



# DEVELOPING SMALL-SCALE SOLID WASTE TRANSFER STATIONS ON TRIBAL LANDS

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# WELCOME AND INTRODUCTIONS

Meet your instructor  
Meet your classmates  
Course Logistics  
Questions





## ALASKA-SPECIFIC ASSISTANCE

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If the materials covered during today's session do not address the conditions present in your community, please contact Jim Penor, EPA's Tribal Solid Waste Liaison for Alaska. Jim can provide you with assistance that is specific for your site and local conditions.

**Jim Penor: [Penor.James@epa.gov](mailto:Penor.James@epa.gov), 907-500-4963**



# Online Course Overview

## Session #1: Fundamentals/Needs Assessment

- Intro
- Transfer Station Fundamentals
- Siting
- Planning for capacity & functional needs

## Session #2: Design Factors/Real Life Examples

- Calculating facility size
- Hauling
- Neighbor issues
- Regulations
- Budgeting for construction
- Transfer Station Types & Examples

## Session #3: From Design to Completion

- Site Design & Layout
- Ancillary Facilities & Equipment
- Vehicles & Utilities
- Capital Costs

## Session #4: Operational Challenges

- Operation & Maintenance Tasks & Costs
- Waste Handling
- Site Maintenance & Security
- Emergencies
- Illegal Dumping





# Session One: Fundamentals and Needs Assessment

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- Introduction
- Transfer Station Fundamentals: What's a Transfer Station? Do we need one?
- Siting a Transfer Station: Where should it go?
- Planning for capacity and functional needs: How Big?

# Transfer Station Fundamentals

*What is a transfer station?  
How can it help my Tribe?*



# TRANSFER STATION DEFINITION

- A site at which solid wastes are concentrated for transport to a processing facility or land disposal site
- May be fixed or mobile





# TRANSFER STATION FUNCTION

- Receives solid waste and recyclables
  - Public and collection vehicles
- Processing/diversion options
  - Recyclables
  - Organics
  - Special wastes
- Loading into transfer vehicles
- Long-haul to processing/disposal
- NOT final disposal







# Transfer Station Potential Benefits

- Transportation cost savings
- Environmental benefits
- Waste diversion and material recovery
- Waste screening
- Collection fleet efficiency
- Convenience
- Flexibility in selecting processing or disposal sites
- Reduced illegal dumping





# Transfer Station Implementation Process

## Planning

- Siting
- Requirements
- Type determination

## Design

- Site schematics
- Site furnishings
- Architectural & engineering
- Utilities

## Construction

- Costs & financing
- Bid development
- Project management

## Operations & Maintenance

- O&M costs
- Personnel
- Waste handling
- Maintenance
- Health & safety



# Hoopla Valley Tribal Site



Functional area of transfer station operation

# Planning



- Siting
- Requirements
- Type determination



*Where would we put a transfer station?*





# Siting Factors

- Compatible use
- Community buy-in
- Central location to service population
- Access to major transportation routes
- Access to utilities
- Site size requirements
- Truck and traffic compatibility and queuing
- Gently sloping topography/drainage
- Space for recycling, composting, and other processing
- Expansion potential
- Regulatory requirements





# Siting – Exclusionary Criteria

- Wetlands and floodplains
- Near an airport
- Water pollution potential
- Endangered flora and fauna habitat
- Historical/cultural site
- Prime agricultural land
- Parks and preserves
- Sensitive receptors
  - Schools, residences, public facilities







# Hoopa Valley Tribe Transfer Station Site

## Advantages:

- Central Location
- Access to transportation routes
- Gently sloping topography

## Disadvantages:

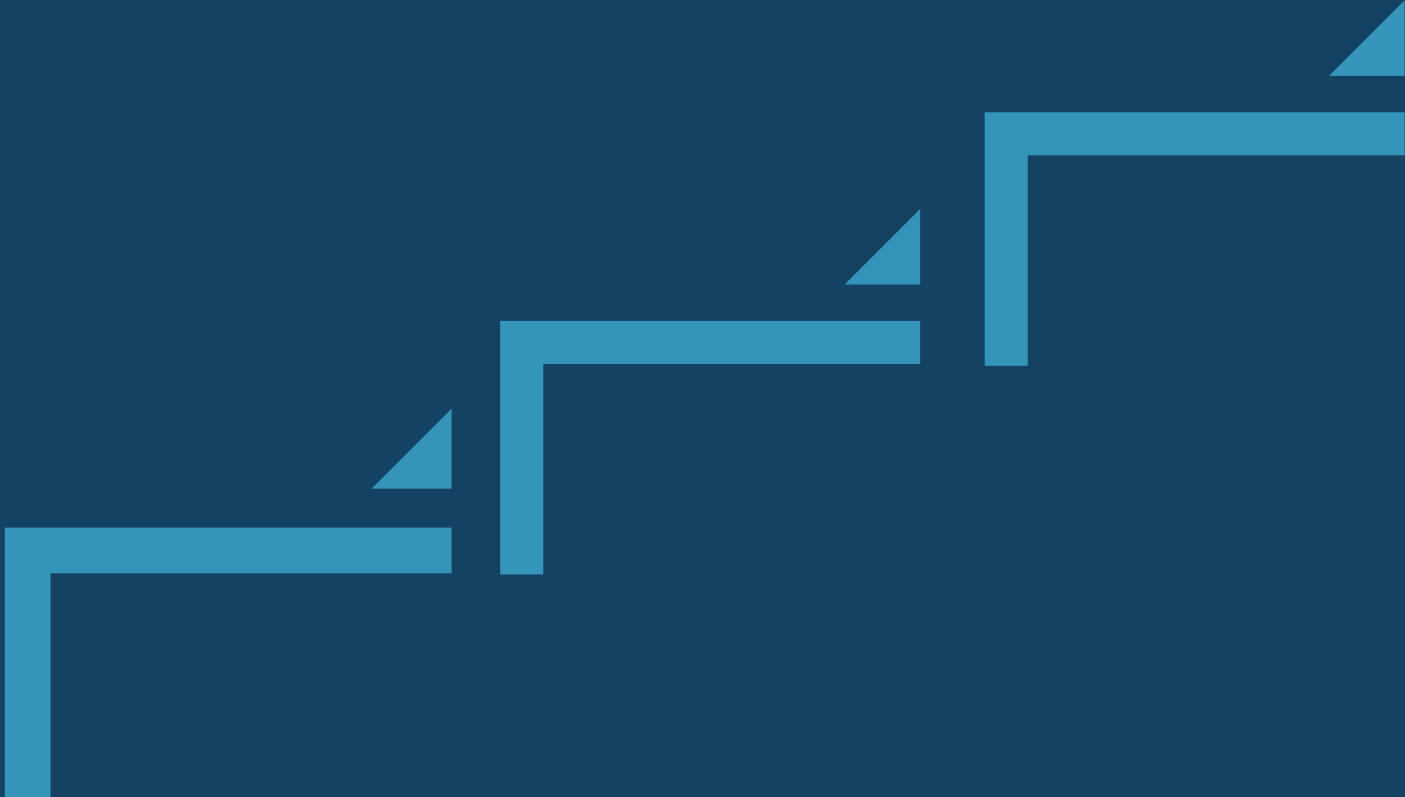
- Compatible use concerns
- Truck and traffic compatibility & queueing
- Site size requirements
- Water pollution potential



# Planning



- Siting
- Requirements
- Type determination



*What needs and limits do we face as we start planning?*





# Requirements: Needs and Limitations for our Transfer Station Plan



# Tonnage: how much material will we be handling?

- Population
  - Residents
  - Businesses
  - Seasonal Residents
  - Visitors
  - Future growth
- Days/Hours of Operation





# Tonnage- Transfer Station Size

## Typical Industry Breakdowns

Small = <100 tpd

Medium = 100-500 tpd

Large = >500 tpd

100 tpd = ~17 40-cy boxes/day



500 tpd = ~84 40-cy boxes/day





# Tonnage- Planning Tipping Floor Area

Tipping Floor Area Calculator				
Waste and Recyclables	Tons per year	Tons per week	Tons per 5 day week	Round up
Total	1,220	23.5	4.7	5.0
Residential (80%)	976	18.8	3.8	
Commercial/Industrial (20%)	244	4.7	0.9	
Transfer station metric 4,000 sq. ft. + 20 sq. ft./ton/day				
		Sq. ft.		
20 sq. ft /ton/day	5.0 x 20 =	100		
Base square feet		4,000		
Total square feet		4,100		

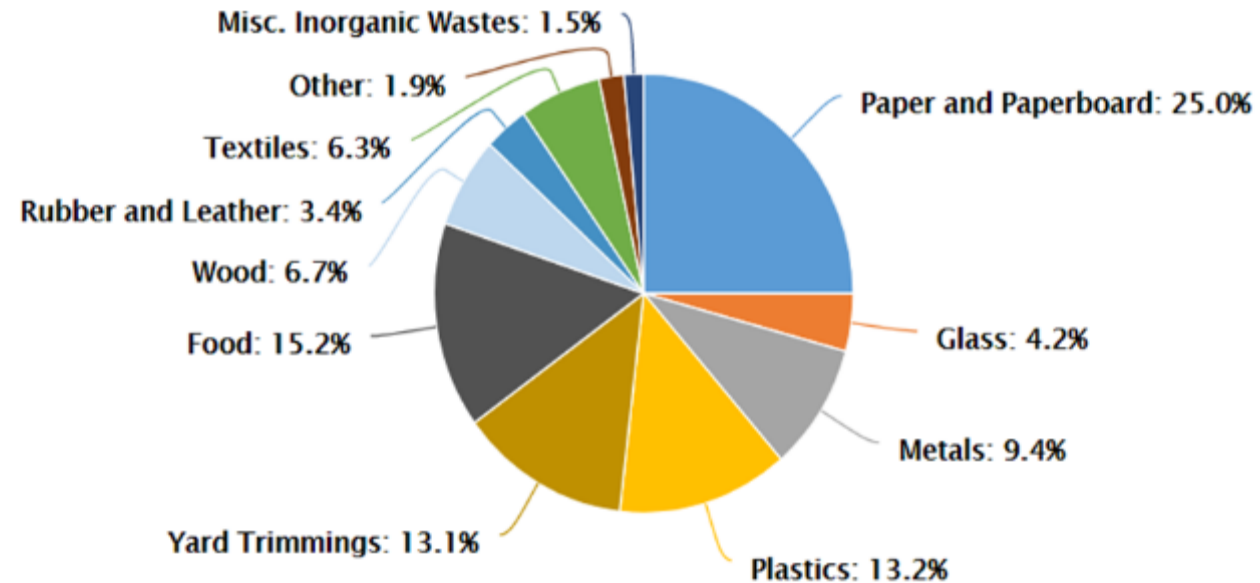
- Calculate tons per year
- Convert to tons per week
- Determine days open per week
- Calculate tons per day facility open
- Tipping area size base of 4,000 sq. ft. + 20 sq./ ft/ per ton/per day
- Does not include recyclable storage area



# Waste Composition: what material will we handle?

- Waste composition assists with determining number, type, and size of containers for layout
- Types of Waste
  - MSW
  - Recyclables
  - Organics
  - Bulky items
- Quantity of Waste
  - Residential vs commercial

Total U.S. Municipal Solid Waste Generated by Material, 2017  
267.8 million tons



