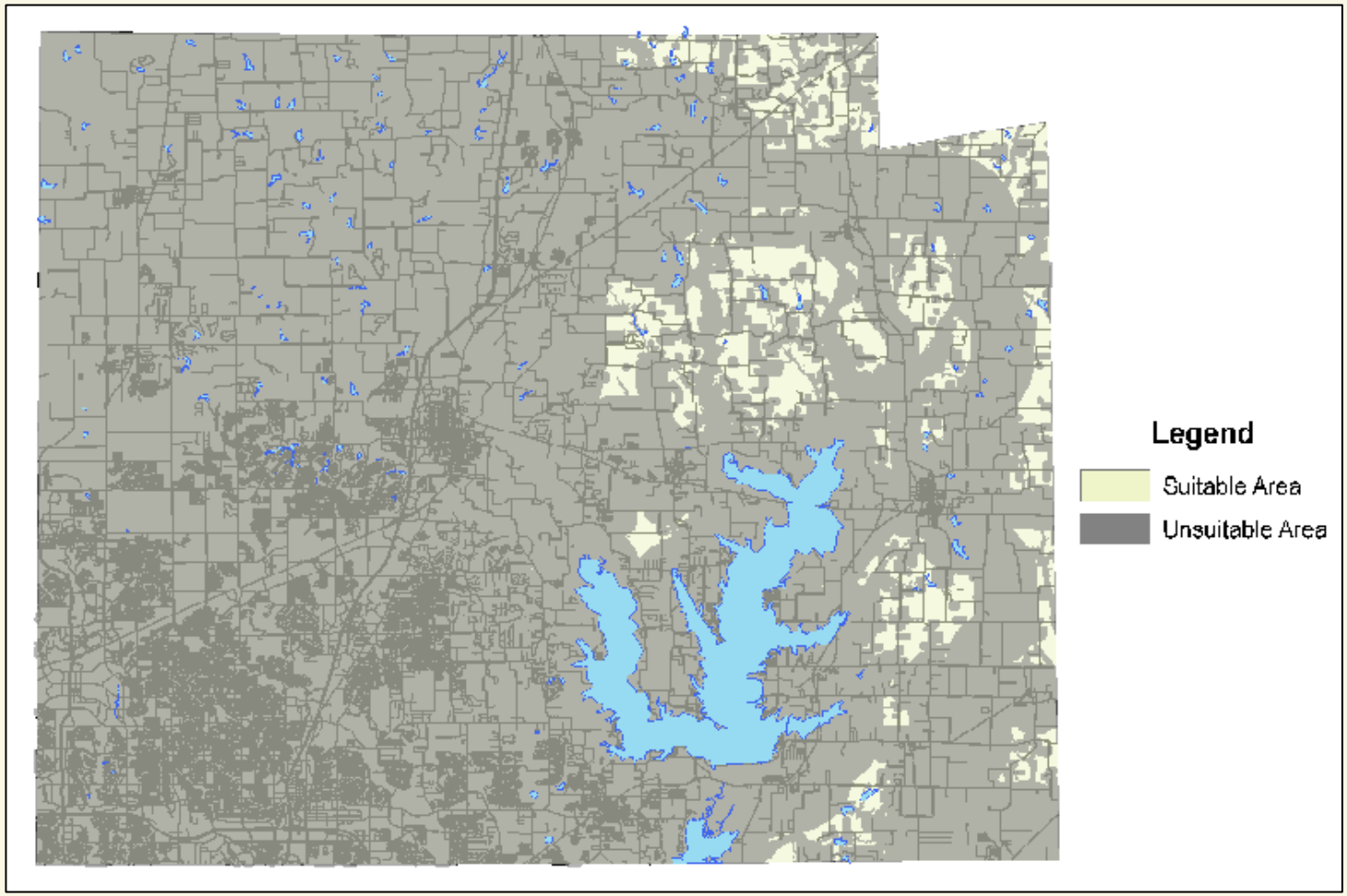
Facility siting criteria

Exclusionary Criteria[1]	Land Use Criteria
▪ Airport safety	▪ Parks and open space
▪ Floodplains	▪ Residential land use
▪ Groundwater	▪ Population density
▪ Endangered or threatened species	▪ Protection of key environmental features
▪ Wetlands	▪ Impact on air quality
▪ Fault lines	▪ Impact on the local infrastructure
▪ Seismic impact zones	▪ Proximity to churches, recreation sites, residences and schools

1. **Texas Administrative Code (30 TAC §330, Subchapter M)**

Site Selection
(Continued)

Example Composite of All Unsuitable Areas for County Siting Ordinance



Types of Transfer Stations

What Type of Transfer Station

- The type and size of the transfer station will depend on a number of factors, many of which are covered in this Workbook.
- Aside from operational requirements, the design may be influenced by climate and local policy decisions.
- Transfer stations can typically be categorized into several groups, although one station could be categorized as more than one:
  - Open-top, Surge Pit, Compactor/Precompactor, Baler, Intermodal.

Primary Transfer Stations Types

- Open Top
  - Waste is either unloaded directly into trailer below (direct dump) or dumped onto a tipping floor and pushed into trailer below (push load).
- Surge Pit
  - Variation of open top transfer station. Waste unloaded into an area below the level of the unloading vehicle. Transfer station equipment then pushes the material into trailer, typically open-top.
- Compactor/Precompactor
  - Waste is compacted into a trailer (compactor) or compacted then loaded into trailer (precompactor). Waste is typically loaded into the rear of fully-enclosed trailer.
- Other (Baler, Intermodal)
  - For baler transfer stations, loads of waste are baled then placed on a trailer for maximum load density
  - For intermodal, waste is loaded into containers that can be loaded onto rail cars.
  - Both are typically used when hauling long distances.

Open Top (Push Load)

Application

- Most common type of transfer station
- Design can be configured for both small and large transfer stations
- Allows for temporary storage of waste on tipping floor
- Examples: City of Killeen, City of Huntsville

Advantages	Disadvantages
▪ Simple technology ▪ Lower capital costs ▪ Some storage of waste is available on tipping floor ▪ Easier to inspect waste on tipping floor	▪ Needs grade separation for top-loading trailers ▪ Customers and floor equipment operating in same area ▪ Waste is only lightly compacted

Open Top (Direct Dump)

Application

- Typically for smaller volume transfer stations
- Some push-load facilities also have direct dump capability
- Example: City of Brenham

Advantages	Disadvantages
▪ Simple technology ▪ Lower capital costs ▪ No additional equipment needed for pushing waste into trailer ▪ Reduces the handling of waste	▪ Needs grade separation for top-loading trailers ▪ No temporary storage of waste ▪ Must always have trailer available for unloading customer waste ▪ Waste is only lightly compacted ▪ Limited inspection capability

Surge Pit

Application

- Most suitable for large transfer stations with uneven flows of incoming waste
- Examples: City of Dallas (Bachman), City of Garland

Advantages	Disadvantages
▪ Short-term storage of waste	▪ High capital costs
▪ Bulky items can be broken down, waste compacted	▪ Additional equipment needed to reload waste into transfer trailer
▪ No roll-out space needed	▪ Fall hazard for people and vehicles
▪ Materials can be recovered	▪ Larger floor area to maintain
▪ Simple technology	

Compactor/Precompactor

Application

- Ideal for transfer stations that need to haul waste long distances
- Examples: Cochise County (AZ), North Texas Municipal Water District

Advantages	Disadvantages
▪ Compacting produces densely packed loads ▪ Waste can be stored in containers for shipment ▪ Some compactors can be designed so that the need for a bi-level transfer station is eliminated	▪ High capital costs ▪ Complex technology ▪ Not suitable for all types of waste ▪ High energy consumption

Other (Baler, Intermodal)

Application

- Ideal for transfer stations that need to haul waste long distances
- Not commonly used in Texas, mainly found in areas where landfill space is scarce
- Examples: Snohomish County (WA) Airport Road TS, Harlem River TS (NY)

Source: Macpresse Europa S.R.I

Advantages	Disadvantages
▪ Allows for economical shipment of waste from transfer station over long distances ▪ Baled waste can be placed in closed trailers or flatbed trailers for shipment	▪ High capital costs ▪ Additional complexity ▪ Not widely used in Texas

Transfer Station Building

- Regardless of what type of transfer station is chosen, the size, climate, and location may influence whether the transfer station is an open-air station (with or without a roof), partially enclosed, or fully-enclosed.
- Most transfer stations are at least partially enclosed to help manage windblown litter, dust and odor.
- Fully enclosed transfer stations have additional requirements for internal dust control and heating/ventilation.

