

Fremont County Solid Waste Disposal District  
**Tire Management Data and Research**  
Revision Date: December 8, 2022

The Fremont County Solid Waste Disposal District (District) annually manages approximately 500 tons of tire waste. A portion of the tires are delivered to our sites in co-mingled loads and are not easily diverted from the landfills; however, the majority of the tires are delivered to the sites in a tire specific load. Approximately, 75% of the tires are delivered to the site are in tire specific loads. The balance of the tires received are within co-mingled loads.

Waste tires consume a far greater volume of airspace per pound than almost any other waste stream. Tires are a very unique waste with their immense material memory (i.e. they bounce back to their original shape after being compacted). Further, the shape of tires is not conducive to efficient airspace management since the center of the tire may allow waste filling, yet the core of the tire remains filled only with air. Tires are also hard on the District's landfill equipment. They get hung-up in dozer tracks and waste compactor wheel-houses.

The Sand Draw Landfill is the one District site that receives the vast majority of the tire specific loads. No other District site receives the volume of tires that the Sand Draw Landfill does; therefore, the Sand Draw Landfill is where the data has been tracked and prior pilot projects were conducted. Tire weights diverted from the Sand Draw Landfill to the Shoshoni Landfill were as follows:

<u>Fiscal Year</u>	<u>Diverted Tonnage</u>
2017-2018	430 tons
2018-2019	540 tons
2019-2020	440 tons

Within this evaluation six different tire management alternatives were evaluated. Of the six alternatives evaluated, two were based off actual field studies completed by the District, and the other four used the data from the field studies along with outside data provided.

The conclusion of the evaluation for the six different tire management alternatives, the following are the results:

<u>Tire Management Alternative</u>	<u>Cost per Ton</u>	<u>Notes/Comments</u>
Contractor tire baling	\$348	Inability to process all
Tires for reclamation landfill	\$268	Freight variability
Liberty tire	\$370	Freight variability
Shredding by a contractor	\$302	Rate variability
Shredding by the District	\$232	
Landfilling at the Sand Draw Landfill (whole tires)	\$347	

Recommendation: Work for the first 6-months of 2023 to provide notice (Public Notice) to the residents of Fremont County that the District will be adopting a new tire disposal rate of \$235 per ton effective July 1, 2023. This will require segregation of tires in loads.

This should generally only cost a family an additional \$20-\$30 per year, per vehicle, if they buy four new tires per year.

The following pages show the full calculations of the six different tire management alternatives:

- Page 3: Contractor tire baling
- Page 4: Tires for reclamation landfill
- Page 5: Liberty tire
- Page 6: Shredding by a contractor
- Pages 7-9: Shredding by the District
- Page 10: Landfilling at the Sand Draw Landfill (whole tires)

1. **Contractor Tire Baling** – the following represents the data collected in the 2015-2016 tire baling pilot project: Between 2015 and 2016 the District conducted a Tire Baling Pilot Project at the Sand Draw Landfill. As a part of this project a local contractor with a tire baling machine was hired to bale tires. Volume reduction, cost, and density were monitored to determine the value of the processing method.

- Baling Rate:
  - o Car and Light Pickup Tires      \$75/ton
    - 70% could be processed
  - o Semi or Equipment Tires      Could not process
    - 30% could not be processed
- Volume Reduction      50%
- Landfilling Rate      \$80/ton at FCSWDD sites