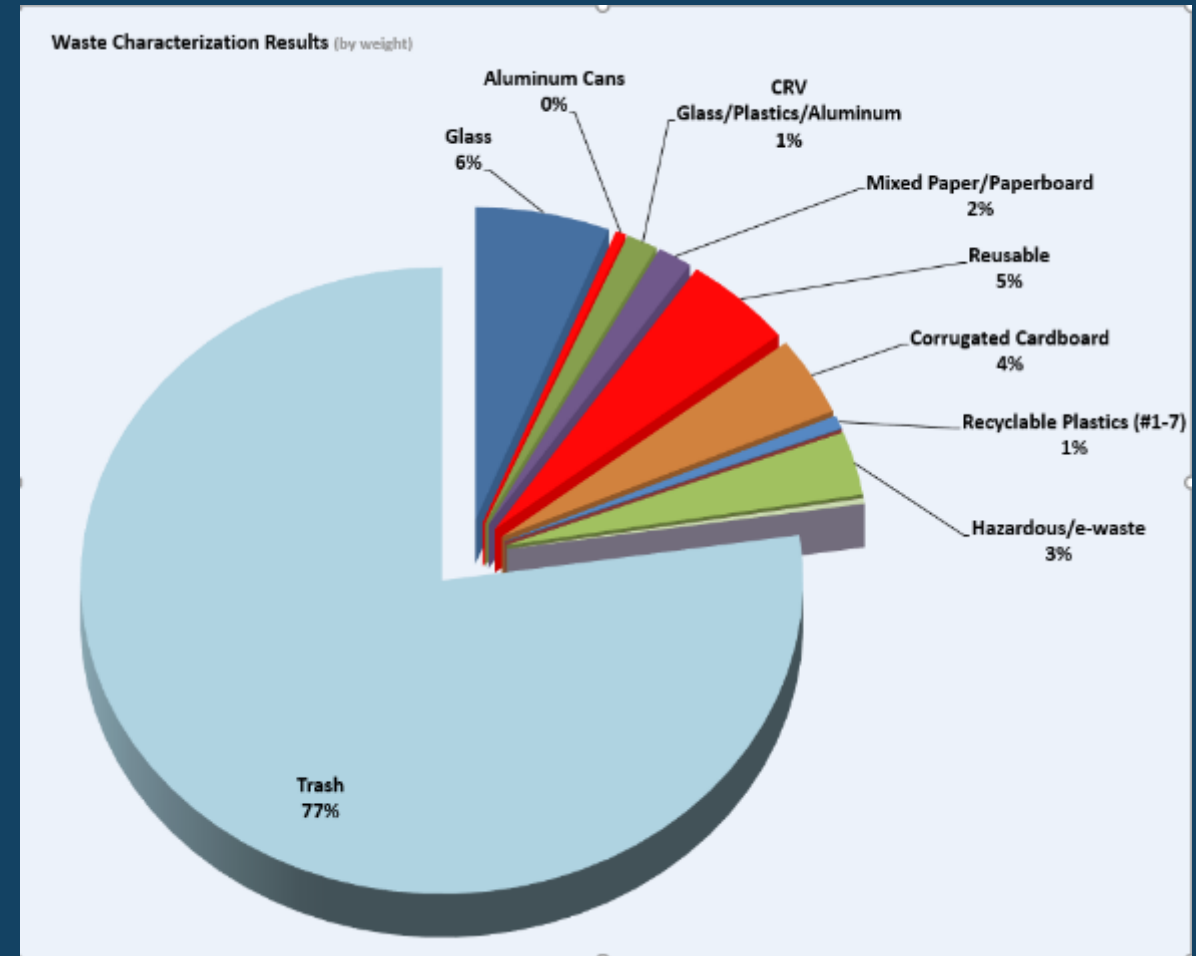
Source: EPA

Consider conducting a waste characterization study

# Hoopa Valley Waste Composition Example

## Hoopa Valley Indian Reservation – Waste Characterization

- 3,346 inhabitants
- 1,220 tons per year solid waste and recyclables
  - 80% households – 30-gallon bags self-haul to transfer station or curbside
  - 20% commercial/industrial tribe/private haul to landfill
- Transfer station rates
  - Fee per pound (0-40 lb. \$5, >40 lb., \$0.14/lb.)
  - Oil and green material free
  - Special charges some items – metal, e-waste, tires, car batteries, paint
- Free dump days





# Waste Streams



## Solid Waste

- Residential
- Business



## Recyclables

- Metal
- Paper
- Cardboard
- Beverage containers

\*Consider trailer collection or portable bin



## Organics

- Green material can make up 20-30% of solid waste stream
- Clean wood waste can be ground for use as mulch
  - Onsite, give-away, sale
- Yard waste and brush can be ground and composted
- Demolition wood
- Food waste options



# Waste Streams



## Demolition

- Demolition wastes heavy
- Wood, inerts, metal, concrete, asphalt, roofing, fixtures
- Difficult to manage due to size
- Reuse/repurpose options



## Special Wastes

- Mattresses
- Carpet
- Tires
- E-waste
- Inerts
- White goods (Special Cautions)
  - Freons, ammonia, sulfur dioxide, Oils, Capacitors, Mercury, Other hazardous materials



## Reuse

- Provides opportunity for diverting items that would become wastes
- Higher level of waste management hierarchy
- Reduces disposal costs
- Provides community service
- Opportunity for repurpose and repair
- Must have safety protocols
- Separate area
- Monitored to control usage





# Waste Streams – Household Hazardous Waste

## Household Hazardous Waste (HHW)

- Common household products that exhibit characteristic of hazardous wastes including paints, cleaners, oils, batteries, and pesticides can contain hazardous ingredients and require special care when you dispose of them.
- Exempt from federal hazardous waste classification
- Some states regulate management of HHW
- Collection of HHW reduces
  - Worker injuries
  - Toxicity of solid waste landfilled

## HHW Facilities Collection

- All types of HHW
- Specific wastes only such as:
  - Used oil and filters
  - Batteries – car and household
  - Fluorescent lamps
  - E-waste
  - Paint
- Simple
- Complex





# Waste Composition – Household Hazardous Waste & Used Oil

## Collection facilities



HHW on shelf in corner of building



Small storage building and oil tank



Hay barn with lockers on sides



Larger storage locker with compartments



Carport with raised concrete pad for used oil collection



## Wrap Up and Questions – Session One

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- Fundamentals: Transfer stations mean different things in different contexts
- Do we need one? Why? Convincing our community and leadership
- Siting: Location is a long term decision
- Capacity: Evaluating our waste disposal habits must guide our design needs
- *Design - - - our next session focus!*





## NEXT SESSION PREVIEW: DESIGN PHASE

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- Calculating Facility Size
- Hauling
- Regulations
- Budgeting for Construction
- Transfer station types and real life examples





## CLOSING ITEMS

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- Evaluation questions
- We'll be sending you a copy of today's slides

THANK YOU!

See you next Thursday!



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# Introduction and Welcome

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- Brief re-introductions – facilitator, instructor, EPA
- Logistics review
- Feedback from last session
- Questions from last week before we start?



## DISCLAIMER

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- Calculating facility size
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- Regulations
- Budgeting for construction
- Transfer Station Types & Examples
- Sample Layouts

## Session #3: From Design to Completion

- Designing a Layout
- Ancillary Facilities & Equipment
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## SESSION TWO: DESIGN FACTORS AND EXAMPLES

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- Calculating Facility Size
- Hauling
- Budgeting for Construction
- Transfer station types and real life examples
- Designing transfer station layouts



# Property Size Calculation Example

- Site may be pre-selected
- Full-function transfer stations need to fit:
  - Tipping area
  - Diversion containers/areas
  - Gatehouse/scale
  - Queuing public and haulers
  - Parking
  - Roads – ingress and egress





# Hauling Distance and Routes

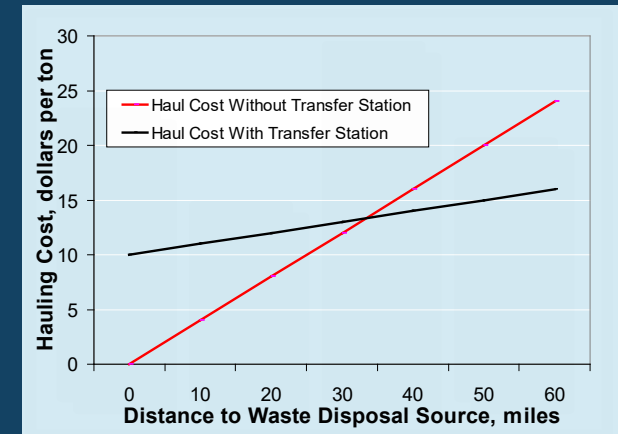
## Hauling Distance

- Transfer station benefit
  - Encourages use of more distant landfill
  - Allows larger payloads
  - More time and fuel efficient
- Consider transporting diverted materials
  - Might transfer mixed materials

*Rule of thumb:* Typically see 35 miles as the break even point -- If the disposal site is more than 35 miles from the community, then a transfer station is likely to be cost effective.

## Routes

- Road and bridge limits
- Railroad crossings
- Overpass height clearance
- Tolls
- Future route improvements
- Weather (snow)







# Hauling - Containers

## Bins, roll-off, debris box

- Bins, debris box, roll-off
- Commonly used for small load (40 cubic yards) of waste or recyclables
- Useful for bulky items
- Not cost effective for long distance haul
- Potential to haul two bins at same time with trailer



## Compactor

- Usually used at business (e.g., cardboard)
- Can be used for transfer
- Need roll-off/debris box truck to transport
- Not effective for long hauls







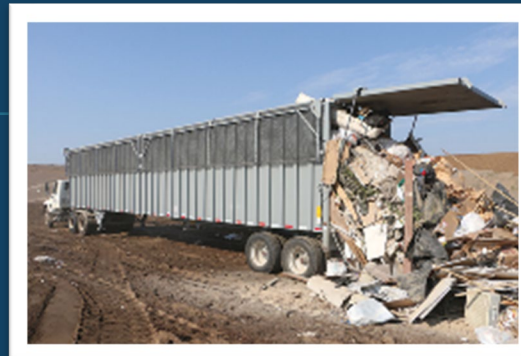
# Hauling – Trailer Types

## End Dump

- Large compartment trailer
- Advantages
  - More efficient transport than boxes for metal
  - Discharge anywhere
- Disadvantages
  - Payload typical maximum volume 36 cubic yards
  - Unstable in high winds when unloading

## Walking Floor

- Trailer contains movable slats to move payload in and out
- Advantages
  - Allows discharge anywhere
- Disadvantages
  - Reduced payload due to increased equipment weight
  - Susceptible to damage
  - Cannot discharge if broken
  - Cost



## Trailer Tipper

- “Possum-belly” – Entire trailer is tipped to unload
- Advantages
  - Maximized payload
- Disadvantages
  - Requires landfill tipper equipment
  - Cannot discharge without tipper
  - Potential unstable tipper



## Hauling - Disposal Facility Concerns

- Agreements
- Acceptable and unacceptable wastes
- Hours of operation
- Unloading technology
- Rejection criteria and penalties
- Permit status
- Permit capacity available and site life
- Emergency considerations for hours and tonnage





# Hauling – Hire Tribal Staff or use Contractor?

## Staff

- Advantages
  - Employment
  - Control
- Disadvantages
  - Replacing staff vacancies

## Contractor

- Advantages
  - Professional service
  - Hire/fire flexibility
  - Provides own vehicles/equipment
- Disadvantages
  - Limited control
  - Need mutual terms



# Contingency Planning

Disaster shutdowns (natural or manmade) require backup plan with prior tribal approval

How to manage incoming waste if hauling slows / stops

EPA's Tribal Climate Resilient Waste Management Planning Tool can help

<https://www.epa.gov/homeland-security-waste/waste-management-planning-mitigate-impact-climate-change>





## Applicable Regulations

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- In Session One we covered federal regulations specific to siting.
- Many states regulate transfer station operations via permit. Although Tribes are exempt from state regulations, they could provide helpful guidance as you build your own systems and tribal codes.
- Anticipate that state regulations usually apply once waste leaves tribal lands! Disposal facilities used might impose standards for operation including state and local requirements.