Site and Facility Size

Factors Affecting Facility/Site Size

- Desired number of days of storage space on tipping floor or pit, if applicable (1/2 day to 2 days typical)
- Types of customers and how long it takes each to unload
- Materials accepted
- Parking for collection vehicles, transfer tractors/trailers, staff, visitors
- Number of vehicles that will use the station and their expected days and hours of arrival (need to design to accommodate peak operations)
- Growth in the waste stream over life of transfer station
- Hours of operation

Factors Affecting Facility/Site Size
(Continued)

- Number of transfer trailers in use
- Transfer trailer capacity
- Time required to load transfer trailers
- Buffer space
- Other activities that may occur at the station (recycling , brush mulching/composting, HHW collection, etc.)
- Support facilities (e.g., vehicle maintenance, fueling station, administration/office space)

Material Types Accepted

- The types of materials accepted may also have an impact on the size of the station and type of equipment used. In addition to MSW, transfer stations may accept:
  - Construction and demolition debris
    - May require “heavier duty” equipment
  - Brush
    - Can reduce density of loads, or space require to grind brush
    - Hauling clean brush requires separation from other waste streams
  - Recyclables
    - Material must be kept separate for other waste streams

Customer Types

- The types of customers serviced at the site will impact the design and operations of the site. Customer types might include:
  - Residential and commercial collection vehicles
  - Roll-off vehicles
  - Residents and small commercial haulers
- Residential and commercial collection vehicles may require taller building and more maneuvering space.

Customer Types
(continued)

- Roll-off collection vehicles have rear doors that open to the side, potentially requiring wider unloading lanes.
- Residents and small commercial haulers often unload material manually, which occupies an unloading lane for longer periods of time.

Hours/Days of Operation

- The hours and days of operation may help determine the size of the facility. Issues that affect hours of operation include:
- Location of transfer station
  - Urban, residential, industrial, rural, etc.
  - Neighboring land uses
- Collection schedules
- Operating hours and days of the disposal facility
- Customer base of the transfer station (collection vehicles, residents, or both)

Traffic Flow Into and Within Site

- Understanding and accounting for how traffic will flow into, out of, and within the site will impact the size of the transfer station. Issues to consider include:
  - Type of access roads and amount of non-transfer station traffic around site
    - Maybe affect how quickly TS traffic can get into and out of site
  - Queuing space at scale house
    - Need to ensure that peak flows will not result in lines beyond site boundary
  - Queuing space between scale house and transfer building entrance

Traffic Flow Into and Within Site
(continued)

- Maneuvering space either within building or outside building
- Unloading lanes wide enough to provide safe distances between vehicles
- Separation between customer types may require additional space
- Adequate turning radius for collection and transfer vehicles
- Timing of when customers arrive at the site can significant impact on size – should not just depend on average tons per hour or tons per day to size transfer station

Traffic Flow Into and Within Site
(continued)

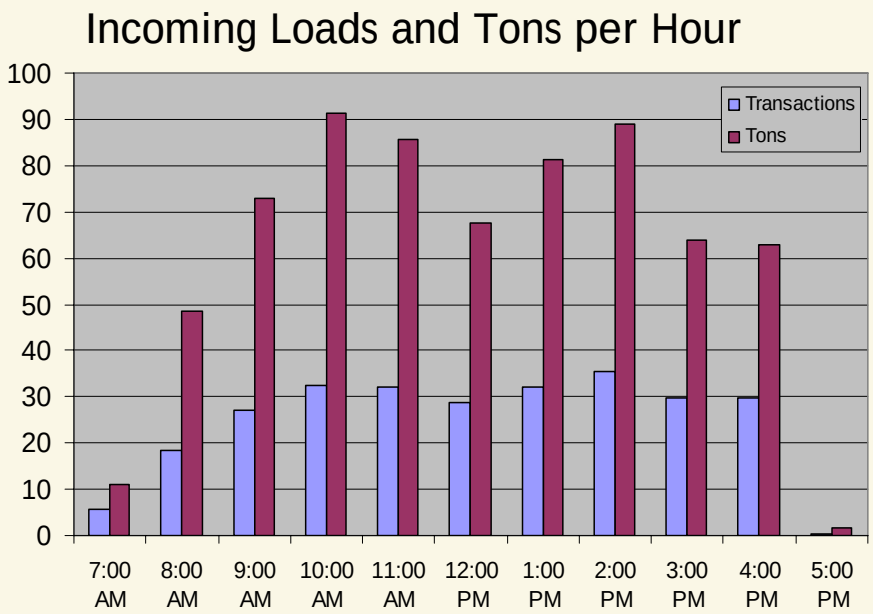
- Number of scales
  - One dual purpose scale (inbound/outbound)
  - One or more inbound, one outbound (usually more inbound scales than outbound scales)
- Transaction processing at scale house
  - Do drivers have to get out of their vehicles to interact with scale house attendant?
  - Will collection vehicles wait behind small haulers and residents?
  - Storing tare weights for consistent customers (collection vehicles) helps reduce transaction time
  - Radio-frequency identification and other automated systems help reduce transaction time

