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Appendix

Life Cycle Assessment of Spokane Waste Management Options

Prepared for

State of Washington Department of Ecology

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Appendix A Calculations

A.1 Materials, Chemicals, and Alternative Daily Cover

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Appendix A.1 Materials, Chemicals, and Alternative Daily Cover

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Washington Department of Ecology
Summary
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

		Spokane WtE	Finley Buttes	Roosevelt	Wenatchee
	Quantity of waste (tons/year)	250000	806004.92	2400000	292389
	% of facility emissions attributed to quantity of Spokane's waste	NA	31.02%	10.42%	85.50%
GHG	CO2e from consumables (MT/year) - Note: only 100-yr GWP available	1350.71	NA	127.22	13.66
GHG	CO2 from hauling of ADC (MT/year)	NA	622.04	229.69	NA
GHG	CH4 from hauling of ADC (MT/year)	NA	0.01	0.02	NA
GHG	N2O from hauling of ADC (MT/year)	NA	0.001	0.01	NA
GHG Total	CO2e (MT/year) with 20-yr GWP - Note: these values are smaller than they should be bc CO2e from consumables only has EFs generated with the 100-yr GWP	1350.71	622.86	359.83	13.66
GHG Total	30 year total (MT) with 20-yr GWP	40521.15	18685.86	10794.77	409.91
GHG Total	CO2e (MT/year) with 100-yr GWP	1350.71	622.46	358.89	13.66
GHG Total	30 year total (MT) with 100-yr GWP	40521.15	18673.70	10766.79	409.91
Criteria Air Pollutants	VOC from hauling of ADC (short tons/year)	NA	0.08	0.08	NA
Criteria Air Pollutants	NOx from hauling of ADC (short tons/year)	NA	1.72	1.68	NA
Criteria Air Pollutants	CO from hauling of ADC (short tons/year)	NA	0.87	0.32	NA
Criteria Air Pollutants	SO2 from hauling of ADC (short tons/year)	NA	2.30E-03	1.16E-03	NA
Criteria Air Pollutants	PM10 from hauling of ADC (short tons/year)	NA	0.07	0.05	NA
Criteria Air Pollutants	PM2.5 from hauling of ADC (short tons/year)	NA	0.03	0.05	NA
Criteria Air Pollutants Total	CAPs (short tons/year)	NA	2.78	2.18	NA

Washington Department of Ecology
Summary
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

		Spokane WtE	Finley Buttes	Roosevelt	Wenatchee	Finley Buttes OPOC (grams)	Roosevelt OPOC (grams)
Other Pollutants of Concern	Ammonia from hauling of ADC (short tons/year)	NA	0.01	NA	NA	12820.76278	NA
	Mercury from hauling of ADC (short tons/year)	NA	2.59E-09	5.16E-09	NA	0.002349983	0.004681246
	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) from hauling of ADC (short tons/yea	NA	NA	9.74E-14	NA	NA	8.83749E-08
	1,2,3,7,8-Pentachlorodibenzo-p-dioxin from hauling of ADC (short tons/year)	NA	NA	NA	NA	NA	NA
	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin from hauling of ADC (short tons/year)	NA	NA	NA	NA	NA	NA
	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin from hauling of ADC (short tons/year)	NA	NA	4.53E-14	NA	NA	4.1125E-08
	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin from hauling of ADC (short tons/year)	NA	NA	2.09E-13	NA	NA	1.89875E-07
	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin from hauling of ADC (short tons/year	NA	4.43E-13	1.83E-12	NA	4.01795E-07	1.66031E-06
	Octachlorodibenzo-p-dioxin from hauling of ADC (short tons/year)	NA	2.94E-12	7.07E-12	NA	2.67098E-06	6.40937E-06
	2,3,7,8-Tetrachlorodibenzofuran from hauling of ADC (short tons/year)	NA	2.15E-14	2.85E-12	NA	1.94775E-08	2.58125E-06
	1,2,3,7,8-Pentachlorodibenzofuran from hauling of ADC (short tons/year)	NA	4.51E-14	6.08E-13	NA	4.09449E-08	5.5125E-07
	2,3,4,7,8-Pentachlorodibenzofuran from hauling of ADC (short tons/year)	NA	1.37E-13	9.72E-13	NA	1.23983E-07	8.81562E-07
	1,2,3,4,7,8-Hexachlorodibenzofuran from hauling of ADC (short tons/year)	NA	9.28E-14	3.52E-13	NA	8.41857E-08	3.19375E-07
	1,2,3,6,7,8-Hexachlorodibenzofuran from hauling of ADC (short tons/year)	NA	1.03E-13	1.86E-13	NA	9.29869E-08	1.68656E-07
	1,2,3,7,8,9-Hexachlorodibenzofuran from hauling of ADC (short tons/year)	NA	NA	1.33E-13	NA	NA	1.20531E-07
	2,3,4,6,7,8-Hexachlorodibenzofuran from hauling of ADC (short tons/year)	NA	7.59E-14	NA	NA	6.88792E-08	NA
	1,2,3,4,6,7,8-Heptachlorodibenzofuran from hauling of ADC (short tons/year)	NA	4.19E-13	9.48E-13	NA	3.80366E-07	8.59687E-07
	1,2,3,4,7,8,9-Heptachlorodibenzofuran from hauling of ADC (short tons/year)	NA	2.45E-14	NA	NA	2.22327E-08	NA
	Octachlorodibenzofuran from hauling of ADC (short tons/year)	NA	7.34E-13	8.13E-13	NA	6.65832E-07	7.37187E-07
Other Pollutants of Concern Total	OPOCs (short tons/year)	NA	0.01	5.18E-09	NA	12820.76514	4.70E-03
	Dioxins/Furans	NA	5.04E-12	1.61E-11	NA		

Unit Conversions

short tons to g 907185

Global Warming Potentials to Convert to CO2e

	CO2	CH4	N2O
Global Warming Potential - 20-year time horizon	1	81.2	273
Global Warming Potential - 100-year time horizon	1	27.9	273

Washington Department of Ecology
Consumables Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Consumable	Activity	Annual Quanity as Reported	Unit	Engineering Assumptions	Source	CO2e EF	Unit	CO2e Emissions	Unit	Notes
Grate blocks	Heating	49,315	lbs	Likely comprised of a proprietary mix of metals (Assumed 1.5% Si, 1.1% Mn, 23.5% Cr, 2% Ni, 71.9% Fe). Recycled after use by WtE.	Jen Lennon (City of Spokane)	7.89	kg CO2e/kg	176.4	MT CO2e	
Side Blocks	Heating	8,752	lbs	Likely comprised of a proprietary mix of metals (Assumed 1.5% Si, 1.1% Mn, 23.5% Cr, 2% Ni, 71.9% Fe). Recycled after use by WtE.	Jen Lennon (City of Spokane)	7.89	kg CO2e/kg	31.3	MT CO2e	
Side Plates	Heating	6,325	lbs	Likely comprised of a proprietary mix of metals (Assumed 1.5% Si, 1.1% Mn, 23.5% Cr, 2% Ni, 71.9% Fe). Recycled after use by WtE.	Jen Lennon (City of Spokane)	7.89	kg CO2e/kg	22.6	MT CO2e	
Tension Rods	Heating	1,332	lbs	Likely comprised of mostly iron. Recycled after use by WtE.	Jen Lennon (City of Spokane)	1.74	kg CO2e/kg	1.1	MT CO2e	
2" Stainless Boiler Tube	Heating	12,467	lbs	Comprised of stainless steel. Recycled after use by WtE.	Jen Lennon (City of Spokane)	4.39	kg CO2e/kg	24.8	MT CO2e	Used a US based EPD for stainless steel sheets because stainless steel was not available in SimaPro
2.5" SS Boiler Tube	Heating	37,043	lbs	Comprised of stainless steel. Recycled after use by WtE.	Jen Lennon (City of Spokane)	4.39	kg CO2e/kg	73.8	MT CO2e	Used a US based EPD for stainless steel sheets because stainless steel was not available in SimaPro
Raw Steel	Heating	12,138	lbs	Non-galvanized steel plate. Recycled after use by WtE.	Jen Lennon (City of Spokane)	1.87	kg CO2e/kg	10.3	MT CO2e	
Sand Blast Sand	Heating	61,280	lbs	Sand	Jen Lennon (City of Spokane)	0.0462	kg CO2e/kg	1.3	MT CO2e	
Refractory Tile	Heating	6,247	lbs	Ceramic tiles	Jen Lennon (City of Spokane)	0.785	kg CO2e/kg	2.2	MT CO2e	
Insulation Blanket	Heating	1,300	sq ft	Glass wool and polypropylene textile (Assumed 1in thick, 90% glass wool, 10% polypropylene textile)	Jen Lennon (City of Spokane)	2.647	kg CO2e/kg	0.2	MT CO2e	
Plastic Ram Refractory	Heating	29,854	lbs	Silica carbide	Jen Lennon (City of Spokane)	7.00	kg CO2e/kg	94.8	MT CO2e	
SC80 Mortar Refractory	Heating	15,356	lbs	Silica carbide	Jen Lennon (City of Spokane)	7.00	kg CO2e/kg	48.8	MT CO2e	
Fabric Filter Bags	Pollution Control	684	filters	Baghouse filter (Assumed each filter = 16ft long & 5in diameter, polytetrafluoroethylene (PTFE))	Jen Lennon (City of Spokane)	137	kg CO2e/kg	209.7	MT CO2e	Chose tetrafluoroethylene because polytetrafluoroethylene was not available in SimaPro
Carbon	Pollution Control	62,800	lbs	Powder activated carbon	Jen Lennon (City of Spokane)	3.27	kg CO2e/kg	93.1	MT CO2e	
Anhydrous Ammonia	Pollution Control	314	tons	Assumed 19% ammonia in water	Jen Lennon (City of Spokane)	0.7207237	kg CO2e/kg	205.3	MT CO2e	
Lime	Pollution Control	4,154	tons	Pebble lime	Jen Lennon (City of Spokane)	0.0427	kg CO2e/kg	160.9	MT CO2e	
Sodium Hydroxide	Process Water Treatment	106	tons	50% lye in water	Jen Lennon (City of Spokane)	1.27	kg CO2e/kg	122.2	MT CO2e	
Hydrochloric Acid	Process Water Treatment	72	tons	28-36% hydrochloric acid in water	Jen Lennon (City of Spokane)	0.891	kg CO2e/kg	57.9	MT CO2e	
Oils Disposed	Various	668	gallons	Hydraulic oil. Composition assumed similar to lubrication oil	Jen Lennon (City of Spokane)	2.85	kg CO2e/kg	5.9	MT CO2e	CDM Smith SME expressed that mineral oil has a similar composition to hydraulic oils. An EF for the recycling of mineral oil was the closest we could identify in SimaPro
Oils Recycled	Various	804	gallons	Hydraulic oil. Composition assumed similar to lubrication oil. Recycled after use by WtE.	Jen Lennon (City of Spokane)	2.85	kg CO2e/kg	7.2	MT CO2e	CDM Smith SME expressed that mineral oil has a similar composition to hydraulic oils. An EF for the recycling of mineral oil was the closest we could identify in SimaPro
Grease	Various	651	pounds	Lubrication grease	Jen Lennon (City of Spokane)	2.85	kg CO2e/kg	0.8	MT CO2e	CDM Smith SME expressed that mineral oil has a similar composition to lubricating oils. An EF for the recycling of mineral oil was the closest we could identify in SimaPro
							WtE Total	1351	MT CO2e	

Washington Department of Ecology
Consumables Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Finely Buttes Landfill

Consumable	Activity	Annual Quanity as Reported	Unit	Consumable Characteristics	Source	CO2e EF	Unit	CO2e Emissions	Unit	Notes
NA										

Roosevelt Landfill

Consumable	Activity	Annual Quanity as Reported	Unit	Consumable Characteristics	Source	CO2e EF	Unit	CO2e Emissions	Unit	Notes
Tarps	Cover	14,205	kg	2 tarps/year		2.25	kg CO2e/kg	32	MT CO2e	
Convert methane to renewable natural gas	Processing renewable natural gas at Klickitat Public Utility District	5,018,535	kg			0.237	kg CO2e/kg	1189	MT CO2e	Emissions from transmission between Roosevelt and Klickitat PUD are considered negligible because the facilities are next to each other
							Roosevelt Total	1221	MT CO2e	

Wenatchee Landfill

Consumable	Activity	Annual Quanity as Reported	Unit	Consumable Characteristics	Source	CO2e EF	Unit	CO2e Emissions	Unit	Notes
Tarps	Cover	7102	kg	1 tarp/year		2.25	kg CO2e/kg	16	MT CO2e	

Unit Conversions:

g to kg	0.001
lbs to kg	0.4536
kg to metric tons	0.0010
short ton to kg	907.1850
ft2 to m2	0.0929
ft3 to m3	0.0283
liquid gallon to m3	0.0038
in to ft	0.0833

Density Conversions:

Insulation blanket (kg/m3)	29	source: https://www.insulationecoin.com/portfolio-items/glass-wool-blanket/ (took median of density range)
Oil (kg/m3)	825	source: https://www.machinerylubrication.com/Read/29319/measuring-relative-density (took median of density range)
Baghouse filters (g/m2)	1150	source: https://www.gore.com/resources/data-sheet-gore-remedia-catalytic-filter-bags

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Finley Buttes Landfill

Item transported	Activity	Mass Quantity	Unit	Material origin	One-Way Trip	Unit	Hauling Vehicle
Auto shredder fluff	Alternate daily cover	18,380	tons	Portland	178	miles	Combination Long Haul Truck - Diesel
Paper pulp	Alternate daily cover	42,886	tons	Eastern Washington	197	miles	Combination Long Haul Truck - Diesel

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Finley Buttes Landfill

Item transported	Vehicle Capacity Limit	Unit	Number of One-Way Trips Assumed per Year	Total Distance	Unit	CO2 EF	Unit	CO2 Emissions	Unit
Auto shredder fluff	19	tons/truck	967	344,382	VMT	1625.55	g/VMT	560	MT CO2
Paper pulp	19	tons/truck	2,257	889,330	VMT	1625.55	g/VMT	1,446	MT CO2
							Finley Buttes Total	2,005	MT CO2

CH4 EF	Unit	CH4 Emissions	Unit
0.02	g/VMT	0.01	MT CH4
0.02	g/VMT	0.02	MT CH4
	Finley Buttes Total	0.02	MT CH4

N2O EF	Unit	N2O Emissions	Unit
0.002	g/VMT	0.001	MT N2O
0.002	g/VMT	0.002	MT N2O
	Finley Buttes Total	0.002	MT N2O

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Finley Buttes Landfill

Item transported	VOC Emission Factor	Unit	VOC Emissions	Unit	NOx Emission Factor	Unit	NOx Emissions	Unit	CO Emission Factor	Unit	CO Emissions	Unit	SO2 Emission Factor	Unit
Auto shredder fluff	0.183	grams/VMT	0.063	MT	4.086	grams/VMT	1.407	MT	2.057	grams/VMT	0.708	MT	0.005	grams/VMT
Paper pulp	0.183	grams/VMT	0.162	MT	4.086	grams/VMT	3.634	MT	2.057	grams/VMT	1.829	MT	0.005	grams/VMT
				short ton				short ton				short ton		
			0.248	VOC			5.557	NOx			2.797	CO		

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Finley Buttes Landfill

Item transported	SO2 Emissions	Unit	Total_PM10 Emission Factor	Unit	Total_PM10 Emissions	Unit	TotalPM_25 Emission Factor	Unit	TotalPM_25 Emissions	Unit	Ammonia Emission Factor	Unit	Ammonia Emissions	Unit
Auto shredder fluff	0.002	MT	0.178	grams/VMT	0.061	MT	0.081	grams/VMT	0.028	MT	0.034	grams/VMT	0.012	MT
Paper pulp	0.005	MT	0.178	grams/VMT	0.158	MT	0.081	grams/VMT	0.072	MT	0.034	grams/VMT	0.030	MT
		short ton				short ton				short ton				short ton
	0.007	SO2			0.242	PM10			0.111	PM2.5			0.046	Ammonia

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Finley Buttes Landfill

Item transported	Mercury Emission Factor	Unit	Mercury Emissions	Unit	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Factor (milligrams/VMT)	Unit	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emissions	Unit	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Unit
Auto shredder fluff	1.10E-08	grams/VMT	3.79E-09	MT	0	milligrams/VMT	0.00E+00	MT	0	milligrams/VMT
Paper pulp	1.10E-08	grams/VMT	3.79E-09	MT	0	milligrams/VMT	0.00E+00	MT	0	milligrams/VMT
				short ton				Tetrachlorodibenzo-p-dioxin		
			8.35E-09	Mercury			0.00E+00			

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Finley Buttes Landfill

Item transported	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emissions	Unit	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Unit	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emissions	Unit	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Unit	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emissions	Unit
Auto shredder fluff	0.00E+00	MT	0	milligrams/VMT	0.00E+00	MT	0	milligrams/VMT	0.00E+00	MT
Paper pulp	0.00E+00	MT	0	milligrams/VMT	0.00E+00	MT	0	milligrams/VMT	0.00E+00	MT
	0.00E+00	Pentachlorodibenzo-p-dioxin			0.00E+00	Hexachlorodibenzo-p-dioxin			0.00E+00	Hexachlorodibenzo-p-dioxin

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Finley Buttes Landfill

Item transported	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Unit	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emissions	Unit	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Unit	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emissions	Unit	Octachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Unit	Octachlorodibenzo-p-dioxin Emissions	Unit
Auto shredder fluff	0	milligrams/VMT	0.00E+00	MT	1.05E-09	milligrams/VMT	3.62E-13	MT	6.98E-09	milligrams/VMT	2.40E-12	MT
Paper pulp	0	milligrams/VMT	0.00E+00	MT	1.05E-09	milligrams/VMT	9.34E-13	MT	6.98E-09	milligrams/VMT	6.21E-12	MT
			0.00E+00	Hexachlorodibenzo-p-			1.43E-12	1,2,3,4,6,7,8-			9.49E-12	Octachlorodibenzo-p-

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Finley Buttes Landfill

Item transported	2,3,7,8-Tetrachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	2,3,7,8-Tetrachlorodibenzofuran Emissions	Unit	1,2,3,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	1,2,3,7,8-Pentachlorodibenzofuran Emissions	Unit	2,3,4,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	2,3,4,7,8-Pentachlorodibenzofuran Emissions	Unit
Auto shredder fluff	5.09E-11	milligrams/VMT	1.75E-14	MT	1.07E-10	milligrams/VMT	3.68E-14	MT	3.24E-10	milligrams/VMT	1.12E-13	MT
Paper pulp	5.09E-11	milligrams/VMT	4.53E-14	MT	1.07E-10	milligrams/VMT	9.52E-14	MT	3.24E-10	milligrams/VMT	2.88E-13	MT
			6.92E-14	2,3,7,8-Tetrachloro			1.46E-13	1,2,3,7,8-Pentachlor			4.41E-13	2,3,4,7,8-Pentachloro

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Finley Buttes Landfill

Item transported	1,2,3,4,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	1,2,3,4,7,8-Hexachlorodibenzofuran Emissions	Unit	1,2,3,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	1,2,3,6,7,8-Hexachlorodibenzofuran Emissions	Unit	1,2,3,7,8,9-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	1,2,3,7,8,9-Hexachlorodibenzofuran Emissions	Unit
Auto shredder fluff	2.20E-10	milligrams/VMT	7.58E-14	MT	2.43E-10	milligrams/VMT	8.37E-14	MT	0	milligrams/VMT	0.00E+00	MT
Paper pulp	2.20E-10	milligrams/VMT	1.96E-13	MT	2.43E-10	milligrams/VMT	2.16E-13	MT	0	milligrams/VMT	0.00E+00	MT
			2.99E-13	1,2,3,4,7,8-Hexachloro			3.30E-13	1,2,3,6,7,8-Hexachloro			0.00E+00	Hexachloro dibenzofur

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Finley Buttes Landfill

Item transported	2,3,4,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	2,3,4,6,7,8-Hexachlorodibenzofuran Emissions	Unit	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emissions	Unit	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emissions	Unit
Auto shredder fluff	1.80E-10	milligrams/VMT	6.20E-14	MT	9.94E-10	milligrams/VMT	3.42E-13	MT	5.81E-11	milligrams/VMT	2.00E-14	MT
Paper pulp	1.80E-10	milligrams/VMT	1.60E-13	MT	9.94E-10	milligrams/VMT	8.84E-13	MT	5.81E-11	milligrams/VMT	5.17E-14	MT
			2.45E-13	Hexachlorodibenzofuran			1.35E-12	1,2,3,4,6,7,8-			7.90E-14	1,2,3,4,7,8,9-

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Finley Buttes Landfill

Item transported	Octachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	Octachlorodibenzofuran Emissions	Unit
Auto shredder fluff	1.74E-09	milligrams /VMT	5.99E-13	MT
Paper pulp	1.74E-09	milligrams /VMT	1.55E-12	MT
			2.37E-12	Octachloro dibenzofur

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Roosevelt Landfill

Item transported	Activity	Average Mass Quantity	Unit	Material origin	One-Way Trip	Unit	Hauling Vehicle
Contaminated soils	Alternate daily cover	175,000	tons	Seattle	300	miles	Rail

Mass Quantity	Unit	Backhauled Mass Quantity
350,000	tons	0

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Roosevelt Landfill

Item transported	Railroad factor (to account for back-hauling)	Unit	Round Trip VMT (accounts for back-hauling)	Total Distance	Unit	CO2 EF	Unit	CO2 Emissions	Unit
Contaminated soils	2	N/A	600	N/A	N/A	0.0210	kg/ton-mile	2,205	MT CO2

CH4 EF	Unit	CH4 Emissions	Unit
0.0016	g/ton-mile	0.17	MT CH4

N2O EF	Unit	N2O Emissions	Unit
0.0005	g/ton-mile	0.05	MT N2O

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Roosevelt Landfill

Item transported	VOC Emission Factor	Unit	VOC Emissions	Unit	NOx Emission Factor	Unit	NOx Emissions	Unit	CO Emission Factor	Unit	CO Emissions	Unit	SO2 Emission Factor	Unit
Contaminated soils	0.013	grams/ton-mile	0.67	MT	0.279	grams/ton-mile	14.63	MT	0.053	grams/ton-mile	2.80	MT	0.0002	grams/ton-mile
				short ton				short ton				short ton		
			0.735	VOC			16.130	NOx			3.082	CO		

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Roosevelt Landfill

Item transported	SO2 Emissions	Unit	Total_PM10 Emission Factor	Unit	Total_PM10 Emissions	Unit	TotalPM_25 Emission Factor	Unit	TotalPM_25 Emissions	Unit	Ammonia Emission Factor	Unit	Ammonia Emissions	Unit
Contaminated soils	0.01	MT	0.008	grams/ton-mile	0.44	MT	0.008	grams/ton-mile	0.42	MT	NA	NA	NA	NA
		short ton				short ton				short ton				short ton
	0.011	SO2			0.481	PM10			0.467	PM2.5			NA	Ammonia

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Roosevelt Landfill

Item transported	Mercury Emission Factor	Unit	Mercury Emissions	Unit	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Factor	Unit	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emissions	Unit	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Unit
Contaminated soils	2.14E-07	grams/gallon	4.494E-08	MT	4.04E-12	grams/gallon	8.484E-13	MT	0	grams/gallon
			4.95E-08	short ton Mercury			9.35E-13	short ton 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)		

Roosevelt Landfill

Item transported	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emissions	Unit	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Unit	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emissions	Unit	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Unit	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emissions	Unit
Contaminated soils	0	MT	0	grams/gallon	0		1.88E-12	grams/gallon	3.948E-13	MT
	0.00E+00	short ton 1,2,3,7,8-Pentachlorodibenzo-p-dioxin			0.00E+00	short ton 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin			4.35E-13	short ton 1,2,3,6 dioxin

Roosevelt Landfill

Item transported	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Unit	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emissions	Unit	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Unit	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emissions	Unit	Octachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Unit	Octachlorodibenzo-p-dioxin Emissions	Unit
Contaminated soils	8.68E-12	grams/gallon	1.823E-12	MT	7.59E-11	grams/gallon	1.594E-11	MT	2.93E-10	grams/gallon	6.153E-11	MT
	,7,8-Hexachlorodibenzo-p-		2.01E-12	short ton 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin			1.76E-11	short ton 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin			6.78E-11	short ton Octa

Roosevelt Landfill

Item transported	2,3,7,8-Tetrachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	2,3,7,8-Tetrachlorodibenzofuran Emissions	Unit	1,2,3,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	1,2,3,7,8-Pentachlorodibenzofuran Emissions	Unit	2,3,4,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	2,3,4,7,8-Pentachlorodibenzofuran Emissions	Unit
Contaminated soils	1.18E-10	grams/gallon	2.478E-11	MT	2.52E-11	grams/gallon	5.292E-12	MT	4.03E-11	grams/gallon	8.463E-12	MT
	chlorodibenzo-p-dioxin		2.73E-11	short ton 2,3,7,8-Tetrachlorodibenzofuran			5.83E-12	short ton 1,2,3,7,8-Pentachlorodibenzofuran			9.33E-12	short ton 2,3,4 Pentachlorodi

Roosevelt Landfill

Item transported	1,2,3,4,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	1,2,3,4,7,8-Hexachlorodibenzofuran Emissions	Unit	1,2,3,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	1,2,3,6,7,8-Hexachlorodibenzofuran Emissions	Unit	1,2,3,7,8,9-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	1,2,3,7,8,9-Hexachlorodibenzofuran Emissions	Unit
Contaminated soils	1.46E-11	grams/gallon	3.066E-12	MT	7.71E-12	grams/gallon	1.619E-12	MT	5.51E-12	grams/gallon	1.157E-12	MT
	1,7,8-benzofuran		3.38E-12	short ton 1,2,3,4,7,8-Hexachlorodibenzofuran			1.78E-12	short ton 1,2,3,6,7,8-Hexachlorodibenzofuran			1.28E-12	short ton 1,2 Hexachlorod

Roosevelt Landfill

Item transported	2,3,4,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	2,3,4,6,7,8-Hexachlorodibenzofuran Emissions	Unit	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emissions	Unit	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emissions	Unit
Contaminated soils	0	grams/gallon	0	MT	3.93E-11	grams/gallon	8.253E-12	MT	0	grams/gallon	0	MT
	,3,7,8,9-ibenzofuran		0.00E+00	short ton 2,3,4,6,7,8-Hexachlorodibenzofuran			9.10E-12	short ton 1,2,3,4,6,7,8-Heptachlorodibenzofuran			0.00E+00	short ton 1,2,Heptachlorod

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Roosevelt Landfill

Item transported	Octachlorodibenzofuran Emission Factor (milligrams/VMT)	Unit	Octachlorodibenzofuran Emissions	Unit
Contaminated soils	3.37E-11	grams/gallon	7.08E-12	MT
	3,4,7,8,9-ibenzofuran		7.80E-12	Octachlorodibenzofur

Washington Department of Ecology
Hauling Calculations
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Wenatchee Landfill

Item transported	Activity	Mass Quantity	Unit	Material origin
NA				

Assumptions

Truck Capacity	19	tons/truck

Unit Conversions

MT to kg	1000		
kg to g	1000		
MT to short ton	1.10231		
g to mg	1000		
BNSF Fuel Efficiency	500	ton-miles/gallon	https://www.bnsf.com/ship-with-bnsf/sustainability-customers/pdf/orange-is-new-green-cp.pdf

Washington Department of Ecology
Emission Factors for Consumables
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Consumable	Landfill or WTE	Market or Transformation?	Name in EcoInvent	CO2e EF	Unit	Description
Anhydrous Ammonia	WTE	market	ammonia, anhydrous, liquid {RNA}| market for ammonia, anhydrous, liquid | Cut-off, U 81% - Tap water {GLO}| market group for | Cut-off, U 19% - ammonia, anhydrous, liquid {RNA}| market for ammonia, anhydrous, liquid | Cut-off, U	3.79	kg CO2e/kg	This dataset is a consumption mix, representing the supply of ''ammonia, anhydrous, liquid'' from activities that produce it, to activities that consume it within the geography of this dataset, Northern America. Included activities start: This activity starts at the gate of the activities that produce ''ammonia, anhydrous, liquid'' with the product ready for transportation. Included activities end: This activity ends with the supply of 1 kg of ''ammonia, anhydrous, liquid'' to the consumers of this product within the geography of Northern America. Transport is included.
Anhydrous Ammonia	WTE	market		0.7207237	kg CO2e/kg	hybrid emission factor
Carbon	WTE	market	Activated carbon, granular {GLO}| market activated carbon, granular | Cut-off, U	3.27	kg CO2e/kg	This dataset represents the supply of 1 kg of activated carbon, granular from activities that produce it within the geography of this dataset. Included activities start: This activity starts at the gate of the activities that produce activated carbon, granular within the geography of this dataset, with the product ready for transportation. Included activities end: This activity ends with the supply of 1 kg of activated carbon, granular to the consumers of this product. Transport is included. Product losses during transportation are assumed negligible and are therefore not included.
Sodium Hydroxide	WTE	market	Sodium Hydroxide, without water, in 50% solution state {GLO}| market for | Cut-off, U	1.27	kg CO2e/kg	This is a constrained market. The justification for a market constraint is included in the comment field of the conditional exchange. Production volume: 62165536768 kg Sodium hydroxide, without water, in 50% solution state {CA-QC}| chlor-alkali electrolysis, membrane cell | Cut-off, U Sodium hydroxide, without water, in 50% solution state {RER}| chlor-alkali electrolysis, diaphragm cell | Cut-off, U Sodium hydroxide, without water, in 50% solution state {RER}| chlor-alkali electrolysis, membrane cell | Cut-off, U Sodium hydroxide, without water, in 50% solution state {RER}| chlor-alkali electrolysis, mercury cell | Cut-off, U Sodium hydroxide, without water, in 50% solution state {RoW}| chlor-alkali electrolysis, diaphragm cell | Cut-off, U Sodium hydroxide, without water, in 50% solution state {RoW}| chlor-alkali electrolysis, membrane cell | Cut-off, U Sodium hydroxide, without water, in 50% solution state {RoW}| chlor-alkali electrolysis, mercury cell | Cut-off, U Transport, freight train {GLO}| market group for | Cut-off, U Transport, freight, inland waterways, barge {GLO}| market group for transport, freight, inland waterways, barge | Cut-off, U Transport, freight, lorry, unspecified {GLO}| market group for transport, freight, lorry, unspecified | Cut-off, U transport, freight, sea, container ship {GLO}| market for transport, freight, sea, container ship | Cut-off, U
Lime	WTE	Market	Lime {RoW} | market for lime | Cut-off, U	0.0427	kg CO2e/kg	Lime {CA-QC}| lime production, milled, loose | Cut-off, U lime {GLO}| zinc mine operation | Cut-off, U Lime {RoW}| production, milled, loose | Cut-off, U Transport, freight, lorry, unspecified {RoW}| market for transport, freight, lorry, unspecified | Cut-off, U transport, freight, lorry, unspecified {ZA}| market for transport, freight, lorry, unspecified | Cut-off, U
oils	WTE	market	waste mineral oil {RoW}| treatment of waste mineral oil, hazardous waste incineration, with energy recovery | Cut-off, U	2.85	kg CO2e/kg	Inventoried waste contains 100% waste oil; . waste composition (wet, in ppm): upper heating value 41.8 MJ/kg; lower heating value 34.7 MJ/kg; H2O 100000; O n.a.; H 120000; C 778270; S n.a.; N n.a.; P 750; B n.a.; Cl n.a.; Br n.a.; F n.a.; I n.a.; Ag n.a.; As 1.2; Ba n.a.; Cd 0.8; Co n.a.; Cr 11.2; Cu 100; Hg 0.0012; Mn n.a.; Mo n.a.; Ni 3.2; Pb 184; Sb n.a.; Se n.a.; Sn n.a.; V n.a.; Zn 680; Be n.a.; Sc n.a.; Sr n.a.; Ti n.a.; Tl 0.6; W n.a.; Si n.a.; Fe n.a.; Ca n.a.; Al n.a.; K n.a.; Mg n.a.; Na n.a.; Share of carbon in waste that is biogenic 0%. Net energy produced in HWI: 25.82MJ/kg thermal energy and 2.44MJ/kg electric energy. Allocation of energy production: no substitution or expansion. 100% of burden allocated to waste disposal function of HWI. One kg of this waste produces 0.01143 kg of residues, which are landfilled. Additional solidification with 0.004571 kg of cement. Included activities start: Included activities end: waste-specific air and water emissions from incineration, auxiliary material consumption for flue gas cleaning. Short-term emissions to river water and long-term emissions to ground water from residual material landfill (from solidified fly ashes and scrubber slugde). Process energy demands for HWI.