# Expansion Potential

- Population increases
- Business increases
- New business, industry
- More or new processing (e.g., composting)





# Budget

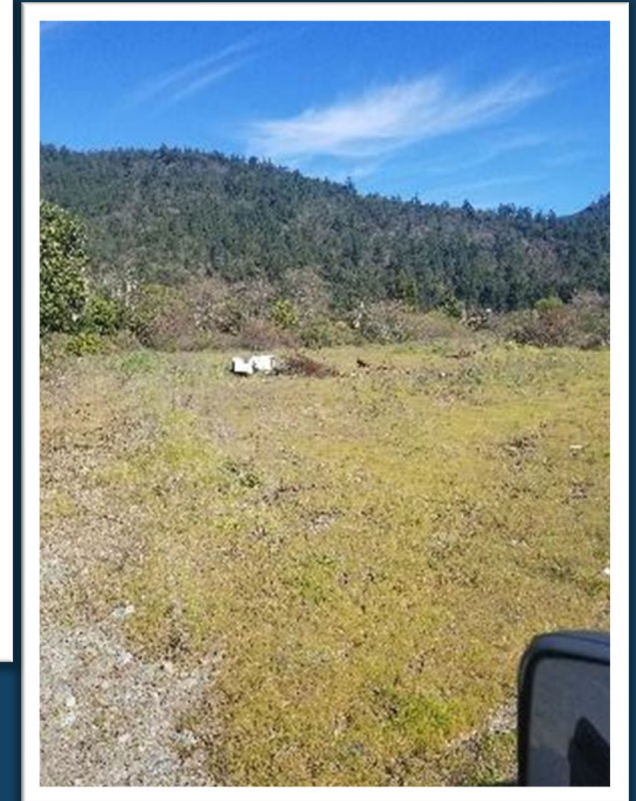
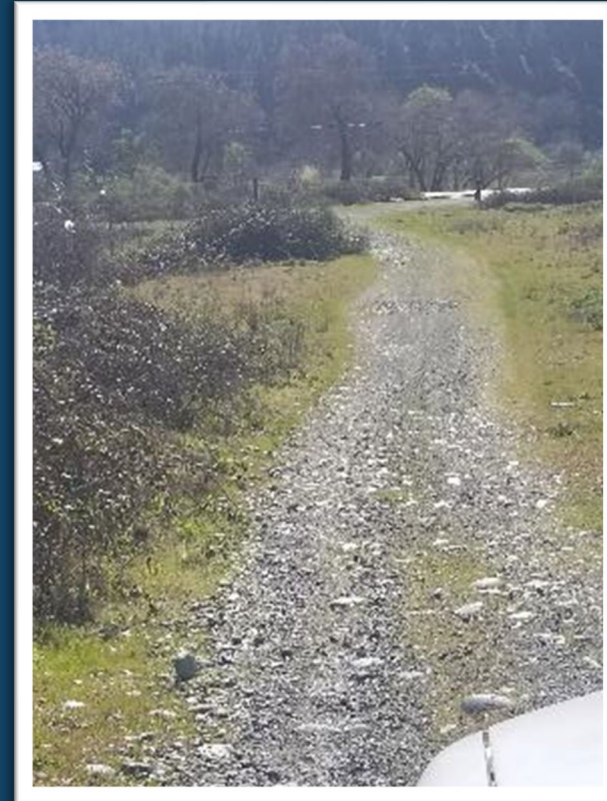
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- When determining the size needs for your facility keep the budget in mind
- Determine costs
  - Facility design
  - Facility construction including earth work
  - Operational costs
  - Hauling and disposal costs
  - Maintenance
  - Contingency
- Budgetary limitations may force redesign or phased in features/programs



# Case Study – Hoopa Valley Requirements

- Tonnage needs
- Neighbors, competing uses
- Hauling distances
- Property size
- Expansion potential
- Budget







# CASE STUDY – HOOPA VALLEY REQUIREMENTS



- Site preparation:
  - Survey
  - Geotechnical investigation
  - Design: layout, civil engineering, electrical

# Planning



- Siting
- Requirements
- Type determination



*What type of transfer station would best suit our needs?*



# Convenience Center/Drop-Off Station



Solid waste



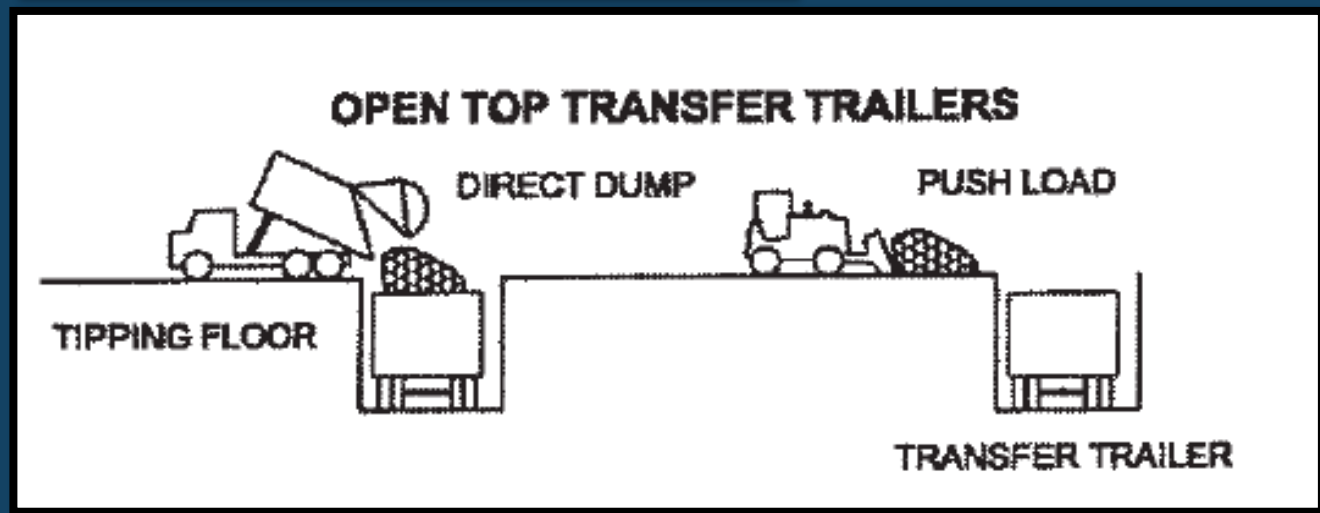
Recyclables

<b>CONSTRUCTION COST</b>	None	<b>HANDLING &amp; EQUIPMENT</b>	Minimal (containers only)
<b>OPERATION</b>	Simple	<b>COMMUNITY USE</b>	Open lid and throw waste into bin
<b>VOLUME/CAPACITY</b>	Low	<b>EFFICIENCY</b>	Less (no compaction)
<b>VEHICLE TYPES</b>	No transfer trailer	<b>HAULING DISTANCE</b>	Short



# Direct Discharge

Most Popular





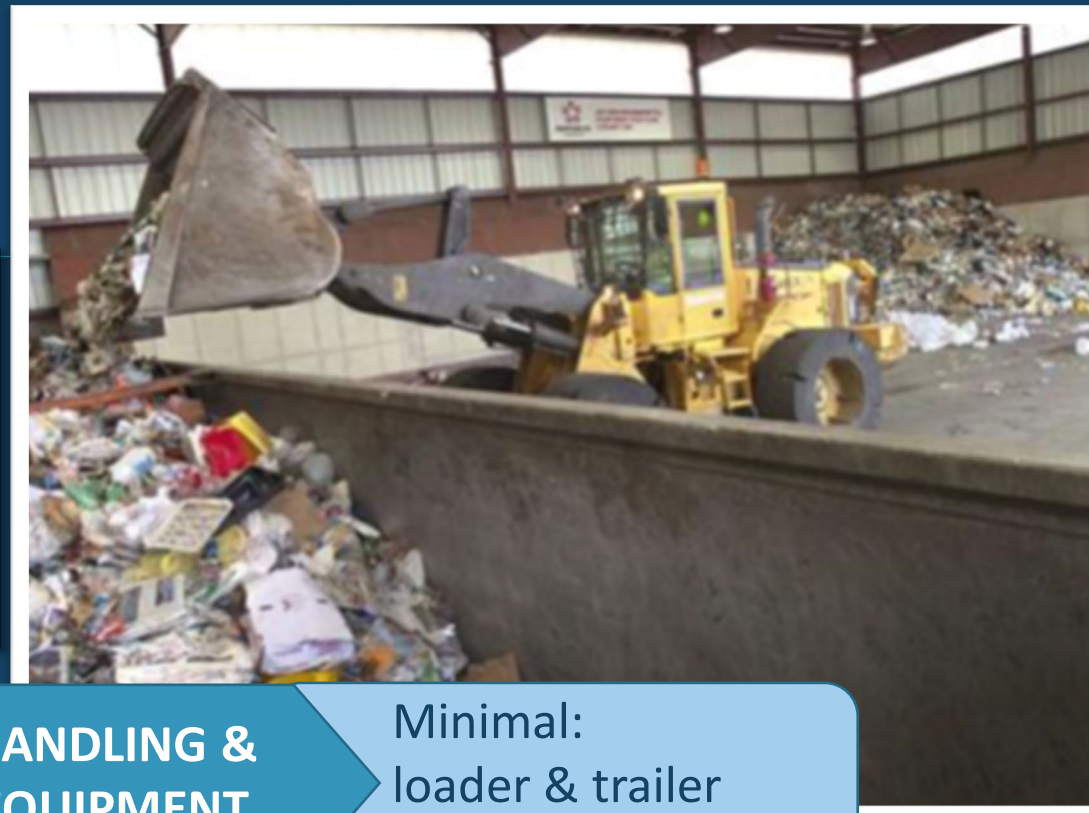
# Direct Discharge

<b>CONSTRUCTION COST</b>	Low (need a grade separation)
<b>OPERATION</b>	Simple
<b>VOLUME/ CAPACITY</b>	Medium
<b>VEHICLE TYPES</b>	Typically bin(s), but transfer trailer option

<b>HANDLING &amp; EQUIPMENT</b>	Minimal (loader, bins, and/or maybe trailer )
<b>COMMUNITY USE</b>	Drop waste off edge directly into trailer or bin. Floor unloading option.
<b>EFFICIENCY</b>	Less (no compaction)
<b>HAULING DISTANCE</b>	Short if bins are used or long if trailer used



# Floor Loading



## CONSTRUCTION COST

Minimal  
(push wall recommended but no grade separation)

## OPERATION

Medium  
(long loading time)

## VOLUME/CAPACITY

Medium

## VEHICLE TYPES

Need transfer trailer

## HANDLING & EQUIPMENT

Minimal:  
loader & trailer  
(risk of trailer damage)

## COMMUNITY USE

Unload on floor

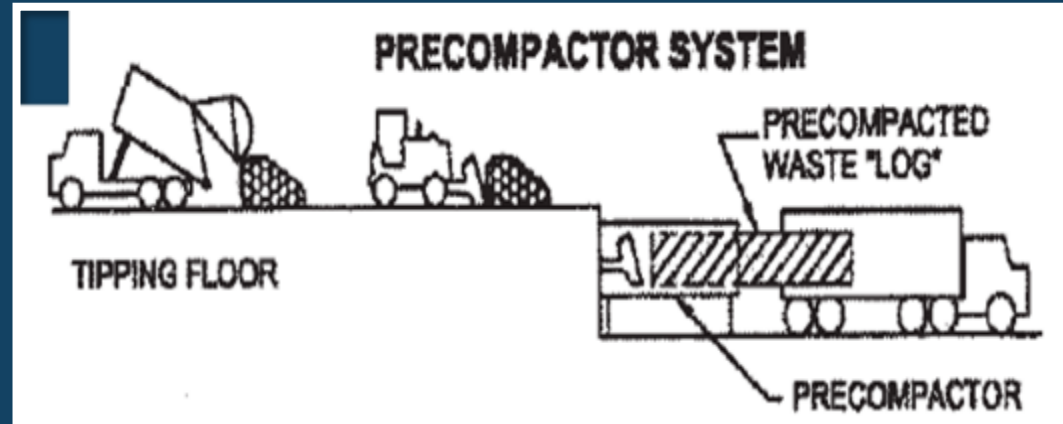
## EFFICIENCY

Less  
(no compaction)

## HAULING DISTANCE

Long

# Precompaction



Note:  
Risk of trailer damage and compaction breakdown.  
Not suitable for oversized waste.