**Baling Costs = (500 tons) x (\$75/ton) = \$37,500**

**Landfill Airspace Consumption Expense (using 229-lbs/yd<sup>3</sup> loose density)**

***\*Note: the 229-lbs/yd<sup>3</sup> was determined during the 2022 shredding project.***

**=> Loose Volume = (500 tons x 2,000lbs/ton) / (229-lbs/yd<sup>3</sup>) = 4,367 yd<sup>3</sup>**

**= 70% processed = (4,367 yd<sup>3</sup>) x (70%) = 3,057 yd<sup>3</sup> that could be processed**

**= 30% unprocessed = (4,367 yd<sup>3</sup>) x (30%) = 1,310 yd<sup>3</sup> that could not be processed**

**=> Baled Volume = (3,057 yd<sup>3</sup>) x 50% = 1,529 yd<sup>3</sup>**

**=> Non-baled Volume = 1,310 yd<sup>3</sup>**

**=> Airspace Value at 1,200lbs/yd<sup>3</sup> AUF and \$80/ton fee = \$48/yd<sup>3</sup>**

**= Baled Volume at (1,529 yd<sup>3</sup>) x (\$48/yd<sup>3</sup>) = \$73,400**

**= Non-baled Volume at (1,310 yd<sup>3</sup>) x (\$48/yd<sup>3</sup>) = \$62,900**

**Total Processing Expense = \$37,500**

**Airspace Expense = \$136,300**

**➔ Total Management Expense = \$173,800 (i.e. \$348/ton)**

**➔ Disposal Fees Paid to the District (@ \$80/ton) = \$40,000**

**➔ Losses = \$133,800 (equates to a loss of \$268/ton)**

***\*Note: This process cannot handle anything larger than light car and pickup tires.***

**➔ Disposal Fee to Cover all Costs = \$348 per ton**

2. **Tires for Reclamation** – a landfill located near Laurel, Montana committed to waste tire landfilling. The estimated remaining life at this landfill is 30-years. Management costs associated with this site are:

- Car and light pickup tires \$1/each
- Semi-truck and trailer tires \$3/each
- Small Implement and Tractor \$6/each
- Larger Implement and Tractor \$20-30/each

Bulk Tire Rates

- Whole Tires (weight) \$75/ton ← Selected rate for evaluation
- Whole Tires (volumetric) \$10/cubic yard
- Shredded tire disposal same as above

A general cost estimate for freight to haul from Lander, WY to Laurel, MT is as follows:

- Approximately 260 miles one-way.
- Assume \$9.00/loaded mile (assumed higher rate: the town is not a hub and specialized trailer requirements (i.e. walking floor type trailer)).
- Approximately 13 tons per walking floor trailer load. This weight estimate has been used based on District historic hauling efforts.
- Freight estimate is \$2,340 per load of 13 tons.

Using a 500 tons per year tonnage, the annual management cost based on the tonnage would be as follows:

**Freight = (500 tons / 13 tons) x \$2,340/load = \$91,260**

**Disposal Costs = (500 tons) x (\$75/ton) = \$37,500**

***\*Note: no expense was included for District staff or equipment to load the tires into the trailers being used to haul the tires. Assume 40-hours with one staff person and one front-end loader = \$5,000 is a close estimate.***

**→ Total Management Expense = \$133,760 (i.e. \$268/ton)**

**→ Disposal Fees Paid to the District (@ \$80/ton) = \$40,000**

**→ Total Losses = \$93,760 (equates to a loss of \$188/ton)**

**→ Disposal Fee to Cover all Costs = \$268 per ton**

3. **Liberty Tire** – a large-scale recycler that utilizes waste tires for resale, crumbling for various uses, and sale to a concrete plant kiln. The closest location is in Salt Lake City, Utah. Management costs associated with this site are:

- Car and light pickup tires                      \$160/ton
- Semi-truck and trailer tires                      \$160/ton
- Tractor and equipment tires                      \$260/ton
- Shredded tire disposal                              \$260/ton
- Additional costs:
  - o If the car and light pickup tires are mixed (i.e. the two groups not sorted and separated) with the semi-truck and trailer tires, the disposal cost is \$210/ton.
  - o If there is any trash, metal, rims, etc. within a delivered load, the entire load disposal cost is \$260/ton. ← **Selected rate for evaluation**

A general cost estimate for freight to haul from Lander, WY to Salt Lake City, Utah is as follows:

- Approximately 300 miles.
- Assume \$4.25/loaded mile.
- Approximately 13 tons per walking floor trailer load. This weight estimate has been used based on District historic hauling efforts.
- Freight estimate is \$1,275 per load of 13 tons

Since it is not likely that we will require source separation, this evaluation is using the 500 tons per year tonnage with mixed loads of car and light pickup tires, semi-truck and trailer tires, and equipment tires together. The annual management cost based on the tonnage would be as follows:

**Freight = (500 tons / 11 tons) x \$1,275/load = \$50,000**

**Disposal Costs (with equipment and truck tires mixed) = (500 tons) x (\$260/ton) = \$130,000**

***\*Note: no expense was included for District staff or equipment to load the tires into the trailers being used to haul the tires. Assume 40-hours with one staff person and one front-end loader = \$5,000 is a close estimate.***

**→ Total Management Expense = \$185,000 (i.e. \$370/ton)**

**→ Disposal Fees Paid to the District (@ \$80/ton) = \$40,000**

**→ Losses = \$145,000 (equates to a loss of \$290/ton)**

**→ Disposal Fee to Cover all Costs = \$370 per ton**

4. **Shredding by Contractor** – a contractor in Shoshoni, WY offers tire grinding/shredding for solid waste facilities. Management costs associated with this option are:

- Contractor Shredding Rate           \$150/ton
- Contractor Mobilization Cost       \$0
- Volume Reduction                    **Unknown (assume 63.8% for calculations – same as 2022 shredding project)**
- Landfilling Rate                      \$80/ton at FCSWDD sites

Using a 500 tons per year tonnage, the annual management cost based on the tonnage would be as follows:

**Shredding Costs = (500 tons) x (\$150/ton) = \$75,000**

**Landfill Airspace Consumption Expense (using 229-lbs/yd<sup>3</sup> loose density)**

*\*Note: the 229-lbs/yd<sup>3</sup> was determined during the 2022 shredding project.*

=> Loose Volume = (500 tons x 2,000lbs/ton) / (229-lbs/yd<sup>3</sup>) = 4,367 yd<sup>3</sup>

=> Shredded Volume = (4,367 yd<sup>3</sup>) reduced by 63.8% = 1,581 yd<sup>3</sup>

*\*Note: the 64% airspace reduction was determined during the 2022 shredding project.*

=> Airspace Value at 1,200lbs/yd<sup>3</sup> AUF and \$80/ton fee = \$48/yd<sup>3</sup>

= (1,581 yd<sup>3</sup>) x (\$48/yd<sup>3</sup>) = \$75,900

**Mobilization = \$0**

**Total Processing Expense = \$75,000**

**Airspace Expense = \$75,900**

→ **Total Management Expense = \$150,900 (i.e. \$302/ton)**

→ **Disposal Fees Paid to the District (@ \$80/ton) = \$40,000**

→ **Losses = \$110,900 (equates to a loss of \$222/ton)**

→ **Disposal Fee to Cover all Costs = \$302 per ton**

5. **Shredding by the District** – Tire shredding at the Sand Draw Landfill took place between March 22, 2022, and March 26, 2022. The following represents the findings of the Tire Shredding Pilot Project:

- Tonnage:	417 tons
- Loose Density:	229-lbs/yd <sup>3</sup>
- Shredded and Placed Density:	633-lbs/yd <sup>3</sup>
- Shredding Volume Reduction:	46.6%
- Shredding and Landfill Placement/Compaction Reduction:	63.8%
- Pilot Project Total Cost:	\$33,172
- Disposal Cost at \$80 per ton on the 417 tons:	\$33,360
- Airspace Consumption Cost Prior to Shredding:	\$174,950
- Airspace Consumption Cost Post Shredding:	\$63,300
- Airspace Consumption Savings by Shredding:	\$111,650
- Financial Loss at \$80 per ton:	\$63,112
- Required Disposal Rate to Cover Processing and Landfilling:	\$232 per ton

*Estimated Tonnage	417 tons
Initial Tire Stockpile Survey:	3,644.55 yd <sup>3</sup>
Shredded Tire Stockpile Survey:	1,947.34 yd <sup>3</sup>
Shredded and Landfilled Survey:	1,318.40 yd <sup>3</sup>

*\*Note: Not all of the tires were weighed into the Sand Draw Landfill separate from the typical waste stream leading into this project; however, prior estimates of the tire weights for a one-year period calculated the annual tonnage to be approximately 500 tons. Further, the last tire hauling event offsite (to the Shoshoni Landfill) took place 5/29/2022.*

Shredding (alone) volumetric reduction:

- $(3,644.55 \text{ yd}^3) - (1,947.34 \text{ yd}^3) = 1,697.21 \text{ yd}^3$  less airspace consumed
- $(1,697.21 \text{ yd}^3) / (3,644.55 \text{ yd}^3) \times 100 = 46.6\%$  reduction
  - ⇒ Using an \$80 per ton disposal rate and assuming a typical 1,200lb/ yd<sup>3</sup> compaction rate, the airspace value should be worth \$48 per yd<sup>3</sup>
  - ⇒  **$(\$48/\text{yd}^3) \times (1,697.21 \text{ yd}^3) = \$81,466$  worth of airspace gained/saved**

Shredding and landfilling volumetric reduction:

- $(3,644.55 \text{ yd}^3) - (1,318.40 \text{ yd}^3) = 2,326.15 \text{ yd}^3$  less airspace consumed
- $(2,326.15 \text{ yd}^3) / (3,644.55 \text{ yd}^3) \times 100 = 63.8\%$  reduction
  - ⇒ Using an \$80 per ton disposal rate and assuming a typical 1,200lb/ yd<sup>3</sup> compaction rate, the airspace value should be worth \$48 per yd<sup>3</sup>
  - ⇒  **$(\$48/\text{yd}^3) \times (2,326.15 \text{ yd}^3) = \$111,650$  worth of airspace gained/saved**

Operational Costs Associated (for Sand Draw Only):

• Shredder Rental:	\$10,175 (actual rental was \$20,350, used ½)
• Freight on delivery	\$4,300 (included all freight)
• District Staff (Total Comp)	\$6,842
• District Loaders	\$6,046

• District Roll-Off Trucks	\$3,837
• Fuel/DEF	\$1,972
• Cumulative	\$33,172

**Calculations:**

- Annual Tire Tonnages:
  - o RTO and Baileys loads for this period equated to 300 tons. This only accounts for the two very large generators.
  - o Previously calculated annual tonnage was approximately 500 tons.
  - o Last hauled offsite 5/28/2021.
  - o Approximately 10 months between the previous hauling event and tire processing:
    - $(10/12) \times (500) = 417$  tons.
  
- Staff Wages (total compensation):
  - o Darrell Summerlin: \$58.24 per hour
    - Worked 46 hours = \$2,680
  - o Dale Lobdell: \$37.85 per hour
    - Worked 46 hours = \$1,742
  - o Buddy Nimmo: \$31.09 per hour
    - Worked 36 hours = \$1,120
  - o Wade Appelhans \$35.59 per hour
    - Worked 36.5 hours = \$1,300
  - o Cost = \$6,842
  
- Fuel Usage:
  - o 437 gallons.
  - o The District was paying \$4.35 per gallon for diesel fuel in March 2022.
  - o Cost = \$1,901
  
- DEF Usage:
  - o 20 gallons.
  - o The District was paying \$3.51 per gallon for DEF in March 2022.
  - o Cost = \$71
  
- Equipment:
  - o Referenced Wyoming Rents in Riverton on 9/8/2022 for "standard" rental rates for comparable equipment.
    - Mid-size front-end loader: \$685 per 8-hour day = \$85.63 per hour
    - End dump trucks: \$396 per 8-hour day = \$49.50 per hour

	<u>Hours</u>	<u>Hourly Cost</u>	<u>Op. Cost</u>
o Cat 924K Loader	34.2	\$85.63	\$2,929
o Cat IT-14 Loader	36.4	\$85.63	\$3,117
o Mack Roll-Off Truck	37.5	\$49.50	\$1,857
o International Roll-Off Truck	40	\$49.50	\$1,980
o <u>Cost = \$9,883</u>			



- Total Management Expense = \$96,472 (i.e. \$231/ton)
- Disposal Fees Paid to the District (@ \$80/ton) = \$33,360
  
- Losses = \$63,112 (equates to a loss of \$152/ton)
  
- Disposal Fee to Cover all Costs = \$232 per ton

6. **Landfilling at the Sand Draw Landfill** – landfilling whole tires at the site. Using the volume reduction between the shredded tires and the shredded and landfilled tires (i.e. placed with a dozer and compacted with a waste compactor) determined during the 2022 tire shredding project, the reduction was 17.2%.

- Landfilling Rate	\$80/ton at FCSWDD sites
- Freight	\$0.00
- Volume Reduction from Landfill compactor	17.2% (best estimate)

**Landfill Airspace Consumption Expense (using 229-lbs/yd<sup>3</sup> loose density)**

*\*Note: the 229-lbs/yd<sup>3</sup> was determined during the 2022 shredding project.*

=> Loose Volume = (500 tons x 2,000lbs/ton) / (229-lbs/yd<sup>3</sup>) = 4,367 yd<sup>3</sup>

=> Landfilled Volume = (4,367 yd<sup>3</sup>) @ 17.2% = 3,616 yd<sup>3</sup>

=> Airspace Value at 1,200lbs/yd<sup>3</sup> AUF and \$80/ton fee = \$48/yd<sup>3</sup>

= (3,616 yd<sup>3</sup>) x (\$48/yd<sup>3</sup>) = \$173,568

→ Total Management Expense = \$173,568 (i.e. 347/ton)

→ Disposal Fees Paid to the District (@ \$80/ton) = \$40,000

→ Losses = \$133,568 (equates to a loss of \$267/ton)

→ Disposal Fee to Cover all Costs = \$347 per ton