Consumable	Landfill or WTE	Market or Transformation?	Name in EcoInvent	CO2e EF	Unit	Description
Grate blocks/Side blocks/Tension rods/side plates	WTE	market	Manganese {GLO}| market for | Cut-off, U	5.43	kg CO2e/kg	Manganese {GLO}| treatment of non-Fe-Co-metals, from used Li-ion battery, hydrometallurgical processing | Cut-off, U Manganese {RER}| production | Cut-off, U Manganese {RoW}| production | Cut-off, U Transport, freight train {GLO}| market group for | Cut-off, U Transport, freight, inland waterways, barge {GLO}| market group for transport, freight, inland waterways, barge | Cut-off, U Transport, freight, lorry, unspecified {GLO}| market group for transport, freight, lorry, unspecified | Cut-off, U transport, freight, sea, container ship {GLO}| market for transport, freight, sea, container ship | Cut-off, U
Grate blocks/Side blocks/Tension rods/side plates	WTE	market	Chromium {GLO}| market for | Cut-off, U	26.3	kg CO2e/kg	Chromium {RER}| production | Cut-off, U Chromium {RoW}| production | Cut-off, U Transport, freight train {GLO}| market group for | Cut-off, U Transport, freight, lorry, unspecified {GLO}| market group for transport, freight, lorry, unspecified | Cut-off, U transport, freight, sea, container ship {GLO}| market for transport, freight, sea, container ship | Cut-off, U
Grate blocks/Side blocks/Tension rods/side plates	WTE	market	23.5% - Chromium {GLO}| market for | Cut-off, U 1.1% - Manganese {GLO}| market for | Cut-off, U 2% - Nickel, class 1 {GLO}| market for nickel, class 1 | APOS, S 71.9% - Cast iron {GLO}| market for | Cut-off, U 1.5% - Silica sand {GLO}| market for | Cut-off, U	7.886483	kg CO2e/kg	hybrid emission factor
Grate blocks/Side blocks/Tension rods/side plates	WTE	market	Cast iron {GLO}| market for | Cut-off, U	1.74	kg CO2e/kg	In this market, expert judgement was used to develop product specific transport distance estimations.
Grate blocks/Side blocks/Tension rods/side plates	WTE	market	Reinforcing steel {GLO}| market for | Cut-off, U	1.87	kg CO2e/kg	In this market, expert judgement was used to develop product specific transport distance estimations.
Sand blast sand	WTE	market	Silica sand {GLO}| market for | Cut-off, U	0.0462	kg CO2e/kg	Silica sand {DE}| production | Cut-off, U Silica sand {GLO}| cryolite production, from fluosilicic acid | Cut-off, U Silica sand {RoW}| production | Cut-off, U Transport, freight train {GLO}| market group for | Cut-off, U Transport, freight, inland waterways, barge {GLO}| market group for transport, freight, inland waterways, barge | Cut-off, U Transport, freight, light commercial vehicle {GLO}| market group for transport, freight, light commercial vehicle | Cut-off, U Transport, freight, lorry, unspecified {GLO}| market group for transport, freight, lorry, unspecified | Cut-off, U transport, freight, sea, bulk carrier for dry goods {GLO}| market for transport, freight, sea, bulk carrier for dry goods | Cut-off, U
Refractory Tile	WTE	market	Ceramic tile {GLO}| market for | Cut-off, U	0.785	kg CO2e/kg	Ceramic tile {CH}| production | Cut-off, U Ceramic tile {RoW}| production | Cut-off, U Transport, freight train {GLO}| market group for | Cut-off, U Transport, freight, light commercial vehicle {GLO}| market group for transport, freight, light commercial vehicle | Cut-off, U Transport, freight, lorry, unspecified {GLO}| market group for transport, freight, lorry, unspecified | Cut-off, U

Consumable	Landfill or WTE	Market or Transformation?	Name in EcoInvent	CO2e EF	Unit	Description
Insulation blanket	WTE	market	Glass wool mat {GLO}| market for | Cut-off, U	2.63	kg CO2e/kg	Glass wool mat {CA-QC}| production | Cut-off, U Glass wool mat {CH}| production | Cut-off, U Glass wool mat {GLO}| production, without cullet | Cut-off, U Glass wool mat {RoW}| production | Cut-off, U Transport, freight train {GLO}| market group for | Cut-off, U Transport, freight, inland waterways, barge {GLO}| market group for transport, freight, inland waterways, barge | Cut-off, U Transport, freight, light commercial vehicle {GLO}| market group for transport, freight, light commercial vehicle | Cut-off, U Transport, freight, lorry, unspecified {GLO}| market group for transport, freight, lorry, unspecified | Cut-off, U
Insulation blanket	WTE	market	textile, non-woven polypropylene {GLO}| market for textile, non woven polypropylene | Cut-off, U	2.8	kg CO2e/kg	This dataset represents the supply of textile, non-woven polypropylene from activities that produce it within the geography of this dataset. Included activities start: This activity starts at the gate of the activities that produce textile, non-woven polypropylene within the geography of this dataset, with the product ready for transportation. Included activities end: This activity ends with the supply of textile, non-woven polypropylene to the consumers of this product. Transport is included. Product losses during transportation are assumed negligible and are therefore not included.
Insulation blanket	WTE	market	90% - Glass wool mat {GLO}| market for | Cut-off, U 10% - textile, non-woven polypropylene {GLO}| market for textile, non woven polypropylene | Cut-off, U	2.647	kg CO2e/kg	hybrid emission factor
Plastic Ram Refractory/SC80 Mortar Refractory	WTE	market	Silicon carbide {GLO}| market for | Cut-off, U	7	kg CO2e/kg	Silicon carbide {RER}| production | Cut-off, U Silicon carbide {RER}| treatment of spent sawing slurry from Si-wafer cutting | Cut-off, U Silicon carbide {RoW}| production | Cut-off, U Silicon carbide {RoW}| treatment of spent sawing slurry from Si-wafer cutting | Cut-off, U Transport, freight train {GLO}| market group for | Cut-off, U Transport, freight, light commercial vehicle {GLO}| market group for transport, freight, light commercial vehicle | Cut-off, U Transport, freight, lorry, unspecified {GLO}| market group for transport, freight, lorry, unspecified | Cut-off, U
Fabric filter bags	WTE	market	Tetrafluoroethylene {GLO}| market for | Cut-off, U	137	kg CO2e/kg	Included activities start: This activity starts at the gate of the activities that produce tetrafluoroethylene within the geography of this dataset, with the product ready for transportation. Included activities end: This activity ends with the supply of 1 kg of tetrafluoroethylene to the consumers of this product. Transport is included. Product losses during transportation are assumed negligible and are therefore not included.
Landfill tarps	landfills	market	Polyethylene, high density, granulate {GLO}| market for | Cut-off, U	2.25	kg CO2e/kg	Polyethylene, high density, granulate {CH}| polyethylene, high density, granulate, recycled to generic market for high density PE granulate | Cut-off, U Polyethylene, high density, granulate {Europe without Switzerland}| polyethylene, high density, granulate, recycled to generic market for high density PE granulate | Cut-off, U Polyethylene, high density, granulate {RER}| production | Cut-off, U Polyethylene, high density, granulate {RoW}| production | Cut-off, U Polyethylene, high density, granulate {RoW}| polyethylene, high density, granulate, recycled to generic market for high density PE granulate | Cut-off, U Polyethylene, high density, granulate {US}| polyethylene, high density, granulate, recycled to generic market for high density PE granulate | Cut-off, U Transport, freight train {GLO}| market group for | Cut-off, U Transport, freight, lorry, unspecified {GLO}| market group for transport, freight, lorry, unspecified | Cut-off, U transport, freight, sea, container ship {GLO}| market for transport, freight, sea, container ship | Cut-off, U

Consumable	Landfill or WTE	Market or Transformation?	Name in EcoInvent	CO2e EF	Unit	Description
Hydrochloric Acid	WTE	market	Hydrochloric acid, without water, in 30% solution state {RoW}| market for | Cut-off, U	0.891	kg CO2e/kg	Hydrochloric acid, without water, in 30% solution state {CA-QC}| hydrochloric acid production, from the reaction of hydrogen with chlorine | Cut-off, U Hydrochloric acid, without water, in 30% solution state {GLO}| tetrafluoroethane production | Cut-off, U Hydrochloric acid, without water, in 30% solution state {RoW}| allyl chloride production, reaction of propylene and chlorine | Cut-off, U Hydrochloric acid, without water, in 30% solution state {RoW}| benzene chlorination | Cut-off, U Hydrochloric acid, without water, in 30% solution state {RoW}| hydrochloric acid production, from the reaction of hydrogen with chlorine | Cut-off, U Hydrochloric acid, without water, in 30% solution state {RoW}| Mannheim process | Cut-off, U Hydrochloric acid, without water, in 30% solution state {RoW}| tetrafluoroethylene production | Cut-off, U Transport, freight train {CN}| market for | Cut-off, U transport, freight train {IN}| market for transport, freight train | Cut-off, U Transport, freight train {RoW}| market for | Cut-off, U Transport, freight train {US}| market for | Cut-off, U transport, freight train {ZA}| market for transport, freight train | Cut-off, U Transport, freight, inland waterways, barge {RoW}| market for transport, freight, inland waterways, barge | Cut-off, U Transport, freight, lorry, unspecified {RoW}| market for transport, freight, lorry, unspecified | Cut-off, U transport, freight, lorry, unspecified {ZA}| market for transport, freight, lorry, unspecified | Cut-off, U transport, freight, sea, container ship {GLO}| market for transport, freight, sea, container ship | Cut-off, U
Water	WTE	market	Tap water {GLO}| market group for | Cut-off, U	0.00077	kg CO2e/kg	tap water {BR}| market for tap water | Cut-off, U Tap water {CA-QC}| market for | Cut-off, U tap water {CO}| market for tap water | Cut-off, U tap water {IN}| market for tap water | Cut-off, U tap water {PE}| market for tap water | Cut-off, U Tap water {RER}| market group for | Cut-off, U Tap water {RoW}| market for | Cut-off, U tap water {ZA}| market for tap water | Cut-off, U
Biogas purification to biomethane	Roosevelt Landfill	transformation	biomethane, high pressure {CH}| biogas purification to biomethane by pressure swing adsorption | Cut-off, U	0.237	kg CO2e/kg	Emissions are calculated based on a) the composition of the biogas entering the process, b) the composition of biomethane being produced and the fugitive emissions of CH4 (on the basis of the biomethane produced). The composition of the biogas is the following: CH4: 63.3% v/v and CO2: 33.4% v/v, N: 3.2% v/v and H2S: 0.0005% v/v. The composition of the biomethane is the following: CH4: 96% v/v, CO2: 2% v/v, N: 1% v/v, H2S: 0.0003% v/v. Fugitive emissions for this type of upgrading technology have been measured to be 1.25% of CH4 in biogas. Nitrogen and hydrogen sulfide in the biogas, exit the process as emissions to air. Density of CO2 and CH4 considered to be: 1.977 kg/m3 and 0.708 kg/m3 respectively.

Emission Factors from EPA MOVES3

Year	Vehicle	Fuel	CO2 Emission Factor (grams/VMT)	CH4 Emission Factor (grams/VMT)	N2O Emission Factor (grams/VMT)	VOC Emission Factor (grams/VMT)	NOx Emission Factor (grams/VMT)	CO Emission Factor (grams/VMT)	SO2 Emission Factor (grams/VMT)	Total_PM10 Emission Factor (grams/VMT)	TotalPM_25 Emission Factor (grams/VMT)
2024	Single Unit Short-haul Truck	Gasoline	1,101	0.049	0.0291	0.7946	0.4676	9.2035	0.0073	0.0902	0.0291
2024	Single Unit Short-haul Truck	Diesel Fuel	1,014	0.058	0.0051	0.1840	1.9437	1.2529	0.0034	0.1455	0.0504
2024	Single Unit Long-haul Truck	Gasoline	1,026	0.024	0.0088	0.5496	0.3016	7.0379	0.0068	0.0686	0.0188
2024	Single Unit Long-haul Truck	Diesel Fuel	929	0.016	0.0033	0.1114	1.6270	1.0966	0.0031	0.1258	0.0473
2024	Combination Short-haul Tru	Gasoline	1,602	0.333	0.0000	6.1111	6.0000	109.0000	0.0000	0.2222	0.0000
2024	Combination Short-haul Tru	Diesel Fuel	1,625	0.024	0.0029	0.1800	3.8652	1.9100	0.0054	0.1808	0.0744
2024	Combination Long-haul Truc	Diesel Fuel	1,626	0.020	0.0020	0.1825	4.0864	2.0570	0.0054	0.1776	0.0813

Source: EPA MOVES3

Emission Factors from EPA MOVES3

Year	Vehicle	Fuel	Ammonia Emission Factor (grams/VMT)	Mercury Emission Factor (Elemental Gaseous Phase + Reactive Gaseous Phase + Particulate Phase) (g/VMT)	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Factor (milligrams/VMT)	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Octachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)
2024	Single Unit Short-haul Truck	Gasoline	0.0555								
2024	Single Unit Short-haul Truck	Diesel Fuel	0.0328								
2024	Single Unit Long-haul Truck	Gasoline	0.0529								
2024	Single Unit Long-haul Truck	Diesel Fuel	0.0316								
2024	Combination Short-haul Tru	Gasoline	0.0000								
2024	Combination Short-haul Tru	Diesel Fuel	0.0351								
2024	Combination Long-haul Truc	Diesel Fuel	0.0335	1.10E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-09	6.98E-09
Source: EPA MOVES3				Source: EPA MOVES, Air Toxic Emissions from Onroad Vehicles in MOVES3, Table 3-6 (https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1010TJM.pdf)	Source: EPA MOVES, Air Toxic Emissions from Onroad Vehicles in MOVES3, Table 3-7 (https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1010TJM.pdf)						

Emission Factors from EPA MOVES3

Year	Vehicle	Fuel	2,3,7,8-Tetrachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)	2,3,4,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,7,8,9-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	2,3,4,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)	Octachlorodibenzofuran Emission Factor (milligrams/VMT)
2024	Single Unit Short-haul Truck	Gasoline										
2024	Single Unit Short-haul Truck	Diesel Fuel										
2024	Single Unit Long-haul Truck	Gasoline										
2024	Single Unit Long-haul Truck	Diesel Fuel										
2024	Combination Short-haul Tru	Gasoline										
2024	Combination Short-haul Tru	Diesel Fuel										
2024	Combination Long-haul Truc	Diesel Fuel	5.09E-11	1.07E-10	3.24E-10	2.2E-10	2.43E-10	0.00E+00	1.8E-10	9.94E-10	5.81E-11	1.74E-09

Source: EPA MOVES3

Emission Factors from EPA Emission Factor Hub

Emission Factors from EPA Technical Highlights (used EFs calculated in Waste Hauling spreadsheet, tab 'Locomotive Emission Factors')

Year	Vehicle	Fuel	CO2 Emission Factor (kilograms/ton-mile)	CH4 Emission Factor (grams/ton-mile)	N2O Emission Factor (grams/ton-mile)	VOC Emission Factor (grams/ton-mile)	NOx Emission Factor (grams/ton-mile)	CO Emission Factor (grams/ton-mile)	SO2 Emission Factor (grams/ton-mile)	Total_PM10 Emission Factor (grams/ton-mile)	TotalPM_25 Emission Factor (grams/ton-mile)
2024	Rail	Diesel	0.0210	0.0016	0.0005	0.0127034	0.27872	0.053248	0.0001932	0.00832	0.0080704

Source: EPA GHG Emission Factors Hub, Table 8 (https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf)

Source: EPA Office of Transportation and Air Quality, Table 1 and Table 3 (https://nepis.epa.gov/Exe/ZyPDF.cgi/P100500B.PDF?Dockey=P100500B.pdf)

Emission Factors from EPA Emission Factor Hub

Speciation Profiles and Toxic Emission Factors for Nonroad Engines in MOVES3 (used EFs calculated in Waste Hauling spreadsheet, tab 'Locomotive Emission Factors')

Year	Vehicle	Fuel	Ammonia Emission Factor (g/gallon)	Mercury Emission Factor (g/gallon)	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Factor (g/gallon)	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Factor (g/gallon)	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (g/gallon)	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (g/gallon)	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Factor (g/gallon)	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Factor (g/gallon)	Octachlorodibenzo-p-dioxin Emission Factor (g/gallon)
2024	Rail	Diesel	NA	2.14E-07	4.04E-12	0	0	1.88E-12	8.68E-12	7.59E-11	2.93E-10

Source: EPA GHG Emission Factors Hub, Table 8 (https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf)

Source: EPA MOVES, Speciation Profiles and Toxic Emission Factors for Nonroad Engines in MOVES3, Table 3-6 and Table 3-7 (https://www.epa.gov/system/files/documents/2022-07/420r22015.pdf)

Emission Factors from EPA Emission Factor Hub

Year	Vehicle	Fuel	2,3,7,8-Tetrachlorodibenzofuran Emission Factor (g/gallon)	1,2,3,7,8-Pentachlorodibenzofuran Emission Factor (g/gallon)	2,3,4,7,8-Pentachlorodibenzofuran Emission Factor (g/gallon)	1,2,3,4,7,8-Hexachlorodibenzofuran Emission Factor (g/gallon)	1,2,3,6,7,8-Hexachlorodibenzofuran Emission Factor (g/gallon)	1,2,3,7,8,9-Hexachlorodibenzofuran Emission Factor (g/gallon)	2,3,4,6,7,8-Hexachlorodibenzofuran Emission Factor (g/gallon)	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Factor (g/gallon)	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Factor (g/gallon)	Octachlorodibenzofuran Emission Factor (g/gallon)
2024	Rail	Diesel	1.18E-10	2.52E-11	4.03E-11	1.46E-11	7.71E-12	5.51E-12	0	3.93E-11	0	3.37E-11

Source: EPA GHG Emission Factors Hub, Table 8 (https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf)

Washington Department of Ecology
Emission Factor for Klickitat PUD
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Roosevelt data from LandGEM:

Year	Waste Accepted		Waste-In-Place		**Total landfill gas**		
	(Mg/year)	(short tons	(Mg)	(short tons	(Mg/year)	**(m3/year)**	(short tons/year)
2024	227272.7	250000	0	0	0	0	0
2025	227272.7	250000	227272.7	250000	1125.141	900960.7	1237.655
2026	227272.7	250000	454545.5	500000	2228.003	1784081	2450.803
2027	227272.7	250000	681818.2	750000	3309.026	2649715	3639.929
2028	227272.7	250000	909090.9	1000000	4368.644	3498207	4805.508
2029	227272.7	250000	1136364	1250000	5407.28	4329899	5948.008
2030	227272.7	250000	1363636	1500000	6425.35	5145122	7067.884
2031	227272.7	250000	1590909	1750000	7423.26	5944202	8165.586
2032	227272.7	250000	1818182	2000000	8401.411	6727460	9241.552
2033	227272.7	250000	2045455	2250000	9360.192	7495208	10296.21
2034	227272.7	250000	2272727	2500000	10299.99	8247753	11329.99
2035	227272.7	250000	2500000	2750000	11221.18	8985398	12343.29
2036	227272.7	250000	2727273	3000000	12124.12	9708436	13336.54
2037	227272.7	250000	2954545	3250000	13009.19	10417156	14310.11
2038	227272.7	250000	3181818	3500000	13876.73	11111843	15264.41
2039	227272.7	250000	3409091	3750000	14727.1	11792775	16199.81
2040	227272.7	250000	3636364	4000000	15560.62	12460223	17116.68
2041	227272.7	250000	3863636	4250000	16377.64	13114455	18015.4
2042	227272.7	250000	4090909	4500000	17178.48	13755732	18896.33
2043	227272.7	250000	4318182	4750000	17963.47	14384311	19759.81
2044	227272.7	250000	4545455	5000000	18732.91	15000443	20606.2
2045	227272.7	250000	4772727	5250000	19487.11	15604375	21435.82
2046	227272.7	250000	5000000	5500000	20226.38	16196348	22249.02
2047	227272.7	250000	5227273	5750000	20951.01	16776600	23046.11
2048	227272.7	250000	5454545	6000000	21661.3	17345361	23827.43
2049	227272.7	250000	5681818	6250000	22357.52	17902861	24593.27
2050	227272.7	250000	5909091	6500000	23039.95	18449321	25343.94
2051	227272.7	250000	6136364	6750000	23708.87	18984961	26079.75
2052	227272.7	250000	6363636	7000000	24364.54	19509994	26800.99
2053	227272.7	250000	6590909	7250000	25007.23	20024631	27507.95
2054	227272.7	250000	6818182	7500000	25637.2	20529077	28200.92
2055	0	0	7045455	7750000	26254.69	21023535	28880.16

Washington Department of Ecology
Emission Factor for Klickitat PUD
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

[LandGEM] Annual average quantity of landfill gas (m3/year)

12,326,681

[LandGEM] Annual average quantity of landfill gas (cf/year)

435,313,058

[Kevin Ricks] Annual average quantity of landfill gas going to Klickitat (cf/year)

3,204,000,000

[Kevin Ricks] RNG produced annually (MMBTU)

1,600,000

RNG produced annually (MMBTU RNG /year) / Landfill gas into Klickitat (cf landfill gas/year)

0.00049938

RNG produced annu	RNG produced annually	RNG produced annually (lbs/year)
217,385	209,830,886	11,063,962.95

RNG produced annually (kg RNG/year)

5,018,535

Unit Conversions:		Source
m3 to cf	35.3147	
MMBTU to cf (for n	965.2509653	https://www.eia.gov/tools/faqs/faq.php?id=45&t=8#:~:text=One%20thousand%20cubic%20feet%20(Mcf,1.036%20MMBtu%2C%20or%2010.36%20therms
cf to lbs (for natural	0.052728	https://cimarron.com/conversion-of-volume-of-natural-gas-to-mass-of-natural-gas/
lbs to kg	0.453592909	

Tarps

Dimensions of project tarp:

Length	100	ft
Width	50	ft
Depth	20	mil
Volume	8.333	ft3
Weight of 1 tarp	7102	kg

Source data:

Sample tarp: 40ft x 48ft x 20mil weighs 2727.3 kg (https://www.tarpomatic.com/specifications)

Sample tarp density: 852.3 kg/ft3

Assumptions:

Assumed project tarp: 100ft x 50ft x 20mil

Unit Conversions:

mil to inch	0.001
inch to foot	0.083

Washington Department of Ecology
EPD Stainless Steel Characteristics
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Source:	https://info.nsf.org/Certified/Sustain/ProdCert/EPD10475.pdf
Product:	Stainless steel wall covering sheets
Issued:	Nov 11th, 2020 - valid for 5 years
Market:	North America
Impact method:	TRACI 2.1

		m3
Functional unit:	1 m2 x 16 gauge	0.001588
Composition of functional unit:	98.94% stainless steel, 1.06% adhesive tape	

A1-A3	A4	A5	Total (A1-A5)	
48.8	1.5	5.4	55.7	kg CO2e / unit of product
			35075.56675	kg CO2e / m3 product
			4.44	kg CO2e / kg product
			4.39	kg CO2e / kg stainless steel (product is 98.94% stainless steel)

Unit conversions:		Source
16 gauge stainless steel sheet to mm	1.588	https://color-metals.com/catalog/gauge-inch-mm/
mm to m	0.001	
m to cm	100	
kg to g	1000	

Material properties:	**g/cm3**	**g/m3**	**kg/m3**	Source
Density of stainless steel	7.9	7900000	7900	https://www.acestainless.com/blog-4-density-of-stainless-steel#:~:text=Stainless%20steel%2C%20an%20iron%2Dchromium,7.75%20to%208.03%20g%2Fcm3.

Washington Department of Ecology
WTEF Materials Source Data
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Material Use

	2022		2021		2020		2019		2018		5 year average		
	Quantity	Weight (lbs)	Quantity	Weight (lbs)	Quantity	Weight (lbs)	Quantity	Weight (lbs)	Quantity	Weight (lbs)	Quantity	Weight or area	UOM
Grate blocks	2,818	92,994	1,057	34,881	1,560	51,480	1,397	46,101	640	21,120	1,494	49,315	lbs
Side Blocks	300	12,000	220	8,800	217	8,680	223	8,920	134	5,360	219	8,752	lbs
Side Plates	172	9,460	120	6,600	110	6,050	74	4,070	99	5,445	115	6,325	lbs
Tension Rods	422	2,110	300	1,500	94	470	352	1,760	164	820	266	1,332	lbs
2" Stainless Boiler Tube	93	8,500	44	4,021	265	24,221	260	23,764	20	1,828	136	12,467	lbs
2.5" SS Boiler Tube	98	11,524	88	10,348	1076	126,537	263	30,928	50	5,880	315	37,043	lbs
Raw Steel	N/A	6,492	N/A	25,365	N/A	7,325	N/A	13,863	N/A	7,647	N/A	12,138	lbs
Sand Blast Sand	N/A	86,200	N/A	86,200	N/A	90,000	N/A	22,000	N/A	22,000	N/A	61,280	lbs
Refractory Tile	2,118	6,354	2,995	8,985	2,603	7,809	2,100	6,300	596	1,788	2,082	6,247	lbs
Insulation Blanket	20	1,000 sq ft	34	1,700 sq ft	28	1,400 sq ft	34	1,700 sq ft	14	700 sq ft	26	1,300	sq ft
Plastic Ram Refractory	518	28,490	750	41,250	786	43,230	360	19,800	300	16,500	543	29,854	lbs
SC80 Mortar Refractory	164	9,020	156	8,580	936	51,480	70	3,850	70	3,850	279	15,356	lbs
Fabric Filter Bags*											684		

*** There are 1710 bags per unit and they are completely replaced every five years.**

Recycled

Washington Department of Ecology
WTEF Chemicals Sour Data
Emissions Associated with Materials, Chemicals, and Alternative Daily Cover

Chemical Use

	2022		2021		2020		2019		2018		5 year average	
Carbon	54,000	lbs	80,000	lbs	72,000	lbs	54,000	lbs	54,000	lbs	62,800	lbs
Anhydrous Ammonia	340	tons	353	tons	311	tons	275	tons	291	tons	314	tons
Lime	3,760	tons	3,949	tons	4,481	tons	4,030	tons	4,550	tons	4,154	tons
Sodium Hydroxide*	96	tons	114	tons	104	tons	112	tons	105	tons	106	tons
Hydrochloric Acid*	74	tons	82	tons	66	tons	65	tons	72	tons	72	tons
Oils Disposed	903	gallons	1,053	gallons	276	gallons	634	gallons	472	gallons	668	gallons
Oils Recycled	996	gallons	589	gallons	989	gallons	275	gallons	1,170	gallons	804	gallons
Grease	954	pounds	675	pounds	715	pounds	336	pounds	576	pounds	651	pounds

***These chemicals are used for the treatment of process water**

Appendix A.2 Direct Emissions from Waste

Table of Contents

CAPs and OPOCs Associated with Waste

Washington Department of Ecology
Environmental Impacts of Waste Disposal
East WGA Waste Composition Breakdown - Assigned to WARM Waste Material Types