<b>CONSTRUCTION COST</b>	High
<b>OPERATION</b>	Medium (compress waste & load directly on trailer; need power)
<b>VOLUME/CAPACITY</b>	High
<b>VEHICLE TYPES</b>	Need transfer trailer

<b>HANDLING &amp; EQUIPMENT</b>	Medium (load wastes into unit & discharge into transfer container)
<b>COMMUNITY USE</b>	Unload on floor
<b>EFFICIENCY</b>	Most
<b>HAULING DISTANCE</b>	Long





# Ord Ranch Transfer Station



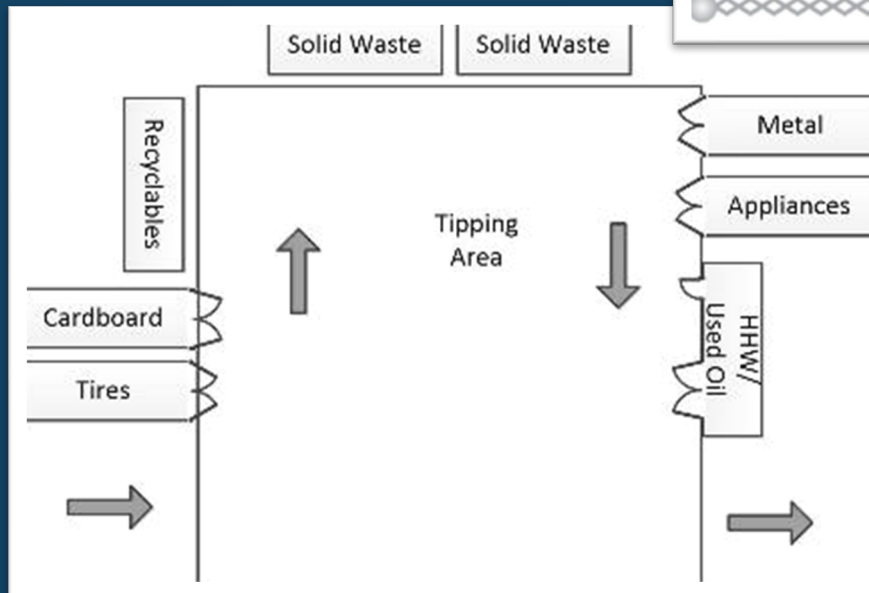
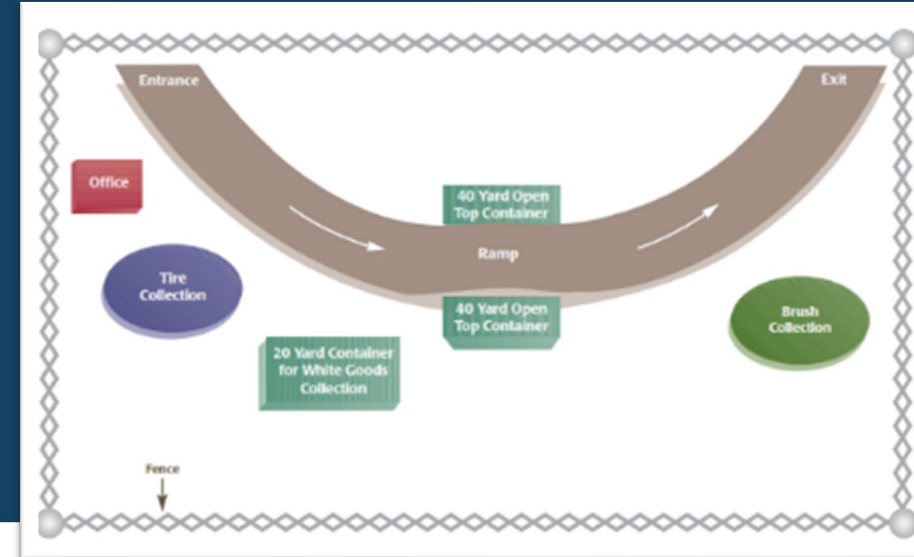
# Design



- Site schematics
  - Site furnishings
  - Architectural & engineering
  - Utilities
- 
- 

# Determining Layout and Waste Flow

- Entrance with queuing
- Waste/material flow
- Traffic flow
- Unloading area with queuing
- Diversion activities
- Loadout waste and recyclables
- Trailer/container capacity
- Ancillary areas
- Security, fencing
- Prevailing wind direction











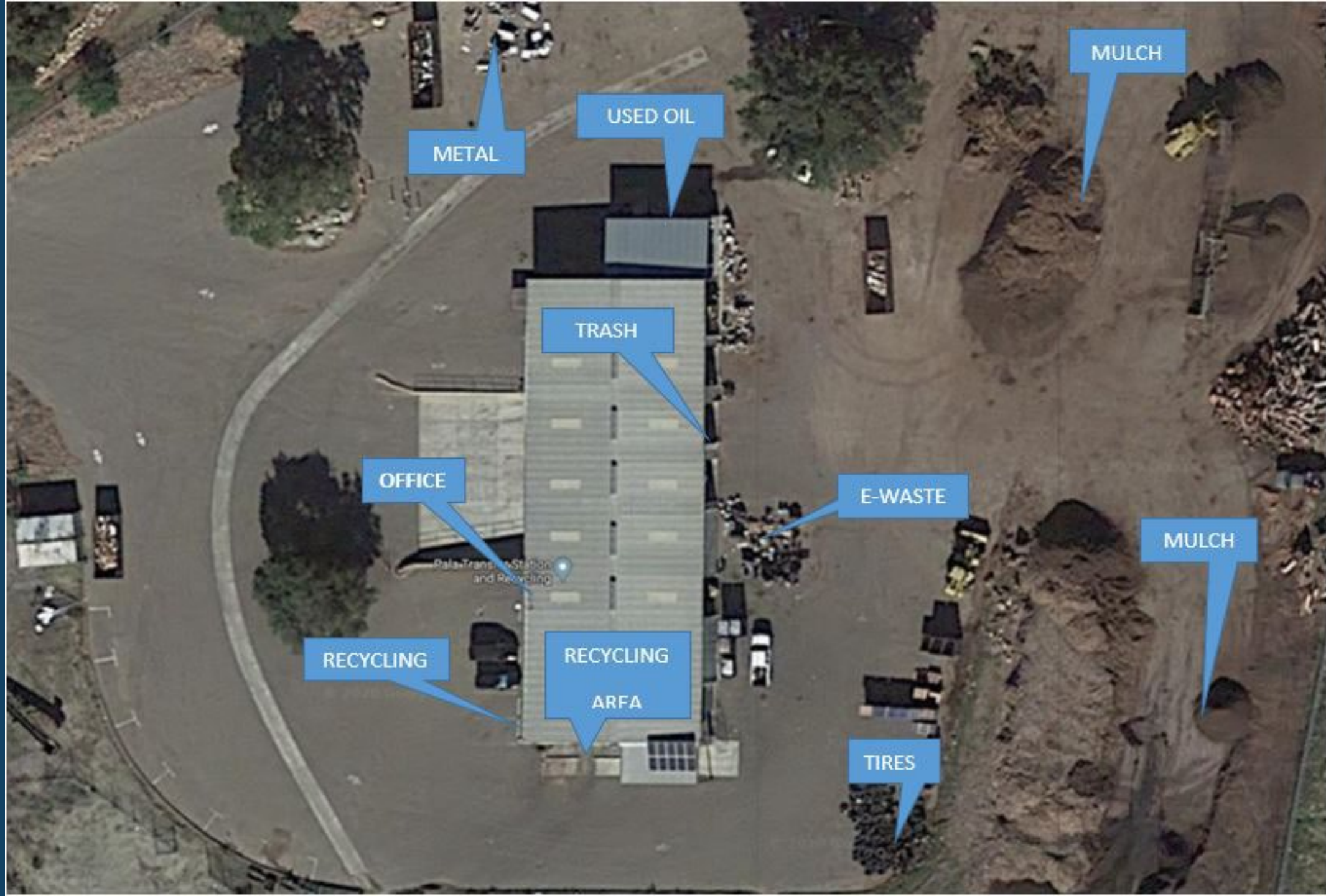
**Pala Band  
Transfer  
Station**

Google









METAL

USED OIL

MULCH

TRASH

OFFICE

E-WASTE

MULCH

RECYCLING

RECYCLING  
ARFA

TIRES

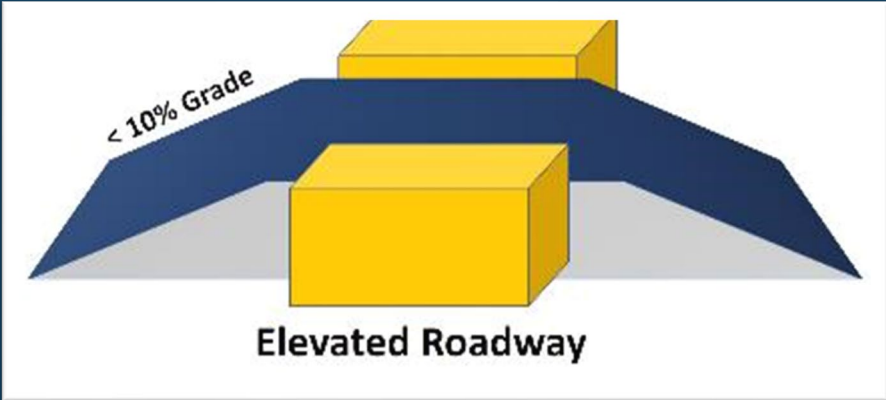
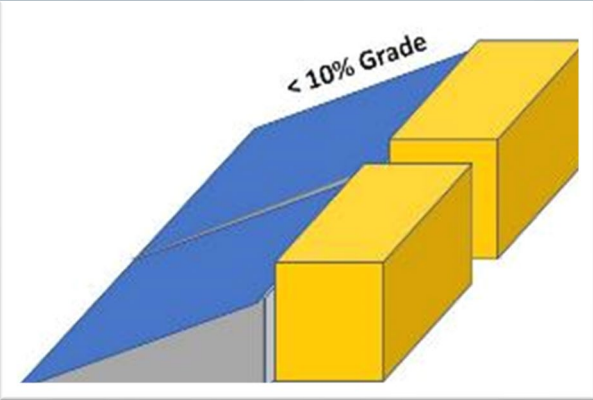


# Additional Layout Ideas

### Typical Configuration



### Z-Wall



Cement Base under transfer bins, concrete and steel reinforced retaining walls





# Additional Design Features



Cement Base under transfer bins, concrete and steel reinforced retaining walls.



Height of bin compared to the platform-Transfer



Concrete lip and container offset to prevent vehicles backing over the platform edge



Railing to prevent vehicles backing over the platform edge



# What's Wrong with These Pictures?







# Traffic Routing and Safety Design

## Traffic Routing

- Safe routing critical safety design
- Clear directions
- Incoming
  - Public
  - Collection vehicles
  - Emergency vehicles
- Outgoing
  - Customers
  - Recyclable materials and waste transfer

## Safety

- Facility should be designed for safety
- Security features – gate, fence
- Road surface maintained – paved, gravel, dirt
- Avoid water ponding
- Routing minimize cross traffic
- Curbs on road and tip area
- Emergency vehicle access



# Waste Loading and Ancillary Facilities

## Waste Loading

- Means for transferring wastes to vehicles/containers
- Transfer diverted materials to larger containers
  - Tippers
  - Loader
- Shipment to destination

## Ancillary Facilities

- Administration
- Maintenance
- Collection
- Fueling
- Parking
  - Customers
  - Employees
  - Equipment



# Landscaping

## Landscaping

- Provides aesthetic appearance
- Can be good neighbor
- Screen activities
- Wind and litter control benefit

## Stormwater

- Need to manage storm water prior to discharge offsite
- Consider bioswales (possible use of compost or mulch)
- Consider retention basin
- Drainage channels direct flow
- Typical design 25-year storm

## Rainwater Harvesting

- Cisterns to capture rainwater from roofs and directly
- Can be used for irrigation and toilet flushing