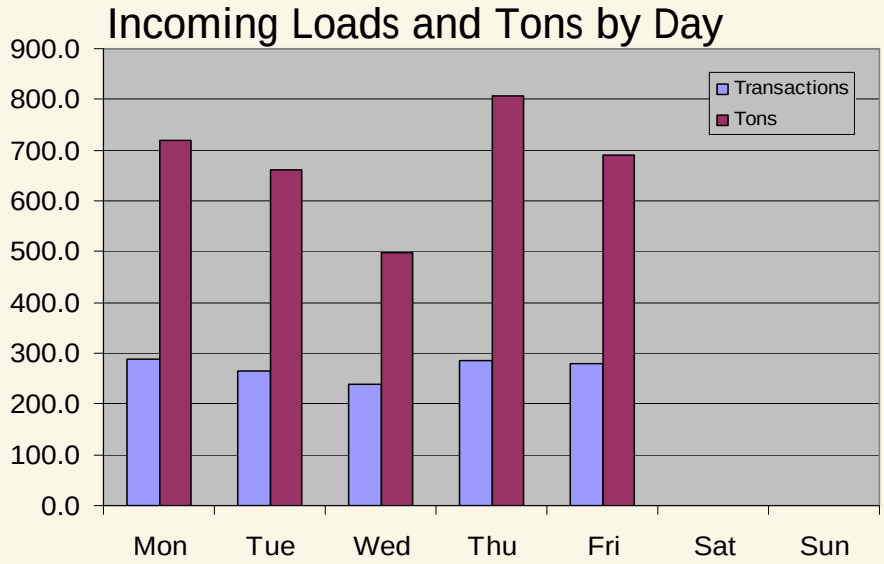
Use of Transfer Trailers

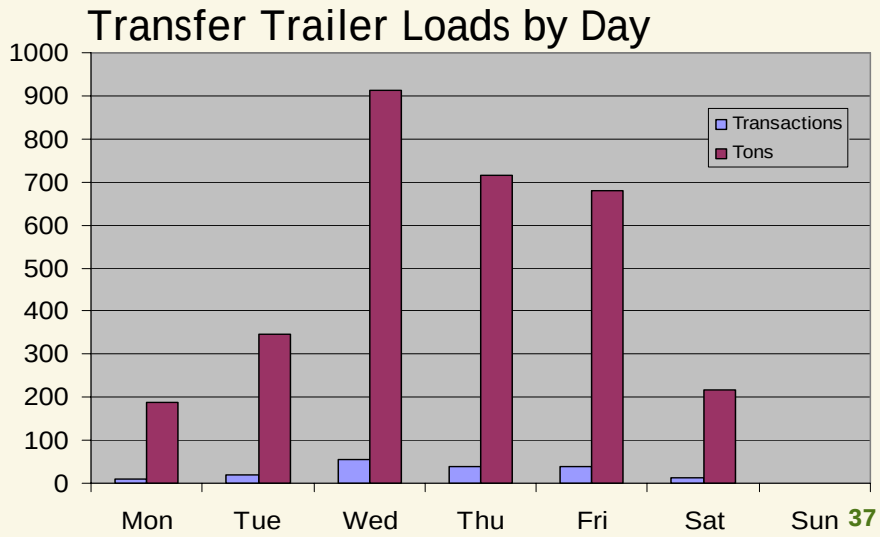
- A “drop and hook” operation uses a yard tractor to continuously load transfer trailers rather than waiting for vehicles to arrive from the landfill
  - May reduce amount of tipping floor storage needed
  - Reduces downtime caused by having no trailers to load
  - Can reduce wait time for transfer drivers
  - Requires additional trailers

Source: Mid-Pacific Industries

Example Waste Flow
(Surge Pit Transfer Station)







Determining Transfer Station Capacity

- Example formula for transfer station capacity

Formulas for Determining Transfer Station Capacity

Pit Stations

Based on rate at which wastes can be unloaded from collection vehicles:

$C = P_c \times (L/W) \times (60 \times H_w/T_c) \times F$

Based on rate at which transfer trailers are loaded:

$C = (P_t \times N \times 60 \times H_t)/(T_t + B)$

Direct Dump Stations

$C = (N_n \times P_t \times F \times 60 \times H_w)/ [((P_t/P_c) \times (W/L_n)) \times T_c + B]$

Hopper Compaction Stations

$C = (N_n \times P_t \times F \times 60 \times H_w)/[(P_t/P_c \times T_c) + B]$

Push Pit Compaction Station

$C= (N_p \times P_t \times F \times 60 \times H_w)/[(P_t/P_c \times W/L_p \times T_c) + B_c + B]$

where:

C	=	Station capacity (tons/day)
P_c	=	Collection vehicle payload (tons)
L	=	Total length of dumping space (feet)
W	=	Width of each dumping space (feet)
H_w	=	Hours per day that waste is delivered
T_c	=	Time to unload each collection vehicle (minutes)
F	=	Peaking factor (ratio of number of collection vehicles received during an average 30-minute period to the number received during a peak 30-minute period)
P_t	=	Transfer trailer payload (tons)
N	=	Number of transfer trailers loading simultaneously
H_t	=	Hours per day used to load trailers (empty trailers must be available)
B	=	Time to remove and replace each loaded trailer (minutes)
T_t	=	Time to load each transfer trailer (minutes)
N_n	=	Number of hoppers
L_n	=	Length of each hopper (feet)
L_p	=	Length of push pit (feet)
N_p	=	Number of push pits
B_c	=	Total cycle time for clearing each push pit and compacting waste into trailer

Source: O'Leary, Phillip, and Walsh Patrick. Decision Maker's Guide to Solid Waste Management, Volume II. 1995.

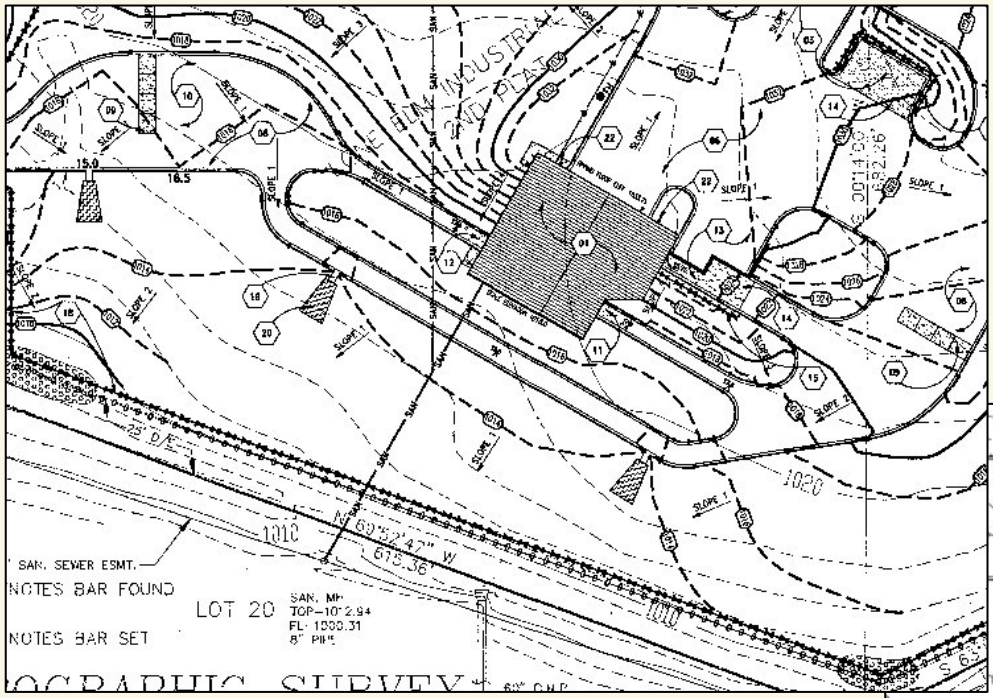
Expansion Capability

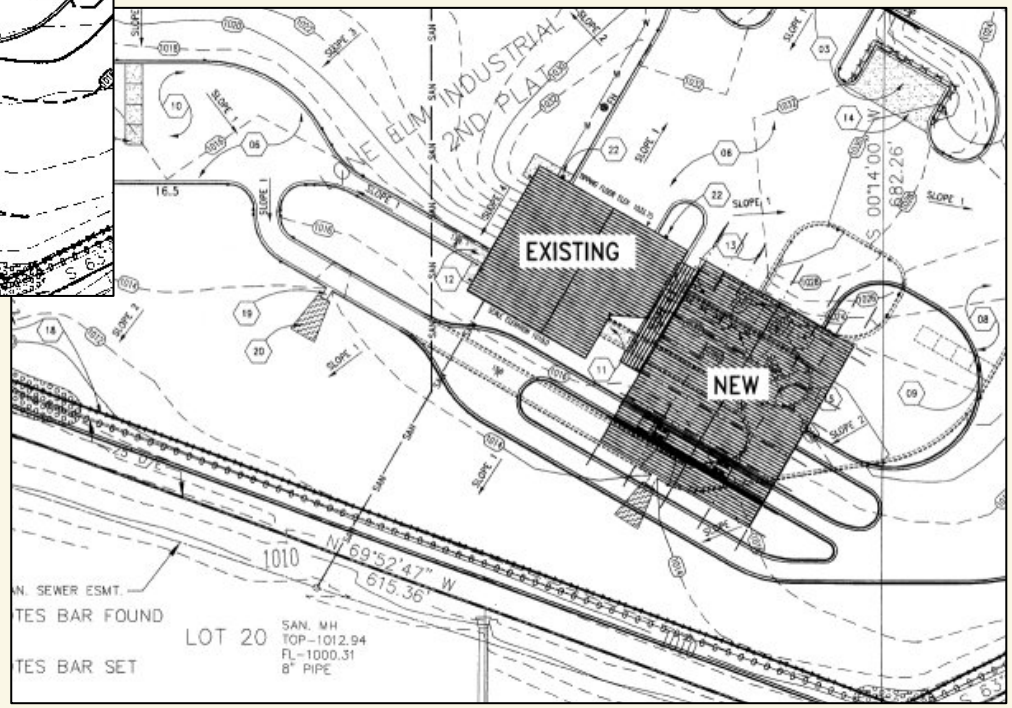
- Design should account for options to expand.
- Ways to accomplish this might include:
  - Expand hauling operation: add transfer trailer, increase operating hours, implement “drop and hook” operation.
  - Expand tipping floor for additional storage capacity.
  - Add scales or scale house automation (e.g., radio-frequency identification tags).
  - Add/open additional hoppers in top-load facility (preferably without adding lanes). The hoppers may already be in place with the holes covered.
  - Add citizen collection station to reduce small hauler traffic within the transfer station.