East WGA Waste Category	East WGA Waste Material	Percentage	Assigned WARM Category	Notes
CONSTRUCTION MATERIALS	Asphalt Roofing	0.8%	Asphalt Shingles	
CONSTRUCTION MATERIALS	Carpet	1.0%	Carpet	
CONSTRUCTION MATERIALS	Carpet Padding	0.7%	Carpet	
CONSTRUCTION MATERIALS	Soil, Rocks, & Sand	0.7%	EXCLUDE - Asphalt Concrete	Exclude from WARM because not combustible.
CONSTRUCTION MATERIALS	Asphalt Paving	0.1%	EXCLUDE - Asphalt Concrete	Exclude from WARM because not combustible.
CONSTRUCTION MATERIALS	Ceramics & Brick	0.0%	EXCLUDE - Clay Bricks	Exclude from WARM because not combustible.
CONSTRUCTION MATERIALS	Concrete	2.5%	EXCLUDE - Concrete	Exclude from WARM because not combustible.
CONSTRUCTION MATERIALS	R/C Construction Materials	0.6%	EXCLUDE - Concrete	Exclude from WARM because not combustible.
CONSTRUCTION MATERIALS	Drywall	1.1%	EXCLUDE - Drywall	Exclude from WARM because not combustible.
CONSTRUCTION MATERIALS	Insulation	0.8%	EXCLUDE - Fiberglass Insulation	Exclude from WARM because not combustible.
CONSTRUCTION MATERIALS	Plastic Lumber	0.2%	HDPE	
CONSTRUCTION MATERIALS	Plastic Floor Covering	0.0%	Vinyl Flooring	
CONSUMER PRODUCTS	Computer Monitors - CRT	0.0%	CRT Displays	
CONSUMER PRODUCTS	Computers	0.0%	Desktop CPUs	
CONSUMER PRODUCTS	Computer Peripherals	0.0%	Electronic peripherals	
CONSUMER PRODUCTS	Audio Equipment	0.0%	Electronic peripherals	
CONSUMER PRODUCTS	Electronic Gaming Equipment	0.0%	Electronic peripherals	
CONSUMER PRODUCTS	Televisions - CRT	0.5%	Flat-Panel Displays	
CONSUMER PRODUCTS	Televisions - LCD	0.3%	Flat-Panel Displays	
CONSUMER PRODUCTS	Television Peripherals	0.0%	Flat-Panel Displays	
CONSUMER PRODUCTS	Computer Monitors - LCD	0.0%	Flat-Panel Displays	
CONSUMER PRODUCTS	Computer Printers	0.2%	Hard-Copy Devices	
CONSUMER PRODUCTS	Other Consumer Electronics	0.7%	Mixed Electronics	
CONSUMER PRODUCTS	Furniture	2.5%	Mixed MSW	Assume Mixed MSW because consumer product.
CONSUMER PRODUCTS	Textiles- Synthetic/Mixed/Unknown	0.8%	Mixed MSW	Assume Mixed MSW because consumer product.
CONSUMER PRODUCTS	R/C Consumer Products	0.6%	Mixed MSW	Assume Mixed MSW because consumer product.
CONSUMER PRODUCTS	Mattresses	0.6%	Mixed MSW	Assume Mixed MSW because consumer product.
CONSUMER PRODUCTS	Shoes/Purses/Belts	0.3%	Mixed MSW	Assume Mixed MSW because consumer product.
CONSUMER PRODUCTS	Textiles- Organic	2.5%	Mixed Organics	Assume Mixed organics because consumer product likely cotton.
CONSUMER PRODUCTS	Tires & Other Rubber	0.4%	Tires	
GLASS	Non-glass Ceramics	0.1%	EXCLUDE - Clay Bricks	Exclude from WARM because not combustible. No ceramic category in WARM, clay bricks closest proxy.
GLASS	Clear Glass Containers	1.2%	Glass	
GLASS	Green Glass Containers	0.4%	Glass	
GLASS	Brown/Other Colored Glass Containers	0.3%	Glass	
GLASS	R/C Glass	0.1%	Glass	
GLASS	Plate Glass	0.0%	Glass	
HAZARDOUS AND SPECIAL WASTES	Medical Wastes	3.1%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Personal Care Products	0.3%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW

Washington Department of Ecology
Environmental Impacts of Waste Disposal
East WGA Waste Composition Breakdown - Assigned to WARM Waste Material Types

East WGA Waste Category	East WGA Waste Material	Percentage	Assigned WARM Category	Notes
HAZARDOUS AND SPECIAL WASTES	Solvents	0.2%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Water-based Paint	0.1%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Oil Filters	0.1%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	HID/UV/Germicidal Lamps	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Dry-cell Batteries- Single Use	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Other Potentially Hazardous Wastes	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Pharmaceuticals & Vitamins	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Water-based Adhesives/Glues	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Primers/Sealings/Coatings	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Other Cleaners/Chemicals	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Pesticides	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Caustic Cleaners	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Water Repellents & Waterproofers	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Florescent Tubes	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Sharps	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Compact Florescent Lamps	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Solvent-based Adhesives/Glues	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Oil-based Paint	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Lacquer/Varnish/Urethane Coatings/Stains	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Field & Lawn Markings	0.0%	Mixed MSW	are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Dry-cell Batteries- Rechargeable	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Wet-cell Batteries	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW

Washington Department of Ecology
Environmental Impacts of Waste Disposal
East WGA Waste Composition Breakdown - Assigned to WARM Waste Material Types

East WGA Waste Category	East WGA Waste Material	Percentage	Assigned WARM Category	Notes
HAZARDOUS AND SPECIAL WASTES	Gasoline/Kerosene	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Motor Oil	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Antifreeze	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Other Vehicle Fluids	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
HAZARDOUS AND SPECIAL WASTES	Explosives	0.0%	Mixed MSW	Spokane WTEF does not accept hazardous and special wastes, so we are assuming its Mixed MSW
METAL	Aluminum Beverage Cans	0.5%	Aluminum Cans	
METAL	Aluminum Foil/Containers	0.2%	Aluminum Ingot	Leaving as ingot because recycling of this type of material may be more involved than aluminum cans.
METAL	Other Non-ferrous Metal	0.0%	Aluminum Ingot	WARM documentation indicates to put this if you have non ferrous metal.
METAL	Other Aluminum	0.0%	Aluminum Ingot	
METAL	Other Non-ferrous Metal	0.0%	Copper Wire	WARM documentation indicates to put this if you have non ferrous metal.
METAL	R/C Metal	2.2%	Mixed Metals	No details on metals type.
METAL	White Goods	0.8%	Mixed Metals	WARM definition of mixed MSW says not to include white goods.
METAL	Food Cans - Tinned	0.5%	Mixed Metals	WARM assumes 35% aluminum cans and 65% steel cans.
METAL	Food Cans - Coated	0.0%	Mixed Metals	WARM assumes 35% aluminum cans and 65% steel cans.
METAL	Other Ferrous Metal	2.9%	Steel Cans	WARM documentation indicates to use steel cans for other ferrous metal.
ORGANICS	Yard/Garden Waste- Prunings	0.5%	Branches	
ORGANICS	Animal Manure	3.4%	Food Waste	No category for manure. If source reduction is not considered, all food waste is the same for combustion and landfilling.
ORGANICS	Animal Carcasses & Offal	0.2%	Food Waste	
ORGANICS	Food Processing Wastes	0.0%	Food Waste	
ORGANICS	Edible Food Waste- Meats/Fats/Oils	2.7%	Food Waste (meat only)	Meat only used, no specifics on what type of meat.
ORGANICS	Inedible Food Waste- Meats/Fats/Oils	0.5%	Food Waste (meat only)	Meat only used, no specifics on what type of meat.
ORGANICS	Edible Food Waste- Vegetative	7.7%	Food Waste (non-meat)	
ORGANICS	Inedible Food Waste- Vegetative	3.3%	Food Waste (non-meat)	
ORGANICS	Yard/Garden Waste- Leaves and Grass	1.2%	Grass	Assumed 50% leaves and 50% grass
ORGANICS	Yard/Garden Waste- Leaves and Grass	1.2%	Leaves	Assumed 50% leaves and 50% grass
ORGANICS	R/C Organics	0.3%	Mixed Organics	No details on organics type. Mixed organics are made up of a weighted average based on 53% food waste and 47% yard trimmings.
PAPER PACKAGING	Cardboard & Kraft Packaging	6.0%	Corrugated Containers	
PAPER PACKAGING	Gable Top Containers	0.2%	Mixed MSW	

Washington Department of Ecology
Environmental Impacts of Waste Disposal
East WGA Waste Composition Breakdown - Assigned to WARM Waste Material Types

East WGA Waste Category	East WGA Waste Material	Percentage	Assigned WARM Category	Notes
PAPER PACKAGING	Other Polycoated Packaging	0.1%	Mixed MSW	
PAPER PACKAGING	Aseptic Containers	0.1%	Mixed MSW	
PAPER PACKAGING	Compostable Paper Packaging	1.7%	Mixed Organics	
PAPER PACKAGING	Mixed/Low-grade Paper Packaging	1.8%	Mixed Paper (general)	
PAPER PACKAGING	R/C Paper Packaging	1.8%	Mixed Paper (general)	
PAPER PACKAGING	Newspaper Packaging	0.0%	Newspaper	
PAPER PRODUCTS	Magazines	0.2%	Magazines/Third-class Mail	
PAPER PRODUCTS	Compostable Paper Products	3.4%	Mixed Organics	
PAPER PRODUCTS	R/C Paper Products	1.2%	Mixed Paper (general)	
PAPER PRODUCTS	Cardboard & Kraft Paper Products	0.0%	Mixed Paper (general)	
PAPER PRODUCTS	Mixed/Low-grade Paper Products	1.7%	Mixed Paper (primarily residential)	
PAPER PRODUCTS	Newspaper Products	0.4%	Newspaper	
PAPER PRODUCTS	Other Groundwood Paper Products	0.0%	Newspaper	
PAPER PRODUCTS	High-Grade Paper Products	0.2%	Office Paper	
PLASTIC PACKAGING	#2 HDPE Plastic Jars and Tubs	0.4%	HDPE	
PLASTIC PACKAGING	#2 HDPE Plastic Colored Bottles	0.3%	HDPE	
PLASTIC PACKAGING	#2 HDPE Plastic Natural Bottles	0.2%	HDPE	
PLASTIC PACKAGING	Packaging Film Plastic	2.3%	LDPE	Packaging film plastic are mostly LDPE, LLDPE, PP, PE, and PET. Because film plastic, choosing LDPE.
PLASTIC PACKAGING	Transportation Packaging Film Plastic	0.5%	LDPE	Because film plastic, choosing LDPE.
PLASTIC PACKAGING	Plastic Merchandise Bags	0.4%	LDPE	Assume LDPE.
PLASTIC PACKAGING	Flexible Plastic Packaging	0.1%	LDPE	Most common flexible is LDPE, PP, and LLDPE. All same emission factors.
PLASTIC PACKAGING	#4 LDPE Plastic Packaging	0.0%	LDPE	
PLASTIC PACKAGING	#7 Other/Unknown Plastic Packaging	0.9%	Mixed Plastics	
PLASTIC PACKAGING	R/C Plastic Packaging	0.0%	Mixed Plastics	No details on plastic type. WARM categorizes Mixed Plastics as 60% PET and 40% HDPE.
PLASTIC PACKAGING	#1 PETE Plastic Bottles	1.0%	PET	
PLASTIC PACKAGING	#1 PETE Plastic Non-bottles	0.4%	PET	
PLASTIC PACKAGING	PLA Compostable Packaging	0.0%	PLA	
PLASTIC PACKAGING	#5 PP Plastic Packaging	1.0%	PP	
PLASTIC PACKAGING	Expanded Polystyrene Packaging	0.6%	PS	
PLASTIC PACKAGING	#6 PS Plastic Packaging	0.1%	PS	
PLASTIC PACKAGING	#3 PVC Plastic Packaging	0.0%	PVC	
PLASTIC PRODUCTS	Bulky Rigid Plastic Products	2.8%	HDPE	Assume typically HDPE
PLASTIC PRODUCTS	#2 HDPE Plastic Products:	0.0%	HDPE	
PLASTIC PRODUCTS	Plastic Garbage Bags	1.5%	LDPE	Assume LDPE.
PLASTIC PRODUCTS	Plastic Non-bag Film Products	0.7%	LDPE	Because film plastic, choosing LDPE.
PLASTIC PRODUCTS	#4 LDPE Plastic Products	0.0%	LDPE	
PLASTIC PRODUCTS	#7 Other/Unknown Plastic Products	1.0%	Mixed Plastics	No details on plastic type. WARM categorizes Mixed Plastics as 60% PET and 40% HDPE.
PLASTIC PRODUCTS	R/C Plastic Products	0.9%	Mixed Plastics	No details on plastic type. WARM categorizes Mixed Plastics as 60% PET and 40% HDPE.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
East WGA Waste Composition Breakdown - Assigned to WARM Waste Material Types

East WGA Waste Category	East WGA Waste Material	Percentage	Assigned WARM Category	Notes
PLASTIC PRODUCTS	#1 PETE Plastic Products	0.0%	PET	
PLASTIC PRODUCTS	PLA Compostable Products	0.0%	PLA	
PLASTIC PRODUCTS	#5 PP Plastic Products	0.0%	PP	
PLASTIC PRODUCTS	#6 PS Plastic Products	0.0%	PS	
PLASTIC PRODUCTS	#3 PVC Plastic Products	0.0%	PVC	
RESIDUALS	Ash	0.2%	EXCLUDE - Fly Ash	Exclude from WARM
RESIDUALS	Dust	0.0%	EXCLUDE - Fly Ash	Exclude from WARM
RESIDUALS	Fines/Sorting Residues	1.9%	Mixed MSW	Fines/Sorting Residues are from various categories, assumed to be Mixed MSW
RESIDUALS	Disposable Diapers	1.7%	Mixed MSW	Assume Mixed MSW because consumer product.
RESIDUALS	Sludges & Other Special Industrial Wastes	0.0%	N/A	
WOOD DEBRIS	Painted Wood	3.8%	Dimensional Lumber	
WOOD DEBRIS	Pallets & Crates	2.6%	Dimensional Lumber	
WOOD DEBRIS	Engineered Wood	0.9%	Dimensional Lumber	
WOOD DEBRIS	Dimensional Lumber	0.8%	Dimensional Lumber	
WOOD DEBRIS	Treated Wood	0.4%	Dimensional Lumber	
WOOD DEBRIS	Natural Wood	0.2%	Dimensional Lumber	
WOOD DEBRIS	R/C Wood Debris	0.9%	Wood Flooring	
WOOD DEBRIS	Wood By-products	0.2%	Wood Flooring	
WOOD DEBRIS	Other Untreated Wood	0.0%	Wood Flooring	

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Waste Tonnage Inputs for WARM

Final Categories (Material Type)	Final Categories (Material)	Final Percentages	Tons of Waste	Notes
Paper	Corrugated Containers	6.0%	452,953	
Paper	Magazines/Third-class Mail	0.2%	14,465	
Paper	Newspaper	0.4%	32,149	
Paper	Office Paper	0.2%	16,712	
Paper	Phonebooks	0.0%	0	
Paper	Textbooks	0.0%	0	
Paper	Mixed Paper (general)	4.8%	359,210	
Paper	Mixed Paper (primarily residential)	1.7%	130,812	
Paper	Mixed Paper (primarily from offices)	0.0%	0	
Food Waste	Food Waste	3.5%	264,289	
Food Waste	Food Waste (non-meat)	11.0%	826,698	
Food Waste	Food Waste (meat only)	3.2%	238,968	
Food Waste	Beef	0.0%	0	
Food Waste	Poultry	0.0%	0	
Food Waste	Grains	0.0%	0	
Food Waste	Bread	0.0%	0	
Food Waste	Fruits and Vegetables	0.0%	0	
Food Waste	Dairy Products	0.0%	0	
Yard Trimmings	Yard Trimmings	0.0%	0	
Yard Trimmings	Grass	1.2%	87,434	
Yard Trimmings	Leaves	1.2%	87,434	
Yard Trimmings	Branches	0.5%	35,043	
Mixed Plastics	HDPE	3.9%	292,843	
Mixed Plastics	LDPE	5.6%	422,594	
Mixed Plastics	PET	1.4%	103,000	
Mixed Plastics	LLDPE	0.0%	0	
Mixed Plastics	PP	1.0%	71,558	
Mixed Plastics	PS	0.8%	61,277	
Mixed Plastics	PVC	0.0%	261	
Mixed Plastics	Mixed Plastics	2.8%	210,058	
Bioplastics	PLA	0.0%	2,874	
Electronics	Desktop CPUs	0.0%	0	
Electronics	Portable Electronic Devices	0.0%	0	
Electronics	Flat-Panel Displays	0.8%	61,667	
Electronics	CRT Displays	0.0%	0	
Electronics	Electronic Peripherals	0.0%	0	
Electronics	Hard-Copy Devices	0.2%	14,453	
Electronics	Mixed Electronics	0.7%	50,621	
Metals	Aluminum Cans	0.5%	35,947	
Metals	Aluminum Ingot	0.2%	17,360	

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Waste Tonnage Inputs for WARM

Final Categories (Material Type)	Final Categories (Material)	Final Percentages	Tons of Waste	Notes
Metals	Steel Cans	2.9%	216,911	
Metals	Copper Wire	0.0%	2,404	
Metals	Mixed Metals	3.5%	264,569	
Glass	Glass	1.9%	145,695	
Construction Materials	Asphalt Concrete	0.0%	0	WARM does not model combustion for this material. Asphalt is not combusted as an end-of-life management pathway, not would it be logical to do so. Therefore, this waste category is excluded.
Construction Materials	Asphalt Shingles	0.8%	60,153	
Construction Materials	Carpet	1.8%	132,031	
Construction Materials	Clay Bricks	0.0%	0	WARM does not model combustion for this material as clay bricks cannot be combusted. Therefore, this waste category is excluded.
Construction Materials	Concrete	0.0%	0	Concrete cannot be combusted; therefore, WARM does not include an emission factor for combustion. Therefore, this waste category is excluded.
Construction Materials	Dimensional Lumber	8.7%	651,261	
Construction Materials	Drywall	0.0%	0	Drywall is generally not combusted and is even banned from combustion facilities in some states. EPA therefore did not develop an emission factor for combustion. Therefore, this waste category is excluded.
Construction Materials	Fiberglass Insulation	0.0%	0	Fiberglass Insulation is generally not combusted, thus EPA did not include an emission factor in WARM for the combustion of fiberglass insulation. Therefore, this waste category is excluded.
Construction Materials	Fly Ash	0.0%	0	Fly ash cannot be combusted; therefore, WARM does not include an emission factor for combustion. This waste category is excluded.
Construction Materials	Medium-density Fiberboard	0.0%	0	
Construction Materials	Structural Steel	0.0%	0	Structural steel cannot be combusted; consequently, WARM does not include an emission factor for the combustion of structural steel. This waste category is excluded.
Construction Materials	Vinyl Flooring	0.0%	1,248	
Construction Materials	Wood Flooring	1.2%	86,391	
Tires	Tires	0.4%	33,518	
Mixed Materials	Mixed Recyclables	0.0%	0	
Mixed Materials	Mixed Organics	7.9%	596,155	
Mixed Materials	Mixed MSW	12.8%	961,575	
TOTAL WASTE INCLUDED IN ANALYSIS		93.9%	7,042,594	
TOTAL WASTE EXCLUDED FROM ANALYSIS		6.1%	457,406	This material is a mix of asphalt concrete, clay bricks, concrete, drywall, fiberglass insulation, fly ash, and structural steel which all cannot be combusted.

Notes:
1. Waste composition breakdown is based on "East WGA" breakdown. See "East WGA Waste Composition Breakdown - Assigned to WARM Waste Material Types".
2. Those waste categories that cannot be combusted (asphalt concrete, clay bricks, concrete, drywall, fiberglass insulation, fly ash, and structural steel) are excluded from this analysis. Therefore the total waste input into this analysis is less than the annual 250,000 tons over 30 years.

Total Annual Waste	250,000	tons
Years	30	years

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Results Summary

Emissions & Energy Over Lifetime (30 years)

	GHG Emissions - 100 year GWP (MT CO2e)	GHG Emissions - 20 year GWP (MT CO2e)	Energy (MMBtu)
WTEF	908,360	840,105	-46,825,990
Roosevelt	1,130,050	4,812,427	-635,341
Finley Buttes	1,130,050	4,812,427	-635,341
Wenatchee	2,906,421	9,416,255	1,589,426

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Inputs - WTEF and Roosevelt

Locations

In order to account for the avoided electricity-related emissions in the landfilling and combustion pathways, EPA assigns the appropriate regional "marginal" electricity grid mix emission factor based on your location

Please select state or national average: Washington

Region location: **Pacific**

Waste Transport Characteristics

Emissions that occur during transport of materials to the management facility are included in this model. You may use default transport distances, 20 miles, or provide information on the transport distances for the various MSW management options.

- ○ Use default distance
- ◉ Define distance

Management option	Default Distance (miles)	Defined Distance (miles)
Landfill	20	0
Combustion	20	0
Recycling	20	0
Composting	20	0
Anaerobic Digestion	20	0

Source reduction

To estimate the benefits from source reduction, EPA usually assumes that the material that is source reduced would have been manufactured from the current mix of virgin and recycled inputs. However, you may choose to estimate the emission reductions from source reduction under the assumption that the material would have been manufactured from 100% virgin inputs in order to obtain an upper bound estimate of the benefits from source reduction. Select which assumption you want to use in the analysis. Note that for materials for which information on the share of recycled inputs used in production is unavailable or is not a common practice; EPA assumes that the current mix is comprised of 100% virgin inputs. Consequently, the source reduction benefits of both the "Current mix" and "100% virgin" inputs are the same.

- ◉ Current Mix
- ○ 100% Virgin

Landfill Characteristics (I, II, III)

I) Landfill Type

The emissions from landfilling depend on whether the landfill where your waste is disposed has a landfill gas (LFG) control system. If you do not know whether your landfill has LFG control, select "National Average", which calculates emissions based on the proportions of landfills with LFG control in 2012. If your landfill does not have a LFG system, select "No LFG Recovery". If a LFG system is in place at your landfill, select "LFG Recovery" and click one of the indented buttons to indicate whether LFG is recovered for energy or flared.

- ○ National Average
- ○ No LFG Recovery
- ◉ LFG Recovery
  - ◉ Recover for energy
  - ○ Flare

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Inputs - WTEF and Roosevelt

II) Landfill Gas Recovery

For landfills that recover gas, the landfill gas collection efficiency will vary throughout the life of the landfill. Based on a literature review of field measurements and expert discussion, a range of collection efficiencies was estimated for a series of different landfill scenarios. The "typical" landfill is judged to represent the average U.S. landfill, although it must be recognized that every landfill is unique and a typical landfill is an approximation of reality. The worst-case collection scenario represents a landfill that is in compliance with EPA's New Source Performance Standards (NSPS). The aggressive gas collection scenario includes landfills where the operator is aggressive in gas collection relative to a typical landfill. Bioreactor landfills, which are operated to accelerate decomposition, are assumed to collect gas aggressively. The California regulatory collection scenario allows users to estimate and view landfill management results based on California regulatory requirements.

- (●) Typical operation - DEFAULT
- ( ) Worst-case collection
- ( ) Aggressive gas collection
- ( ) California regulatory collection

Landfill gas collection efficiency (%) assumptions
Typical: Years 0-1: 0%; Years 2-4: 50%; Years 5-14: 75%; Years 15 to 1 year before final cover: 82.5%; Final cover: 90%
Worst-case: Years 0-4: 0%; Years 5-9: 50%; Years 10-14: 75%; Years 15 to 1 year before final cover: 82.5%; Final cover:
Aggressive: Year 0: 0%; Years 0.5-2: 50%; Years 3-14: 75%; Years 15 to 1 year before final cover: 82.5%; Final cover: 90%
California: Year 0: 0%; Year 1: 50%; Years 2-7: 80%; Years 8 to 1 year before final cover: 85%; Final cover: 90%

III) Moisture Conditions and Decay Rates

Which of the following moisture conditions and associated bulk MSW decay rate (k) most accurately describes the average conditions at the landfill? The decay rates, also referred to as k values, describe the rate of change per year (yr-1) for the decomposition of organic waste in landfills. A higher average decay rate means that waste decomposes faster in the landfill.

- ( ) National Average - DEFAULT
- (●) Dry (k = 0.02)
- ( ) Moderate (k = 0.04)
- ( ) Wet (k = 0.06)
- ( ) Biorecator (k = 0.12)

Moisture condition assumptions
Dry (k=0.02): Less than 20 inches of precipitation per year
Moderate (k=0.04): Between 20 and 40 inches of precipitation per year
Wet (k=0.06): Greater than 40 inches of precipitation per year
Bioreactor (k=0.12): Water is added until the moisture content reaches 40 percent moisture on a wet weight basis
National average: Weighted average based on the share of waste received at each landfill type

Anaerobic Digestion

Digestion Type

For anaerobic digestion of food waste materials (including beef, poultry, grains, bread, fruits and vegetables, and dairy products), please choose the appropriate type of anaerobic digestion process used. Note that for grass, leaves, branches, yard trimmings and mixed organics, wet digestion is not applicable based on current technology and practices in the United States. Therefore, dry digestion is the only digestion type modeled in WARM for these materials. Only one type of digestion process (wet or dry) can be modeled at a time in WARM.

- ( ) Wet Digestion
- (●) Dry Digestion

Digestate Curing

WARM assumes that digestate resulting from anaerobic digestion processes will be applied to land. In many cases, the digestate is cured before land application.When digestate is cured, the digestate is dewatered and any liquids are recovered and returned to the reactor (when using a wet digester). Next, the digestate is aerobically cured in turned windrows, then screened and applied to agricultural fields. Select whether the digestate resulting from your anaerobic digester is cured before land application.

- (●) Cured - DEFAULT
- ( ) Not Cured

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Outputs - GHG - WTEF and Roosevelt

	Baseline Scenario						Alternative Scenario							
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total MTCO2E	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total MTCO2E	Change (Alt-Base) MTCO2E
Corrugated Containers	0	0	452953	N/A	N/A	-143857.8	0	0	452953	0	N/A	N/A	-84626.91	59230.88
Magazines/Third-class Mail	0	0	14465	N/A	N/A	-3274.37	0	0	14465	0	N/A	N/A	-8697.04	-5422.67
Newspaper	0	0	32149	N/A	N/A	-11700.9	0	0	32149	0	N/A	N/A	-31506.86	-19805.97
Office Paper	0	0	16712	N/A	N/A	-5100.16	0	0	16712	0	N/A	N/A	10610.63	15710.79
Mixed Paper (general)	0	0	359210	N/A	N/A	-114567.53	0	0	359210	0	N/A	N/A	-88824.34	25743.19
Mixed Paper (primarily residential)	0	0	130812	N/A	N/A	-41519.73	0	0	130812	0	N/A	N/A	-38876.77	2642.95
Food Waste	N/A	0	264289	0	0	-20813.68	0	N/A	264289	0	0	0	67512.87	88326.55
Food Waste (non-meat)	N/A	0	826698	0	0	-65105.35	0	N/A	826698	0	0	0	211180.77	276286.12
Food Waste (meat only)	N/A	0	238968	0	0	-18819.56	0	N/A	238968	0	0	0	61044.6	79864.16
Grass	N/A	0	87434	0	0	-8807.37	N/A	N/A	87434	0	0	0	2164.47	10971.84
Leaves	N/A	0	87434	0	0	-8807.37	N/A	N/A	87434	0	0	0	-55562.31	-46754.94
Branches	N/A	0	35043	0	0	-3529.94	N/A	N/A	35043	0	0	0	-26505.28	-22975.35
HDPE	0	0	292843	N/A	N/A	520783.53	0	0	292843	0	N/A	N/A	4969.67	-515813.85
LDPE	N/A	0	422594	N/A	N/A	753861.71	0	N/A	422594	0	N/A	N/A	7171.6	-746690.11
PET	0	0	103000	N/A	N/A	154635.33	0	0	103000	0	N/A	N/A	1747.95	-152887.37
PP	0	0	71558	N/A	N/A	127392.01	0	0	71558	0	N/A	N/A	1214.37	-126177.64
PS	N/A	0	61277	N/A	N/A	128360.69	0	N/A	61277	0	N/A	N/A	1039.9	-127320.8
PVC	N/A	0	261	N/A	N/A	223.4	0	N/A	261	0	N/A	N/A	4.43	-218.97

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Outputs - GHG - WTEF and Roosevelt

	Baseline Scenario						Alternative Scenario							
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total MTCO2E	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total MTCO2E	Change (Alt-Base) MTCO2E
Mixed Plastics	0	0	210058	N/A	N/A	338493	0	0	210058	0	N/A	N/A	3564.77	-334928.22
PLA	N/A	0	2874	0	N/A	-1212.8	0	N/A	2874	0	0	N/A	-4730.31	-3517.52
Flat-panel Displays	0	0	61667	N/A	N/A	3703.47	0	0	61667	0	N/A	N/A	1046.52	-2656.95
Hard-copy Devices	0	0	14453	N/A	N/A	17823.68	0	0	14453	0	N/A	N/A	245.27	-17578.41
Mixed Electronics	0	0	50621	N/A	N/A	21343.31	N/A	0	50621	0	N/A	N/A	859.06	-20484.25
Aluminum Cans	0	0	35947	N/A	N/A	820.95	0	0	35947	0	N/A	N/A	610.04	-210.91
Aluminum Ingot	0	0	17360	N/A	N/A	396.46	0	0	17360	0	N/A	N/A	294.61	-101.86
Steel Cans	0	0	216911	N/A	N/A	-346936.51	0	0	216911	0	N/A	N/A	3681.07	350617.58
Copper Wire	0	0	2404	N/A	N/A	47.22	0	0	2404	0	N/A	N/A	40.8	-6.43
Mixed Metals	0	0	264569	N/A	N/A	-272603.92	0	0	264569	0	N/A	N/A	4489.85	277093.77
Glass	0	0	145695	N/A	N/A	2582.67	0	0	145695	0	N/A	N/A	2472.51	-110.17
Asphalt Shingles	0	0	60153	N/A	N/A	-21528.8	0	0	60153	0	N/A	N/A	1020.82	22549.63
Carpet	0	0	132031	N/A	N/A	169435.12	0	0	132031	0	N/A	N/A	2240.62	-167194.49
Dimensional Lumber	0	0	651261	N/A	N/A	-248682.45	0	0	651261	0	N/A	N/A	-678912.85	-430230.39
Vinyl Flooring	N/A	0	1248	N/A	N/A	-144.65	0	N/A	1248	0	N/A	N/A	21.18	165.83
Wood Flooring	N/A	0	86391	N/A	N/A	-41004.94	0	N/A	86391	0	N/A	N/A	-74516.14	-33511.2
Tires	0	0	33518	N/A	N/A	16642.56	0	0	33518	0	N/A	N/A	568.81	-16073.75
Mixed Organics	N/A	0	596155	0	0	-53059.63	N/A	N/A	596155	0	0	0	-5351.05	47708.58
Mixed MSW	N/A	0	961575	N/A	N/A	124908.97	N/A	N/A	961575	0	N/A	N/A	103802.61	-21106.36
						950376.61							-604490.08	

Total Change in GHG Emissions (MTCO2E): **-1554866.69**
This is equivalent to...