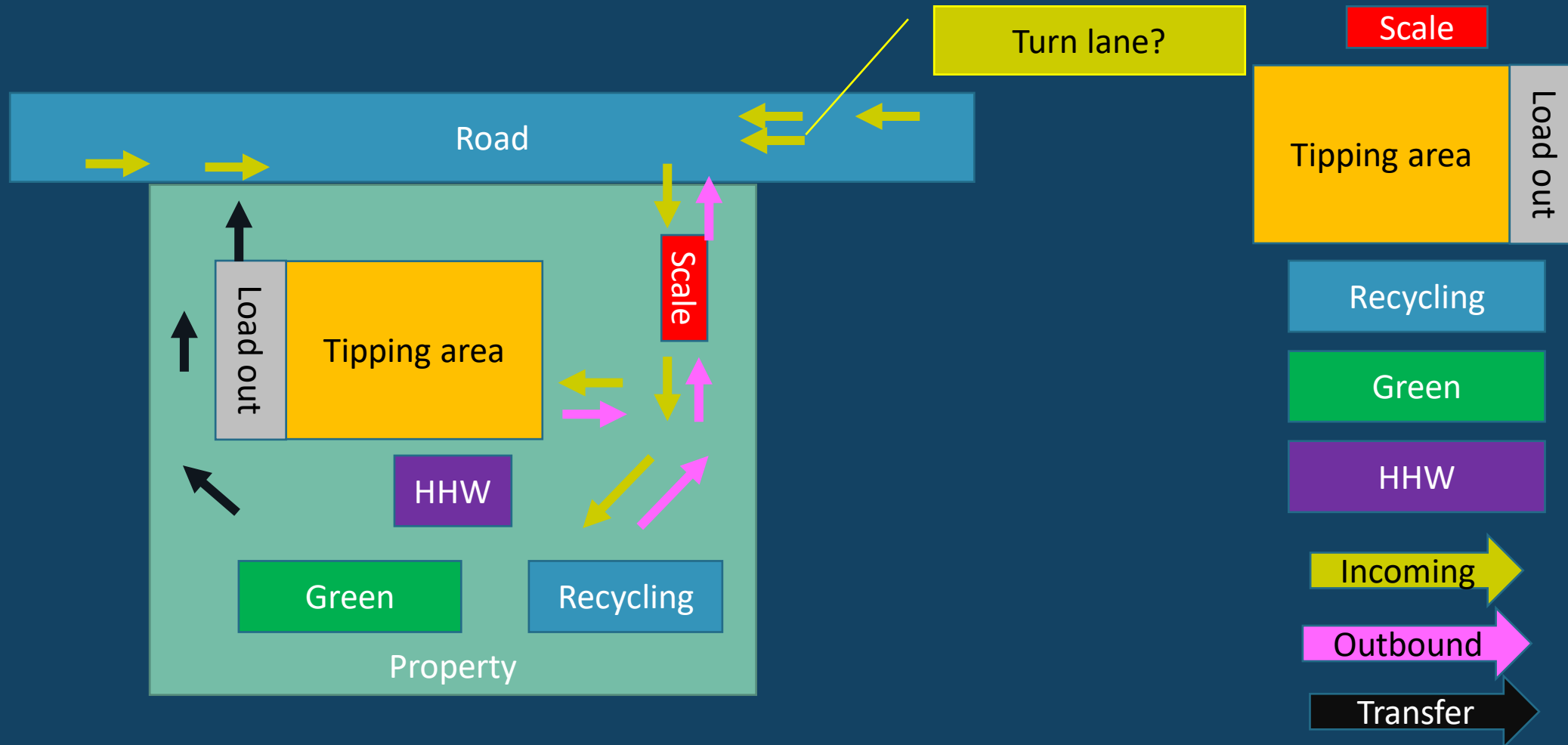


# Environmental Considerations

- Site drainage
- Water pollution
- Weather
- Dust Control
- Odor
- Covered loads
- Noise
- Neighbors
- Climate impacts and resiliency



# ACTIVITY: CREATE A TWO-DIMENSIONAL LAYOUT







## SESSION TWO RECAP: DESIGN FACTORS AND EXAMPLES

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- Calculating Facility Size
- Hauling
- Budgeting for Construction
- Transfer station types and real life examples
- Designing transfer station layouts



## SESSION 3 PREVIEW: FROM DESIGN TO COMPLETION

- Site Design & Layout, continued
- Ancillary Facilities & Equipment
- Vehicles & Utilities
- Capital Costs



Please submit an evaluation!



Presentation will be emailed at end of today's session





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- Funding

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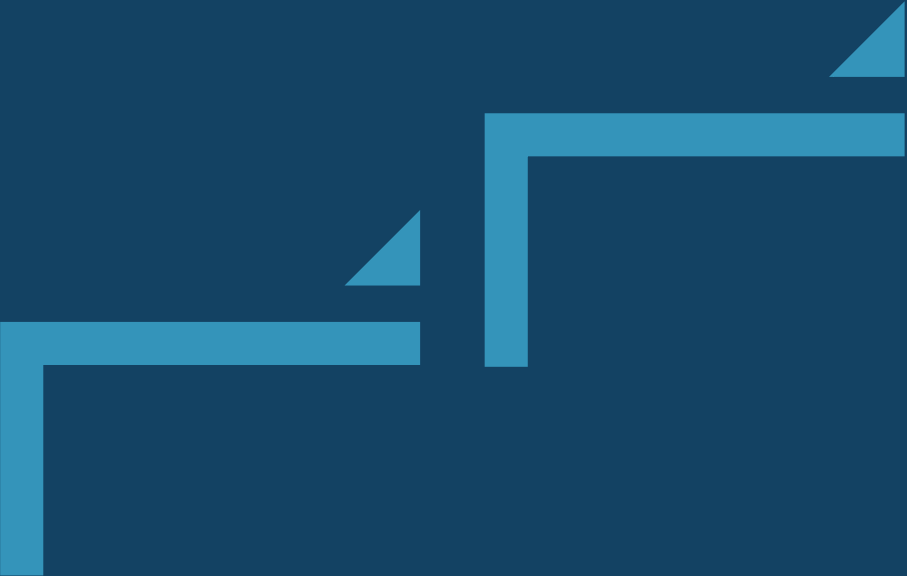


## SESSION 3 PREVIEW: FROM DESIGN TO COMPLETION

- Site Design & Layout
- Ancillary Facilities & Equipment
- Vehicles & Utilities
- Capital Costs
- Financing

# Design



- Site schematics
  - **Site furnishings**
  - Architectural & engineering
  - Utilities
- 
- 



# In-House Small Scale Transfer Station Design and Construction

Small – scale transfer operation constructed by Pechanga Band of Luiseno Indians







# Scales

- Aboveground
- Inground
- Maybe confined space when servicing
- Volume conversion alternative common in rural areas





# Containers

- Portable storage for segregated materials
  - Examples: metal, cardboard, appliances
- May require equipment for moving or removal of materials
- Many sizes and types available



# Container Examples - Public Drop-Off







## Container Examples – Open Bin

Duck Valley Cardboard Collections (bins are open but housed under a 3-sided, covered shelter)







# Container Examples – Recycling Trailers



**Pueblo of Santa Ana in New Mexico**  
Great signage and the cage design helps users know exactly what is supposed to go in



# Container Examples - Other



Sorted Collection Trailer



Dumpster



Cart / x gallon tote

Open-top Roll-off



Covered Sorted Roll-off / Gable Top Divided Recycling Roll-off





# Container Examples - HHW and Used Oil

Hazardous Waste Cabinets



Used Motor Oil Collection Site



Fibrex Group:  
Used Oil Filter Container





# Sorting Equipment

## Conveyers

- Commonly used for beverage containers and cardboard or other baled materials
- Moves material from floor up to containers
- Need loader to place material on conveyor
- May need misting system







# Compaction Equipment - Balers

## Compaction Balers

- Compresses material into high-density, self-contained units
  - Primarily use cardboard, paper, cans, plastic
- Large and small units
- Bound with wire tie
- Can be moved with forklift
- Can be transported on flat bed trucks
- Safety precautions mandatory
  - Lock-out/tag-out
  - Broken binding wires dangerous
- Vertical baler
  - Example: 750-1,600 pound bale weight  
60"x30"x48"



Cram-A-Lot 60 Inch Vertical Baler



# Compaction Equipment - Compactors

## Compactor

- Stationary
  - Compress waste or material into containers/trailers or bales
  - Separate from container/trailer to save weight
- Mobile
  - Roll-off type unit
  - Decreases payload due to integrated weight
  - Typical used at businesses
  - Hauled directly to landfill/processor



**Cram-A-Lot Self-Contained  
Trash Compactor ~\$22,000**



# Vehicles

- Vehicles used on site for moving materials
  - Forklifts
  - Loaders
    - Large
    - Skid
    - Backhoe/bucket
- Maintenance truck
- Roll-off





# Signage



- **Visitors/Users**
  - Name and contact
  - Hours of operation
  - Acceptable/unacceptance wastes
  - Conditions of use
  - Speed limit
  - Directional
  - Area designation



# Design



- Site schematics
  - Site furnishings
  - Architectural & engineering design
  - Utilities
- 
- 



# Structure Design

## Roof

- Open configuration (Most common for small sites)
- Roof over tipping area (Moderate expensive)
- Enclosed structure (high cost)
  - Full walls with doors
  - Partial walls
- Provides weather protection – heat, rain, snow
- Need free-spanning
- Clear span minimum 30 feet
- May need fire suppression
- Skylights are nice
- Consider snow load for design





# Structure Design

---

## Walls

- Can provide full or partial enclosure
- Can be masonry, metal, fence with slats
- Interior push-walls maybe needed
- Advantages
  - Provide protection from weather
  - Essential in high wind areas
  - Reduces litter
  - Provides screening
- Disadvantages
  - Added cost
  - Expensive for small sites
  - Maintenance required for removing dust



# Structure Design

## Tipping Floor

- Area where waste is unloaded
- Some diversion may occur
- Waste pushed into trailer/container
- Requires loader
- Need push walls on side to protect building
- Garbage is abrasive needing replacement

## Storage Bunker

- For recyclables and other material storage prior to load out
- Can unload hoppers in stall
- Direct loading from sort line





# Design



- Site schematics
  - Site furnishings
  - Architectural & engineering
  - Utilities
- 
- 



# Utilities

## Energy Usage

- Source
  - Solar
  - Biomass
  - Electricity
  - Propane
- Lighting
  - Consider skylights or open areas

## Water Supply

- Well water
- Water line
- Onsite storage tanks
- Potable vs. dust suppression vs. fire suppression

## Sewer

- Treatment plant or septic system for discharges
  - Site
  - Restrooms
- Water contacting solid waste is considered leachate and needs management
- May need septic system



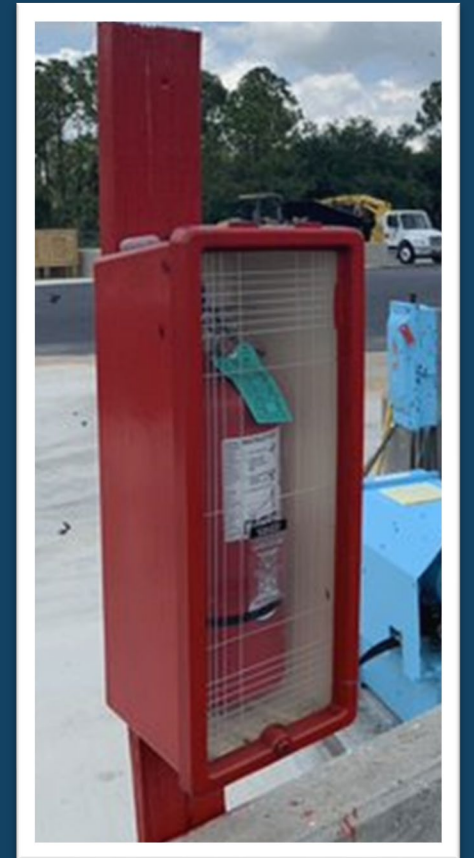
# Utilities

## Communications

- Onsite
  - Radios
  - Speakers
  - Emergency alert
- External
  - Telephone
  - Satellite phone option
  - Emergency services