Expansion Capability
(Continued)

- Leave sufficient room for improvements to site infrastructure such as:
  - Storm water ponds
  - Buffers between site and adjacent properties
  - Additional internal roads
  - Additional scales

Expansion Capability
(Continued)



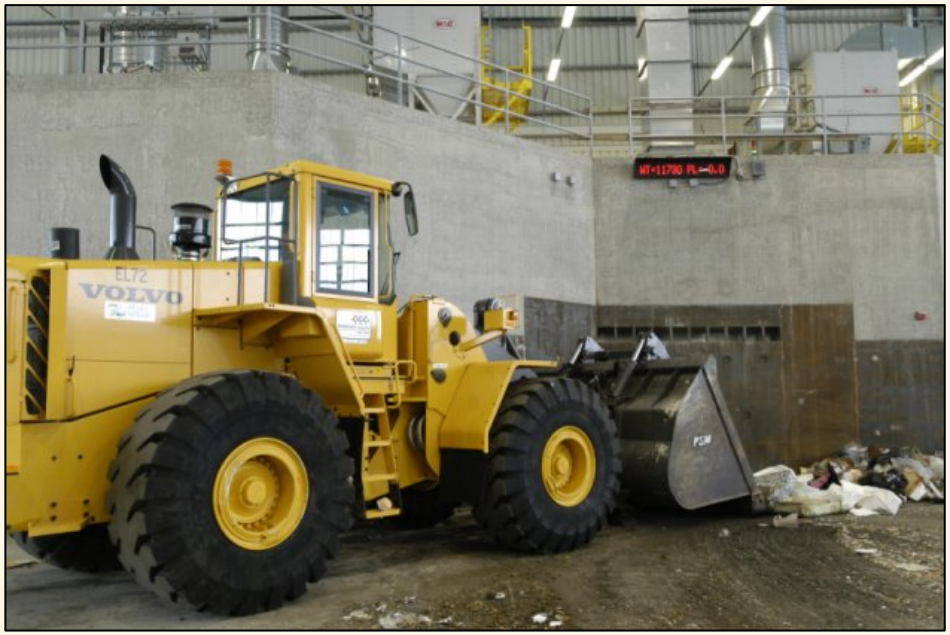


Equipment

Transfer Station Equipment

- Most common equipment used to manage and load waste within transfer stations include:
  - Wheeled front loaders
    - Quicker and more maneuverable than tracked loaders
    - Rubber tires produce less wear on floor
  - Tracked loaders
    - Better for volume reduction before loading into trailers
    - Tracks cause additional wear on floor surfaces (need to maintain thin layer of waste on floor to help reduce wear)
    - More common in surge pit transfer stations

Transfer Station Equipment
(continued)



Wheeled Loader

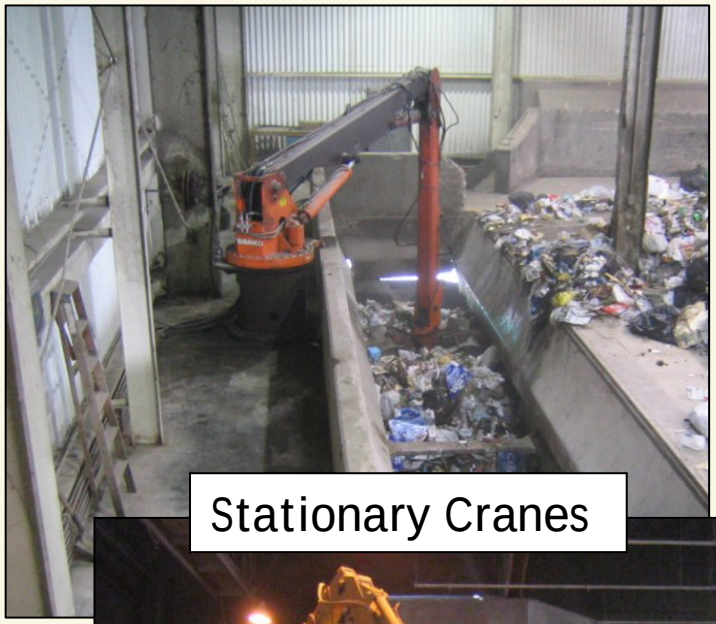
Source: Caterpillar website

Track Loader

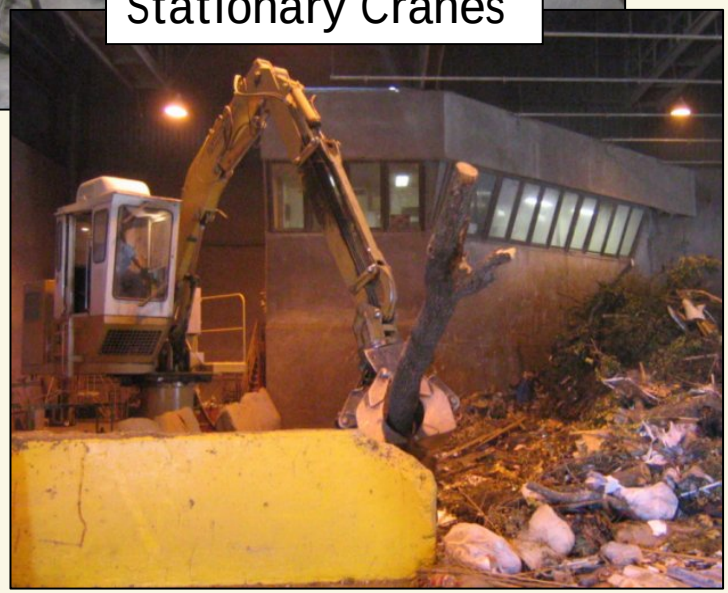
Transfer Station Equipment
(continued)

- In open top (push load) facilities, additional equipment is used to distribute and compact loads. Most common equipment is:
  - Excavators
    - Can be moved around transfer station for other uses as needed
    - Back-up unit can be brought in when primary unit is being repaired
  - Stationary cranes
    - Typically less expensive than excavator
    - Dedicated to loading waste (fixed in one location)

Transfer Station Equipment
(continued)



Stationary Cranes



Excavator

Transfer Station Equipment
(continued)

- Other ancillary equipment may include:
  - Skid steer (Bobcat)
  - Small forklift
  - Sweeper
  - Brush grinding equipment
  - Roll-off vehicle (for citizens' collection station)