Removing annual emissions from **330120** Passenger Vehicles
Conserving **174959681** Gallons of Gasoline
Conserving **64786111** Cylinders of Propane Used for Home Barbeques
0.00087% Annual CO2 emissions from the U.S. transportation sector
0.00086% Annual CO2 emissions from the U.S. energy sector

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Outputs - Energy - WTEF and Roosevelt

	Baseline Scenario						Alternative Scenario							
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total million BTU	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total million BTU	Change (Alt-Base) million BTU
Corrugated Containers	0	0	452953	N/A	N/A	-2649152.1	0	0	452953	0	N/A	N/A	-275189.65	2373962.46
Magazines/Third-class Mail	0	0	14465	N/A	N/A	-63315.1	0	0	14465	0	N/A	N/A	-2045.98	61269.12
Newspaper	0	0	32149	N/A	N/A	-212065.36	0	0	32149	0	N/A	N/A	-3567.21	208498.16
Office Paper	0	0	16712	N/A	N/A	-94394.44	0	0	16712	0	N/A	N/A	-17043.34	77351.1
Mixed Paper (general)	0	0	359210	N/A	N/A	-2108666.6	0	0	359210	0	N/A	N/A	-191429.93	1917236.64
Mixed Paper (primarily residential)	0	0	130812	N/A	N/A	-764648.65	0	0	130812	0	N/A	N/A	-65898.78	698749.87
Food Waste	N/A	0	264289	0	0	-527611.44	0	N/A	264289	0	0	0	-68725.57	458885.87
Food Waste (non-meat)	N/A	0	826698	0	0	-1650372.6	0	N/A	826698	0	0	0	-214974.11	1435398.49
Food Waste (meat only)	N/A	0	238968	0	0	-477062.05	0	N/A	238968	0	0	0	-62141.11	414920.94
Grass	N/A	0	87434	0	0	-205541.77	N/A	N/A	87434	0	0	0	7267.46	212809.23
Leaves	N/A	0	87434	0	0	-205541.77	N/A	N/A	87434	0	0	0	3176.86	208718.63
Branches	N/A	0	35043	0	0	-82379.85	N/A	N/A	35043	0	0	0	-8123.13	74256.72
HDPE	0	0	292843	N/A	N/A	-4837070.5	0	0	292843	0	N/A	N/A	66091.04	4903161.54
LDPE	N/A	0	422594	N/A	N/A	-6942624.3	0	N/A	422594	0	N/A	N/A	95374.23	7037998.55
PET	0	0	103000	N/A	N/A	-904433.68	0	0	103000	0	N/A	N/A	23245.82	927679.5
PP	0	0	71558	N/A	N/A	-1179785.5	0	0	71558	0	N/A	N/A	16149.75	1195935.24
PS	N/A	0	61277	N/A	N/A	-911878.29	0	N/A	61277	0	N/A	N/A	13829.46	925707.75

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Outputs - Energy - WTEF and Roosevelt

	Baseline Scenario						Alternative Scenario							
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total million BTU	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total million BTU	Change (Alt-Base) million BTU
PVC	N/A	0	261	N/A	N/A	-1705.5	0	N/A	261	0	N/A	N/A	58.9	1764.41
Mixed Plastics	0	0	210058	N/A	N/A	-2490396.7	0	0	210058	0	N/A	N/A	47407.49	2537804.19
PLA	N/A	0	2874	0	N/A	-19948.19	0	N/A	2874	0	0	N/A	648.63	20596.82
Flat-panel Displays	0	0	61667	N/A	N/A	-482159.22	0	0	61667	0	N/A	N/A	13917.48	496076.7
Hard-copy Devices	0	0	14453	N/A	N/A	-114008.24	0	0	14453	0	N/A	N/A	3261.86	117270.1
Mixed Electronics	0	0	50621	N/A	N/A	-270475.15	N/A	0	50621	0	N/A	N/A	11424.53	281899.68
Aluminum Cans	0	0	35947	N/A	N/A	8396.45	0	0	35947	0	N/A	N/A	8112.79	-283.66
Aluminum Ingot	0	0	17360	N/A	N/A	4054.92	0	0	17360	0	N/A	N/A	3917.94	-136.99
Steel Cans	0	0	216911	N/A	N/A	-3791529.9	0	0	216911	0	N/A	N/A	48954.12	3840484.01
Copper Wire	0	0	2404	N/A	N/A	437.66	0	0	2404	0	N/A	N/A	542.55	104.89
Mixed Metals	0	0	264569	N/A	N/A	-2980664.4	0	0	264569	0	N/A	N/A	59709.94	3040374.37
Glass	0	0	145695	N/A	N/A	22020.57	0	0	145695	0	N/A	N/A	32881.56	10860.99
Asphalt Shingles	0	0	60153	N/A	N/A	-531908.04	0	0	60153	0	N/A	N/A	13575.79	545483.83
Carpet	0	0	132031	N/A	N/A	-832825	0	0	132031	0	N/A	N/A	29797.76	862622.76
Dimensional Lumber	0	0	651261	N/A	N/A	-4483839.5	0	0	651261	0	N/A	N/A	112331.25	4596170.79
Vinyl Flooring	N/A	0	1248	N/A	N/A	-8155.06	0	N/A	1248	0	N/A	N/A	281.66	8436.72
Wood Flooring	N/A	0	86391	N/A	N/A	-777280.24	0	N/A	86391	0	N/A	N/A	19497.38	796777.61
Tires	0	0	33518	N/A	N/A	-966360.97	0	0	33518	0	N/A	N/A	7564.6	973925.57
Mixed Organics	N/A	0	596155	0	0	-1288681.6	N/A	N/A	596155	0	0	0	-79555.26	1209126.37
Mixed MSW	N/A	0	961575	N/A	N/A	-4004418	N/A	N/A	961575	0	N/A	N/A	-285668.21	3718749.74
						-46825990							-635341.44	

a) For explanation of methodology, see the EPA WARM Documentation
b) Emissions estimates provided by this model are intended to support voluntary GHG measurement and reporting initiatives.

Total Change in Energy Use (million BTU): **46190648.71**

This is equivalent to...

Consuming **504198** Households' Annual Energy
Consuming **7950197** Barrels of Oil
Consuming **383476427** Gallons of Gasoline

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Adjusted Results - GHG - WTEF and Roosevelt

	WTEF - WARM GHG (AR4) (MT CO2e)	WTEF - GHG 100 year (AR6) (MT CO2e)	WTEF - GHG 20 year (AR6) (MT CO2e)	Roosevelt - WARM GHG (AR4) (MT CO2e)	Roosevelt - GHG 100 year (AR6) (MT CO2e)	Roosevelt - GHG 20 year (AR6) (MT CO2e)
Carbon (landfill storage)	0	0	0	-2,151,177	-2,151,177	-2,151,177
Carbon (landfill storage) - Adjusted	0	0	0	-497,534	-497,534	-497,534
Methane	-32,014	-35,728	-103,983	1,727,194	1,927,548	5,609,925
Carbon dioxide	921,965	921,965	921,965	-299,329	-299,329	-299,329
Nitrous oxide	174,363	159,735	159,735	-694	-635	-635
GHGs (unspecified)	-137,612	-137,612	-137,612	0	0	0
TOTAL GHG	926,701	908,360	840,105	929,638	1,130,050	4,812,427

Note: The carbon (landfill storage) - adjusted value removes the carbon storage associated with those materials with long carbon lifecycles.

	WTEF - WARM GHG (AR4) (MT CO2e)	WTEF - GHG 100 year (AR6) (MT CO2e)	WTEF - GHG 20 year (AR6) (MT CO2e)	Roosevelt - WARM GHG (AR4) (MT CO2e)	Roosevelt - GHG 100 year (AR6) (MT CO2e)	Roosevelt - GHG 20 year (AR6) (MT CO2e)
Combustion	3,964,964	3,888,552	3,888,552	0	0	0
Electricity	-2,324,189	-2,270,409	-2,338,664	-300,394	-300,379	-301,171
Source Reduction	-712,854	-708,570	-708,570	0	0	0
Recycling	-4,518	-4,491	-4,491	0	0	0
Other	3,298	3,278	3,278	0	0	0
Landfilling (subtotal)	0	0	0	1,230,031	1,430,429	5,113,598
Landfilling - Carbon Storage	0	0	0	-497,534	-497,534	-497,534
Landfilling - Methane	0	0	0	1,727,565	1,927,963	5,611,131
TOTAL GHG	926,701	908,360	840,105	929,638	1,130,050	4,812,427

	WTEF - WARM GHG (AR4) (MT CO2e)	WTEF - GHG 100 year (AR6) (MT CO2e)	WTEF - GHG 20 year (AR6) (MT CO2e)	Roosevelt - WARM GHG (AR4) (MT CO2e)	Roosevelt - GHG 100 year (AR6) (MT CO2e)	Roosevelt - GHG 20 year (AR6) (MT CO2e)
Anthropogenic Direct Emissions	3,968,262	3,891,830	3,891,830	1,727,565	1,927,963	5,611,131
Electricity Generation	-2,324,189	-2,270,409	-2,338,664	-300,394	-300,379	-301,171
Source Reduction & Recycling	-717,372	-713,061	-713,061	0	0	0
Carbon Storage	0	0	0	-497,534	-497,534	-497,534
TOTAL GHG	926,701	908,360	840,105	929,638	1,130,050	4,812,427

GWPs Used in WARM (AR4)

	100-Year
Carbon Dioxide	1
Methane	25
Nitrous Oxide	298

Note: WARM defaults to the GWPs from IPCC AR4. See WARM Background Guidance (page 1-3):
https://www.epa.gov/sites/default/files/2020-12/documents/warm_background_v15_10-29-2020.pdf

GWPs to be Used in Analysis (AR6)

	100-Year	20-Year
Carbon Dioxide	1	1
Methane	27.9	81.2
Nitrous Oxide	273	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)
https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Heavy Equipment for Landfilling Exclusion

Heavy Equipment Emissions (MT CO2e)	119,516

Note: WARM includes the emissions associated with heavy equipment use for landfills and transport. Because this was calculated outside of WARM, this was eliminated.

WTEF Transport Exclusion

WTEF Transport Emissions (MT CO2e)	23,676

Note: WARM includes the emissions associated with transport for WTEF. Because this was calculated outside of WARM, this was eliminated.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Inputs - WTEF and Finley Buttes

Locations

In order to account for the avoided electricity-related emissions in the landfilling and combustion pathways, EPA assigns the appropriate regional "marginal" electricity grid mix emission factor based on your location

Please select state or national average: Oregon

Region location: **Pacific**

Waste Transport Characteristics

Emissions that occur during transport of materials to the management facility are included in this model. You may use default transport distances, 20 miles, or provide information on the transport distances for the various MSW management options.

- ○ Use default distance
- ◉ Define distance

Management option	Default Distance (miles)	Defined Distance (miles)
Landfill	20	0
Combustion	20	0
Recycling	20	0
Composting	20	0
Anaerobic Digestion	20	0

Source reduction

To estimate the benefits from source reduction, EPA usually assumes that the material that is source reduced would have been manufactured from the current mix of virgin and recycled inputs. However, you may choose to estimate the emission reductions from source reduction under the assumption that the material would have been manufactured from 100% virgin inputs in order to obtain an upper bound estimate of the benefits from source reduction. Select which assumption you want to use in the analysis. Note that for materials for which information on the share of recycled inputs used in production is unavailable or is not a common practice; EPA assumes that the current mix is comprised of 100% virgin inputs. Consequently, the source reduction benefits of both the "Current mix" and "100% virgin" inputs are the same.

- ◉ Current Mix
- ○ 100% Virgin

Landfill Characteristics (I, II, III)

I) Landfill Type

The emissions from landfilling depend on whether the landfill where your waste is disposed has a landfill gas (LFG) control system. If you do not know whether your landfill has LFG control, select "National Average", which calculates emissions based on the proportions of landfills with LFG control in 2012. If your landfill does not have a LFG system, select "No LFG Recovery". If a LFG system is in place at your landfill, select "LFG Recovery" and click one of the indented buttons to indicate whether LFG is recovered for energy or flared.

- ○ National Average
- ○ No LFG Recovery
- ◉ LFG Recovery
  - ◉ Recover for energy
  - ○ Flare

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Inputs - WTEF and Finley Buttes

II) Landfill Gas Recovery

For landfills that recover gas, the landfill gas collection efficiency will vary throughout the life of the landfill. Based on a literature review of field measurements and expert discussion, a range of collection efficiencies was estimated for a series of different landfill scenarios. The "typical" landfill is judged to represent the average U.S. landfill, although it must be recognized that every landfill is unique and a typical landfill is an approximation of reality. The worst-case collection scenario represents a landfill that is in compliance with EPA's New Source Performance Standards (NSPS). The aggressive gas collection scenario includes landfills where the operator is aggressive in gas collection relative to a typical landfill. Bioreactor landfills, which are operated to accelerate decomposition, are assumed to collect gas aggressively. The California regulatory collection scenario allows users to estimate and view landfill management results based on California regulatory requirements.

- (•) Typical operation - DEFAULT
- ( ) Worst-case collection
- ( ) Aggressive gas collection
- ( ) California regulatory collection

Landfill gas collection efficiency (%) assumptions
Typical: Years 0-1: 0%; Years 2-4: 50%; Years 5-14: 75%; Years 15 to 1 year before final cover: 82.5%; Final cover: 90%
Worst-case: Years 0-4: 0%; Years 5-9: 50%; Years 10-14: 75%; Years 15 to 1 year before final cover: 82.5%; Final cover:
Aggressive: Year 0: 0%; Years 0.5-2: 50%; Years 3-14: 75%; Years 15 to 1 year before final cover: 82.5%; Final cover: 90%
California: Year 0: 0%; Year 1: 50%; Years 2-7: 80%; Years 8 to 1 year before final cover: 85%; Final cover: 90%

III) Moisture Conditions and Decay Rates

Which of the following moisture conditions and associated bulk MSW decay rate (k) most accurately describes the average conditions at the landfill? The decay rates, also referred to as k values, describe the rate of change per year (yr-1) for the decomposition of organic waste in landfills. A higher average decay rate means that waste decomposes faster in the landfill.

- ( ) National Average - DEFAULT
- (•) Dry (k = 0.02)
- ( ) Moderate (k = 0.04)
- ( ) Wet (k = 0.06)
- ( ) Biorecator (k = 0.12)

Moisture condition assumptions
Dry (k=0.02): Less than 20 inches of precipitation per year
Moderate (k=0.04): Between 20 and 40 inches of precipitation per year
Wet (k=0.06): Greater than 40 inches of precipitation per year
Bioreactor (k=0.12): Water is added until the moisture content reaches 40 percent moisture on a wet weight basis
National average: Weighted average based on the share of waste received at each landfill type

Anaerobic Digestion

Digestion Type

For anaerobic digestion of food waste materials (including beef, poultry, grains, bread, fruits and vegetables, and dairy products), please choose the appropriate type of anaerobic digestion process used. Note that for grass, leaves, branches, yard trimmings and mixed organics, wet digestion is not applicable based on current technology and practices in the United States. Therefore, dry digestion is the only digestion type modeled in WARM for these materials. Only one type of digestion process (wet or dry) can be modeled at a time in WARM.

- ( ) Wet Digestion
- (•) Dry Digestion

Digestate Curing

WARM assumes that digestate resulting from anaerobic digestion processes will be applied to land. In many cases, the digestate is cured before land application.When digestate is cured, the digestate is dewatered and any liquids are recovered and returned to the reactor (when using a wet digester). Next, the digestate is aerobically cured in turned windrows, then screened and applied to agricultural fields. Select whether the digestate resulting from your anaerobic digester is cured before land application.

- (•) Cured - DEFAULT
- ( ) Not Cured

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Outputs - GHG - WTEF and Finley Buttes

	Baseline Scenario						Alternative Scenario							
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total MTCO2E	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total MTCO2E	Change (Alt-Base) MTCO2E
Corrugated Containers	0	0	452953	N/A	N/A	-143857.8	0	0	452953	0	N/A	N/A	-84626.91	59230.88
Magazines/Third-class Mail	0	0	14465	N/A	N/A	-3274.37	0	0	14465	0	N/A	N/A	-8697.04	-5422.67
Newspaper	0	0	32149	N/A	N/A	-11700.9	0	0	32149	0	N/A	N/A	-31506.86	-19805.97
Office Paper	0	0	16712	N/A	N/A	-5100.16	0	0	16712	0	N/A	N/A	10610.63	15710.79
Mixed Paper (general)	0	0	359210	N/A	N/A	-114567.53	0	0	359210	0	N/A	N/A	-88824.34	25743.19
Mixed Paper (primarily residential)	0	0	130812	N/A	N/A	-41519.73	0	0	130812	0	N/A	N/A	-38876.77	2642.95
Food Waste	N/A	0	264289	0	0	-20813.68	0	N/A	264289	0	0	0	67512.87	88326.55
Food Waste (non-meat)	N/A	0	826698	0	0	-65105.35	0	N/A	826698	0	0	0	211180.77	276286.12
Food Waste (meat only)	N/A	0	238968	0	0	-18819.56	0	N/A	238968	0	0	0	61044.6	79864.16
Grass	N/A	0	87434	0	0	-8807.37	N/A	N/A	87434	0	0	0	2164.47	10971.84
Leaves	N/A	0	87434	0	0	-8807.37	N/A	N/A	87434	0	0	0	-55562.31	-46754.94
Branches	N/A	0	35043	0	0	-3529.94	N/A	N/A	35043	0	0	0	-26505.28	-22975.35
HDPE	0	0	292843	N/A	N/A	520783.53	0	0	292843	0	N/A	N/A	4969.67	-515813.85
LDPE	N/A	0	422594	N/A	N/A	753861.71	0	N/A	422594	0	N/A	N/A	7171.6	-746690.11
PET	0	0	103000	N/A	N/A	154635.33	0	0	103000	0	N/A	N/A	1747.95	-152887.37
PP	0	0	71558	N/A	N/A	127392.01	0	0	71558	0	N/A	N/A	1214.37	-126177.64
PS	N/A	0	61277	N/A	N/A	128360.69	0	N/A	61277	0	N/A	N/A	1039.9	-127320.8
PVC	N/A	0	261	N/A	N/A	223.4	0	N/A	261	0	N/A	N/A	4.43	-218.97

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Outputs - GHG - WTEF and Finley Buttes

	Baseline Scenario						Alternative Scenario							
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total MTCO2E	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total MTCO2E	Change (Alt-Base) MTCO2E
Mixed Plastics	0	0	210058	N/A	N/A	338493	0	0	210058	0	N/A	N/A	3564.77	-334928.22
PLA	N/A	0	2874	0	N/A	-1212.8	0	N/A	2874	0	0	N/A	-4730.31	-3517.52
Flat-panel Displays	0	0	61667	N/A	N/A	3703.47	0	0	61667	0	N/A	N/A	1046.52	-2656.95
Hard-copy Devices	0	0	14453	N/A	N/A	17823.68	0	0	14453	0	N/A	N/A	245.27	-17578.41
Mixed Electronics	0	0	50621	N/A	N/A	21343.31	N/A	0	50621	0	N/A	N/A	859.06	-20484.25
Aluminum Cans	0	0	35947	N/A	N/A	820.95	0	0	35947	0	N/A	N/A	610.04	-210.91
Aluminum Ingot	0	0	17360	N/A	N/A	396.46	0	0	17360	0	N/A	N/A	294.61	-101.86
Steel Cans	0	0	216911	N/A	N/A	-346936.51	0	0	216911	0	N/A	N/A	3681.07	350617.58
Copper Wire	0	0	2404	N/A	N/A	47.22	0	0	2404	0	N/A	N/A	40.8	-6.43
Mixed Metals	0	0	264569	N/A	N/A	-272603.92	0	0	264569	0	N/A	N/A	4489.85	277093.77
Glass	0	0	145695	N/A	N/A	2582.67	0	0	145695	0	N/A	N/A	2472.51	-110.17
Asphalt Shingles	0	0	60153	N/A	N/A	-21528.8	0	0	60153	0	N/A	N/A	1020.82	22549.63
Carpet	0	0	132031	N/A	N/A	169435.12	0	0	132031	0	N/A	N/A	2240.62	-167194.49
Dimensional Lumber	0	0	651261	N/A	N/A	-248682.45	0	0	651261	0	N/A	N/A	-678912.85	-430230.39
Vinyl Flooring	N/A	0	1248	N/A	N/A	-144.65	0	N/A	1248	0	N/A	N/A	21.18	165.83
Wood Flooring	N/A	0	86391	N/A	N/A	-41004.94	0	N/A	86391	0	N/A	N/A	-74516.14	-33511.2
Tires	0	0	33518	N/A	N/A	16642.56	0	0	33518	0	N/A	N/A	568.81	-16073.75
Mixed Organics	N/A	0	596155	0	0	-53059.63	N/A	N/A	596155	0	0	0	-5351.05	47708.58
Mixed MSW	N/A	0	961575	N/A	N/A	124908.97	N/A	N/A	961575	0	N/A	N/A	103802.61	-21106.36
						950376.61							-604490.08	

Total Change in GHG Emissions (MTCO2E): **-1554866.69**
This is equivalent to...

Removing annual emissions from **330120** Passenger Vehicles
Conserving **174959681** Gallons of Gasoline
Conserving **64786111** Cylinders of Propane Used for Home Barbeques
0.00087% Annual CO2 emissions from the U.S. transportation sector
0.00086% Annual CO2 emissions from the U.S. energy sector

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Outputs - Energy - WTEF and Finley Buttes

	Baseline Scenario						Alternative Scenario							
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total million BTU	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total million BTU	Change (Alt-Base) million BTU
Corrugated Containers	0	0	452953	N/A	N/A	-2649152.1	0	0	452953	0	N/A	N/A	-275189.65	2373962.46
Magazines/Third-class Mail	0	0	14465	N/A	N/A	-63315.1	0	0	14465	0	N/A	N/A	-2045.98	61269.12
Newspaper	0	0	32149	N/A	N/A	-212065.36	0	0	32149	0	N/A	N/A	-3567.21	208498.16
Office Paper	0	0	16712	N/A	N/A	-94394.44	0	0	16712	0	N/A	N/A	-17043.34	77351.1
Mixed Paper (general)	0	0	359210	N/A	N/A	-2108666.6	0	0	359210	0	N/A	N/A	-191429.93	1917236.64
Mixed Paper (primarily residential)	0	0	130812	N/A	N/A	-764648.65	0	0	130812	0	N/A	N/A	-65898.78	698749.87
Food Waste	N/A	0	264289	0	0	-527611.44	0	N/A	264289	0	0	0	-68725.57	458885.87
Food Waste (non-meat)	N/A	0	826698	0	0	-1650372.6	0	N/A	826698	0	0	0	-214974.11	1435398.49
Food Waste (meat only)	N/A	0	238968	0	0	-477062.05	0	N/A	238968	0	0	0	-62141.11	414920.94
Grass	N/A	0	87434	0	0	-205541.77	N/A	N/A	87434	0	0	0	7267.46	212809.23
Leaves	N/A	0	87434	0	0	-205541.77	N/A	N/A	87434	0	0	0	3176.86	208718.63
Branches	N/A	0	35043	0	0	-82379.85	N/A	N/A	35043	0	0	0	-8123.13	74256.72
HDPE	0	0	292843	N/A	N/A	-4837070.5	0	0	292843	0	N/A	N/A	66091.04	4903161.54
LDPE	N/A	0	422594	N/A	N/A	-6942624.3	0	N/A	422594	0	N/A	N/A	95374.23	7037998.55
PET	0	0	103000	N/A	N/A	-904433.68	0	0	103000	0	N/A	N/A	23245.82	927679.5
PP	0	0	71558	N/A	N/A	-1179785.5	0	0	71558	0	N/A	N/A	16149.75	1195935.24
PS	N/A	0	61277	N/A	N/A	-911878.29	0	N/A	61277	0	N/A	N/A	13829.46	925707.75

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Outputs - Energy - WTEF and Finley Buttes

	Baseline Scenario						Alternative Scenario							
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total million BTU	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total million BTU	Change (Alt-Base) million BTU
PVC	N/A	0	261	N/A	N/A	-1705.5	0	N/A	261	0	N/A	N/A	58.9	1764.41
Mixed Plastics	0	0	210058	N/A	N/A	-2490396.7	0	0	210058	0	N/A	N/A	47407.49	2537804.19
PLA	N/A	0	2874	0	N/A	-19948.19	0	N/A	2874	0	0	N/A	648.63	20596.82
Flat-panel Displays	0	0	61667	N/A	N/A	-482159.22	0	0	61667	0	N/A	N/A	13917.48	496076.7
Hard-copy Devices	0	0	14453	N/A	N/A	-114008.24	0	0	14453	0	N/A	N/A	3261.86	117270.1
Mixed Electronics	0	0	50621	N/A	N/A	-270475.15	N/A	0	50621	0	N/A	N/A	11424.53	281899.68
Aluminum Cans	0	0	35947	N/A	N/A	8396.45	0	0	35947	0	N/A	N/A	8112.79	-283.66
Aluminum Ingot	0	0	17360	N/A	N/A	4054.92	0	0	17360	0	N/A	N/A	3917.94	-136.99
Steel Cans	0	0	216911	N/A	N/A	-3791529.9	0	0	216911	0	N/A	N/A	48954.12	3840484.01
Copper Wire	0	0	2404	N/A	N/A	437.66	0	0	2404	0	N/A	N/A	542.55	104.89
Mixed Metals	0	0	264569	N/A	N/A	-2980664.4	0	0	264569	0	N/A	N/A	59709.94	3040374.37
Glass	0	0	145695	N/A	N/A	22020.57	0	0	145695	0	N/A	N/A	32881.56	10860.99
Asphalt Shingles	0	0	60153	N/A	N/A	-531908.04	0	0	60153	0	N/A	N/A	13575.79	545483.83
Carpet	0	0	132031	N/A	N/A	-832825	0	0	132031	0	N/A	N/A	29797.76	862622.76
Dimensional Lumber	0	0	651261	N/A	N/A	-4483839.5	0	0	651261	0	N/A	N/A	112331.25	4596170.79
Vinyl Flooring	N/A	0	1248	N/A	N/A	-8155.06	0	N/A	1248	0	N/A	N/A	281.66	8436.72
Wood Flooring	N/A	0	86391	N/A	N/A	-777280.24	0	N/A	86391	0	N/A	N/A	19497.38	796777.61
Tires	0	0	33518	N/A	N/A	-966360.97	0	0	33518	0	N/A	N/A	7564.6	973925.57
Mixed Organics	N/A	0	596155	0	0	-1288681.6	N/A	N/A	596155	0	0	0	-79555.26	1209126.37
Mixed MSW	N/A	0	961575	N/A	N/A	-4004418	N/A	N/A	961575	0	N/A	N/A	-285668.21	3718749.74
						-46825990							-635341.44	

a) For explanation of methodology, see the EPA WARM Documentation
b) Emissions estimates provided by this model are intended to support voluntary GHG measurement and reporting initiatives.

Total Change in Energy Use (million BTU): **46190648.71**
This is equivalent to...
Consuming **504198** Households' Annual Energy
Consuming **7950197** Barrels of Oil
Consuming **383476427** Gallons of Gasoline

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Adjusted Results - GHG - WTEF and Finley Buttes

	WTEF - WARM GHG (AR4) (MT CO2e)	WTEF - GHG 100 year (AR6) (MT CO2e)	WTEF - GHG 20 year (AR6) (MT CO2e)	Finley Buttes - WARM GHG (AR4) (MT CO2e)	Finley Buttes - GHG 100 year (AR6) (MT CO2e)	Finley Buttes - GHG 20 year (AR6) (MT CO2e)
Carbon (landfill storage)	0	0	0	-2,151,177	-2,151,177	-2,151,177
Carbon (landfill storage) - Adjusted	0	0	0	-497,534	-497,534	-497,534
Methane	-32,014	-35,728	-103,983	1,727,194	1,927,548	5,609,925
Carbon dioxide	921,965	921,965	921,965	-299,329	-299,329	-299,329
Nitrous oxide	174,363	159,735	159,735	-694	-635	-635
GHGs (unspecified)	-137,612	-137,612	-137,612	0	0	0
TOTAL GHG	926,701	908,360	840,105	929,638	1,130,050	4,812,427

Note: The carbon (landfill storage) - adjusted value removes the carbon storage associated with those materials with long carbon lifecycles.

	WTEF - WARM GHG (AR4) (MT CO2e)	WTEF - GHG 100 year (AR6) (MT CO2e)	WTEF - GHG 20 year (AR6) (MT CO2e)	Finley Buttes - WARM GHG (AR4) (MT CO2e)	Finley Buttes - GHG 100 year (AR6) (MT CO2e)	Finley Buttes - GHG 20 year (AR6) (MT CO2e)
Combustion	3,964,964	3,888,552	3,888,552	0	0	0
Electricity	-2,324,189	-2,270,409	-2,338,664	-300,394	-300,379	-301,171
Source Reduction	-712,854	-708,570	-708,570	0	0	0
Recycling	-4,518	-4,491	-4,491	0	0	0
Other	3,298	3,278	3,278	0	0	0
Landfilling (subtotal)	0	0	0	1,230,031	1,430,429	5,113,598
Landfilling - Carbon Storage	0	0	0	-497,534	-497,534	-497,534
Landfilling - Methane	0	0	0	1,727,565	1,927,963	5,611,131
TOTAL GHG	926,701	908,360	840,105	929,638	1,130,050	4,812,427

	WTEF - WARM GHG (AR4) (MT CO2e)	WTEF - GHG 100 year (AR6) (MT CO2e)	WTEF - GHG 20 year (AR6) (MT CO2e)	Finley Buttes - WARM GHG (AR4) (MT CO2e)	Finley Buttes - GHG 100 year (AR6) (MT CO2e)	Finley Buttes - GHG 20 year (AR6) (MT CO2e)
Anthropogenic Direct Emissions	3,968,262	3,891,830	3,891,830	1,727,565	1,927,963	5,611,131
Electricity Generation	-2,324,189	-2,270,409	-2,338,664	-300,394	-300,379	-301,171
Source Reduction & Recycling	-717,372	-713,061	-713,061	0	0	0
Carbon Storage	0	0	0	-497,534	-497,534	-497,534
TOTAL GHG	926,701	908,360	840,105	929,638	1,130,050	4,812,427

GWPs Used in WARM (AR4)

	100-Year
Carbon Dioxide	1
Methane	25
Nitrous Oxide	298

Note: WARM defaults to the GWPs from IPCC AR4. See WARM Background Guidance (page 1-3):
https://www.epa.gov/sites/default/files/2020-12/documents/warm_background_v15_10-29-2020.pdf

GWPs to be Used in Analysis (AR6)

	100-Year	20-Year
Carbon Dioxide	1	1
Methane	27.9	81.2
Nitrous Oxide	273	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)
https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Heavy Equipment for Landfilling Exclusion

Heavy Equipment Emissions (MT CO2e)	119,516

Note: WARM includes the emissions associated with heavy equipment use for landfills and transport. Because this was calculated outside of WARM, this was eliminated.