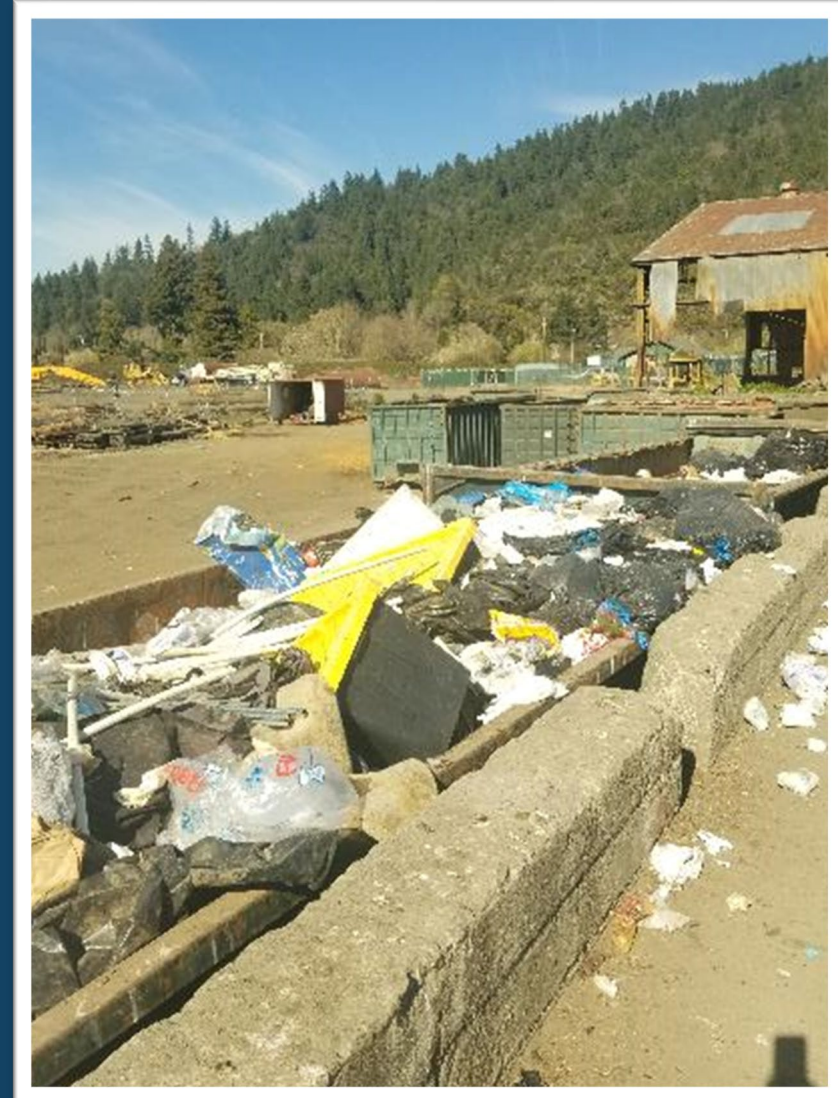
## Fire Suppression

- Need water access
  - Maybe portable storage tanks
- Alternative systems, e.g. foam



## Case Study: Hoopa Valley Tribe – Current Status

- Four 40-yard bins – solid waste
- Tire & scrap metal storage
- Bins – metal, white goods, e-waste
- Used oil collection
- Stationary compactor (w/Hopper)
- 40 cy compaction container
- 6 cy rear loader
- 16 cy rear loader
- Baler





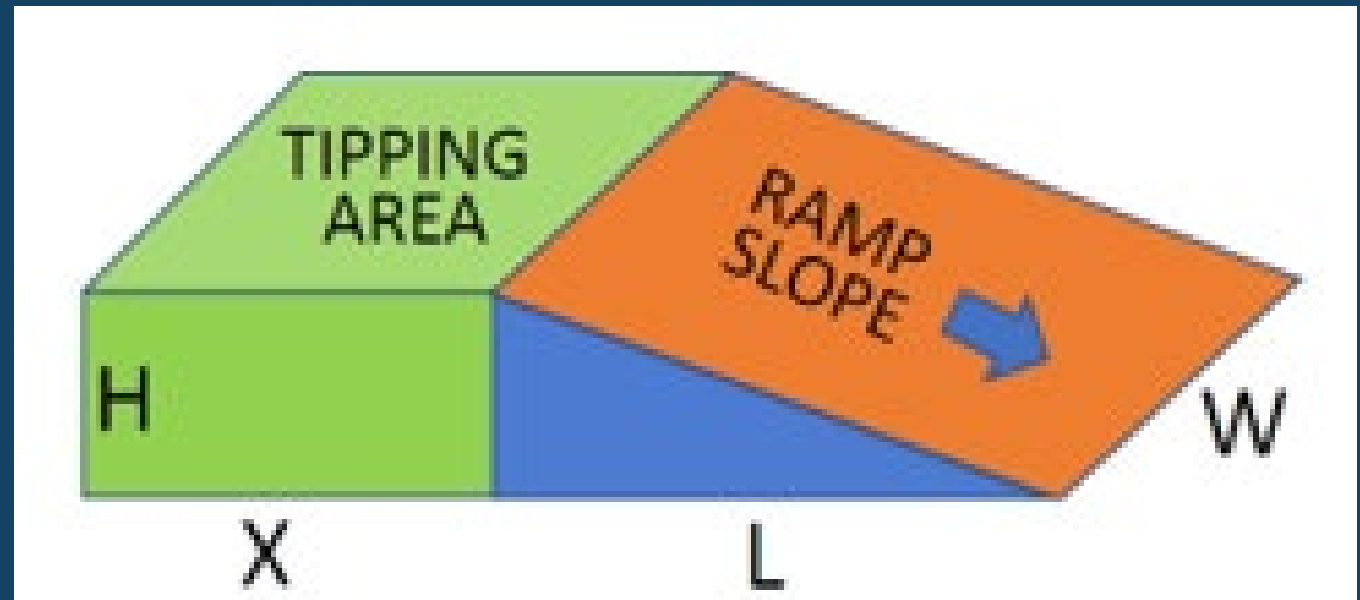
# CASE STUDY – HOOPA VALLEY TRIBE: IMPROVE CURRENT SITE?



- Formalize / Resolve shared land use issues at current site: dedicating area for exclusive use for scale and tip area
- Remediate pooling water and possibly contaminated drainage to river via grading, paving
- Reconstruct ramp
- Containers for used oil, HHW, recyclables



# RAMPS FOR SELF-HAUL AT TRANSFER STATIONS





# RAMP DESIGN CALCULATOR

<i>RAMP CALCULATOR</i>	<i>Formula</i>	<i>Sample</i>
Slope (%)	Slope	5%

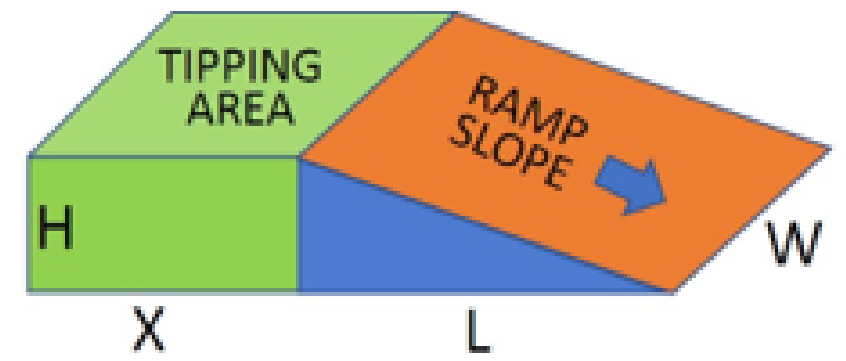
Slope percent is height divided by length. Max recommendation 5%.

<i>Ramp</i>	<i>Feet</i>	<i>Feet</i>
Width	W	40
Height	H	6
Length	=H/S	120

*Tipping Area (Flat area at top. Matches height)*

Length	X	15
--------	---	----

Volume	Formula	Cubic Feet	Cubic Yards
Ramp wedge	$1/2 \times W \times H \times L$	14,400	533
Tipping area, wedge	$H \times W \times X$	3,600	133
Total	Compacted		667



## CASE STUDY – HOOPA VALLEY TRIBE: BUILD AT NEW SITE?



### Site Preparation:

- Geotech, leachfield investigations
- Layout Design (coordinate with utility providers, state highways agency)
- Architectural services
- Engineering Design
- Wastewater treatment design
- Utilities





## CASE STUDY – HOOPA VALLEY TRIBE: BUILD AT NEW SITE?



### Site Construction:

- Grading and road access
- Utilities installation including water, electrical, & sewage
- Fencing
- Ramp construction
- Stormwater drainage

# Construction



- Costs & financing
- Bid development
- Project management

# COSTS

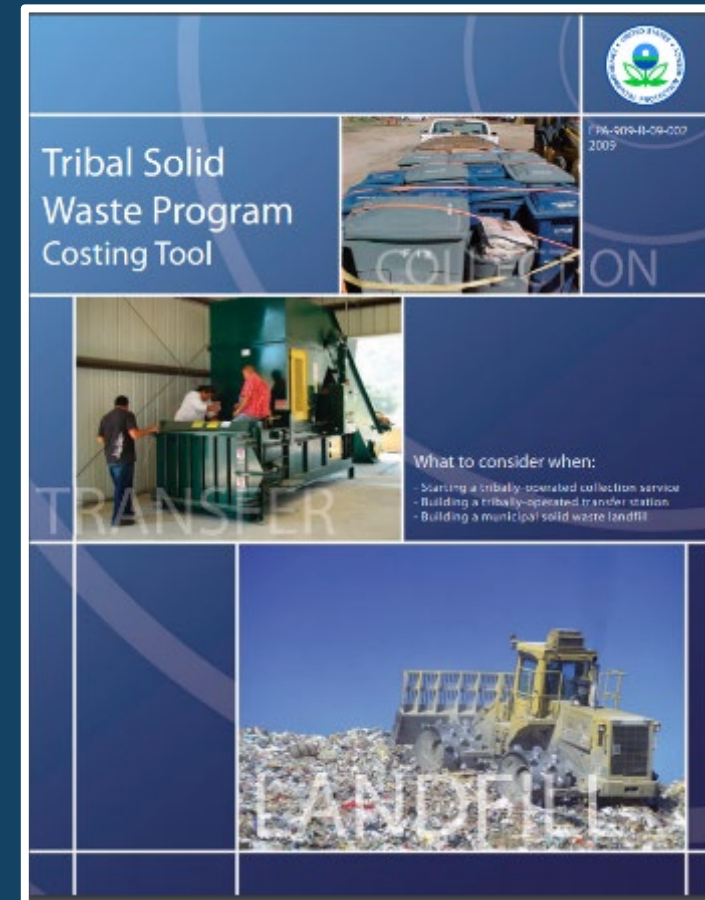
## Calculating costs considerations

- Start with optimal design
- Consider phasing
- Consider retrofit
- Develop total cost
- Calculate cost per ton
- May consider outside expertise

## Cost categories

- Site development
- Land purchase
- Improvements and environmental considerations
- Grading and excavation – pits, loading
- Utility access
- Local approval and permitting
- Building constructions

Resource: Tribal Solid Waste Program Costing Tool  
<https://www.epa.gov/file/tribal-solid-waste-program-costing-tool>





## SAMPLE CAPITAL COSTS: SIMPLE CONVENIENCE CENTER



- Fencing (\$4,000)
- Containers (vehicle?)
  - \$2,000-\$5,000 each)
- Grading/Paving (\$8,000)
- Drainage
- Signage (\$400)
- Trail camera?



# Sample Capital Costs: Transfer Station

- Assumptions
  - Convenience transfer drop-off
  - Dumpster/roll-off (3)
  - Paved site
  - Disposal 100 miles

Construction Item		Cost		
Site, Pad and Ramp Grading		\$ 12,000		
Concrete Pads for Roll-off Containers & Attendant Bldg.		\$ 18,000		
Gravel and Asphalt		\$ 24,000		
Attendant Building Infrastructure		\$ 30,000		
Electrical Work for entire site		\$ 20,000		
Plumbing Work for entire site		\$ 20,000		
Fence/Gates		\$ 10,000		
Signage		\$ 1,000		
Electrical Work for Compactor		\$ 1,000		
Lighting System		\$ 1,500		
Security Cameras		\$ 2,000		
<b>Total Construction</b>		<b>\$ 139,500</b>		
Equipment Costs		Quantity	Unit Cost	Total Cost
Compactor / 30 Yard Container		1	\$ 41,000	\$ 41,000
Roll-off Container, 20 yard		3	\$ 3,900	\$ 11,700
Roll-off Truck with Hoist		1	\$230,000	\$ 230,000
Recycling Trailer, 20 yard, 16 feet		1	\$ 4,500	\$ 4,500
Pickup Truck, 3.3L V6		1	\$ 32,000	\$ 32,000
Skid Steer		1	\$ 30,000	\$ 30,000
<b>Total Equipment</b>				<b>\$ 349,200</b>



# BID DEVELOPMENT AND PROJECT MANAGEMENT

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## Bid Development

- Request for Proposals
- Request for Qualifications
- Complete or Partial Bid
- Evaluating Proposals

## Project Management

- Construction Management
- Design, Bid, Build
- Design Build



## Types of Financing

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- EPA GAP, Hazardous Waste Grant
- Indian Health Service
- US Department of Agriculture
- US Housing and Urban Development
- General Services Administration (equipment)
- State funding
- [EPA's Tribal Waste Management Funding Resources Directory](#)



# Allowable Transfer Station-related Capital Costs under EPA GAP

Description	Examples
Source separation projects (activities that are part of a sustainable waste management program designed to increase waste source reduction, recycling, composting, and sustainable materials management)	Source separation supplies and equipment
The repair, upgrade, and replacement of municipal solid waste supplies and equipment.	Repairing, upgrading, and replacing regular trash collection program supplies and equipment
The construction, repair, upgrade, and replacement of municipal solid waste facilities.  (OITA-AIEO-GAP-2016-001)	Constructing, repairing, upgrading, and replacing regular trash collection program facilities. Due to the general prohibition on use of GAP funds for construction, ... [grantees must] receive approval from the AIEO Director for all construction activities.