Transfer Trailers

Evaluating Transfer Trailer Needs

- System Level Decisions vs. Efficiency of Individual Trailers

System Level Decisions	Efficiency of Individual Trailers (Life cycle costs)
▪ Type of transfer station system chosen will influence type of transfer trailer needed ▪ Example: If the transfer station is an intermodal station, typically an open-top trailer will not be used	Factors to consider: ▪ Purchase price of trailer ▪ Annual maintenance and repair cost ▪ Payload capacity ▪ Expected useful life

Types of Trailers

Open Top

- Used for top load facilities
- Can be made of steel or aluminum
- Equipped with tarp to prevent materials from blowing out during transportation
- Maximum waste loads are typically attained with open top trailers made of aluminum
- Can either be straight bottom or “possum belly” style trailers

Types of Trailers
(Continued)

Compactor/Precompactor

- Both types are fully enclosed with an full or partial opening in the rear
- Compactor trailers typically made of steel and reinforced, smaller waste payload due to additional weight of trailer
- Precompactor trailers can have less reinforcement and therefore may be lighter weight, potential for larger waste payload

Types of Trailers
(Continued)

Aerodynamic

- Smooth sides vs. sheet-and-posts design
- Debatable if increased fuel efficiency offsets additional costs and potential reduced durability
- Optional open airflow tailgate design offers further reduced fuel consumption when the truck is driven empty
- Recent article in *MSW Management* offers additional reference on subject matter[2]

Source: East Manufacturing website

2. Talend, Don. "Making a Haul—Profitably." MSW Management May/June. 2008. www.mswmanagement.com/may-june-2008/making-haul-profitably.aspx

Types of Trailers
(Continued)

Containers

- Different than transfer trailers
  - Stand alone storage container
  - Often based on ISO shipping containers
- Typically used for intermodal transfer stations
  - Containers are transferred from transfer station to rail yard by transfer vehicles, or directly placed on rail at the transfer station

Source: Waste by Rail, Inc. website

Trailer Unloading

Self-unloading Trailers

- Generally more expensive
- Offers flexibility of hauling to multiple landfills
- May be heavier than other types of trailers (less hauling capacity)
- Types
  - Full Eject (Hydraulic Ram)
  - Dumping
  - Live Floor (e.g., Walking Floor®)

Source: J&J Truck Bodies and Trailers website

Trailer Unloading
(Continued)

Tipper Trailers/Containers

- Typically used with high volume of trailers going to one destination
- Cost of tipper offset by low cost of trailers
- Potential waste payload increase vs. self-unloading trailers
- Need to know how trailers will unload when tipper is down for repair or maintenance

Trailer Material

Aluminum vs. Steel

	Aluminum	Steel
Cost	Higher	Lower
Durability	Lower	Higher
Weight	Lower	Higher

Factors to Consider:

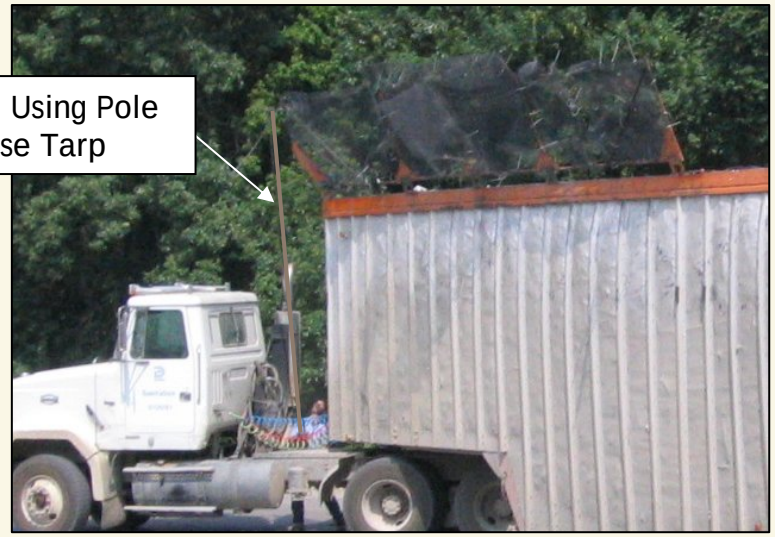
- Distance to landfill
- Types of waste hauled
- Size of trailer
- Price of fuel
- Purchase price of trailer

Transfer Trailer Tarps

- Tarps come in a variety of styles
  - Manually operated or power-operated
  - Single piece or sections
  - Deployed from the side or along length of trailer
- Manual tarps are lower cost, but require more time to deploy – decision may depend on how many loads per day or haul

Transfer Trailer Tarps
(continued)

Source: Mountain Tarps website



Source: Roll-Rite website

Personnel

Personnel

- The number of personnel used at a transfer station will vary greatly based on the style of the transfer station and the amount of waste processed. Typical positions include:
  - Oversight/Administration
  - Site Supervisor
  - Equipment Operators
  - Transfer Drivers
  - Scale House Attendants / Cashiers
  - Laborers

Personnel
(Continued)

Oversight/Administration

- Typically, this position is filled by either the City's Solid Waste Director or the Public Utilities Director
- Works under very little direction, direct supervisor for other positions
- Responsible for the overall performance of program, oversees all operations and procedures, identifies areas where improvement is needed
- Represents the program at meetings, hearings, conferences, etc.

Site Supervisor

- Hires, supervises, counsels and instructs transfer station employees, provides routine training when needed
- Oversees and designs all schedules and plans for transfer station
- Identifies and implements methods to improve production

Personnel
(Continued)

Transfer Tractor Drivers

- Drives tractor truck from transfer station to landfill and may operate compactor, if applicable
- May act as back-up equipment operator
- Inspects, cleans, maintains and services vehicle
- Detects needed repairs to prevent safety hazards
- Monitors and records mileage by documenting odometer readings before and after driving vehicle

Equipment Operators

- Operates heavy equipment safely and efficiently
- Inspects, cleans, services and makes minor repairs to equipment
- Works with site workers when not operating equipment
- May act as back-up transfer driver

Personnel
(Continued)

Scale House Attendants / Cashiers

- Weighs vehicles entering the transfer station, records tonnage data
- Responsible for collecting fees, managing payments and recording charges
- Answers questions and handles complaints regarding transfer station
- Works to improve operations by decreasing turnaround times, notifying Site Supervisor of special loads entering station and streamlining work processes

Site Workers / Laborers

- Performs daily tasks as instructed by Site Supervisor or Crew Leader
- Cleans and maintains transfer station and equipment used
- Inspects waste received for any unacceptable materials or items
- Works safely and notifies Site Supervisor of any safety hazard observed

Recycling

Co-locating Recycling and Transfer Activities

- Transfer stations can support recycling by serving as:
  - Citizen drop-off points for recycling
  - Transfer facilities for collected recyclables
  - Facilities that house both transfer and MRF operations

Transferring Waste and Recyclables

- New facilities can be designed for additional load- out areas for recyclables
- Need to consider how recyclables are collected
  - Single-stream can have one load-out area
  - Two-sort may need two separate load-out points for paper and commingled containers
- Can use jersey barricades to divide one load-out point into two separate storage areas
- For an existing facility, material may be stored in a designated area until a full load is collected