WTE Transport Exclusion

WTEF Transport Emissions (MT CO2e)	23,676

Note: WARM includes the emissions associated with transport for WTEF. Because this was calculated outside of WARM, this was eliminated.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Inputs - WTEF and Wenatchee

Locations

In order to account for the avoided electricity-related emissions in the landfilling and combustion pathways, EPA assigns the appropriate regional "marginal" electricity grid mix emission factor based on your location

Please select state or national average: Washington

Region location: **Pacific**

Waste Transport Characteristics

Emissions that occur during transport of materials to the management facility are included in this model. You may use default transport distances, 20 miles, or provide information on the transport distances for the various MSW management options.

- ○ Use default distance
- ◉ Define distance

Management option	Default Distance (miles)	Defined Distance (miles)
Landfill	20	0
Combustion	20	0
Recycling	20	0
Composting	20	0
Anaerobic Digestion	20	0

Source reduction

To estimate the benefits from source reduction, EPA usually assumes that the material that is source reduced would have been manufactured from the current mix of virgin and recycled inputs. However, you may choose to estimate the emission reductions from source reduction under the assumption that the material would have been manufactured from 100% virgin inputs in order to obtain an upper bound estimate of the benefits from source reduction. Select which assumption you want to use in the analysis. Note that for materials for which information on the share of recycled inputs used in production is unavailable or is not a common practice; EPA assumes that the current mix is comprised of 100% virgin inputs. Consequently, the source reduction benefits of both the "Current mix" and "100% virgin" inputs are the same.

- ◉ Current Mix
- ○ 100% Virgin

Landfill Characteristics (I, II, III)

I) Landfill Type

The emissions from landfilling depend on whether the landfill where your waste is disposed has a landfill gas (LFG) control system. If you do not know whether your landfill has LFG control, select "National Average", which calculates emissions based on the proportions of landfills with LFG control in 2012. If your landfill does not have a LFG system, select "No LFG Recovery". If a LFG system is in place at your landfill, select "LFG Recovery" and click one of the indented buttons to indicate whether LFG is recovered for energy or flared.

- ○ National Average
- ○ No LFG Recovery
- ◉ LFG Recovery
  - ○ Recover for energy
  - ◉ Flare

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Environmental Impacts of Waste Disposal
WARM Inputs - WTEF and Wenatchee

II) Landfill Gas Recovery

For landfills that recover gas, the landfill gas collection efficiency will vary throughout the life of the landfill. Based on a literature review of field measurements and expert discussion, a range of collection efficiencies was estimated for a series of different landfill scenarios. The "typical" landfill is judged to represent the average U.S. landfill, although it must be recognized that every landfill is unique and a typical landfill is an approximation of reality. The worst-case collection scenario represents a landfill that is in compliance with EPA's New Source Performance Standards (NSPS). The aggressive gas collection scenario includes landfills where the operator is aggressive in gas collection relative to a typical landfill. Bioreactor landfills, which are operated to accelerate decomposition, are assumed to collect gas aggressively. The California regulatory collection scenario allows users to estimate and view landfill management results based on California regulatory requirements.

- (●) Typical operation - DEFAULT
- ( ) Worst-case collection
- ( ) Aggressive gas collection
- ( ) California regulatory collection

Landfill gas collection efficiency (%) assumptions
Typical: Years 0-1: 0%; Years 2-4: 50%; Years 5-14: 75%; Years 15 to 1 year before final cover: 82.5%; Final cover: 90%
Worst-case: Years 0-4: 0%; Years 5-9: 50%; Years 10-14: 75%; Years 15 to 1 year before final cover: 82.5%; Final cover:
Aggressive: Year 0: 0%; Years 0.5-2: 50%; Years 3-14: 75%; Years 15 to 1 year before final cover: 82.5%; Final cover: 90%
California: Year 0: 0%; Year 1: 50%; Years 2-7: 80%; Years 8 to 1 year before final cover: 85%; Final cover: 90%

III) Moisture Conditions and Decay Rates

Which of the following moisture conditions and associated bulk MSW decay rate (k) most accurately describes the average conditions at the landfill? The decay rates, also referred to as k values, describe the rate of change per year (yr-1) for the decomposition of organic waste in landfills. A higher average decay rate means that waste decomposes faster in the landfill.

- ( ) National Average - DEFAULT
- (●) Dry (k = 0.02)
- ( ) Moderate (k = 0.04)
- ( ) Wet (k = 0.06)
- ( ) Biorecator (k = 0.12)

Moisture condition assumptions
Dry (k=0.02): Less than 20 inches of precipitation per year
Moderate (k=0.04): Between 20 and 40 inches of precipitation per year
Wet (k=0.06): Greater than 40 inches of precipitation per year
Bioreactor (k=0.12): Water is added until the moisture content reaches 40 percent moisture on a wet weight basis
National average: Weighted average based on the share of waste received at each landfill type

Anaerobic Digestion

Digestion Type

For anaerobic digestion of food waste materials (including beef, poultry, grains, bread, fruits and vegetables, and dairy products), please choose the appropriate type of anaerobic digestion process used. Note that for grass, leaves, branches, yard trimmings and mixed organics, wet digestion is not applicable based on current technology and practices in the United States. Therefore, dry digestion is the only digestion type modeled in WARM for these materials. Only one type of digestion process (wet or dry) can be modeled at a time in WARM.

- ( ) Wet Digestion
- (●) Dry Digestion

Digestate Curing

WARM assumes that digestate resulting from anaerobic digestion processes will be applied to land. In many cases, the digestate is cured before land application.When digestate is cured, the digestate is dewatered and any liquids are recovered and returned to the reactor (when using a wet digester). Next, the digestate is aerobically cured in turned windrows, then screened and applied to agricultural fields. Select whether the digestate resulting from your anaerobic digester is cured before land application.

- (●) Cured - DEFAULT
- ( ) Not Cured

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Outputs - GHG - WTEF and Wenatchee

	Baseline Scenario						Alternative Scenario							
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total MTCO2E	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total MTCO2E	Change (Alt-Base) MTCO2E
Corrugated Containers	0	0	452953	N/A	N/A	-143857.8	0	0	452953	0	N/A	N/A	242418.36	386276.16
Magazines/Third-class Mail	0	0	14465	N/A	N/A	-3274.37	0	0	14465	0	N/A	N/A	-5392.74	-2118.37
Newspaper	0	0	32149	N/A	N/A	-11700.9	0	0	32149	0	N/A	N/A	-22549.26	-10848.36
Office Paper	0	0	16712	N/A	N/A	-5100.16	0	0	16712	0	N/A	N/A	28084.39	33184.55
Mixed Paper (general)	0	0	359210	N/A	N/A	-114567.53	0	0	359210	0	N/A	N/A	138111.2	252678.74
Mixed Paper (primarily residential)	0	0	130812	N/A	N/A	-41519.73	0	0	130812	0	N/A	N/A	40328.3	81848.03
Food Waste	N/A	0	264289	0	0	-20813.68	0	N/A	264289	0	0	0	142996.68	163810.37
Food Waste (non-meat)	N/A	0	826698	0	0	-65105.35	0	N/A	826698	0	0	0	447294.71	512400.07
Food Waste (meat only)	N/A	0	238968	0	0	-18819.56	0	N/A	238968	0	0	0	129296.46	148116.02
Grass	N/A	0	87434	0	0	-8807.37	N/A	N/A	87434	0	0	0	7701.17	16508.54
Leaves	N/A	0	87434	0	0	-8807.37	N/A	N/A	87434	0	0	0	-46415.57	-37608.2
Branches	N/A	0	35043	0	0	-3529.94	N/A	N/A	35043	0	0	0	-12368.94	-8839
HDPE	0	0	292843	N/A	N/A	520783.53	0	0	292843	0	N/A	N/A	4969.67	-515813.85
LDPE	N/A	0	422594	N/A	N/A	753861.71	0	N/A	422594	0	N/A	N/A	7171.6	-746690.11
PET	0	0	103000	N/A	N/A	154635.33	0	0	103000	0	N/A	N/A	1747.95	-152887.37
PP	0	0	71558	N/A	N/A	127392.01	0	0	71558	0	N/A	N/A	1214.37	-126177.64
PS	N/A	0	61277	N/A	N/A	128360.69	0	N/A	61277	0	N/A	N/A	1039.9	-127320.8
PVC	N/A	0	261	N/A	N/A	223.4	0	N/A	261	0	N/A	N/A	4.43	-218.97
Mixed Plastics	0	0	210058	N/A	N/A	338493	0	0	210058	0	N/A	N/A	3564.77	-334928.22

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Outputs - GHG - WTEF and Wenatchee

	Baseline Scenario						Alternative Scenario							
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total MTCO2E	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total MTCO2E	Change (Alt-Base) MTCO2E
PLA	N/A	0	2874	0	N/A	-1212.8	0	N/A	2874	0	0	N/A	-4730.31	-3517.52
Flat-panel Displays	0	0	61667	N/A	N/A	3703.47	0	0	61667	0	N/A	N/A	1046.52	-2656.95
Hard-copy Devices	0	0	14453	N/A	N/A	17823.68	0	0	14453	0	N/A	N/A	245.27	-17578.41
Mixed Electronics	0	0	50621	N/A	N/A	21343.31	N/A	0	50621	0	N/A	N/A	859.06	-20484.25
Aluminum Cans	0	0	35947	N/A	N/A	820.95	0	0	35947	0	N/A	N/A	610.04	-210.91
Aluminum Ingot	0	0	17360	N/A	N/A	396.46	0	0	17360	0	N/A	N/A	294.61	-101.86
Steel Cans	0	0	216911	N/A	N/A	-346936.51	0	0	216911	0	N/A	N/A	3681.07	350617.58
Copper Wire	0	0	2404	N/A	N/A	47.22	0	0	2404	0	N/A	N/A	40.8	-6.43
Mixed Metals	0	0	264569	N/A	N/A	-272603.92	0	0	264569	0	N/A	N/A	4489.85	277093.77
Glass	0	0	145695	N/A	N/A	2582.67	0	0	145695	0	N/A	N/A	2472.51	-110.17
Asphalt Shingles	0	0	60153	N/A	N/A	-21528.8	0	0	60153	0	N/A	N/A	1020.82	22549.63
Carpet	0	0	132031	N/A	N/A	169435.12	0	0	132031	0	N/A	N/A	2240.62	-167194.49
Dimensional Lumber	0	0	651261	N/A	N/A	-248682.45	0	0	651261	0	N/A	N/A	-654662.1	-405979.65
Vinyl Flooring	N/A	0	1248	N/A	N/A	-144.65	0	N/A	1248	0	N/A	N/A	21.18	165.83
Wood Flooring	N/A	0	86391	N/A	N/A	-41004.94	0	N/A	86391	0	N/A	N/A	-74516.14	-33511.2
Tires	0	0	33518	N/A	N/A	16642.56	0	0	33518	0	N/A	N/A	568.81	-16073.75
Mixed Organics	N/A	0	596155	0	0	-53059.63	N/A	N/A	596155	0	0	0	115544.48	168604.11
Mixed MSW	N/A	0	961575	N/A	N/A	124908.97	N/A	N/A	961575	0	N/A	N/A	509655.1	384746.13
						950376.61							1018099.66	

Total Change in GHG Emissions (MTCO2E): **67723.05**
This is equivalent to...

Adding annual emissions from **14378** Passenger Vehicles
Consuming **7620462** Gallons of Gasoline
Consuming **2821793** Cylinders of Propane Used for Home Barbeques
0.00004% Annual CO2 emissions from the U.S. transportation sector
0.00004% Annual CO2 emissions from the U.S. energy sector

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Outputs - Energy - WTEF and Wenatchee

	Baseline Scenario						Alternative Scenario							
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total million BTU	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total million BTU	Change (Alt-Base) million BTU
Corrugated Containers	0	0	452953	N/A	N/A	-2649152.1	0	0	452953	0	N/A	N/A	102225.88	2751377.99
Magazines/Third-class Mail	0	0	14465	N/A	N/A	-63315.1	0	0	14465	0	N/A	N/A	3264.57	66579.67
Newspaper	0	0	32149	N/A	N/A	-212065.36	0	0	32149	0	N/A	N/A	7255.63	219321
Office Paper	0	0	16712	N/A	N/A	-94394.44	0	0	16712	0	N/A	N/A	3771.69	98166.13
Mixed Paper (general)	0	0	359210	N/A	N/A	-2108666.6	0	0	359210	0	N/A	N/A	81069.24	2189735.82
Mixed Paper (primarily residential)	0	0	130812	N/A	N/A	-764648.65	0	0	130812	0	N/A	N/A	29522.65	794171.3
Food Waste	N/A	0	264289	0	0	-527611.44	0	N/A	264289	0	0	0	59646.75	587258.19
Food Waste (non-meat)	N/A	0	826698	0	0	-1650372.6	0	N/A	826698	0	0	0	186575.49	1836948.09
Food Waste (meat only)	N/A	0	238968	0	0	-477062.05	0	N/A	238968	0	0	0	53932.12	530994.16
Grass	N/A	0	87434	0	0	-205541.77	N/A	N/A	87434	0	0	0	19732.77	225274.54
Leaves	N/A	0	87434	0	0	-205541.77	N/A	N/A	87434	0	0	0	19732.77	225274.54
Branches	N/A	0	35043	0	0	-82379.85	N/A	N/A	35043	0	0	0	7908.77	90288.63
HDPE	0	0	292843	N/A	N/A	-4837070.5	0	0	292843	0	N/A	N/A	66091.04	4903161.54
LDPE	N/A	0	422594	N/A	N/A	-6942624.3	0	N/A	422594	0	N/A	N/A	95374.23	7037998.55
PET	0	0	103000	N/A	N/A	-904433.68	0	0	103000	0	N/A	N/A	23245.82	927679.5
PP	0	0	71558	N/A	N/A	-1179785.5	0	0	71558	0	N/A	N/A	16149.75	1195935.24
PS	N/A	0	61277	N/A	N/A	-911878.29	0	N/A	61277	0	N/A	N/A	13829.46	925707.75
PVC	N/A	0	261	N/A	N/A	-1705.5	0	N/A	261	0	N/A	N/A	58.9	1764.41

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Outputs - Energy - WTEF and Wenatchee

	Baseline Scenario						Alternative Scenario							
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total million BTU	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Tons Anaerobically Digested	Total million BTU	Change (Alt-Base) million BTU
Mixed Plastics	0	0	210058	N/A	N/A	-2490396.7	0	0	210058	0	N/A	N/A	47407.49	2537804.19
PLA	N/A	0	2874	0	N/A	-19948.19	0	N/A	2874	0	0	N/A	648.63	20596.82
Flat-panel Displays	0	0	61667	N/A	N/A	-482159.22	0	0	61667	0	N/A	N/A	13917.48	496076.7
Hard-copy Devices	0	0	14453	N/A	N/A	-114008.24	0	0	14453	0	N/A	N/A	3261.86	117270.1
Mixed Electronics	0	0	50621	N/A	N/A	-270475.15	N/A	0	50621	0	N/A	N/A	11424.53	281899.68
Aluminum Cans	0	0	35947	N/A	N/A	8396.45	0	0	35947	0	N/A	N/A	8112.79	-283.66
Aluminum Ingot	0	0	17360	N/A	N/A	4054.92	0	0	17360	0	N/A	N/A	3917.94	-136.99
Steel Cans	0	0	216911	N/A	N/A	-3791529.9	0	0	216911	0	N/A	N/A	48954.12	3840484.01
Copper Wire	0	0	2404	N/A	N/A	437.66	0	0	2404	0	N/A	N/A	542.55	104.89
Mixed Metals	0	0	264569	N/A	N/A	-2980664.4	0	0	264569	0	N/A	N/A	59709.94	3040374.37
Glass	0	0	145695	N/A	N/A	22020.57	0	0	145695	0	N/A	N/A	32881.56	10860.99
Asphalt Shingles	0	0	60153	N/A	N/A	-531908.04	0	0	60153	0	N/A	N/A	13575.79	545483.83
Carpet	0	0	132031	N/A	N/A	-832825	0	0	132031	0	N/A	N/A	29797.76	862622.76
Dimensional Lumber	0	0	651261	N/A	N/A	-4483839.5	0	0	651261	0	N/A	N/A	146981.54	4630821.08
Vinyl Flooring	N/A	0	1248	N/A	N/A	-8155.06	0	N/A	1248	0	N/A	N/A	281.66	8436.72
Wood Flooring	N/A	0	86391	N/A	N/A	-777280.24	0	N/A	86391	0	N/A	N/A	19497.38	796777.61
Tires	0	0	33518	N/A	N/A	-966360.97	0	0	33518	0	N/A	N/A	7564.6	973925.57
Mixed Organics	N/A	0	596155	0	0	-1288681.6	N/A	N/A	596155	0	0	0	134544.79	1423226.42
Mixed MSW	N/A	0	961575	N/A	N/A	-4004418	N/A	N/A	961575	0	N/A	N/A	217015.56	4221433.51
						-46825990							1589425.5	

a) For explanation of methodology, see the EPA WARM Documentation
b) Emissions estimates provided by this model are intended to support voluntary GHG measurement and reporting initiatives.

Total Change in Energy Use (million BTU): **48415415.65**
This is equivalent to...
Consuming **528483** Households' Annual Energy
Consuming **8333118** Barrels of Oil
Consuming **401946522** Gallons of Gasoline

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WARM Adjusted Results - GHG WTEF and Wenatchee

	WTEF - WARM GHG (AR4) (MT CO2e)	WTEF - GHG 100 year (AR6) (MT CO2e)	WTEF - GHG 20 year (AR6) (MT CO2e)	Wenatchee - WARM GHG (AR4) (MT CO2e)	Wenatchee - GHG 100 year (AR6) (MT CO2e)	Wenatchee - GHG 20 year (AR6) (MT CO2e)
Carbon (landfill storage)	0	0	0	-2,154,809	-2,154,809	-2,154,809
Carbon (landfill storage) - Adjusted	0	0	0	-501,165	-501,165	-501,165
Methane	-32,014	-35,728	-103,983	3,053,393	3,407,586	9,917,420
Carbon dioxide	921,965	921,965	921,965	0	0	0
Nitrous oxide	174,363	159,735	159,735	0	0	0
GHGs (unspecified)	-137,612	-137,612	-137,612	0	0	0
TOTAL GHG	926,701	908,360	840,105	2,552,227	2,906,421	9,416,255

Note: The carbon (landfill storage) - adjusted value removes the carbon storage associated with those materials with long carbon lifecycles.

	WTEF - WARM GHG (AR4) (MT CO2e)	WTEF - GHG 100 year (AR6) (MT CO2e)	WTEF - GHG 20 year (AR6) (MT CO2e)	Wenatchee - WARM GHG (AR4) (MT CO2e)	Wenatchee - GHG 100 year (AR6) (MT CO2e)	Wenatchee - GHG 20 year (AR6) (MT CO2e)
Combustion	3,964,964	3,888,552	3,888,552	0	0	0
Electricity	-2,324,189	-2,270,409	-2,338,664	0	0	0
Source Reduction	-712,854	-708,570	-708,570	0	0	0
Recycling	-4,518	-4,491	-4,491	0	0	0
Other	3,298	3,278	3,278	0	0	0
Landfilling (Storage)	0	0	0	2,552,227	2,906,421	9,416,255
Landfilling - Carbon Storage	0	0	0	-501,165	-501,165	-501,165
Landfilling - Methane	0	0	0	3,053,393	3,407,586	9,917,420
TOTAL GHG	926,701	908,360	840,105	2,552,227	2,906,421	9,416,255

	WTEF - WARM GHG (AR4) (MT CO2e)	WTEF - GHG 100 year (AR6) (MT CO2e)	WTEF - GHG 20 year (AR6) (MT CO2e)	Wenatchee - WARM GHG (AR4) (MT CO2e)	Wenatchee - GHG 100 year (AR6) (MT CO2e)	Wenatchee - GHG 20 year (AR6) (MT CO2e)
Anthropogenic Direct Emissions	3,968,262	3,891,830	3,891,830	3,053,393	3,407,586	9,917,420
Electricity Generation	-2,324,189	-2,270,409	-2,338,664	0	0	0
Source Reduction & Recycling	-717,372	-713,061	-713,061	0	0	0
Carbon Storage	0	0	0	-501,165	-501,165	-501,165
TOTAL GHG	926,701	908,360	840,105	2,552,227	2,906,421	9,416,255

GWPs Used in WARM (AR4)

	100-Year
Carbon Dioxide	1
Methane	25
Nitrous Oxide	298

Note: WARM defaults to the GWPs from IPCC AR4. See WARM Background Guidance (page 1-3):
https://www.epa.gov/sites/default/files/2020-12/documents/warm_background_v15_10-29-2020.pdf

GWPs to be Used in Analysis (AR6)

	100-Year	20-Year
Carbon Dioxide	1	1
Methane	27.9	81.2
Nitrous Oxide	273	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)
https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Heavy Equipment for Landfilling Exclusion

Heavy Equipment Emissions (MT CO2e)	119,516

Note: WARM includes the emissions associated with heavy equipment use for landfills and transport. Because this was calculated outside of WARM, this was eliminated.

WTEF Transport Exclusion

WTEF Transport Emissions (MT CO2e)	23,676

Note: WARM includes the emissions associated with transport for WTEF. Because this was calculated outside of WARM, this was eliminated.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Landfill Carbon Storage for Tree Products Exclusion

Carbon Storage for Excluded "Tree Products"

Material	Est. Percent	Waste Category - WARM	Estimated Annual Tonnage (ton per year)	Estimated Total Tonnage (tons)	Amount of Carbon Stored ($MT CO_2e$ per Wet Short Ton)	Annual Carbon Storage (MT CO2e per year)	Total Carbon Storage (MT CO2e)
Newspaper Packaging	0.0%	Newspaper	49.7	1,492	1.19	59.2	1,775
Cardboard & Kraft Packaging	6.0%	Corrugated Containers	15,098	452,953	0.72	10,871	326,126
Mixed/Low-grade Paper Packaging	1.8%	Mixed Paper (general)	4,437	133,113	0.72	3,209	96,268
Compostable Paper Packaging	1.7%	Mixed Organics	4,260	127,790	0.30	1,284	38,529
R/C Paper Packaging	1.8%	Mixed Paper (general)	4,375	131,259	0.72	3,164	94,927
Newspaper Products	0.4%	Newspaper	903	27,096	1.19	1,075	32,245
Cardboard & Kraft Paper Products	0.0%	Mixed Paper (general)	54.9	1,648	0.72	39.7	1,192
Magazines	0.2%	Magazines/Third-class Mail	482	14,465	0.85	410	12,295
High-Grade Paper Products	0.2%	Office Paper	557	16,712	0.12	66.8	2,005
Other Groundwood Paper Products	0.0%	Newspaper	119	3,561	1.19	141	4,237
Mixed/Low-grade Paper Products	1.7%	Mixed Paper (primarily residential)	4,360	130,812	0.76	3,301	99,038
Compostable Paper Products	3.4%	Mixed Organics	8,611	258,342	0.30	2,596	77,890
R/C Paper Products	1.2%	Mixed Paper (general)	3,106	93,190	0.72	2,246	67,395
Natural Wood	0.2%	Dimensional Lumber	541	16,236	1.09	590	17,697
Treated Wood	0.4%	Dimensional Lumber	982	29,470	1.09	1,071	32,122
Painted Wood	3.8%	Dimensional Lumber	9,474	284,207	1.09	10,326	309,786
Dimensional Lumber	0.8%	Dimensional Lumber	1,949	58,475	1.09	2,125	63,738
Engineered Wood	0.9%	Dimensional Lumber	2,235	67,038	1.09	2,436	73,072
Pallets & Crates	2.6%	Dimensional Lumber	6,528	195,835	1.09	7,115	213,460
Other Untreated Wood	0.0%	Wood Flooring	54.6	1,639	1.04	56.8	1,704
Wood By-products	0.2%	Wood Flooring	527	15,823	1.04	549	16,456
R/C Wood Debris	0.9%	Wood Flooring	2,298	68,930	1.04	2,390	71,687
					TOTAL	**55,121**	**1,653,644**

Carbon Storage for Excluded "Tree Products"

Material	Total MSW (short tons)	Total Carbon Storage (MT CO2e)	Note
Newspaper	32,149	38,257	
Corrugated Containers	452,953	326,126	
Mixed Paper (general)	359,210	259,781	
Mixed MSW	0	0	
Mixed Organics	386,132	116,419	This mixed organics category includes compostable paper packaging and compostable paper products.
Magazines/Third-class Mail	14,465	12,295	
Office Paper	16,712	2,005	
Mixed Paper (primarily residential)	130,812	99,038	
Dimensional Lumber	651,261	709,875	
Wood Flooring	86,391	89,847	
	TOTAL	**2,130,086**	**1,653,644**

TOTALS

Long Carbon Life Cycle Carbon Storage (MT CO2e)	1,653,644

ASSUMPTIONS

Assumed Waste Quantity	250,000	tpy
Years of Analysis	30	years

Material	Amount of Carbon Stored (MT CO_2e per Wet Short Ton)	Source
Corrugated Containers	0.72	a
Magazines/Third-Class Mail	0.85	a
Newspaper	1.19	a
Office Paper	0.12	a
Phonebooks	1.19	a
Textbooks	0.12	a
Dimensional Lumber	1.09	a
Medium-Density Fiberboard	0.92	a
Food Waste	0.09	a
Yard Trimmings	0.54	a
Grass	0.14	a
Leaves	0.79	a
Branches	1.06	a
Mixed MSW	0.21	a
Drywall	0.08	a
Wood Flooring	1.04	a
Mixed Organics	0.30	b
Mixed Paper (general)	0.72	c
Mixed Paper (primarily residential)	0.76	d
Food Waste (meat only)	0.09	e
Food Waste (non-meat)	0.09	f

Source:

a: Documentation for Greenhouse Gas Emission and Energy Factors Used in Waste Reduction Model (WARM), Management Practice Chapters, 2020, Exhibit 6-13 (pp. 6-16)

b: Calculated based on mixed organics being 53% food waste and 47% yard waste from Documentation for Greenhouse Gas Emission and Energy Factors Used in Waste Reduction Model (WARM), Background Chapters, 2020, (pp. 1-3).

c: Calculated based on mixed paper (general) being 24% newspaper, 48% corrugated cardboard, 8% magazines, and 20% office paper from Documentation for Greenhouse Gas Emission and Energy Factors Used in Waste Reduction Model (WARM), Background Chapters, 2020, (pp. 1-3). WARM Background Chapters pp. 1-3 references the following paper in discussing the percentages for mixed paper (general): Barlaz, M.A. (1998) Carbon storage during biodegradation of municipal solid waste components in laboratory-scale landfills. Global Biogeochem. Cycles, 12 (2), 373–380.

d: Calculated based on mixed paper (residential) being 23% newspaper, 53% corrugated cardboard, 10% magazines and 14% office paper from Documentation for Greenhouse Gas Emission and Energy Factors Used in Waste Reduction Model (WARM), Background Chapters, 2020, (pp. 1-3). WARM Background Chapters pp. 1-3 references the following paper in discussing the percentages for mixed paper (primarily residential): Barlaz, M.A. (1998) Carbon storage during biodegradation of municipal solid waste components in laboratory-scale landfills. Global Biogeochem. Cycles, 12 (2), 373–380.

e: Food waste (meat only) is considered food waste, as there are not separate carbon storage estimates for beef and poultry in Documentation for Greenhouse Gas Emission and Energy Factors Used in Waste Reduction Model (WARM), Management Practice Chapters, 2020, Exhibit 6-13 (pp. 6-16).

f: Food waste (non-meat) is considered food waste, as there are not separate carbon storage estimates for non-meat in Documentation for Greenhouse Gas Emission and Energy Factors Used in Waste Reduction Model (WARM), Management Practice Chapters, 2020, Exhibit 6-13 (pp. 6-16).