# IHS Sanitation Facilities Construction Program

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- Cooperative Agreement, Direct Payment, or Federal Contract
- Environmental engineering assistance with utility master planning. Development of multi-agency-funded sanitation projects, interagency coordination, leveraging of IHS funds.
- Provision of water supply and waste disposal facilities.
- Professional engineering design and/or construction services for water supply and waste disposal facilities.
- Technical consultation and training for waste disposal operators.



# USDA Rural Utilities Service Solid Waste Management Grants

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- Technical Assistance provided by grantees to tribes – tribes can also be technical assistance providers
- Free technical assistance and/or training provided by the grant recipients
- Program improves planning and management of solid waste sites in rural areas
- Cannot be used for construction
- Competitive grant



# EPA Hazardous Waste Management Grant Program for Tribes

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- Funds for building capacity to improve and maintain regulatory compliance, and for developing solutions to address improper management of hazardous waste on tribal lands
- Can fund household hazardous waste collection stations; reuse stations for hazardous materials like paint, wood stains, etc; oil collection stations; codes and ordinances development
- Usually awards 3 grants per year at approximately \$97,000
- Emphasis on technical assistance/transferability of project successes to other tribes
- Competitive grant usually announced each April



# USDA Water and Waste Disposal Loan and Grant Program

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- Helps communities extend and improve water and waste treatment facilities
- Assists qualified applicants who can't obtain commercial credit on reasonable terms
- Funds may be used to finance the acquisition, construction or improvement of solid waste collection, disposal or closure
- Long-term, low-interest loans up to a 40-year payback period
- If funds available, a grant may be combined with a loan to keep user costs reasonable





## US Housing & Urban Development Indian Community Development Block Grant (ICDBG)

- Funds housing, community facilities, and economic development. Community Facilities includes infrastructure construction, e.g., roads, water and sewer facilities; and, single or multipurpose community buildings.
- Awards are \$500,000 to \$5,000,000, with average award of \$600,000
- Preapplication coordination is required with your regional HUD office
- Applications due annually about April – May



## Allowable Operating Costs Eligible under EPA GAP

---

Costs are allowable – if resources allow:

- Staffing costs beyond pilot phase
- Fuel
- Tipping fees
- Supplies
- Vehicle maintenance



## SESSION 3 RECAP: FROM DESIGN TO COMPLETION

- Site Design & Layout
- Ancillary Facilities & Equipment
- Vehicles & Utilities
- Capital Costs
- Financing



## SESSION 4 PREVIEW: OPERATIONAL CHALLENGES

- Operation & Maintenance Tasks & Costs
- Waste Handling
- Site Maintenance & Security
- Emergencies
- Illegal Dumping





**THANK YOU**

**PLEASE SUBMIT EVALUATION**



# DEVELOPING SMALL-SCALE SOLID WASTE TRANSFER STATIONS ON TRIBAL LANDS

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## Introduction and Welcome to Session 4

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- Welcome
- Introductions in the chat bar
- Reintroducing your instructor
- Responding to questions and comments from prior sessions in today's Lightning Round



# DISCLAIMER

This webinar is provided as part of the U.S. EPA Waste & Materials Management Training Series for Tribes and EPA's Sustainable Materials Management Webinar series.

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# Online Course Overview

## Session #1: Fundamentals/Needs Assessment

- Intro
- Transfer Station Fundamentals
- Siting
- Planning for capacity & functional needs

## Session #2: Design Factors/Real Life Examples

- Calculating facility size
- Hauling
- Neighbor issues
- Regulations
- Budgeting for construction
- Transfer Station Types & Examples

## Session #3: From Design to Completion

- Site Design & Layout
- Ancillary Facilities & Equipment
- Vehicles & Utilities
- Capital Costs
- Funding

## Session #4: Operational Challenges

- Operation & Maintenance Tasks & Costs
- Waste Handling
- Site Maintenance & Security
- Emergencies
- Illegal Dumping



# LIGHTNING ROUND!

## Answering Your Questions – Beat the Buzzer!

- Transporting a 40-yard bin
- Regulations for temporary HW & HHW storage containers & storage areas
- CATEX & NEPA requirements for federal funding of transfer stations
- EPA approvals for transfer stations
- Federal inspections





## LIGHTNING ROUND! (CONTINUED)

### Answering Your Questions – Beat the Buzzer!

- How to research vendors & costs of equipment
- Standard Operating Procedures
- Funds for construction
- Use of scales
- How to work with local governments on joint transfer station operations
- Funding operations & maintenance at tribal transfer stations





## SESSION 4 PREVIEW: OPERATIONAL CHALLENGES

- Operation & Maintenance Tasks & Costs
- Waste Handling
- Site Maintenance & Security
- Emergencies
- Illegal Dumping



# Operation & Maintenance

- O&M costs
- Personnel
- Waste handling
- Maintenance
- Health & safety



# Costs

- Facility Maintenance
- Personnel
- Equipment
- Revenue from recyclables
- Transportation costs
- Disposal costs



# Transfer Station Equipment Specifications Handout

## Designing Small-Scale Transfer Stations on Tribal Lands Online Course August 2020

This handout provides estimates and approximations that may be useful when designing a solid waste transfer station.

### Volume-to-Weight Conversion Factors:

[https://www.epa.gov/sites/production/files/2016-04/documents/volume\\_to\\_weight\\_conversion\\_factors\\_memorandum\\_04192016\\_508fnl.pdf](https://www.epa.gov/sites/production/files/2016-04/documents/volume_to_weight_conversion_factors_memorandum_04192016_508fnl.pdf)

*Source: US EPA Office of Resource Conservation and Recovery. Volume-to-Weight Conversion Factors. April 2016*

Equipment and specifications	Volume (cubic yards)	Dimensions L x W x H (ft)	Gross vehicle weight (lbs)	Estimated Cost
Roll-off box (debris box)	40	22 x 8 x 8	6,500	\$5,000
Roll-off box "Dirt"	10	12 x 8 x 3.5	3,500	\$3,000
Recycling Trailer	20	30 x 8.5 x 6	9,900	\$5,100
Recycling trailer, compartment, with hydraulic lift	9 to 28	30 x 8.5 x 6	9,900	\$20,000
Landscape/cage trailer	18	14 x 6.4 x 6	9,900	\$4,000
Baler, vertical (material dependent 50-1,000 pounds/bale)	NA	Varies 4 x 2 x 5	NA	25,000
End dump	36	40 x 8.5 x 6.3	12,400	\$20,000

### Small "skip" loader



[https://www.123rf.com/photo\\_114300199\\_yellow-mini-loader-with-small-bucket-3d-render-on-white-background-with-shadow.html](https://www.123rf.com/photo_114300199_yellow-mini-loader-with-small-bucket-3d-render-on-white-background-with-shadow.html)

### Roll-off, 10 cubic yard, open top



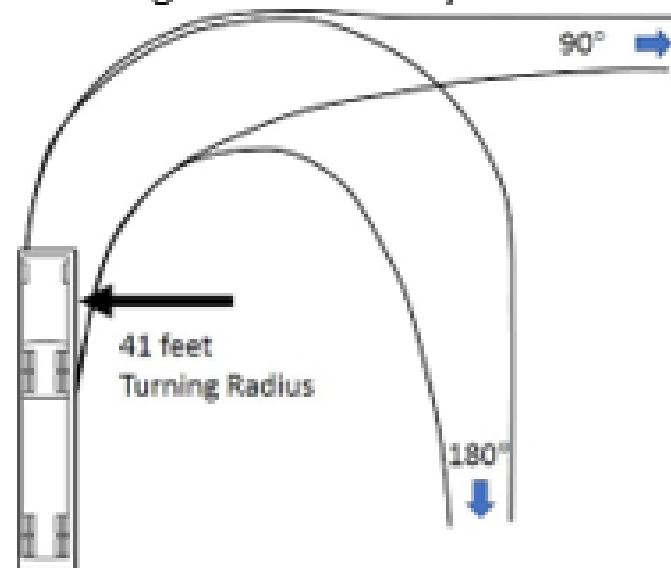
[https://www.orangecansinc.com/wp-content/uploads/2012/09/IMG\\_0956.jpg](https://www.orangecansinc.com/wp-content/uploads/2012/09/IMG_0956.jpg)

### Trailer, Possum belly



Photo from Sweetser & Associates, Inc.

### Turning radius example



### Roll-off truck and container



Photo from Sweetser & Associates, Inc.

### End dump



<https://www.overdriveonline.com/wp-content/uploads/sites/8/2012/12/Trail-King-Steel-Half-Round-800x581.jpg>



# Costs

## Operating Costs

### Facility Maintenance

- Tip floor – e.g. 12 inches reinforced concrete
- Roof
- Walls
  - Exterior
  - Interior push walls
- Loading area
- Equipment
- Roads
- Landscaping
- Ancillary areas

### Personnel

- Varies by hours of operation
- Varies by activities/roles
- Rates







# Costs

## Operating Costs

### Equipment

- Area where waste is unloaded
- Some diversion may occur
- Waste pushed into trailer/container
- Requires loader
- Need push walls on side to protect building
- Garbage is abrasive needing replacement
- Maintenance

### Recycling Revenue

- Provide revenue (sometimes)
- Market fluctuations common
- Some negative net value
- Not usually self-supporting
- Fewer export outlets
- Storage concerns –weather, vectors
- Quality control
- How to ship
- Avoid stockpiling
- Short-term landfill consideration





# Costs

## Operating Costs

### Transportation

- Formula
- $\text{Cost per ton} = (\text{Trailer cost/hour}) \times (\text{Number of hours}) / (\text{Tons per load})$
- Cost per hour  $\approx$  \$70 per hour
- Hours  $\approx$  Miles / Miles per hour
- Average payload  $\approx$  20 tons
- e.g.  $\text{Cost per ton} = (\$70/\text{hr.} \times (50 \text{ miles}/50 \text{ mph}))/20$   
tons = \$35/ton

### Disposal

- Negotiated rate
- Select several site for options
- Guarantee capacity
- Due diligence



# Sample Operating Costs

Category/Description	Annual Operating Expenses
Ops & Maintenance	
Fuel Costs	\$ 25,068
O & M, Truck and Equipment	\$ 2,600
Insurance for trucks	\$ 707
Permits/Licensing	\$ 177
Utilities	\$ 3,600
Other recurring site costs	\$ 3,600
<b>Total Ops and Maintenance</b>	<b>\$ 35,752</b>
Staff	
Employee Salaries	\$ 79,560
Employee Payroll Tax / Benefits	\$ 22,277
<b>Total Staff</b>	<b>\$ 101,837</b>
<b>Total Annual Operating Expenses</b>	<b>\$ 137,588</b>



## Allowable Operating Costs Eligible under EPA GAP

---

Costs are allowable – if resources allow:

- Staffing costs beyond pilot phase
- Fuel
- Tipping fees
- Supplies
- Vehicle maintenance

# Operation & Maintenance

- O&M costs
- Personnel
- Waste handling
- Maintenance
- Health & safety





# Personnel/Staffing

## Typical Responsibilities

- Gate attendant/scale weighmaster
- Open/close, collect fees, direct users, recordkeeping
- Laborer
- Traffic, recycling, waste screening, litter, etc.
- Equipment operator
- Loaders, forklift, bin truck
- Driver
- Long-haul, recyclables
- Maintenance
- HHW staff