Transfer Station as Citizen Drop-off for Recyclables

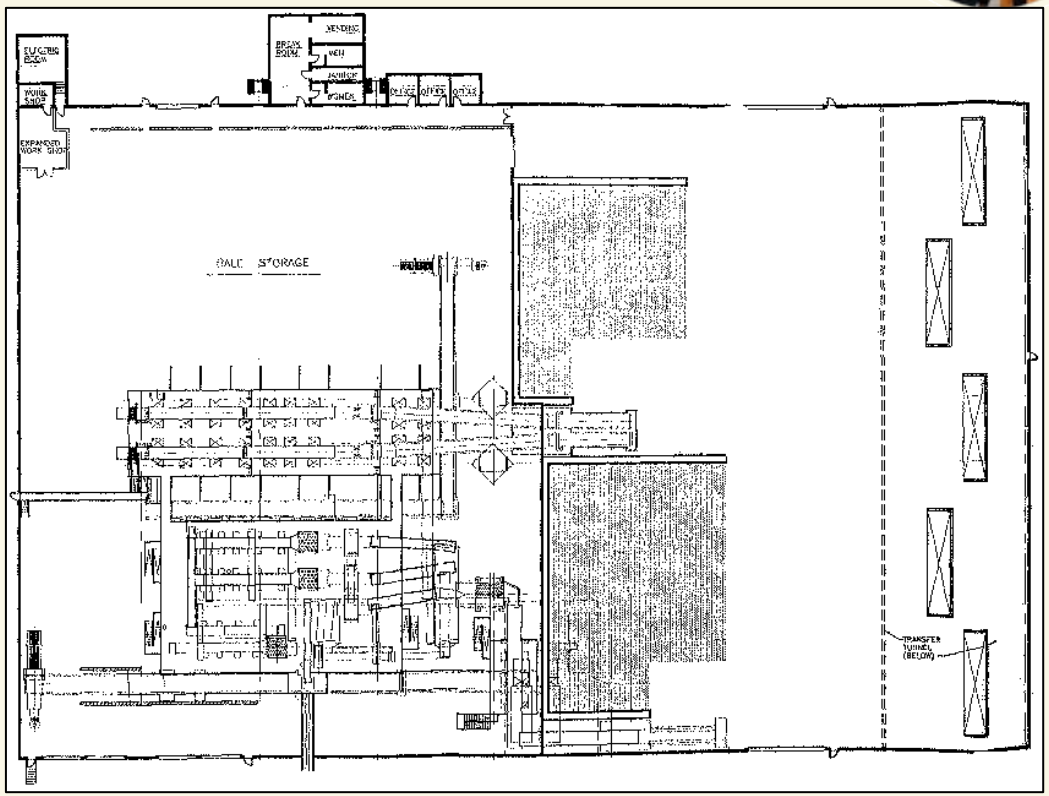
- Transfer stations are often centrally located
- May be convenient location for citizen drop-off
- Need to keep citizen traffic away from commercial trucks
- Adequate room must be provided for citizens to safely unload their vehicles
- Operators must remain aware of citizens who become confused and drive on to tip floor

Transferring Waste and Recyclables

- Important to keep waste from contaminating recyclables
  - Jersey barricades makes an effective divider
- Glass can be more abrasive on tipping floors than waste
- Need to provide clear direction to drivers to dump in correct location
- It is difficult to get full weight in a trailer of commingled containers

Transfer Station and MRF in Same Facility

- Design must consider both operations – usually requires a large tipping floor to accommodate more activity
- Scale operations may need to track materials separately
- Tipping areas should be well separated



- May need to track "residue" from MRF separately from waste hauled through transfer station
- May operate transfer station to segregate high value materials from waste (e.g., remove cardboard from waste deliveries)

Limiting Off-Site Impacts

Limiting Off Site Impacts

- It is important for a transfer station to be a good neighbor
- Potential concerns
  - Dust
  - Odor
  - Litter
  - Noise
  - Visual Impacts

Good Neighbor Policy

- Solid waste transfer stations will receive complaints
- Always respond in a professional manner
- Respond promptly to address citizen complaints
- Keep a log to document efforts
- Advise appropriate authorities (i.e., your boss) of particularly sensitive complaints
- Be honest and straight forward about how you will respond

Dust

- Dust can be an health issues inside the transfer station and a nuisance to neighbors
- If access roads are unpaved, a water source must be provided to keep dust down
- Proper ventilation is the appropriate engineering control to protect workers from dust
- Misting systems can keep dust down
  - Important to keep misting systems in proper repair
- Dust may be more of a problem in dry times of year
- May need to operate a “bag house” to collect dust
- Adequate buffer can reduce dust complaints

Odor

- Neighbors often very sensitive to odors
  - Odor control methods
  - Keep facility clean and wash floors regularly
  - Move waste on a first-in/first-out basis
  - Dump “smelly” loads directly into trailers (e.g., packing house waste or grocery store compactors)
  - Misting systems can disperse an odor control agent
  - Misting system can be at waste handling area and at property boundary
  - Adequate buffer can reduce odor complaints

Noise

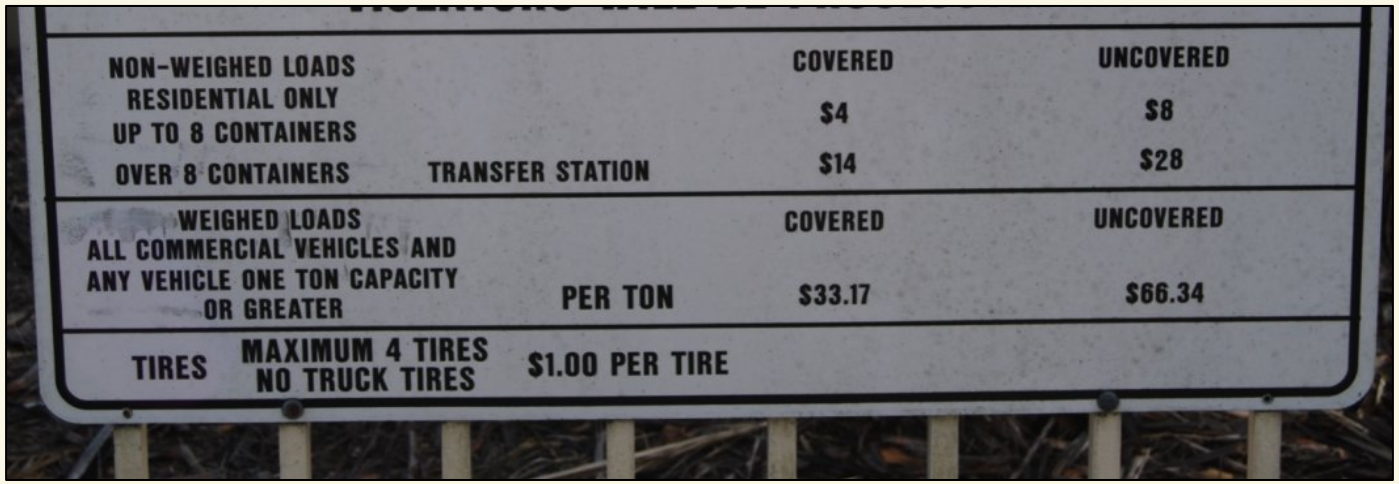
- Operate machinery correctly
- Make sure operating hours are appropriate for surrounding neighborhoods
- Conduct operations within an enclosed building or use earthen berms to deflect noise
- Do not allow haulers to slam tailgates or drop containers

Visual Impacts

- Pick up litter right away
- Use vegetation to screen operations from surrounding properties
- Conduct operations within a building
- Design facility to “fit in” with surroundings
- Orient operations away from sensitive areas (i.e., away from homes or nearby highways)
- Maintain odor control measures (often, if they can’t smell you, they won’t see you)

Litter

- Daily pick-up litter at facility and on any right away leading to facility and coordinate with DOT efforts
- Post signs notifying haulers of requirement to contain loads
- Use litter fences for wind blown litter
- Move waste into trailers quickly
- Require haulers caught littering to pick-up material
- Charge a higher tip fee for un-tarped loads



Health and Safety

Health and Safety

- Responsibility for Health and Safety
- Employee Training
- Waste Acceptance and Prohibited Material
- Personal Protection Equipment
- Safe Work Environment
- Operations In the Event of an Emergency