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Electricity Generation Calculated in WARM

Electricity Generation

	Emissions Offset from Electricity (MT CO2e)	Back-Calculated Electricity Generated (MMBtu)	Back-Calculated Electricity Generated (MWh)
WTEF	2,324,189	15,391,978	4,510,944
Roosevelt	300,394	1,989,362	583,025
Finley Buttes	300,394	1,989,362	583,025

Electricity Grid Emission Factor Non-Baseload Offset	0.151	MT CO2e/MMBtu

Unit Conversions

1 MMBtu =	293.07107	kWh
1 MWh =	1000	kWh
1 MMBtu =	10.0023877	therms

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WTEF - Total Biogenic CO_2e from Tree Products for 20-year GWP

Biogenic Type	Spokane Waste-to-Energy Facility Biogenic CO_2e from Tree Products (Metric Tons)	Roosevelt Regional Landfill Biogenic CO_2e from Tree Products (Metric Tons)	Finley Buttes Landfill Biogenic CO_2e from Tree Products (Metric Tons)	Greater Wenatchee Regional Landfill Biogenic CO_2e from Tree Products (Metric Tons)
71 Wood flooring	142,532	4,278	4,278	4,278
15 Corrugated Containers	747,302	176,080	176,080	176,080
64 Dimensional Lumber	1,074,480	6,649	6,649	6,649
22 Mixed Paper (Primarily Residential)	836,033	109,164	109,164	109,164
17 Newspaper	76,905	8,844	8,844	8,844
74 Mixed Organics (Compostable Packaging & Products)	384,718	90,673	90,673	90,673
Total Biogenic from Tree Products	***3,261,970***	***395,688***	***395,688***	***395,688***

Notes:

1. Wood flooring includes the following categories from the East WGA Waste Characterization Study: other untreated wood, wood by-products, remainder/composite wood debris.
2. Corrugated containers includes the following waste categories from the East WGA Waste Characterization Study: cardboard and kraft packaging.
3. Dimensional lumber includes the following waste categories from the East WGA Waste Characterization Study: natural wood, treated wood, painted wood, dimensional lumber, engineered wood, pallets and crates.
4. Mixed paper (primarily residential) includes the following categories from the East WGA Waste Characterization Study: mixed/low grade paper packaging, remainder/composite paper packaging, cardboard and kraft paper products, high-grade paper products, mixed/low-grade paper products, remainder/composite paper products.
5. Newspaper includes the following categories from the East WGA Waste Characterization Study: newspaper packaging, newspaper products, magazines, and other groundwood paper products.
6. Mixed organics (compostable packaging) includes compostable paper packaging and compostable paper products.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WTEF - Total Biogenic CO_2e from Tree Products for 100-year GWP

Biogenic Type	Spokane Waste-to-Energy Facility Biogenic CO_2e from Tree Products (Metric Tons)	Roosevelt Regional Landfill Biogenic CO_2e from Tree Products (Metric Tons)	Finley Buttes Landfill Biogenic CO_2e from Tree Products (Metric Tons)	Greater Wenatchee Regional Landfill Biogenic CO_2e from Tree Products (Metric Tons)
71 Wood flooring	141,953	4,272	4,272	4,272
15 Corrugated Containers	744,263	175,850	175,850	175,850
64 Dimensional Lumber	1,070,111	6,641	6,641	6,641
22 Mixed Paper (Primarily Residential)	832,634	109,022	109,022	109,022
17 Newspaper	76,593	8,832	8,832	8,832
74 Mixed Organics (Compostable Packaging & Products)	379,285	90,555	90,555	90,555
Total Biogenic from Tree Products	***3,244,838***	***395,172***	***395,172***	***395,172***

Notes:

1. Wood flooring includes the following categories from the East WGA Waste Characterization Study: other untreated wood, wood by-products, remainder/composite wood debris.
2. Corrugated containers includes the following waste categories from the East WGA Waste Characterization Study: cardboard and kraft packaging.
3. Dimensional lumber includes the following waste categories from the East WGA Waste Characterization Study: natural wood, treated wood, painted wood, dimensional lumber, engineered wood, pallets and crates.
4. Mixed paper (primarily residential) includes the following categories from the East WGA Waste Characterization Study: mixed/low grade paper packaging, remainder/composite paper packaging, cardboard and kraft paper products, high-grade paper products, mixed/low-grade paper products, remainder/composite paper products.
5. Newspaper includes the following categories from the East WGA Waste Characterization Study: newspaper packaging, newspaper products, magazines, and other groundwood paper products.
6. Mixed organics (compostable packaging) includes compostable paper packaging and compostable paper products.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WTEF Combustion Biogenic CO2e from Tree Products for 20-year GWP

Biogenic Type	WTEF (MSW tonnage/Year)	CO2 (MT/Year)	CH4 (MT/Year)	CO2e (MT/Year)	Total CO2e
71 Wood flooring	2,880	4,722	0.362	4,751	142,532
15 Corrugated Containers	15,098	24,756	1.90	24,910	747,302
64 Dimensional Lumber	21,709	35,594	2.73	35,816	1,074,480
22 Mixed Paper	16,891	27,695	2.13	27,868	836,033
17 Newspaper	1,554	2,548	0.196	2,564	76,905
74 Mixed Organics (Compostable Packaging & Products)	12,871	12,548	3.40	12,824	384,718

Note: N2O combustion-related emissions are already accounted for in WARM and are therefore, excluded here.

Assumptions

			References:
Wood and Wood Residuals (dry basis) Default High Heat value	17.48	mmBtu/short ton	*40 CFR Appendix Table C-1 to Subpart C of Part 98*
Agricultural Byproducts Default High Heat value	8.25	mmBtu/short ton	*40 CFR Appendix Table C-1 to Subpart C of Part 98*
Years of Operation	30	years	

Emission Factors

Wood and Wood Residuals (dry basis)

kg CO2/mmBtu	93.8	kg/mmBtu	*40 CFR Appendix Table C-1 to Subpart C of Part 98*
kg CH4/mmBtu	0.0072	kg/mmBtu	*40 CFR Appendix Table C-2 to Subpart C of Part 98*

Agricultural Byproducts

kg CO2/mmBtu	118.17	kg/mmBtu	*40 CFR Appendix Table C-1 to Subpart C of Part 98*

Biomass Fuels - Solid (except wood and wood residuals)

kg CH4/mmBtu	0.032	kg/mmBtu	*40 CFR Appendix Table C-2 to Subpart C of Part 98*

Global Warming Potentials to Convert to CO2e

	CO2	CH4	N2O
Global Warming Potential - 20-year time horizon	1	81.2	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Unit Conversion

1 metric ton (MT) =	1000	kilogram

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WTEF Combustion Biogenic CO2e from Tree Products for 100-year GWP

Biogenic Type	WTEF (MSW tonnage/Year)	CO2 (MT/Year)	CH4 (MT/Year)	CO2e (MT/Year)	Total CO2e
71 Wood flooring	2,880	4,722	0.362	4,732	141,953
15 Corrugated Containers	15,098	24,756	1.90	24,809	744,263
64 Dimensional Lumber	21,709	35,594	2.73	35,670	1,070,111
22 Mixed Paper	16,891	27,695	2.13	27,754	832,634
17 Newspaper	1,554	2,548	0.196	2,553	76,593
74 Mixed Organics (Compostable Packaging & Products)	12,871	12,548	3.40	12,643	379,285

Note: N2O combustion-related emissions are already accounted for in WARM and are therefore, excluded here.

Assumptions

			References:
Wood and Wood Residuals (dry basis) Default High Heat value	17.48	mmBtu/short ton	*40 CFR Appendix Table C-1 to Subpart C of Part 98*
Agricultural Byproducts Default High Heat value	8.25	mmBtu/short ton	*40 CFR Appendix Table C-1 to Subpart C of Part 98*
Years of Operation	30	years	

Emission Factors

Wood and Wood Residuals (dry basis)

kg CO2/mmBtu	93.8	kg/mmBtu	*40 CFR Appendix Table C-1 to Subpart C of Part 98*
kg CH4/mmBtu	0.0072	kg/mmBtu	*40 CFR Appendix Table C-2 to Subpart C of Part 98*

Agricultural Byproducts

kg CO2/mmBtu	118.17	kg/mmBtu	*40 CFR Appendix Table C-1 to Subpart C of Part 98*

Biomass Fuels - Solid (except wood and wood residuals)

kg CH4/mmBtu	0.032	kg/mmBtu	*40 CFR Appendix Table C-2 to Subpart C of Part 98*

Global Warming Potentials to Convert to CO2e

	CO2	CH4	N2O
Global Warming Potential - 100-year time horizon	1	27.9	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Unit Conversion

1 metric ton (MT) =	1000	kilogram

Washington Department of Ecology

Environmental Impacts of Waste Disposal

Biogenic CO2 - LandGEM Inputs for Landfills - Summary

Inputs to WARM	General Info	Name	Address	County	Methane Generation Rate, k (year-1)
	Scenario 1	Spokane Waste-to-Energy Facility	2900 S Geiger Blvd, Spokane, WA 99224	Spokane	0.02
	Scenario 2	Republic Services Roosevelt Regional Landfill	500 Roosevelt Grade Rd, Roosevelt, WA 99356	Klickitat	0.02
	Scenario 3	Waste Connection Finley Buttes Landfill	73221 Bombing Range Rd, Boardman, OR 97818	Morrow	0.02
	Scenario 4	Waste Management Greater Wenatchee Regional Landfill	191 Webb Road East Wenatchee, WA 98802	Douglas	0.02

Inputs to LandGEM	Category	Landfill Name/File Names	Methane Generation Rate, k (year-1)	Potential Methane Generation Capacity, L0 (m3/Mg)	Waste Composition Percentage	Short tons/year Waste Acceptance Rate
	Dimensional Lumber	All Landfills_Dimensional Lumber Waste	Inventory Arid Area - 0.02	4.00	8.7%	21,709
	Woodflooring	All Landfills_Woodflooring Waste	Inventory Arid Area - 0.02	19.40	1.2%	2,880
	Newspaper	All Landfills_Newspaper Waste	Inventory Arid Area - 0.02	74.33	0.6%	1,554
	Mixed Paper	All Landfills_Mixed Paper Waste	Inventory Arid Area - 0.02	84.40	6.8%	16,891
	Mixed Organics	All Landfills_Mixed Organics Waste	Inventory Arid Area - 0.02	92.00	5.1%	12,871
	Corrugated Containers	All Landfills_Corrugated Containers Waste	Inventory Arid Area - 0.02	152.30	6.0%	15,098

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Landfill Precipitation and Methane Generation Rate (k)

Landfill	Closest WRCC Location	Precipitation Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total (in)	Methane Generation Rate, k (year-1)
		Rainfall	1.43	1.00	0.73	0.53	0.59	0.49	0.15	0.20	0.35	0.65	1.25	1.50	8.87	
	Arlington,	Snowfall	5.00	1.40	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	2.30	9.70	
Roosevelt	Oregon	Total	1.93	1.14	0.75	0.53	0.59	0.49	0.15	0.20	0.35	0.65	1.33	1.73	9.84	0.02
		Rainfall	1.23	0.85	0.67	0.65	0.69	0.50	0.22	0.29	0.39	0.60	1.14	1.32	8.55	
	Boardman,	Snowfall	1.90	1.30	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.50	2.70	6.70	
Finley Buttes	Oregon	Total	1.42	0.98	0.69	0.65	0.69	0.50	0.22	0.29	0.39	0.61	1.19	1.59	9.22	0.02
		Rainfall	1.09	0.79	0.62	0.59	0.64	0.55	0.26	0.31	0.30	0.46	1.07	1.38	8.06	
	Wenatchee,	Snowfall	10.30	4.30	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.20	4.20	12.00	32.60	
Wenatchee	Washington	Total	2.12	1.22	0.78	0.59	0.64	0.55	0.26	0.31	0.30	0.48	1.49	2.58	11.32	0.02

Notes:
1. Precipitation is defined as rain, snow, hail, and sleet. https://education.nationalgeographic.org/resource/types-precipitation,
2. For the study, precipitation will only account for rain and snow due to lack of readily available data for hail and sleet
3. Snowfall is 10 times the rainfall volume. 1 inch of rain is equivalent to 10 inches of snowfall
https://www.omnicalculator.com/other/rain-to-snow
4. Precipitation data is from Western Regional Climate Center (WRCC) and is an average from 01/01/1893 to 06/10/2016. The closest WRCC station to the landfill was identified

7. Which of the following moisture conditions and associated bulk MSW decay rate (k) most accurately describes the average conditions at the landfill?
The decay rates, also referred to as k values, describe the rate of change per year (yr-1) for the decomposition of organic waste in landfills. A higher average decay rate means that waste decomposes faster in the landfill.

- (•) National average - DEFAULT
- ( ) Dry (k=0.02)
- ( ) Moderate (k = 0.04)
- ( ) Wet (k = 0.06)
- ( ) Bioreactor (k = 0.12)

	Moisture condition assumptions
Dry (k=0.02)	*Less than 20 inches of precipitation per year*
Moderate (k=0.04)	*Between 20 and 40 inches of precipitation per year*
Wet (k=0.06)	*Greater than 40 inches of precipitation per year*
Bioreactor (k=0.12)	*Water is added until the moisture content reaches 40 percent moisture on a wet weight basis*
National average	*Weighted average based on the share of waste received at each landfill type*

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Methane Yield Assignment for Landfills

Methane Yield of Solid Waste Composition Types

Waste	Potential Methane Generation Capacity, L0 (m3/Mg)	Source
Dimensional Lumber	4.00	(Wang et al. 2011) Average of softwood radiata pine and spruce.
Medium Density Fiberboard	4.60	(Wang et al. 2011) Value is for medium-density fiberboard.
Woodflooring	19.40	(Wang et al. 2011) Average of hardwood red oak and plywood.
Leaves	30.60	(Eleazer et al. 1997) Value is for "leaves".
Yard Trimmings	62.60	(Eleazer et al. 1997) Value is for "branch".
Newspaper	74.33	(Eleazer et al. 1997) Value is for "old newsprint".
Mixed Paper	84.40	(Eleazer et al. 1997) Value is for "coated paper".
Mixed Organics	92.00	(Eleazer et al. 1997) Value is for "MSW".
Corrugated Containers	152.30	(Eleazer et al. 1997) Value is for "old corrugated containers".
Food Waste	300.70	(Eleazer et al. 1997) Value is for "food".

Sources: Eleazer, W., W. Odle, Y. Wang, and M. Barlaz. 1997 Biodegradability of Municipal Solid Waste Components in Laboratory-Scale Landfills. Environmental Science Technology 31, 911-917. https://pubs.acs.org/doi/10.1021/es9606788
Wang, X., J. Padgett, F. De la Cruz, and M. Barlaz 2011 Wood Biodegradation in Laboratory-Scae Landfills. Environmental Science & Technology 45, 6864-6871 https://pubs.acs.org/doi/full/10.1021/es201241g

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Tree Products Input to LandGem

Material	Est. Percent	+ / -	Est. Tons	Tons + / -	Tonnage Input to LandGEM	Waste Category
PAPER	**19.0%**	**2.2%**	**160,811**	**18,752**	47,583.20	Superclass header.
PAPER PACKAGING	**11.8%**	**1.7%**	**99,323**	**14,263**	29,389.01	Superclass header.
Newspaper Packaging	0.0%	0.0%	168	161	49.72	Newspaper
Cardboard & Kraft Packaging	6.0%	1.1%	51,026	9,073	15,098.43	Corrugated Containers
Mixed/Low-grade Paper Packaging	1.8%	0.3%	14,996	2,709	4,437.11	Mixed Paper
Compostable Paper Packaging	1.7%	0.4%	14,396	3,155	4,259.68	Mixed Organics
R/C Paper Packaging	1.8%	1.3%	14,787	10,982	4,375.31	Mixed Paper
PAPER PRODUCTS	**7.3%**	**1.0%**	**61,489**	**8,812**	18,194.19	Superclass header.
Newspaper Products	0.4%	0.1%	3,052	1,168	903.21	Newspaper
Cardboard & Kraft Paper Products	0.0%	0.0%	186	302	54.93	Mixed Paper
Magazines	0.2%	0.1%	1,630	1,118	482.17	Newspaper
High-Grade Paper Products	0.2%	0.1%	1,883	761	557.07	Mixed Paper
Other Groundwood Paper Products	0.0%	0.1%	401	508	118.69	Newspaper
Mixed/Low-grade Paper Products	1.7%	0.4%	14,736	3,668	4,360.41	Mixed Paper
Compostable Paper Products	3.4%	0.6%	29,103	5,337	8,611.39	Mixed Organics
R/C Paper Products	1.2%	0.7%	10,498	5,925	3,106.32	Mixed Paper
WOOD DEBRIS	**9.8%**	**2.6%**	**83,099**	**22,043**	24,588.43	Superclass header.
Natural Wood	0.2%	0.3%	1,829	2,353	541.20	Dimensional Lumber
Treated Wood	0.4%	0.3%	3,320	2,741	982.33	Dimensional Lumber
Painted Wood	3.8%	1.8%	32,017	15,233	9,473.57	Dimensional Lumber
Dimensional Lumber	0.8%	0.3%	6,587	2,926	1,949.18	Dimensional Lumber
Engineered Wood	0.9%	0.4%	7,552	3,027	2,234.61	Dimensional Lumber
Pallets & Crates	2.6%	1.4%	22,061	11,928	6,527.83	Dimensional Lumber
Other Untreated Wood	0.0%	0.0%	185	152	54.63	Woodflooring
Wood By-products	0.2%	0.2%	1,783	1,780	527.43	Woodflooring
R/C Wood Debris	0.9%	0.5%	7,765	4,413	2,297.65	Woodflooring

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Landfill Fugitive Biogenic CO2 from Tree Products

Biogenic Type	Total Biogenic CO_2 from Tree Products (Metric Tons)
71 Wood flooring	2,561
15 Corrugated Containers	105,432
64 Dimensional Lumber	3,981
22 Mixed Paper (Primarily Residential)	65,365
17 Newspaper	5,295
74 Mixed Organics (Compostable Packaging & Products)	54,293

Notes:

Even though some of the CO_2 gets collected by the gas collection system, the collected CO_2 passess through the control combustion device (flare or generator) and gets released to the atmosphere anyway. Therefore, all surface CO2 is considered to be emitted to the atmosphere.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Landfill Combustion Biogenic CO2e from Tree Products for 20-year GWP

Biogenic Type	Total Landfill Gas (ft^3)	Total CO2 (MT)	Total CH4 (MT)	Total N2O (MT)	CO2e (MT)
71 Wood flooring	98,835,619	1,702	0.105	0.0206	1,716
15 Corrugated Containers	4,068,122,099	70,066	4.31	0.848	70,647
64 Dimentional Lumber	153,623,016	2,646	0.163	0.0320	2,668
22 Mixed Paper	2,522,109,277	43,439	2.67	0.526	43,799
17 Newspaper	204,323,917	3,519	0.216	0.0426	3,548
74 Mixed Organics (Compostable Packaging & Products)	2,094,905,467	36,081	2.22	0.44	36,380

Assumptions

			References:
GCCS collection efficiency	68.2%		*Documentation for Greenhouse Gas Emission and Energy Factors Used in the WARM Exhibit 6-10: Management Practices Chapters (assmuming "Typical collection" to represent average U.S. landfill), November 2020 version*
Landfill Gas Default High Heat value	0.000485	mmBtu/scf	*40 CFR Appendix Table C-1 to Subpart C of Part 98*

Emission Factors

kg CO2/mmBtu	52.07	kg/mmBtu	*40 CFR Appendix Table C-1 to Subpart C of Part 98*
kg CH4/mmBtu	0.0032	kg/mmBtu	*40 CFR Appendix Table C-2 to Subpart C of Part 98 (Biomass Fuels - Gaseous)*
kg N2O/mmBtu	0.00063	kg/mmBtu	*40 CFR Appendix Table C-2 to Subpart C of Part 98 (Biomass Fuels - Gaseous)*

Global Warming Potentials to Convert to CO2e

	CO2	CH4	N2O
Global Warming Potential - 20-year time horizon	1	81.2	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Unit Conversion

1 metric ton (MT) =	1000	kilogram

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Landfill Combustion Biogenic CO2e from Tree Products for 100-year GWP

Biogenic Type	Total Landfill Gas (ft^3)	Total CO2 (MT)	Total CH4 (MT)	Total N2O (MT)	CO2e (MT)
71 Wood flooring	98,835,619	1,702	0.105	0.0206	1,711
15 Corrugated Containers	4,068,122,099	70,066	4.31	0.848	70,418
64 Dimentional Lumber	153,623,016	2,646	0.163	0.0320	2,659
22 Mixed Paper	2,522,109,277	43,439	2.67	0.526	43,657
17 Newspaper	204,323,917	3,519	0.216	0.0426	3,537
74 Mixed Organics (Compostable Packaging & Products)	2,094,905,467	36,081	2.22	0.437	36,262

Assumptions

			References:
GCCS collection efficiency	68.2%		*Documentation for Greenhouse Gas Emission and Energy Factors Used in the WARM Exhibit 6-10: Management Practices Chapters (assmuming "Typical collection" to represent average U.S. landfill), November 2020 version*
Landfill Gas Default High Heat value	0.000485	mmBtu/scf	*40 CFR Appendix Table C-1 to Subpart C of Part 98*

Emission Factors

kg CO2/mmBtu	52.07	kg/mmBtu	*40 CFR Appendix Table C-1 to Subpart C of Part 98*
kg CH4/mmBtu	0.0032	kg/mmBtu	*40 CFR Appendix Table C-2 to Subpart C of Part 98 (Biomass Fuels - Gaseous)*
kg N2O/mmBtu	0.00063	kg/mmBtu	*40 CFR Appendix Table C-2 to Subpart C of Part 98 (Biomass Fuels - Gaseous)*

Global Warming Potentials to Convert to CO2e

	CO2	CH4	N2O
Global Warming Potential - 100-year time horizon	1	27.9	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Unit Conversion

1 metric ton (MT) =	1000	kilogram

LANDGEM RESULTS **Landfill Name or Identifier:** All Landfills_Dimensional Lumber Waste

Closure Year (with 80-year limit) = 2054
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*
2024	19,735	21,709	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	19,735	21,709	19,735	21,709	3.908E+00	3.129E+03	1.105E+05	1.044E+00	1.565E+03	5.526E+04	2.864E+00	1.565E+03	5.526E+04	6.730E-03	1.878E+00	6.631E+01
2026	19,735	21,709	39,470	43,417	7.739E+00	6.197E+03	2.188E+05	2.067E+00	3.098E+03	1.094E+05	5.672E+00	3.098E+03	1.094E+05	1.333E-02	3.718E+00	1.313E+02
2027	19,735	21,709	59,206	65,126	1.149E+01	9.204E+03	3.250E+05	3.070E+00	4.602E+03	1.625E+05	8.424E+00	4.602E+03	1.625E+05	1.979E-02	5.522E+00	1.950E+02
2028	19,735	21,709	78,941	86,835	1.517E+01	1.215E+04	4.291E+05	4.053E+00	6.075E+03	2.146E+05	1.112E+01	6.075E+03	2.146E+05	2.613E-02	7.290E+00	2.575E+02
2029	19,735	21,709	98,676	108,544	1.878E+01	1.504E+04	5.311E+05	5.017E+00	7.520E+03	2.656E+05	1.376E+01	7.520E+03	2.656E+05	3.235E-02	9.024E+00	3.187E+02
2030	19,735	21,709	118,411	130,252	2.232E+01	1.787E+04	6.311E+05	5.961E+00	8.936E+03	3.156E+05	1.636E+01	8.936E+03	3.156E+05	3.843E-02	1.072E+01	3.787E+02
2031	19,735	21,709	138,146	151,961	2.578E+01	2.065E+04	7.291E+05	6.887E+00	1.032E+04	3.646E+05	1.890E+01	1.032E+04	3.646E+05	4.440E-02	1.239E+01	4.375E+02
2032	19,735	21,709	157,882	173,670	2.918E+01	2.337E+04	8.252E+05	7.795E+00	1.168E+04	4.126E+05	2.139E+01	1.168E+04	4.126E+05	5.026E-02	1.402E+01	4.951E+02
2033	19,735	21,709	177,617	195,378	3.251E+01	2.603E+04	9.194E+05	8.684E+00	1.302E+04	4.597E+05	2.383E+01	1.302E+04	4.597E+05	5.599E-02	1.562E+01	5.516E+02
2034	19,735	21,709	197,352	217,087	3.578E+01	2.865E+04	1.012E+06	9.556E+00	1.432E+04	5.058E+05	2.622E+01	1.432E+04	5.058E+05	6.161E-02	1.719E+01	6.070E+02
2035	19,735	21,709	217,087	238,796	3.898E+01	3.121E+04	1.102E+06	1.041E+01	1.560E+04	5.511E+05	2.856E+01	1.560E+04	5.511E+05	6.712E-02	1.873E+01	6.613E+02
2036	19,735	21,709	236,822	260,505	4.211E+01	3.372E+04	1.191E+06	1.125E+01	1.686E+04	5.954E+05	3.086E+01	1.686E+04	5.954E+05	7.252E-02	2.023E+01	7.145E+02
2037	19,735	21,709	256,558	282,213	4.519E+01	3.618E+04	1.278E+06	1.207E+01	1.809E+04	6.389E+05	3.312E+01	1.809E+04	6.389E+05	7.782E-02	2.171E+01	7.667E+02
2038	19,735	21,709	276,293	303,922	4.820E+01	3.860E+04	1.363E+06	1.287E+01	1.930E+04	6.815E+05	3.532E+01	1.930E+04	6.815E+05	8.301E-02	2.316E+01	8.178E+02
2039	19,735	21,709	296,028	325,631	5.115E+01	4.096E+04	1.447E+06	1.366E+01	2.048E+04	7.233E+05	3.749E+01	2.048E+04	7.233E+05	8.809E-02	2.458E+01	8.679E+02
2040	19,735	21,709	315,763	347,339	5.405E+01	4.328E+04	1.528E+06	1.444E+01	2.164E+04	7.642E+05	3.961E+01	2.164E+04	7.642E+05	9.308E-02	2.597E+01	9.170E+02
2041	19,735	21,709	335,498	369,048	5.689E+01	4.555E+04	1.609E+06	1.519E+01	2.278E+04	8.043E+05	4.169E+01	2.278E+04	8.043E+05	9.797E-02	2.733E+01	9.652E+02
2042	19,735	21,709	355,234	390,757	5.967E+01	4.778E+04	1.687E+06	1.594E+01	2.389E+04	8.437E+05	4.373E+01	2.389E+04	8.437E+05	1.028E-01	2.867E+01	1.012E+03
2043	19,735	21,709	374,969	412,466	6.239E+01	4.996E+04	1.764E+06	1.667E+01	2.498E+04	8.822E+05	4.573E+01	2.498E+04	8.822E+05	1.075E-01	2.998E+01	1.059E+03
2044	19,735	21,709	394,704	434,174	6.507E+01	5.210E+04	1.840E+06	1.738E+01	2.605E+04	9.200E+05	4.769E+01	2.605E+04	9.200E+05	1.121E-01	3.126E+01	1.104E+03
2045	19,735	21,709	414,439	455,883	6.769E+01	5.420E+04	1.914E+06	1.808E+01	2.710E+04	9.570E+05	4.961E+01	2.710E+04	9.570E+05	1.166E-01	3.252E+01	1.148E+03
2046	19,735	21,709	434,174	477,592	7.025E+01	5.626E+04	1.987E+06	1.877E+01	2.813E+04	9.933E+05	5.149E+01	2.813E+04	9.933E+05	1.210E-01	3.375E+01	1.192E+03
2047	19,735	21,709	453,910	499,300	7.277E+01	5.827E+04	2.058E+06	1.944E+01	2.914E+04	1.029E+06	5.333E+01	2.914E+04	1.029E+06	1.253E-01	3.496E+01	1.235E+03
2048	19,735	21,709	473,645	521,009	7.524E+01	6.025E+04	2.128E+06	2.010E+01	3.012E+04	1.064E+06	5.514E+01	3.012E+04	1.064E+06	1.296E-01	3.615E+01	1.277E+03
2049	19,735	21,709	493,380	542,718	7.766E+01	6.218E+04	2.196E+06	2.074E+01	3.109E+04	1.098E+06	5.691E+01	3.109E+04	1.098E+06	1.337E-01	3.731E+01	1.318E+03
2050	19,735	21,709	513,115	564,427	8.003E+01	6.408E+04	2.263E+06	2.138E+01	3.204E+04	1.132E+06	5.865E+01	3.204E+04	1.132E+06	1.378E-01	3.845E+01	1.358E+03
2051	19,735	21,709	532,850	586,135	8.235E+01	6.594E+04	2.329E+06	2.200E+01	3.297E+04	1.164E+06	6.035E+01	3.297E+04	1.164E+06	1.418E-01	3.957E+01	1.397E+03
2052	19,735	21,709	552,586	607,844	8.463E+01	6.777E+04	2.393E+06	2.260E+01	3.388E+04	1.197E+06	6.202E+01	3.388E+04	1.197E+06	1.457E-01	4.066E+01	1.436E+03
2053	19,735	21,709	572,321	629,553	8.686E+01	6.955E+04	2.456E+06	2.320E+01	3.478E+04	1.228E+06	6.366E+01	3.478E+04	1.228E+06	1.496E-01	4.173E+01	1.474E+03
2054	0	0	592,056	651,261	8.905E+01	7.131E+04	2.518E+06	2.379E+01	3.565E+04	1.259E+06	6.526E+01	3.565E+04	1.259E+06	1.534E-01	4.278E+01	1.511E+03
2055	0	0	592,056	651,261	8.728E+01	6.989E+04	2.468E+06	2.331E+01	3.495E+04	1.234E+06	6.397E+01	3.495E+04	1.234E+06	1.503E-01	4.194E+01	1.481E+03
2056	0	0	592,056	651,261	8.556E+01	6.851E+04	2.419E+06	2.285E+01	3.425E+04	1.210E+06	6.270E+01	3.425E+04	1.210E+06	1.473E-01	4.111E+01	1.452E+03
2057	0	0	592,056	651,261	8.386E+01	6.715E+04	2.372E+06	2.240E+01	3.358E+04	1.186E+06	6.146E+01	3.358E+04	1.186E+06	1.444E-01	4.029E+01	1.423E+03
2058	0	0	592,056	651,261	8.220E+01	6.582E+04	2.325E+06	2.196E+01	3.291E+04	1.162E+06	6.024E+01	3.291E+04	1.162E+06	1.416E-01	3.949E+01	1.395E+03
2059	0	0	592,056	651,261	8.057E+01	6.452E+04	2.279E+06	2.152E+01	3.226E+04	1.139E+06	5.905E+01	3.226E+04	1.139E+06	1.388E-01	3.871E+01	1.367E+03
2060	0	0	592,056	651,261	7.898E+01	6.324E+04	2.233E+06	2.110E+01	3.162E+04	1.117E+06	5.788E+01	3.162E+04	1.117E+06	1.360E-01	3.795E+01	1.340E+03
2061	0	0	592,056	651,261	7.741E+01	6.199E+04	2.189E+06	2.068E+01	3.100E+04	1.095E+06	5.674E+01	3.100E+04	1.095E+06	1.333E-01	3.719E+01	1.314E+03
2062	0	0	592,056	651,261	7.588E+01	6.076E+04	2.146E+06	2.027E+01	3.038E+04	1.073E+06	5.561E+01	3.038E+04	1.073E+06	1.307E-01	3.646E+01	1.287E+03
2063	0	0	592,056	651,261	7.438E+01	5.956E+04	2.103E+06	1.987E+01	2.978E+04	1.052E+06	5.451E+01	2.978E+04	1.052E+06	1.281E-01	3.574E+01	1.262E+03
2064	0	0	592,056	651,261	7.291E+01	5.838E+04	2.062E+06	1.947E+01	2.919E+04	1.031E+06	5.343E+01	2.919E+04	1.031E+06	1.256E-01	3.503E+01	1.237E+03
2065	0	0	592,056	651,261	7.146E+01	5.722E+04	2.021E+06	1.909E+01	2.861E+04	1.010E+06	5.237E+01	2.861E+04	1.010E+06	1.231E-01	3.433E+01	1.213E+03
2066	0	0	592,056	651,261	7.005E+01	5.609E+04	1.981E+06	1.871E+01	2.805E+04	9.904E+05	5.134E+01	2.805E+04	9.904E+05	1.206E-01	3.365E+01	1.189E+03
2067	0	0	592,056	651,261	6.866E+01	5.498E+04	1.942E+06	1.834E+01	2.749E+04	9.708E+05	5.032E+01	2.749E+04	9.708E+05	1.182E-01	3.299E+01	1.165E+03
2068	0	0	592,056	651,261	6.730E+01	5.389E+04	1.903E+06	1.798E+01	2.695E+04	9.516E+05	4.932E+01	2.695E+04	9.516E+05	1.159E-01	3.233E+01	1.142E+03
2069	0	0	592,056	651,261	6.597E+01	5.282E+04	1.865E+06	1.762E+01	2.641E+04	9.327E+05	4.835E+01	2.641E+04	9.327E+05	1.136E-01	3.169E+01	1.119E+03
2070	0	0	592,056	651,261	6.466E+01	5.178E+04	1.829E+06	1.727E+01	2.589E+04	9.143E+05	4.739E+01	2.589E+04	9.143E+05	1.114E-01	3.107E+01	1.097E+03
2071	0	0	592,056	651,261	6.338E+01	5.075E+04	1.792E+06	1.693E+01	2.538E+04	8.962E+05	4.645E+01	2.538E+04	8.962E+05	1.092E-01	3.045E+01	1.075E+03
2072	0	0	592,056	651,261	6.213E+01	4.975E+04	1.757E+06	1.659E+01	2.487E+04	8.784E+05	4.553E+01	2.487E+04	8.784E+05	1.070E-01	2.985E+01	1.054E+03
2073	0	0	592,056	651,261	6.090E+01	4.876E+04	1.722E+06	1.627E+01	2.438E+04	8.610E+05	4.463E+01	2.438E+04	8.610E+05	1.049E-01	2.926E+01	1.033E+03
2074	0	0	592,056	651,261	5.969E+01	4.780E+04	1.688E+06	1.594E+01	2.390E+04	8.440E+05	4.375E+01	2.390E+04	8.440E+05	1.028E-01	2.868E+01	1.013E+03
2075	0	0	592,056	651,261	5.851E+01	4.685E+04	1.655E+06	1.563E+01	2.343E+04	8.273E+05	4.288E+01	2.343E+04	8.273E+05	1.008E-01	2.811E+01	9.927E+02
2076	0	0	592,056	651,261	5.735E+01	4.592E+04	1.622E+06	1.532E+01	2.296E+04	8.109E+05	4.203E+01	2.296E+04	8.109E+05	9.877E-02	2.755E+01	9.731E+02
2077	0	0	592,056	651,261	5.621E+01	4.501E+04	1.590E+06	1.502E+01	2.251E+04	7.948E+05	4.120E+01	2.251E+04	7.948E+05	9.681E-02	2.701E+01	9.538E+02
2078	0	0	592,056	651,261	5.510E+01	4.412E+04	1.558E+06	1.472E+01	2.206E+04	7.791E+05	4.038E+01	2.206E+04	7.791E+05	9.489E-02	2.647E+01	9.349E+02
2079	0	0	592,056	651,261	5.401E+01	4.325E+04	1.527E+06	1.443E+01	2.162E+04	7.637E+05	3.958E+01	2.162E+04	7.637E+05	9.301E-02	2.595E+01	9.164E+02
2080	0	0	592,056	651,261	5.294E+01	4.239E+04	1.497E+06	1.414E+01	2.120E+04	7.485E+05	3.880E+01	2.120E+04	7.485E+05	9.117E-02	2.544E+01	8.983E+02
2081	0	0	592,056	651,261	5.189E+01	4.155E+04	1.467E+06	1.386E+01	2.078E+04	7.337E+05	3.803E+01	2.078E+04	7.337E+05	8.937E-02	2.493E+01	8.805E+02
2082	0	0	592,056	651,261	5.087E+01	4.073E+04	1.438E+06	1.359E+01	2.037E+04	7.192E+05	3.728E+01	2.037E+04	7.192E+05	8.760E-02	2.444E+01	8.630E+02
2083	0	0	592,056	651,261	4.986E+01	3.992E+04	1.410E+06	1.332E+01	1.996E+04	7.050E+05	3.654E+01	1.996E+04	7.050E+05	8.586E-02	2.395E+01	8.459E+02
2084	0	0	592,056	651,261	4.887E+01	3.913E+04	1.382E+06	1.305E+01	1.957E+04	6.910E+05	3.582E+01	1.957E+04	6.910E+05	8.416E-02	2.348E+01	8.292E+02
2085	0	0	592,056	651,261	4.790E+01	3.836E+04	1.355E+06	1.280E+01	1.918E+04	6.773E+05	3.511E+01	1.918E+04	6.773E+05	8.250E-02	2.302E+01	8.128E+02
2086	0	0	592,056	651,261	4.695E+01	3.760E+04	1.328E+06	1.254E+01	1.880E+04	6.639E+05	3.441E+01	1.880E+04	6.639E+05	8.086E-02	2.256E+01	7.967E+02
2087	0	0	592,056	651,261	4.602E+01	3.685E+04	1.302E+06	1.229E+01	1.843E+04	6.508E+05	3.373E+01	1.843E+04	6.508E+05	7.926E-02	2.211E+01	7.809E+02
2088	0	0	592,056	651,261	4.511E+01	3.612E+04	1.276E+06	1.205E+01	1.806E+04	6.379E+05	3.306E+01	1.806E+04	6.379E+05	7.769E-02	2.167E+01	7.654E+02
2089	0	0	592,056	651,261	4.422E+01	3.541E+04	1.250E+06	1.181E+01	1.770E+04	6.252E+05	3.241E+01	1.770E+04	6.252E+05	7.615E-02	2.125E+01	7.503E+02
2090	0	0	592,056	651,261	4.334E+01	3.471E+04	1.226E+06	1.158E+01	1.735E+04	6.129E+05	3.177E+01	1.735E+04	6.129E+05	7.465E-02	2.082E+01	7.354E+02
2091	0	0	592,056	651,261	4.249E+01	3.402E+04	1.201E+06	1.135E+01	1.701E+04	6.007E+05	3.114E+01	1.701E+04	6.007E+05	7.317E-02	2.041E+01	7.209E+02
2092	0	0	592,056	651,261	4.164E+01	3.335E+04	1.178E+06	1.112E+01	1.667E+04	5.888E+05	3.052E+01	1.667E+04	5.888E+05	7.172E-02	2.001E+01	7.066E+02
2093	0	0	592,056	651,261	4.082E+01	3.269E+04	1.154E+06	1.090E+01	1.634E+04	5.772E+05	2.992E+01	1.634E+04	5.772E+05	7.030E-02	1.961E+01	6.926E+02
2094	0	0	592,056	651,261	4.001E+01	3.204E+04	1.131E+06	1.069E+01	1.602E+04	5.657E+05	2.932E+01	1.602E+04	5.657E+05	6.891E-02	1.922E+01	6.789E+02
2095	0	0	592,056	651,261	3.922E+01	3.141E+04	1.109E+06	1.048E+01	1.570E+04	5.545E+05	2.874E+01	1.570E+04	5.545E+05	6.754E-02	1.884E+01	6.654E+02
2096	0	0	592,056	651,261	3.844E+01	3.078E+04	1.087E+06	1.027E+01	1.539E+04	5.436E+05	2.817E+01	1.539E+04	5.436E+05	6.621E-02	1.847E+01	6.523E+02
2097	0	0	592,056	651,261	3.768E+01	3.017E+04	1.066E+06	1.007E+01	1.509E+04	5.328E+05	2.762E+01	1.509E+04	5.328E+05	6.489E-02	1.810E+01	6.394E+02