## Staffing Plans

- Staffing levels
- Tasks
- Cross trained
- Backups

## Training

- Operations
- Safety
- Equipment
- HAZWOPER
- PPE
- Occupational hazards

# Operation & Maintenance

- O&M costs
- Personnel
- **Waste handling**
- Maintenance
- Health & safety



# Waste Acceptance

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- Acceptable wastes/materials list
- Terms of acceptance
- Waste/material specific pricing
- Recycling commonly subsidized
- Unaccepted wastes maybe illegally disposed



## Used Oil Collection: Is Contamination Suspected?

1. DO NOT ask hauler to take a little more
2. Stop adding oil to tank – Lock it out
3. Tell employees tank closed
4. Post sign
5. Take sample and test
  - Contact hauler for testing service
  - Typically test – PCB, flash point, other?
  - Need test for reimbursement & disposal



# Waste Screening

- Best efforts to prevent acceptance of hazardous and other prohibited wastes
- Customer notification/education
- Visual surveillance
- Waste inspection
- Provide safe management options







# Education and Outreach

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- Hours
- Acceptable/unacceptable wastes
- Fees
- Special wastes
- Terms and conditions of use
- Methods
  - Signage, flyers, media



# Recordkeeping

- Daily log
- Tonnages
- Waste types
- Environmental testing
- Incident reports
- Training
- Agency reports





# Operation & Maintenance

- O&M costs
- Personnel
- Waste handling
- **Maintenance**
- Health & safety



# MAINTENANCE

- Written procedures each component
- Plan daily, periodic and emergency activities
- Design for ease of maintenance
- Preventative maintenance protects investment
- Garbage is abrasive and erode steel and concrete over time





# Operation & Maintenance

- O&M costs
- Personnel
- Waste handling
- Maintenance
- Health & safety





## Site Security

- Need security site
- Scale secure (handles cash)
- Fencing and entrance gate
- Allow visibility of operating areas





# Animal Control

## Vectors and Animal Considerations

- Solid waste attractive nuisance
  - Especially food waste and unwashed recyclables
- Animals and Vectors
  - Mammals
  - Reptiles
  - Insects
  - Birds
- Deterrents
- Bear Bin Cover
  - Cover slides into place to allow locking “lid”
  - Minimize animal intrusion

## Vector Control

- Keeping the facility clean will keep out disease vectors.
- The facility should have a perimeter fence to keep out bears, foxes, racoons, others.
- Use sustainable practices rather than pesticides





# Litter Control

- Schedule daily/weekly litter control
- Fencing to control litter
- Cover waste/material containers







# Emergencies

- Health and safety plan
- Training
- Recognition
  - Fires
  - Spills
- Procedures
- Cleanup





# Illegal Dumping

- Abandoned wastes
- Onsite
- Access roads
- Community cleanup
- Drug lab wastes







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# REVIEW & WRAP UP

Priority Concepts

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## Objectives – Recap

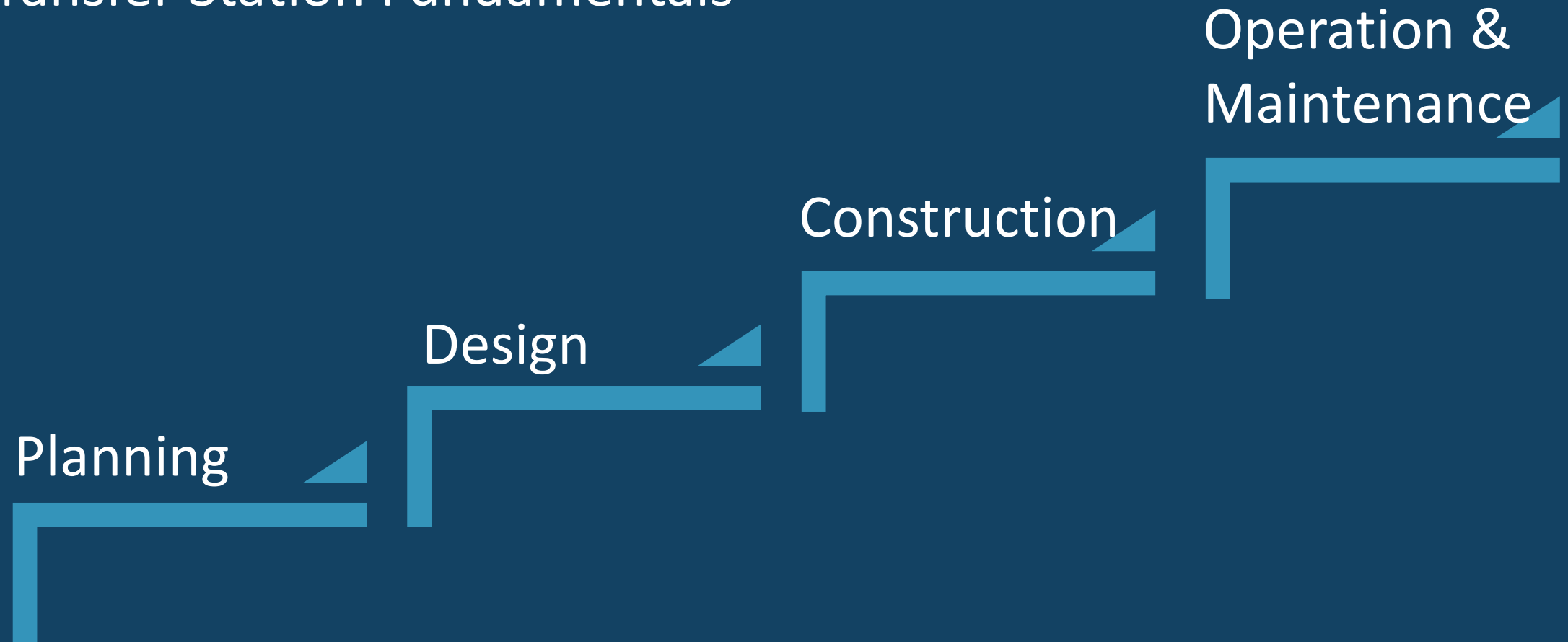
- Evaluate different options for transfer stations or community convenience areas/drop-off sites serving smaller populations
- Right size a transfer facility for your needs
- Understand siting concerns and resource needs for conceptual design, site preparation, construction, and operation of small transfer stations or community drop-off sites





# Review and moving forward

- Transfer Station Fundamentals





## Putting it All Together

Contact for support: Your EPA tribal solid waste coordinator:

R1 Michael Stover

R2 Lorraine Graves

R3 Brian Hamilton

R4 Davy Simonson

Laura McMillan

R5 Dolly Tong

R6 Roger Hancock

R7 Marcus Rivas

R8 Alison Ruhs

R9 Deirdre Nurre

R10 Gabriela Carvalho

**Thank you**



# Transfer Station Equipment Specifications Handout

## Designing Small-Scale Transfer Stations on Tribal Lands Online Course August 2020

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**Volume-to-Weight Conversion Factors:**

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[04/documents/volume to weight conversion factors memorandum 04192016 508fnl.pdf](https://www.epa.gov/sites/production/files/2016-04/documents/volume_to_weight_conversion_factors_memorandum_04192016_508fnl.pdf)

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Recycling Trailer	20	30 x 8.5 x 6	9,900	\$5,100
Recycling trailer, compartment, with hydraulic lift	9 to 28	30 x 8.5 x 6	9,900	\$20,000
Landscape/cage trailer	18	14 x 6.4 x 6	9,900	\$4,000
Baler, vertical (material dependent 50-1,000 pounds/bale)	NA	Varies 4 x 2 x 5	NA	25,000
End dump	36	40 x 8.5 x 6.3	12,400	\$20,000
Loader, small skid steer	Bucket 2-3	NA	NA	\$50,000
Loader, Articulating	Bucket 4-5	NA	NA	\$120,000
Backhoe	Variable	NA	NA	\$96,000
Forklift	NA	NA	NA	\$45,000
¾ ton truck	NA	NA	Tow 13,000	\$40,000
1-ton truck	NA	NA	Tow 30,000	\$60,000
Roll-off truck with hoist	NA	NA	20,000	\$225,000
Roll-off trailer	NA	27 x 8 x 5.5	34,000	\$40,000
Transfer Truck	NA	NA	18,000	\$250,000
Transfer trailer, walking floor	110	50 x 8.5 x 13.5	21,000	\$60,000
Transfer trailer, Possum belly	165	50 x 8.5 x 13.5	19,000	\$40,000


Dimensions are estimates and specific containers specifications may vary. A 40-cubic yard (cy) roll-off box will hold about 16 pickup truck loads. Container weight limited to maximum gross allowed vehicle weight of truck, container and contents. Maximum federal gross vehicle weight is 80,000 pounds unless otherwise specified (e.g. on bridges). Prices are estimates and can vary widely and users should get specific quotes with desired features and delivery costs.

Occupational Safety and Health Administration (OSHA) Guidance (Some related standards)

- Fall protection from an upper level more than four feet above a platform or dangerous equipment by use of guardrails or other measures (29CFR 1910.28 and 1910.29)
- Confined space protection (29 CFR 1910.146)
- Lockout/tagout requirements for servicing and maintaining equipment including balers (29 CFR 1910.147)
- Personal protection equipment (29 CFR 1910.305)
- Forklifts and other powered industrial trucks (29 CFR 1910.178)
- Fire extinguishers (29 CFR 1910.157)

# Transfer Station Equipment Pictures

Example images of standard equipment. Specific equipment design may vary.

<p><i>Loader, articulating</i></p>  <p>Photo from Sweetser &amp; Associates, Inc.</p>	<p><i>Roll-off, 40 cubic yard, open top</i></p>  <p>Photo from Sweetser &amp; Associates, Inc.</p>	<p><i>Walking floor trailer slats</i></p>  <p><a href="https://www.ptrailer.com/walking-floors">https://www.ptrailer.com/walking-floors</a></p>
<p><i>Small "skip" loader</i></p>  <p><a href="https://www.123rf.com/photo_114300199_yellow-mini-loader-with-small-bucket-3d-render-on-white-background-with-shadow.html">https://www.123rf.com/photo_114300199_yellow-mini-loader-with-small-bucket-3d-render-on-white-background-with-shadow.html</a></p>	<p><i>Roll-off, 10 cubic yard, open top</i></p>  <p><a href="https://www.orange cansinc.com/wp-content/uploads/2012/09/IMG_0956.jpg">https://www.orange cansinc.com/wp-content/uploads/2012/09/IMG_0956.jpg</a></p>	<p><i>Trailer, Possum belly</i></p>  <p>Photo from Sweetser &amp; Associates, Inc.</p>
<p><i>Turning radius example</i></p> 	<p><i>Roll-off truck and container</i></p>  <p>Photo from Sweetser &amp; Associates, Inc.</p>	<p><i>End dump</i></p>  <p><a href="https://www.overdriveonline.com/wp-content/uploads/sites/8/2012/12/Trail-King-Steel-Half-Round-800x581.jpg">https://www.overdriveonline.com/wp-content/uploads/sites/8/2012/12/Trail-King-Steel-Half-Round-800x581.jpg</a></p>

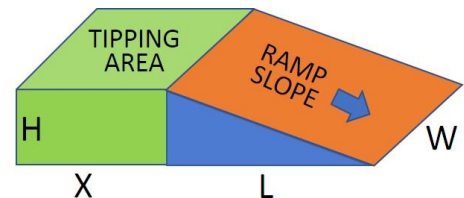
These calculations provide an estimate on the amount of compacted material needed to create a ramp.

<b>RAMP CALCULATOR</b>	<i>Formula</i>	Sample
Slope (%)	Slope	5%

Slope percent is height divided by length. Max recommendation 5%.

<b>Ramp</b>	Feet	Feet
Width	W	40
Height	H	6
Length	=H/S	120

<b>Tipping Area (Flat area at top. Matches height)</b>		
Length	X	15



Volume	Formula	Cubic Feet	Cubic Yards
Ramp wedge	$1/2 \times W \times H \times L$	14,400	533
Tipping area, wedge	$H \times W \times X$	3,600	133
Total	Compacted		667