Responsibility for Health and Safety

- Employers must provide a safe work environment
- Employees are required to comply with safety rules (employer is responsible for enforcing safety rules)
- Facility users must be made aware of safety rules through signs, handouts and clear instructions
- Spirit of cooperation should be encouraged between supervisors, employees and facility users
- Unsafe work conditions should be reported immediately and remedied

Employee Training

- Conduct initial safety orientation and training for new employees before they begin work
  - Facility should have a written health and safety plan
  - Employees should be able to courteously advise facility users of any safety requirements
- Conduct on-going safety meetings at least monthly

- Training topics
  - Haz Comm (Right-to-know)
  - Emergency action plans
  - First aid
  - Bloodborne pathogens
  - Personal protection equipment
  - Confined space
  - Safe equipment operations
  - Fire safety
  - Lock-out/tag-out
  - Detecting prohibited materials (and response)
  - Heat exhaustion & stroke

Waste Acceptance and Prohibited Material

- Unloading shall be confined to as small an area as possible
- An attendant shall monitor incoming loads
- Any prohibited materials shall be returned to the transporter or generator
- Attendant must be trained to identify of what is acceptable and what is prohibited
- Need to have procedures for handling prohibited waste

- <u>Prohibited waste may include:</u>
  - Hazardous waste
    - Ignitable, corrosive, reactive and toxic
  - Compressed gas cylinders
  - Bulk liquids
  - Freon containing refrigerators and air conditioners
  - Biomedical waste and sharps (needles)
  - Asbestos
  - Any material that may affect compliance

Personal Protection Equipment (PPE)

- Employer must conduct job hazard analysis to determine what PPE is necessary
- PPE should be provided to employee for free
- Employees must be trained on PPE care and use
- OSHA standards for use must be followed
- Typical PPE
  - Boots (steel toe & puncture resistant)
  - Gloves
  - Eye protection
  - Hard hat
  - Visibility vests
  - Hearing protections

Safe Work Environment

- Housekeeping – pick up "trip-and-fall" hazards
- Walking surfaces can be slick from leachate or rain
- Clean tipping floor daily and wash once a week
- Proper safety equipment and machine guarding should be maintained (fix broken doors, handrails, lights, etc.)
- Use signs to instruct to workers and customers
- Make sure to have adequate lighting
- May need dust control and adequate ventilation
- Keeping facility clean promotes a safe attitude
- Conduct daily facility and equipment inspections

Operations in the Event of An Emergency

- Employees must be trained on recognizing and responding to emergencies
- Employees must be trained to know what they can handle and when to evacuate
- Emergency notification procedures –if in doubt call 911
- When evacuating facility, all employees must go to "rallying point"
- Potential emergencies to prepare for include:
  - Fire or explosion
  - Release of gas
  - Chemical spill
  - Diesel or hydraulic spill
  - Customer injury
  - Traffic accident

Site Signage

Comprehensive signage program must consider the following:

- Design fundamentals
  - Inventory
  - Layout/legibility
  - Color schemes
  - Type selection/visual images
  - Uniformity
- Viewing specifications
  - Placement
  - Distance
  - Height
- Signage maintenance plan

Site Signage
(continued)

- Minimum signage should include:
  - Facility name
  - Tipping fees
  - Materials accepted, including recycling
  - Prohibited materials
  - Hours of operation
  - Directions to tipping floor
  - Locations of alternate disposal locations, if applicable
  - Owner and/or operator with contact information
  - Emergency phone numbers for fire, police and medical assistance

Other Considerations

Facility Maintenance

- Planned maintenance of the transfer station site is often overlooked in the planning and design process.
- Design and choice of material not only affect initial construction costs, but may also have a lasting effect due to the cost to maintain building and site.
- Annual budgets should also account for routine maintenance to the site such as painting, pressure washing, grounds maintenance, etc.

Green Building

- Public sector entities are facing increasing pressure to develop new facilities in an environmentally friendly manner.
- Some cities have their own green building programs.
- Some cities have adopted ordinances to require that municipal facilities meet requirements of the Leadership in Energy and Environmental Design (LEED) rating system (examples include Cities of Austin and El Paso)

Floor Toppings

- Some floor topping can provide increased durability and longer life between repairs. The following provides information of floor repair alternative evaluated for a transfer station in the NW United States

Material	Comparative Abrasion Resistance	Estimated Life (Years)	Cost Comparison Ratio[1]	Install and Cure Time (Days)
Normal Weight Concrete	Low	2-3	1.0	9
Epoxy with Aggregate	Medium	8-10	4.5	7
Epoxy with Emery Aggregate (1/4-inch depth)	High	4-6	1.6	5
Concrete with Iron Aggregate	High	10-12	1.6	9
Polyurethane Concrete with Iron Aggregate	High	10-12	1.6	3
Epoxy with Emery Aggregate (Full Depth)	High	10-15	4.5	5
Concrete with Emery Aggregate	Very High	15-20	1.6	9

1) Ratio of costs for specific application. May vary by area and depth of transfer station floor, among other factors.

Project Financing

- Projects can be financed solely by the public sector or private sector, or a combination of the two.
- Publically owned facilities can often take advantage of lower costs of capital.
- Partnering with the private sector can take advantage of industry expertise to increase the efficiency of operations.

Project Financing
(continued)

- Public private partnership opportunities include:
  - Publically owned, privately operated facility (City of Georgetown, City of Houston)
  - Publically owned land, privately owned and operated facility (Blanco County)
  - Privately owned and operated with a long-term disposal contract with the public entity (El Paso material recovery facility)
  - Publically owned and operated transfer station with privately operated hauling operation (City of Killeen)

Sources

- R. W. Beck staff
  - Karl Hufnagel, David Gregory, Seth Cunningham, Dave Yanke
- External Reference Materials
  - U.S. EPA's Waste Transfer Stations: A Manual for Decision Making
  - U.S. EPA's Decision Maker's Guide to Solid Waste Management, Volume II (Chapter 4)
- Other primary and secondary research

Case Studies

Transfer Stations Visited

- TDS Starcrest Transfer Station (San Antonio)
- City of Wichita Falls Transfer Station
- IESI Blanco County Transfer Station
- City of Brenham Transfer Station
- City of Killeen Transfer Station

TDS Starcrest (San Antonio)

Basic Information

- 170,000 tons hauled through transfer station in 2007 according to TCEQ records
- Facility has both direct dump and compactor (converted from two compactor system)

Site Details

- Site size approximately 5-6 acres, building footprint approximately 7,000 to 8,000 sq ft[1]
- Located on City owned land, adjacent to the San Antonio Airport (TDS leases the facility)

1) Both site size and building footprint were estimates developed using aerials from Google Earth. At the time of the site visit, the engineering drawings were not available for review.

TDS Starcrest (San Antonio)
(Continued)

Equipment

- Mobile crane/tamper and a wheeled front-end loader primarily used to manage, load and compact waste
- Transfer trailers are aluminum, majority are tipper trailers used in conjunction with tipper at TDS landfill
- TDS keeps about 30 trailers on site, all have manual tarps that are deployed side-to-side

Customer Types

- City residential collection vehicles, TDS collection vehicles, City residents and private haulers

Materials Accepted and Recycling

- TDS accepts MSW, C&D, green waste and some recycling at TS

TDS Starcrest (San Antonio)
(Continued)

Staffing

- TDS uses the following type of personnel at the Starcrest TS:
  - Equipment Operators - operate the wheel loader and crane
  - Spotters - direct traffic and serve as back-up operators
  - Yard Tractor Operators – operate the yard tractors for the drop-and-hook operation
  - Laborers – perform site maintenance duties

Rates and Fees

- Gate rate of $17 per cubic yard
- All loads required to be covered or contained, $15 fee for uncovered loads

TDS Starcrest (San Antonio)
(Continued)

Site Aerial (Source: Google Earth)

Crane compacting and managing waste in open-top trailer

City of Wichita Falls

Basic Information

- 92,525 tons hauled through transfer station in 2007 according to TCEQ records
- Top-load facility with two staggered hoppers and two transfer trailer lanes beneath the tipping floor

Site Details

- Site size approximately 18 acres, building footprint approximately 25,000 sq ft[1]
- Located on City owned land, surrounded by a recently developed commercial area

1) Both site size and building footprint were estimates developed using aerials from Google Earth. At the time of the site visit, the engineering drawings were not available for review.