LANDGEM RESULTS **Landfill Name or Identifier:** All Landfills_Dimensional Lumber Waste

Closure Year (with 80-year limit) = 2054
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*
2098	0	0	592,056	651,261	3.694E+01	2.958E+04	1.044E+06	9.866E+00	1.479E+04	5.222E+05	2.707E+01	1.479E+04	5.222E+05	6.361E-02	1.775E+01	6.267E+02
2099	0	0	592,056	651,261	3.620E+01	2.899E+04	1.024E+06	9.671E+00	1.450E+04	5.119E+05	2.653E+01	1.450E+04	5.119E+05	6.235E-02	1.739E+01	6.143E+02
2100	0	0	592,056	651,261	3.549E+01	2.842E+04	1.004E+06	9.479E+00	1.421E+04	5.018E+05	2.601E+01	1.421E+04	5.018E+05	6.112E-02	1.705E+01	6.021E+02
2101	0	0	592,056	651,261	3.478E+01	2.785E+04	9.837E+05	9.291E+00	1.393E+04	4.918E+05	2.549E+01	1.393E+04	4.918E+05	5.990E-02	1.671E+01	5.902E+02
2102	0	0	592,056	651,261	3.410E+01	2.730E+04	9.642E+05	9.107E+00	1.365E+04	4.821E+05	2.499E+01	1.365E+04	4.821E+05	5.872E-02	1.638E+01	5.785E+02
2103	0	0	592,056	651,261	3.342E+01	2.676E+04	9.451E+05	8.927E+00	1.338E+04	4.725E+05	2.449E+01	1.338E+04	4.725E+05	5.756E-02	1.606E+01	5.671E+02
2104	0	0	592,056	651,261	3.276E+01	2.623E+04	9.264E+05	8.750E+00	1.312E+04	4.632E+05	2.401E+01	1.312E+04	4.632E+05	5.642E-02	1.574E+01	5.558E+02
2105	0	0	592,056	651,261	3.211E+01	2.571E+04	9.080E+05	8.577E+00	1.286E+04	4.540E+05	2.353E+01	1.286E+04	4.540E+05	5.530E-02	1.543E+01	5.448E+02
2106	0	0	592,056	651,261	3.147E+01	2.520E+04	8.901E+05	8.407E+00	1.260E+04	4.450E+05	2.307E+01	1.260E+04	4.450E+05	5.420E-02	1.512E+01	5.340E+02
2107	0	0	592,056	651,261	3.085E+01	2.470E+04	8.724E+05	8.241E+00	1.235E+04	4.362E+05	2.261E+01	1.235E+04	4.362E+05	5.313E-02	1.482E+01	5.235E+02
2108	0	0	592,056	651,261	3.024E+01	2.422E+04	8.552E+05	8.078E+00	1.211E+04	4.276E+05	2.216E+01	1.211E+04	4.276E+05	5.208E-02	1.453E+01	5.131E+02
2109	0	0	592,056	651,261	2.964E+01	2.374E+04	8.382E+05	7.918E+00	1.187E+04	4.191E+05	2.172E+01	1.187E+04	4.191E+05	5.105E-02	1.424E+01	5.029E+02
2110	0	0	592,056	651,261	2.905E+01	2.327E+04	8.216E+05	7.761E+00	1.163E+04	4.108E+05	2.129E+01	1.163E+04	4.108E+05	5.004E-02	1.396E+01	4.930E+02
2111	0	0	592,056	651,261	2.848E+01	2.280E+04	8.054E+05	7.607E+00	1.140E+04	4.027E+05	2.087E+01	1.140E+04	4.027E+05	4.905E-02	1.368E+01	4.832E+02
2112	0	0	592,056	651,261	2.792E+01	2.235E+04	7.894E+05	7.456E+00	1.118E+04	3.947E+05	2.046E+01	1.118E+04	3.947E+05	4.807E-02	1.341E+01	4.736E+02
2113	0	0	592,056	651,261	2.736E+01	2.191E+04	7.738E+05	7.309E+00	1.096E+04	3.869E+05	2.005E+01	1.096E+04	3.869E+05	4.712E-02	1.315E+01	4.643E+02
2114	0	0	592,056	651,261	2.682E+01	2.148E+04	7.585E+05	7.164E+00	1.074E+04	3.792E+05	1.966E+01	1.074E+04	3.792E+05	4.619E-02	1.289E+01	4.551E+02
2115	0	0	592,056	651,261	2.629E+01	2.105E+04	7.434E+05	7.022E+00	1.053E+04	3.717E+05	1.927E+01	1.053E+04	3.717E+05	4.528E-02	1.263E+01	4.461E+02
2116	0	0	592,056	651,261	2.577E+01	2.063E+04	7.287E+05	6.883E+00	1.032E+04	3.644E+05	1.889E+01	1.032E+04	3.644E+05	4.438E-02	1.238E+01	4.372E+02
2117	0	0	592,056	651,261	2.526E+01	2.023E+04	7.143E+05	6.747E+00	1.011E+04	3.571E+05	1.851E+01	1.011E+04	3.571E+05	4.350E-02	1.214E+01	4.286E+02
2118	0	0	592,056	651,261	2.476E+01	1.983E+04	7.001E+05	6.613E+00	9.913E+03	3.501E+05	1.815E+01	9.913E+03	3.501E+05	4.264E-02	1.190E+01	4.201E+02
2119	0	0	592,056	651,261	2.427E+01	1.943E+04	6.863E+05	6.482E+00	9.717E+03	3.431E+05	1.779E+01	9.717E+03	3.431E+05	4.179E-02	1.166E+01	4.118E+02
2120	0	0	592,056	651,261	2.379E+01	1.905E+04	6.727E+05	6.354E+00	9.524E+03	3.363E+05	1.743E+01	9.524E+03	3.363E+05	4.097E-02	1.143E+01	4.036E+02
2121	0	0	592,056	651,261	2.332E+01	1.867E+04	6.594E+05	6.228E+00	9.336E+03	3.297E+05	1.709E+01	9.336E+03	3.297E+05	4.016E-02	1.120E+01	3.956E+02
2122	0	0	592,056	651,261	2.286E+01	1.830E+04	6.463E+05	6.105E+00	9.151E+03	3.232E+05	1.675E+01	9.151E+03	3.232E+05	3.936E-02	1.098E+01	3.878E+02
2123	0	0	592,056	651,261	2.240E+01	1.794E+04	6.335E+05	5.984E+00	8.969E+03	3.168E+05	1.642E+01	8.969E+03	3.168E+05	3.858E-02	1.076E+01	3.801E+02
2124	0	0	592,056	651,261	2.196E+01	1.758E+04	6.210E+05	5.865E+00	8.792E+03	3.105E+05	1.609E+01	8.792E+03	3.105E+05	3.782E-02	1.055E+01	3.726E+02
2125	0	0	592,056	651,261	2.152E+01	1.724E+04	6.087E+05	5.749E+00	8.618E+03	3.043E+05	1.577E+01	8.618E+03	3.043E+05	3.707E-02	1.034E+01	3.652E+02
2126	0	0	592,056	651,261	2.110E+01	1.689E+04	5.966E+05	5.635E+00	8.447E+03	2.983E+05	1.546E+01	8.447E+03	2.983E+05	3.633E-02	1.014E+01	3.580E+02
2127	0	0	592,056	651,261	2.068E+01	1.656E+04	5.848E+05	5.524E+00	8.280E+03	2.924E+05	1.516E+01	8.280E+03	2.924E+05	3.561E-02	9.936E+00	3.509E+02
2128	0	0	592,056	651,261	2.027E+01	1.623E+04	5.732E+05	5.415E+00	8.116E+03	2.866E+05	1.486E+01	8.116E+03	2.866E+05	3.491E-02	9.739E+00	3.439E+02
2129	0	0	592,056	651,261	1.987E+01	1.591E+04	5.619E+05	5.307E+00	7.955E+03	2.809E+05	1.456E+01	7.955E+03	2.809E+05	3.422E-02	9.546E+00	3.371E+02
2130	0	0	592,056	651,261	1.948E+01	1.560E+04	5.508E+05	5.202E+00	7.798E+03	2.754E+05	1.427E+01	7.798E+03	2.754E+05	3.354E-02	9.357E+00	3.305E+02
2131	0	0	592,056	651,261	1.909E+01	1.529E+04	5.398E+05	5.099E+00	7.643E+03	2.699E+05	1.399E+01	7.643E+03	2.699E+05	3.288E-02	9.172E+00	3.239E+02
2132	0	0	592,056	651,261	1.871E+01	1.498E+04	5.292E+05	4.998E+00	7.492E+03	2.646E+05	1.371E+01	7.492E+03	2.646E+05	3.223E-02	8.990E+00	3.175E+02
2133	0	0	592,056	651,261	1.834E+01	1.469E+04	5.187E+05	4.899E+00	7.344E+03	2.593E+05	1.344E+01	7.344E+03	2.593E+05	3.159E-02	8.812E+00	3.112E+02
2134	0	0	592,056	651,261	1.798E+01	1.440E+04	5.084E+05	4.802E+00	7.198E+03	2.542E+05	1.318E+01	7.198E+03	2.542E+05	3.096E-02	8.638E+00	3.050E+02
2135	0	0	592,056	651,261	1.762E+01	1.411E+04	4.983E+05	4.707E+00	7.056E+03	2.492E+05	1.292E+01	7.056E+03	2.492E+05	3.035E-02	8.467E+00	2.990E+02
2136	0	0	592,056	651,261	1.727E+01	1.383E+04	4.885E+05	4.614E+00	6.916E+03	2.442E+05	1.266E+01	6.916E+03	2.442E+05	2.975E-02	8.299E+00	2.931E+02
2137	0	0	592,056	651,261	1.693E+01	1.356E+04	4.788E+05	4.523E+00	6.779E+03	2.394E+05	1.241E+01	6.779E+03	2.394E+05	2.916E-02	8.135E+00	2.873E+02
2138	0	0	592,056	651,261	1.660E+01	1.329E+04	4.693E+05	4.433E+00	6.645E+03	2.347E+05	1.216E+01	6.645E+03	2.347E+05	2.858E-02	7.974E+00	2.816E+02
2139	0	0	592,056	651,261	1.627E+01	1.303E+04	4.600E+05	4.345E+00	6.513E+03	2.300E+05	1.192E+01	6.513E+03	2.300E+05	2.802E-02	7.816E+00	2.760E+02
2140	0	0	592,056	651,261	1.595E+01	1.277E+04	4.509E+05	4.259E+00	6.384E+03	2.255E+05	1.169E+01	6.384E+03	2.255E+05	2.746E-02	7.661E+00	2.705E+02
2141	0	0	592,056	651,261	1.563E+01	1.252E+04	4.420E+05	4.175E+00	6.258E+03	2.210E+05	1.145E+01	6.258E+03	2.210E+05	2.692E-02	7.509E+00	2.652E+02
2142	0	0	592,056	651,261	1.532E+01	1.227E+04	4.332E+05	4.092E+00	6.134E+03	2.166E+05	1.123E+01	6.134E+03	2.166E+05	2.638E-02	7.361E+00	2.599E+02
2143	0	0	592,056	651,261	1.502E+01	1.202E+04	4.247E+05	4.011E+00	6.012E+03	2.123E+05	1.101E+01	6.012E+03	2.123E+05	2.586E-02	7.215E+00	2.548E+02
2144	0	0	592,056	651,261	1.472E+01	1.179E+04	4.162E+05	3.932E+00	5.893E+03	2.081E+05	1.079E+01	5.893E+03	2.081E+05	2.535E-02	7.072E+00	2.497E+02
2145	0	0	592,056	651,261	1.443E+01	1.155E+04	4.080E+05	3.854E+00	5.777E+03	2.040E+05	1.057E+01	5.777E+03	2.040E+05	2.485E-02	6.932E+00	2.448E+02
2146	0	0	592,056	651,261	1.414E+01	1.132E+04	3.999E+05	3.778E+00	5.662E+03	2.000E+05	1.036E+01	5.662E+03	2.000E+05	2.436E-02	6.795E+00	2.400E+02
2147	0	0	592,056	651,261	1.386E+01	1.110E+04	3.920E+05	3.703E+00	5.550E+03	1.960E+05	1.016E+01	5.550E+03	1.960E+05	2.387E-02	6.660E+00	2.352E+02
2148	0	0	592,056	651,261	1.359E+01	1.088E+04	3.842E+05	3.629E+00	5.440E+03	1.921E+05	9.958E+00	5.440E+03	1.921E+05	2.340E-02	6.528E+00	2.305E+02
2149	0	0	592,056	651,261	1.332E+01	1.067E+04	3.766E+05	3.558E+00	5.333E+03	1.883E+05	9.761E+00	5.333E+03	1.883E+05	2.294E-02	6.399E+00	2.260E+02
2150	0	0	592,056	651,261	1.306E+01	1.045E+04	3.692E+05	3.487E+00	5.227E+03	1.846E+05	9.568E+00	5.227E+03	1.846E+05	2.248E-02	6.272E+00	2.215E+02
2151	0	0	592,056	651,261	1.280E+01	1.025E+04	3.619E+05	3.418E+00	5.123E+03	1.809E+05	9.378E+00	5.123E+03	1.809E+05	2.204E-02	6.148E+00	2.171E+02
2152	0	0	592,056	651,261	1.254E+01	1.004E+04	3.547E+05	3.350E+00	5.022E+03	1.774E+05	9.193E+00	5.022E+03	1.774E+05	2.160E-02	6.026E+00	2.128E+02
2153	0	0	592,056	651,261	1.229E+01	9.845E+03	3.477E+05	3.284E+00	4.923E+03	1.738E+05	9.011E+00	4.923E+03	1.738E+05	2.117E-02	5.907E+00	2.086E+02
2154	0	0	592,056	651,261	1.205E+01	9.650E+03	3.408E+05	3.219E+00	4.825E+03	1.704E+05	8.832E+00	4.825E+03	1.704E+05	2.075E-02	5.790E+00	2.045E+02
2155	0	0	592,056	651,261	1.181E+01	9.459E+03	3.340E+05	3.155E+00	4.730E+03	1.670E+05	8.657E+00	4.730E+03	1.670E+05	2.034E-02	5.675E+00	2.004E+02
2156	0	0	592,056	651,261	1.158E+01	9.272E+03	3.274E+05	3.093E+00	4.636E+03	1.637E+05	8.486E+00	4.636E+03	1.637E+05	1.994E-02	5.563E+00	1.965E+02
2157	0	0	592,056	651,261	1.135E+01	9.088E+03	3.209E+05	3.032E+00	4.544E+03	1.605E+05	8.318E+00	4.544E+03	1.605E+05	1.955E-02	5.453E+00	1.926E+02
2158	0	0	592,056	651,261	1.112E+01	8.908E+03	3.146E+05	2.972E+00	4.454E+03	1.573E+05	8.153E+00	4.454E+03	1.573E+05	1.916E-02	5.345E+00	1.888E+02
2159	0	0	592,056	651,261	1.090E+01	8.732E+03	3.084E+05	2.913E+00	4.366E+03	1.542E+05	7.992E+00	4.366E+03	1.542E+05	1.878E-02	5.239E+00	1.850E+02
2160	0	0	592,056	651,261	1.069E+01	8.559E+03	3.023E+05	2.855E+00	4.279E+03	1.511E+05	7.834E+00	4.279E+03	1.511E+05	1.841E-02	5.135E+00	1.814E+02
2161	0	0	592,056	651,261	1.048E+01	8.389E+03	2.963E+05	2.799E+00	4.195E+03	1.481E+05	7.678E+00	4.195E+03	1.481E+05	1.804E-02	5.034E+00	1.778E+02
2162	0	0	592,056	651,261	1.027E+01	8.223E+03	2.904E+05	2.743E+00	4.112E+03	1.452E+05	7.526E+00	4.112E+03	1.452E+05	1.769E-02	4.934E+00	1.742E+02
2163	0	0	592,056	651,261	1.007E+01	8.060E+03	2.847E+05	2.689E+00	4.030E+03	1.423E+05	7.377E+00	4.030E+03	1.423E+05	1.734E-02	4.836E+00	1.708E+02
2164	0	0	592,056	651,261	9.867E+00	7.901E+03	2.790E+05	2.636E+00	3.950E+03	1.395E+05	7.231E+00	3.950E+03	1.395E+05	1.699E-02	4.741E+00	1.674E+02

LANDGEM RESULTS **Landfill Name or Identifier:** All Landfills_Woodflooring Waste