City of Wichita Falls
(Continued)

Equipment

- Wheeled front-end loader and excavator primarily used to manage, load and compact waste
- City has five font-line aluminum sheet-and-post style open-top transfer trailers and five tractors for hauling the trailers
- All tarping systems are manual, mixture of side-to-side and front-to-back

Customer Types

- City-operated collection vehicles, residents and small haulers

Materials Accepted and Recycling

- Primarily MSW and brush, but also C&D, tires, green waste and recycling (glass and newspapers)

City of Wichita Falls
(Continued)

Staffing

- 2 scale house attendants
- 5 transfer drivers
- 2 equipment operators, cross-trained as equipment operators
- 3-4 laborers, some cross-trained as equipment operators

Rates and Fees

- Gate rate of $73 per ton for commercial and non-residents, no charge to residents
- All loads required to be covered or contained, $25 fee for uncovered loads in addition to a possible fine as high as $359 from City ordinance

City of Wichita Falls

(Continued)

Transfer Station Building

Transfer Trailer with Chain Curtain

IESI Blanco Transfer Station

Basic Information

- 16,000 tons hauled through transfer station in fiscal year 2007 according to TCEQ records
- Top-loading facility with one hopper; hydraulic ram transfers waste from hopper into a 40 cy roll-off compactor container

Site Details

- Site size approximately one acre
- Located on County owned land, adjacent to closed Blanco County landfill

IESI Blanco Transfer Station
(Continued)

Equipment

- Wheeled front-end loader and hydraulic ram primarily used to manage, load and compact waste
- IESI normally uses 40 cy roll-off compactor containers and 2 semi trucks to haul the containers to the landfill
- IESI uses a yard roll-off truck to maneuver containers around site

Customer Types

- IESI-operated collection vehicles and County residents

Materials Accepted and Recycling

- MSW, C&D and some metals for recycling

IESI Blanco Transfer Station
(Continued)

Staffing

- 1 Equipment Operator - operates the compactor and loader and collects fees from residents
- 1 Yard Operator - maneuvers the collection vehicles into the transfer station and dumps the MSW into the compactor
- 2 Transfer Drivers - haul roll-offs to and from landfill
- Shared supervisor and admin staff with IESI collection operations
- Laborers as needed - perform duties around site

Rates and Fees

- Gate rate of $25 per cubic yard (loose or compact)
- All loads required to be covered or contained, additional $2.50 per cy for uncovered loads

IESI Blanco Transfer Station
(Continued)

Transfer Station Building

Compactor Container

City of Brenham Transfer Station

Basic Information

- 15,200 tons hauled through TS in FY 2008 according to information provided by City staff
- Direct dump, open-top facility

Site Details

- Site size approximately 2.2 acres
- Located on City owned land, adjacent to City's wastewater treatment facility

City of Brenham Transfer Station
(Continued)

Equipment

- Wheeled back-hoe primarily used to manage, load and compact waste
- Transfer trailers are both aluminum and steel, all of which are walking floor trailers
- City uses three tractor at transfer station. Two are used for hauling to landfill one older model used for maneuvering trailers on site (drop and hook)

Customer Types

- City residential collection vehicles, City residents and private haulers

Materials Accepted and Recycling

- MSW, C&D, green waste and some metals recycling at TS

City of Brenham Transfer Station
(Continued)

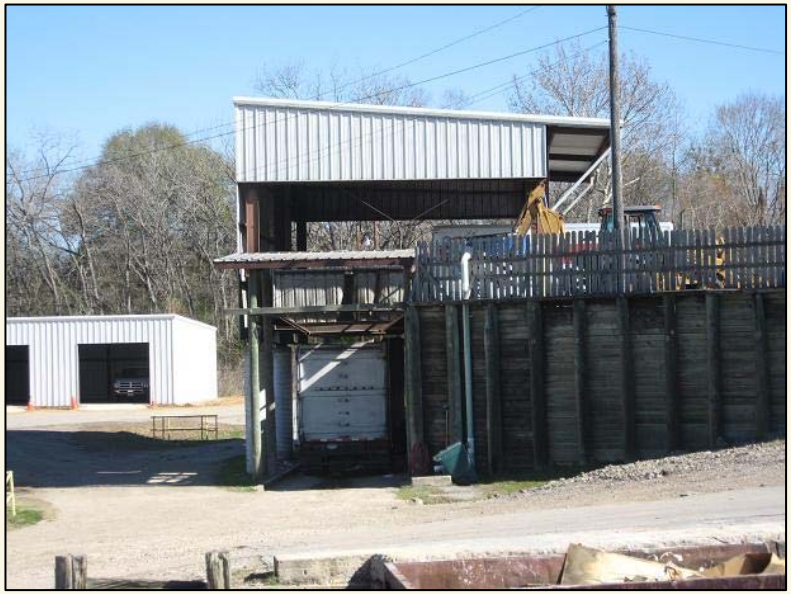
Staffing

- 0.5 Equipment Operators - operate the wheel loader, act as spare driver
- 2 Drivers - Transfer containers between the station and landfill. Also help maintain site and load waste
- 1 Scale House Attendant - weighs in trucks and other administrative duties

Rates and Fees

- Gate rate of $70 per ton for non-City vehicles
- All loads required to be covered or contained, $5-10 fee for uncovered loads depending on vehicle size

City of Brenham Transfer Station
(Continued)



Transfer Station Building

Direct Dump Into Open-Top Container

City of Killeen Transfer Station

Basic Information

- 98,000 tons hauled through TS in FY 2007/2008 according to information provided by TS
- Push-loading, open-top facility with two loading bays

Site Details

- Site size approximately 15 acres, building footprint approximately 33,000 sq ft
- Located on City-owned land, adjacent to the closed City of Killeen landfill and other ancillary properties

City of Killeen Transfer Station
(Continued)

Equipment

- Two stationary cranes and three rubber-tired loaders primarily used to manage, load and compact waste
- City contracts with private hauling company that provides and maintains transfer trailers

Customer Types

- City residential collection vehicles, City residents and small private haulers

Materials Accepted and Recycling

- MSW, C&D, whole car and light truck tires and some metal recycling

City of Killeen Transfer Station
(Continued)

Staffing

- 1 Supervisor and 1 Superintendent-provides day-to-day management of the TS
- 1 Crew Leader and 4 Equipment Operators-operate cranes, loaders, and act as yard driver
- 3 Scale House Attendants-weigh in and out trucks and other administrative duties
- 3 full-time, 1 part-time Laborers-perform duties around site
- 1 Secretary for handling all administration pertaining to TS operations

Rates and Fees

- Gate rate of $51.40 per ton
- All loads required to be covered or contained, additional fee for uncovered loads

City of Killeen Transfer Station
(Continued)

Transfer Station Building

Transfer Station Tipping Floor

Transfer Station Contacts

- City of Killeen – Wayne McBride
- TDS Starcrest – Wade Wheatley
- IESI Blanco County – Bryan Harper (IESI) and Paul Granberg (Blanco County)
- City of Brenham – Dane Rau
- City of Wichita Falls – David Lehfeldt

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