Closure Year (with 80-year limit) = 2054
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*
2024	2,618	2,880	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	2,618	2,880	2,618	2,880	2.514E+00	2.013E+03	7.110E+04	6.716E-01	1.007E+03	3.555E+04	1.843E+00	1.007E+03	3.555E+04	4.330E-03	1.208E+00	4.266E+01
2026	2,618	2,880	5,236	5,759	4.979E+00	3.987E+03	1.408E+05	1.330E+00	1.993E+03	7.040E+04	3.649E+00	1.993E+03	7.040E+04	8.574E-03	2.392E+00	8.448E+01
2027	2,618	2,880	7,854	8,639	7.395E+00	5.921E+03	2.091E+05	1.975E+00	2.961E+03	1.046E+05	5.419E+00	2.961E+03	1.046E+05	1.273E-02	3.553E+00	1.255E+02
2028	2,618	2,880	10,472	11,519	9.762E+00	7.817E+03	2.761E+05	2.608E+00	3.909E+03	1.380E+05	7.155E+00	3.909E+03	1.380E+05	1.681E-02	4.690E+00	1.656E+02
2029	2,618	2,880	13,090	14,399	1.208E+01	9.676E+03	3.417E+05	3.228E+00	4.838E+03	1.709E+05	8.856E+00	4.838E+03	1.709E+05	2.081E-02	5.806E+00	2.050E+02
2030	2,618	2,880	15,708	17,278	1.436E+01	1.150E+04	4.060E+05	3.835E+00	5.749E+03	2.030E+05	1.052E+01	5.749E+03	2.030E+05	2.473E-02	6.899E+00	2.436E+02
2031	2,618	2,880	18,325	20,158	1.659E+01	1.328E+04	4.691E+05	4.431E+00	6.642E+03	2.345E+05	1.216E+01	6.642E+03	2.345E+05	2.857E-02	7.970E+00	2.815E+02
2032	2,618	2,880	20,943	23,038	1.877E+01	1.503E+04	5.309E+05	5.015E+00	7.517E+03	2.655E+05	1.376E+01	7.517E+03	2.655E+05	3.233E-02	9.020E+00	3.185E+02
2033	2,618	2,880	23,561	25,917	2.092E+01	1.675E+04	5.915E+05	5.587E+00	8.375E+03	2.957E+05	1.533E+01	8.375E+03	2.957E+05	3.602E-02	1.005E+01	3.549E+02
2034	2,618	2,880	26,179	28,797	2.302E+01	1.843E+04	6.509E+05	6.148E+00	9.215E+03	3.254E+05	1.687E+01	9.215E+03	3.254E+05	3.964E-02	1.106E+01	3.905E+02
2035	2,618	2,880	28,797	31,677	2.508E+01	2.008E+04	7.091E+05	6.698E+00	1.004E+04	3.546E+05	1.838E+01	1.004E+04	3.546E+05	4.318E-02	1.205E+01	4.255E+02
2036	2,618	2,880	31,415	34,557	2.709E+01	2.170E+04	7.662E+05	7.237E+00	1.085E+04	3.831E+05	1.986E+01	1.085E+04	3.831E+05	4.666E-02	1.302E+01	4.597E+02
2037	2,618	2,880	34,033	37,436	2.907E+01	2.328E+04	8.221E+05	7.765E+00	1.164E+04	4.110E+05	2.131E+01	1.164E+04	4.110E+05	5.007E-02	1.397E+01	4.933E+02
2038	2,618	2,880	36,651	40,316	3.101E+01	2.483E+04	8.769E+05	8.283E+00	1.242E+04	4.385E+05	2.273E+01	1.242E+04	4.385E+05	5.340E-02	1.490E+01	5.261E+02
2039	2,618	2,880	39,269	43,196	3.291E+01	2.635E+04	9.307E+05	8.791E+00	1.318E+04	4.653E+05	2.412E+01	1.318E+04	4.653E+05	5.668E-02	1.581E+01	5.584E+02
2040	2,618	2,880	41,887	46,075	3.477E+01	2.784E+04	9.833E+05	9.288E+00	1.392E+04	4.917E+05	2.548E+01	1.392E+04	4.917E+05	5.988E-02	1.671E+01	5.900E+02
2041	2,618	2,880	44,505	48,955	3.660E+01	2.931E+04	1.035E+06	9.776E+00	1.465E+04	5.175E+05	2.682E+01	1.465E+04	5.175E+05	6.303E-02	1.758E+01	6.210E+02
2042	2,618	2,880	47,123	51,835	3.839E+01	3.074E+04	1.086E+06	1.025E+01	1.537E+04	5.428E+05	2.813E+01	1.537E+04	5.428E+05	6.611E-02	1.844E+01	6.513E+02
2043	2,618	2,880	49,741	54,715	4.014E+01	3.214E+04	1.135E+06	1.072E+01	1.607E+04	5.676E+05	2.942E+01	1.607E+04	5.676E+05	6.913E-02	1.929E+01	6.811E+02
2044	2,618	2,880	52,358	57,594	4.186E+01	3.352E+04	1.184E+06	1.118E+01	1.676E+04	5.919E+05	3.068E+01	1.676E+04	5.919E+05	7.209E-02	2.011E+01	7.103E+02
2045	2,618	2,880	54,976	60,474	4.355E+01	3.487E+04	1.231E+06	1.163E+01	1.744E+04	6.157E+05	3.192E+01	1.744E+04	6.157E+05	7.500E-02	2.092E+01	7.389E+02
2046	2,618	2,880	57,594	63,354	4.520E+01	3.619E+04	1.278E+06	1.207E+01	1.810E+04	6.391E+05	3.313E+01	1.810E+04	6.391E+05	7.784E-02	2.172E+01	7.669E+02
2047	2,618	2,880	60,212	66,233	4.682E+01	3.749E+04	1.324E+06	1.251E+01	1.874E+04	6.620E+05	3.431E+01	1.874E+04	6.620E+05	8.063E-02	2.249E+01	7.944E+02
2048	2,618	2,880	62,830	69,113	4.841E+01	3.876E+04	1.369E+06	1.293E+01	1.938E+04	6.844E+05	3.548E+01	1.938E+04	6.844E+05	8.336E-02	2.326E+01	8.213E+02
2049	2,618	2,880	65,448	71,993	4.996E+01	4.001E+04	1.413E+06	1.335E+01	2.000E+04	7.064E+05	3.662E+01	2.000E+04	7.064E+05	8.604E-02	2.400E+01	8.477E+02
2050	2,618	2,880	68,066	74,873	5.149E+01	4.123E+04	1.456E+06	1.375E+01	2.061E+04	7.280E+05	3.773E+01	2.061E+04	7.280E+05	8.867E-02	2.474E+01	8.736E+02
2051	2,618	2,880	70,684	77,752	5.298E+01	4.242E+04	1.498E+06	1.415E+01	2.121E+04	7.491E+05	3.883E+01	2.121E+04	7.491E+05	9.124E-02	2.545E+01	8.989E+02
2052	2,618	2,880	73,302	80,632	5.445E+01	4.360E+04	1.540E+06	1.454E+01	2.180E+04	7.698E+05	3.990E+01	2.180E+04	7.698E+05	9.377E-02	2.616E+01	9.238E+02
2053	2,618	2,880	75,920	83,512	5.588E+01	4.475E+04	1.580E+06	1.493E+01	2.237E+04	7.901E+05	4.096E+01	2.237E+04	7.901E+05	9.624E-02	2.685E+01	9.482E+02
2054	0	0	78,538	86,391	5.729E+01	4.588E+04	1.620E+06	1.530E+01	2.294E+04	8.100E+05	4.199E+01	2.294E+04	8.100E+05	9.866E-02	2.753E+01	9.721E+02
2055	0	0	78,538	86,391	5.616E+01	4.497E+04	1.588E+06	1.500E+01	2.248E+04	7.940E+05	4.116E+01	2.248E+04	7.940E+05	9.671E-02	2.698E+01	9.528E+02
2056	0	0	78,538	86,391	5.504E+01	4.408E+04	1.557E+06	1.470E+01	2.204E+04	7.783E+05	4.034E+01	2.204E+04	7.783E+05	9.479E-02	2.645E+01	9.339E+02
2057	0	0	78,538	86,391	5.395E+01	4.320E+04	1.526E+06	1.441E+01	2.160E+04	7.629E+05	3.954E+01	2.160E+04	7.629E+05	9.292E-02	2.592E+01	9.154E+02
2058	0	0	78,538	86,391	5.289E+01	4.235E+04	1.496E+06	1.413E+01	2.117E+04	7.478E+05	3.876E+01	2.117E+04	7.478E+05	9.108E-02	2.541E+01	8.973E+02
2059	0	0	78,538	86,391	5.184E+01	4.151E+04	1.466E+06	1.385E+01	2.075E+04	7.330E+05	3.799E+01	2.075E+04	7.330E+05	8.927E-02	2.491E+01	8.796E+02
2060	0	0	78,538	86,391	5.081E+01	4.069E+04	1.437E+06	1.357E+01	2.034E+04	7.184E+05	3.724E+01	2.034E+04	7.184E+05	8.751E-02	2.441E+01	8.621E+02
2061	0	0	78,538	86,391	4.981E+01	3.988E+04	1.408E+06	1.330E+01	1.994E+04	7.042E+05	3.650E+01	1.994E+04	7.042E+05	8.577E-02	2.393E+01	8.451E+02
2062	0	0	78,538	86,391	4.882E+01	3.909E+04	1.381E+06	1.304E+01	1.955E+04	6.903E+05	3.578E+01	1.955E+04	6.903E+05	8.408E-02	2.346E+01	8.283E+02
2063	0	0	78,538	86,391	4.785E+01	3.832E+04	1.353E+06	1.278E+01	1.916E+04	6.766E+05	3.507E+01	1.916E+04	6.766E+05	8.241E-02	2.299E+01	8.119E+02
2064	0	0	78,538	86,391	4.691E+01	3.756E+04	1.326E+06	1.253E+01	1.878E+04	6.632E+05	3.438E+01	1.878E+04	6.632E+05	8.078E-02	2.254E+01	7.959E+02
2065	0	0	78,538	86,391	4.598E+01	3.682E+04	1.300E+06	1.228E+01	1.841E+04	6.501E+05	3.370E+01	1.841E+04	6.501E+05	7.918E-02	2.209E+01	7.801E+02
2066	0	0	78,538	86,391	4.507E+01	3.609E+04	1.274E+06	1.204E+01	1.804E+04	6.372E+05	3.303E+01	1.804E+04	6.372E+05	7.761E-02	2.165E+01	7.646E+02
2067	0	0	78,538	86,391	4.417E+01	3.537E+04	1.249E+06	1.180E+01	1.769E+04	6.246E+05	3.237E+01	1.769E+04	6.246E+05	7.607E-02	2.122E+01	7.495E+02
2068	0	0	78,538	86,391	4.330E+01	3.467E+04	1.224E+06	1.157E+01	1.734E+04	6.122E+05	3.173E+01	1.734E+04	6.122E+05	7.457E-02	2.080E+01	7.347E+02
2069	0	0	78,538	86,391	4.244E+01	3.399E+04	1.200E+06	1.134E+01	1.699E+04	6.001E+05	3.111E+01	1.699E+04	6.001E+05	7.309E-02	2.039E+01	7.201E+02
2070	0	0	78,538	86,391	4.160E+01	3.331E+04	1.176E+06	1.111E+01	1.666E+04	5.882E+05	3.049E+01	1.666E+04	5.882E+05	7.164E-02	1.999E+01	7.059E+02
2071	0	0	78,538	86,391	4.078E+01	3.265E+04	1.153E+06	1.089E+01	1.633E+04	5.766E+05	2.989E+01	1.633E+04	5.766E+05	7.023E-02	1.959E+01	6.919E+02
2072	0	0	78,538	86,391	3.997E+01	3.201E+04	1.130E+06	1.068E+01	1.600E+04	5.652E+05	2.929E+01	1.600E+04	5.652E+05	6.884E-02	1.920E+01	6.782E+02
2073	0	0	78,538	86,391	3.918E+01	3.137E+04	1.108E+06	1.047E+01	1.569E+04	5.540E+05	2.871E+01	1.569E+04	5.540E+05	6.747E-02	1.882E+01	6.648E+02
2074	0	0	78,538	86,391	3.840E+01	3.075E+04	1.086E+06	1.026E+01	1.538E+04	5.430E+05	2.815E+01	1.538E+04	5.430E+05	6.614E-02	1.845E+01	6.516E+02
2075	0	0	78,538	86,391	3.764E+01	3.014E+04	1.064E+06	1.005E+01	1.507E+04	5.322E+05	2.759E+01	1.507E+04	5.322E+05	6.483E-02	1.809E+01	6.387E+02
2076	0	0	78,538	86,391	3.690E+01	2.955E+04	1.043E+06	9.856E+00	1.477E+04	5.217E+05	2.704E+01	1.477E+04	5.217E+05	6.354E-02	1.773E+01	6.260E+02
2077	0	0	78,538	86,391	3.617E+01	2.896E+04	1.023E+06	9.660E+00	1.448E+04	5.114E+05	2.651E+01	1.448E+04	5.114E+05	6.228E-02	1.738E+01	6.136E+02
2078	0	0	78,538	86,391	3.545E+01	2.839E+04	1.002E+06	9.469E+00	1.419E+04	5.012E+05	2.598E+01	1.419E+04	5.012E+05	6.105E-02	1.703E+01	6.015E+02
2079	0	0	78,538	86,391	3.475E+01	2.782E+04	9.826E+05	9.282E+00	1.391E+04	4.913E+05	2.547E+01	1.391E+04	4.913E+05	5.984E-02	1.669E+01	5.896E+02
2080	0	0	78,538	86,391	3.406E+01	2.727E+04	9.632E+05	9.098E+00	1.364E+04	4.816E+05	2.496E+01	1.364E+04	4.816E+05	5.866E-02	1.636E+01	5.779E+02
2081	0	0	78,538	86,391	3.339E+01	2.673E+04	9.441E+05	8.918E+00	1.337E+04	4.721E+05	2.447E+01	1.337E+04	4.721E+05	5.750E-02	1.604E+01	5.665E+02
2082	0	0	78,538	86,391	3.272E+01	2.620E+04	9.254E+05	8.741E+00	1.310E+04	4.627E+05	2.398E+01	1.310E+04	4.627E+05	5.636E-02	1.572E+01	5.552E+02
2083	0	0	78,538	86,391	3.208E+01	2.569E+04	9.071E+05	8.568E+00	1.284E+04	4.535E+05	2.351E+01	1.284E+04	4.535E+05	5.524E-02	1.541E+01	5.443E+02
2084	0	0	78,538	86,391	3.144E+01	2.518E+04	8.891E+05	8.398E+00	1.259E+04	4.446E+05	2.304E+01	1.259E+04	4.446E+05	5.415E-02	1.511E+01	5.335E+02
2085	0	0	78,538	86,391	3.082E+01	2.468E+04	8.715E+05	8.232E+00	1.234E+04	4.358E+05	2.259E+01	1.234E+04	4.358E+05	5.308E-02	1.481E+01	5.229E+02
2086	0	0	78,538	86,391	3.021E+01	2.419E+04	8.543E+05	8.069E+00	1.209E+04	4.271E+05	2.214E+01	1.209E+04	4.271E+05	5.202E-02	1.451E+01	5.126E+02
2087	0	0	78,538	86,391	2.961E+01	2.371E+04	8.373E+05	7.909E+00	1.186E+04	4.187E+05	2.170E+01	1.186E+04	4.187E+05	5.099E-02	1.423E+01	5.024E+02
2088	0	0	78,538	86,391	2.902E+01	2.324E+04	8.208E+05	7.753E+00	1.162E+04	4.104E+05	2.127E+01	1.162E+04	4.104E+05	4.998E-02	1.394E+01	4.925E+02
2089	0	0	78,538	86,391	2.845E+01	2.278E+04	8.045E+05	7.599E+00	1.139E+04	4.023E+05	2.085E+01	1.139E+04	4.023E+05	4.899E-02	1.367E+01	4.827E+02
2090	0	0	78,538	86,391	2.789E+01	2.233E+04	7.886E+05	7.449E+00	1.117E+04	3.943E+05	2.044E+01	1.117E+04	3.943E+05	4.802E-02	1.340E+01	4.732E+02
2091	0	0	78,538	86,391	2.733E+01	2.189E+04	7.730E+05	7.301E+00	1.094E+04	3.865E+05	2.003E+01	1.094E+04	3.865E+05	4.707E-02	1.313E+01	4.638E+02
2092	0	0	78,538	86,391	2.679E+01	2.145E+04	7.577E+05	7.157E+00	1.073E+04	3.788E+05	1.964E+01	1.073E+04	3.788E+05	4.614E-02	1.287E+01	4.546E+02
2093	0	0	78,538	86,391	2.626E+01	2.103E+04	7.427E+05	7.015E+00	1.051E+04	3.713E+05	1.925E+01	1.051E+04	3.713E+05	4.523E-02	1.262E+01	4.456E+02
2094	0	0	78,538	86,391	2.574E+01	2.061E+04	7.280E+05	6.876E+00	1.031E+04	3.640E+05	1.887E+01	1.031E+04	3.640E+05	4.433E-02	1.237E+01	4.368E+02

LANDGEM RESULTS **Landfill Name or Identifier:** All Landfills_Woodflooring Waste

Closure Year (with 80-year limit) = 2054
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*
2095	0	0	78,538	86,391	2.523E+01	2.021E+04	7.135E+05	6.740E+00	1.010E+04	3.568E+05	1.849E+01	1.010E+04	3.568E+05	4.345E-02	1.212E+01	4.281E+02
2096	0	0	78,538	86,391	2.473E+01	1.980E+04	6.994E+05	6.606E+00	9.902E+03	3.497E+05	1.813E+01	9.902E+03	3.497E+05	4.259E-02	1.188E+01	4.196E+02
2097	0	0	78,538	86,391	2.424E+01	1.941E+04	6.856E+05	6.476E+00	9.706E+03	3.428E+05	1.777E+01	9.706E+03	3.428E+05	4.175E-02	1.165E+01	4.113E+02
2098	0	0	78,538	86,391	2.376E+01	1.903E+04	6.720E+05	6.347E+00	9.514E+03	3.360E+05	1.742E+01	9.514E+03	3.360E+05	4.092E-02	1.142E+01	4.032E+02
2099	0	0	78,538	86,391	2.329E+01	1.865E+04	6.587E+05	6.222E+00	9.326E+03	3.293E+05	1.707E+01	9.326E+03	3.293E+05	4.011E-02	1.119E+01	3.952E+02
2100	0	0	78,538	86,391	2.283E+01	1.828E+04	6.456E+05	6.098E+00	9.141E+03	3.228E+05	1.673E+01	9.141E+03	3.228E+05	3.932E-02	1.097E+01	3.874E+02
2101	0	0	78,538	86,391	2.238E+01	1.792E+04	6.329E+05	5.978E+00	8.960E+03	3.164E+05	1.640E+01	8.960E+03	3.164E+05	3.854E-02	1.075E+01	3.797E+02
2102	0	0	78,538	86,391	2.194E+01	1.757E+04	6.203E+05	5.859E+00	8.783E+03	3.102E+05	1.608E+01	8.783E+03	3.102E+05	3.778E-02	1.054E+01	3.722E+02
2103	0	0	78,538	86,391	2.150E+01	1.722E+04	6.080E+05	5.743E+00	8.609E+03	3.040E+05	1.576E+01	8.609E+03	3.040E+05	3.703E-02	1.033E+01	3.648E+02
2104	0	0	78,538	86,391	2.108E+01	1.688E+04	5.960E+05	5.630E+00	8.438E+03	2.980E+05	1.545E+01	8.438E+03	2.980E+05	3.630E-02	1.013E+01	3.576E+02
2105	0	0	78,538	86,391	2.066E+01	1.654E+04	5.842E+05	5.518E+00	8.271E+03	2.921E+05	1.514E+01	8.271E+03	2.921E+05	3.558E-02	9.925E+00	3.505E+02
2106	0	0	78,538	86,391	2.025E+01	1.621E+04	5.726E+05	5.409E+00	8.107E+03	2.863E+05	1.484E+01	8.107E+03	2.863E+05	3.487E-02	9.729E+00	3.436E+02
2107	0	0	78,538	86,391	1.985E+01	1.589E+04	5.613E+05	5.302E+00	7.947E+03	2.806E+05	1.455E+01	7.947E+03	2.806E+05	3.418E-02	9.536E+00	3.368E+02
2108	0	0	78,538	86,391	1.946E+01	1.558E+04	5.502E+05	5.197E+00	7.790E+03	2.751E+05	1.426E+01	7.790E+03	2.751E+05	3.351E-02	9.347E+00	3.301E+02
2109	0	0	78,538	86,391	1.907E+01	1.527E+04	5.393E+05	5.094E+00	7.635E+03	2.696E+05	1.398E+01	7.635E+03	2.696E+05	3.284E-02	9.162E+00	3.236E+02
2110	0	0	78,538	86,391	1.869E+01	1.497E+04	5.286E+05	4.993E+00	7.484E+03	2.643E+05	1.370E+01	7.484E+03	2.643E+05	3.219E-02	8.981E+00	3.172E+02
2111	0	0	78,538	86,391	1.832E+01	1.467E+04	5.181E+05	4.894E+00	7.336E+03	2.591E+05	1.343E+01	7.336E+03	2.591E+05	3.155E-02	8.803E+00	3.109E+02
2112	0	0	78,538	86,391	1.796E+01	1.438E+04	5.079E+05	4.797E+00	7.191E+03	2.539E+05	1.316E+01	7.191E+03	2.539E+05	3.093E-02	8.629E+00	3.047E+02
2113	0	0	78,538	86,391	1.760E+01	1.410E+04	4.978E+05	4.702E+00	7.048E+03	2.489E+05	1.290E+01	7.048E+03	2.489E+05	3.032E-02	8.458E+00	2.987E+02
2114	0	0	78,538	86,391	1.726E+01	1.382E+04	4.880E+05	4.609E+00	6.909E+03	2.440E+05	1.265E+01	6.909E+03	2.440E+05	2.972E-02	8.290E+00	2.928E+02
2115	0	0	78,538	86,391	1.691E+01	1.354E+04	4.783E+05	4.518E+00	6.772E+03	2.392E+05	1.240E+01	6.772E+03	2.392E+05	2.913E-02	8.126E+00	2.870E+02
2116	0	0	78,538	86,391	1.658E+01	1.328E+04	4.688E+05	4.428E+00	6.638E+03	2.344E+05	1.215E+01	6.638E+03	2.344E+05	2.855E-02	7.965E+00	2.813E+02
2117	0	0	78,538	86,391	1.625E+01	1.301E+04	4.595E+05	4.341E+00	6.506E+03	2.298E+05	1.191E+01	6.506E+03	2.298E+05	2.799E-02	7.808E+00	2.757E+02
2118	0	0	78,538	86,391	1.593E+01	1.276E+04	4.504E+05	4.255E+00	6.378E+03	2.252E+05	1.167E+01	6.378E+03	2.252E+05	2.743E-02	7.653E+00	2.703E+02
2119	0	0	78,538	86,391	1.561E+01	1.250E+04	4.415E+05	4.171E+00	6.251E+03	2.208E+05	1.144E+01	6.251E+03	2.208E+05	2.689E-02	7.502E+00	2.649E+02
2120	0	0	78,538	86,391	1.530E+01	1.225E+04	4.328E+05	4.088E+00	6.127E+03	2.164E+05	1.122E+01	6.127E+03	2.164E+05	2.636E-02	7.353E+00	2.597E+02
2121	0	0	78,538	86,391	1.500E+01	1.201E+04	4.242E+05	4.007E+00	6.006E+03	2.121E+05	1.099E+01	6.006E+03	2.121E+05	2.583E-02	7.207E+00	2.545E+02
2122	0	0	78,538	86,391	1.470E+01	1.177E+04	4.158E+05	3.928E+00	5.887E+03	2.079E+05	1.078E+01	5.887E+03	2.079E+05	2.532E-02	7.065E+00	2.495E+02
2123	0	0	78,538	86,391	1.441E+01	1.154E+04	4.076E+05	3.850E+00	5.771E+03	2.038E+05	1.056E+01	5.771E+03	2.038E+05	2.482E-02	6.925E+00	2.445E+02
2124	0	0	78,538	86,391	1.413E+01	1.131E+04	3.995E+05	3.774E+00	5.656E+03	1.998E+05	1.035E+01	5.656E+03	1.998E+05	2.433E-02	6.788E+00	2.397E+02
2125	0	0	78,538	86,391	1.385E+01	1.109E+04	3.916E+05	3.699E+00	5.544E+03	1.958E+05	1.015E+01	5.544E+03	1.958E+05	2.385E-02	6.653E+00	2.350E+02
2126	0	0	78,538	86,391	1.357E+01	1.087E+04	3.838E+05	3.626E+00	5.435E+03	1.919E+05	9.948E+00	5.435E+03	1.919E+05	2.338E-02	6.522E+00	2.303E+02
2127	0	0	78,538	86,391	1.330E+01	1.065E+04	3.762E+05	3.554E+00	5.327E+03	1.881E+05	9.751E+00	5.327E+03	1.881E+05	2.291E-02	6.392E+00	2.257E+02
2128	0	0	78,538	86,391	1.304E+01	1.044E+04	3.688E+05	3.484E+00	5.221E+03	1.844E+05	9.558E+00	5.221E+03	1.844E+05	2.246E-02	6.266E+00	2.213E+02
2129	0	0	78,538	86,391	1.278E+01	1.024E+04	3.615E+05	3.415E+00	5.118E+03	1.807E+05	9.369E+00	5.118E+03	1.807E+05	2.201E-02	6.142E+00	2.169E+02
2130	0	0	78,538	86,391	1.253E+01	1.003E+04	3.543E+05	3.347E+00	5.017E+03	1.772E+05	9.183E+00	5.017E+03	1.772E+05	2.158E-02	6.020E+00	2.126E+02
2131	0	0	78,538	86,391	1.228E+01	9.835E+03	3.473E+05	3.281E+00	4.917E+03	1.737E+05	9.001E+00	4.917E+03	1.737E+05	2.115E-02	5.901E+00	2.084E+02
2132	0	0	78,538	86,391	1.204E+01	9.640E+03	3.404E+05	3.216E+00	4.820E+03	1.702E+05	8.823E+00	4.820E+03	1.702E+05	2.073E-02	5.784E+00	2.043E+02
2133	0	0	78,538	86,391	1.180E+01	9.449E+03	3.337E+05	3.152E+00	4.725E+03	1.668E+05	8.648E+00	4.725E+03	1.668E+05	2.032E-02	5.670E+00	2.002E+02
2134	0	0	78,538	86,391	1.157E+01	9.262E+03	3.271E+05	3.090E+00	4.631E+03	1.635E+05	8.477E+00	4.631E+03	1.635E+05	1.992E-02	5.557E+00	1.963E+02
2135	0	0	78,538	86,391	1.134E+01	9.079E+03	3.206E+05	3.028E+00	4.539E+03	1.603E+05	8.309E+00	4.539E+03	1.603E+05	1.953E-02	5.447E+00	1.924E+02
2136	0	0	78,538	86,391	1.111E+01	8.899E+03	3.143E+05	2.968E+00	4.449E+03	1.571E+05	8.145E+00	4.449E+03	1.571E+05	1.914E-02	5.339E+00	1.886E+02
2137	0	0	78,538	86,391	1.089E+01	8.723E+03	3.080E+05	2.910E+00	4.361E+03	1.540E+05	7.983E+00	4.361E+03	1.540E+05	1.876E-02	5.234E+00	1.848E+02
2138	0	0	78,538	86,391	1.068E+01	8.550E+03	3.019E+05	2.852E+00	4.275E+03	1.510E+05	7.825E+00	4.275E+03	1.510E+05	1.839E-02	5.130E+00	1.812E+02
2139	0	0	78,538	86,391	1.047E+01	8.381E+03	2.960E+05	2.796E+00	4.190E+03	1.480E+05	7.670E+00	4.190E+03	1.480E+05	1.802E-02	5.028E+00	1.776E+02
2140	0	0	78,538	86,391	1.026E+01	8.215E+03	2.901E+05	2.740E+00	4.107E+03	1.451E+05	7.519E+00	4.107E+03	1.451E+05	1.767E-02	4.929E+00	1.741E+02
2141	0	0	78,538	86,391	1.006E+01	8.052E+03	2.844E+05	2.686E+00	4.026E+03	1.422E+05	7.370E+00	4.026E+03	1.422E+05	1.732E-02	4.831E+00	1.706E+02
2142	0	0	78,538	86,391	9.857E+00	7.893E+03	2.787E+05	2.633E+00	3.946E+03	1.394E+05	7.224E+00	3.946E+03	1.394E+05	1.697E-02	4.736E+00	1.672E+02
2143	0	0	78,538	86,391	9.661E+00	7.736E+03	2.732E+05	2.581E+00	3.868E+03	1.366E+05	7.081E+00	3.868E+03	1.366E+05	1.664E-02	4.642E+00	1.639E+02
2144	0	0	78,538	86,391	9.470E+00	7.583E+03	2.678E+05	2.530E+00	3.792E+03	1.339E+05	6.940E+00	3.792E+03	1.339E+05	1.631E-02	4.550E+00	1.607E+02
2145	0	0	78,538	86,391	9.283E+00	7.433E+03	2.625E+05	2.479E+00	3.717E+03	1.312E+05	6.803E+00	3.717E+03	1.312E+05	1.599E-02	4.460E+00	1.575E+02
2146	0	0	78,538	86,391	9.099E+00	7.286E+03	2.573E+05	2.430E+00	3.643E+03	1.286E+05	6.668E+00	3.643E+03	1.286E+05	1.567E-02	4.371E+00	1.544E+02
2147	0	0	78,538	86,391	8.919E+00	7.142E+03	2.522E+05	2.382E+00	3.571E+03	1.261E+05	6.536E+00	3.571E+03	1.261E+05	1.536E-02	4.285E+00	1.513E+02
2148	0	0	78,538	86,391	8.742E+00	7.000E+03	2.472E+05	2.335E+00	3.500E+03	1.236E+05	6.407E+00	3.500E+03	1.236E+05	1.506E-02	4.200E+00	1.483E+02
2149	0	0	78,538	86,391	8.569E+00	6.862E+03	2.423E+05	2.289E+00	3.431E+03	1.212E+05	6.280E+00	3.431E+03	1.212E+05	1.476E-02	4.117E+00	1.454E+02
2150	0	0	78,538	86,391	8.399E+00	6.726E+03	2.375E+05	2.244E+00	3.363E+03	1.188E+05	6.156E+00	3.363E+03	1.188E+05	1.446E-02	4.035E+00	1.425E+02
2151	0	0	78,538	86,391	8.233E+00	6.592E+03	2.328E+05	2.199E+00	3.296E+03	1.164E+05	6.034E+00	3.296E+03	1.164E+05	1.418E-02	3.955E+00	1.397E+02
2152	0	0	78,538	86,391	8.070E+00	6.462E+03	2.282E+05	2.156E+00	3.231E+03	1.141E+05	5.914E+00	3.231E+03	1.141E+05	1.390E-02	3.877E+00	1.369E+02
2153	0	0	78,538	86,391	7.910E+00	6.334E+03	2.237E+05	2.113E+00	3.167E+03	1.118E+05	5.797E+00	3.167E+03	1.118E+05	1.362E-02	3.800E+00	1.342E+02
2154	0	0	78,538	86,391	7.753E+00	6.209E+03	2.193E+05	2.071E+00	3.104E+03	1.096E+05	5.682E+00	3.104E+03	1.096E+05	1.335E-02	3.725E+00	1.316E+02
2155	0	0	78,538	86,391	7.600E+00	6.086E+03	2.149E+05	2.030E+00	3.043E+03	1.075E+05	5.570E+00	3.043E+03	1.075E+05	1.309E-02	3.651E+00	1.289E+02
2156	0	0	78,538	86,391	7.449E+00	5.965E+03	2.107E+05	1.990E+00	2.983E+03	1.053E+05	5.460E+00	2.983E+03	1.053E+05	1.283E-02	3.579E+00	1.264E+02
2157	0	0	78,538	86,391	7.302E+00	5.847E+03	2.065E+05	1.950E+00	2.924E+03	1.032E+05	5.351E+00	2.924E+03	1.032E+05	1.258E-02	3.508E+00	1.239E+02
2158	0	0	78,538	86,391	7.157E+00	5.731E+03	2.024E+05	1.912E+00	2.866E+03	1.012E+05	5.246E+00	2.866E+03	1.012E+05	1.233E-02	3.439E+00	1.214E+02
2159	0	0	78,538	86,391	7.016E+00	5.618E+03	1.984E+05	1.874E+00	2.809E+03	9.920E+04	5.142E+00	2.809E+03	9.920E+04	1.208E-02	3.371E+00	1.190E+02
2160	0	0	78,538	86,391	6.877E+00	5.507E+03	1.945E+05	1.837E+00	2.753E+03	9.723E+04	5.040E+00	2.753E+03	9.723E+04	1.184E-02	3.304E+00	1.167E+02
2161	0	0	78,538	86,391	6.740E+00	5.397E+03	1.906E+05	1.800E+00	2.699E+03	9.531E+04	4.940E+00	2.699E+03	9.531E+04	1.161E-02	3.238E+00	1.144E+02
2162	0	0	78,538	86,391	6.607E+00	5.291E+03	1.868E+05	1.765E+00	2.645E+03	9.342E+04	4.842E+00	2.645E+03	9.342E+04	1.138E-02	3.174E+00	1.121E+02
2163	0	0	78,538	86,391	6.476E+00	5.186E+03	1.831E+05	1.730E+00	2.593E+03	9.157E+04	4.746E+00	2.593E+03	9.157E+04	1.115E-02	3.112E+00	1.099E+02
2164	0	0	78,538	86,391	6.348E+00	5.083E+03	1.795E+05	1.696E+00	2.542E+03	8.976E+04	4.652E+00	2.542E+03	8.976E+04	1.093E-02	3.050E+00	1.077E+02

LANDGEM RESULTS **Landfill Name or Identifier:** All Landfills_Newspaper Waste

Closure Year (with 80-year limit) = 2054
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*
2024	1,413	1,554	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	1,413	1,554	1,413	1,554	5.198E+00	4.162E+03	1.470E+05	1.388E+00	2.081E+03	7.349E+04	3.809E+00	2.081E+03	7.349E+04	8.952E-03	2.497E+00	8.819E+01
2026	1,413	1,554	2,825	3,108	1.029E+01	8.242E+03	2.911E+05	2.749E+00	4.121E+03	1.455E+05	7.543E+00	4.121E+03	1.455E+05	1.773E-02	4.945E+00	1.746E+02
2027	1,413	1,554	4,238	4,661	1.529E+01	1.224E+04	4.323E+05	4.083E+00	6.120E+03	2.161E+05	1.120E+01	6.120E+03	2.161E+05	2.633E-02	7.345E+00	2.594E+02
2028	1,413	1,554	5,650	6,215	2.018E+01	1.616E+04	5.707E+05	5.391E+00	8.080E+03	2.854E+05	1.479E+01	8.080E+03	2.854E+05	3.476E-02	9.696E+00	3.424E+02
2029	1,413	1,554	7,063	7,769	2.498E+01	2.000E+04	7.064E+05	6.672E+00	1.000E+04	3.532E+05	1.831E+01	1.000E+04	3.532E+05	4.302E-02	1.200E+01	4.238E+02
2030	1,413	1,554	8,475	9,323	2.968E+01	2.377E+04	8.394E+05	7.929E+00	1.188E+04	4.197E+05	2.175E+01	1.188E+04	4.197E+05	5.112E-02	1.426E+01	5.036E+02
2031	1,413	1,554	9,888	10,877	3.429E+01	2.746E+04	9.698E+05	9.160E+00	1.373E+04	4.849E+05	2.513E+01	1.373E+04	4.849E+05	5.906E-02	1.648E+01	5.819E+02
2032	1,413	1,554	11,300	12,430	3.881E+01	3.108E+04	1.098E+06	1.037E+01	1.554E+04	5.488E+05	2.845E+01	1.554E+04	5.488E+05	6.684E-02	1.865E+01	6.585E+02
2033	1,413	1,554	12,713	13,984	4.324E+01	3.463E+04	1.223E+06	1.155E+01	1.731E+04	6.114E+05	3.169E+01	1.731E+04	6.114E+05	7.447E-02	2.078E+01	7.337E+02
2034	1,413	1,554	14,125	15,538	4.758E+01	3.810E+04	1.346E+06	1.271E+01	1.905E+04	6.728E+05	3.487E+01	1.905E+04	6.728E+05	8.195E-02	2.286E+01	8.074E+02
2035	1,413	1,554	15,538	17,092	5.184E+01	4.151E+04	1.466E+06	1.385E+01	2.076E+04	7.330E+05	3.799E+01	2.076E+04	7.330E+05	8.928E-02	2.491E+01	8.796E+02
2036	1,413	1,554	16,950	18,646	5.601E+01	4.485E+04	1.584E+06	1.496E+01	2.243E+04	7.919E+05	4.105E+01	2.243E+04	7.919E+05	9.646E-02	2.691E+01	9.503E+02
2037	1,413	1,554	18,363	20,199	6.010E+01	4.812E+04	1.700E+06	1.605E+01	2.406E+04	8.498E+05	4.405E+01	2.406E+04	8.498E+05	1.035E-01	2.887E+01	1.020E+03
2038	1,413	1,554	19,776	21,753	6.411E+01	5.133E+04	1.813E+06	1.712E+01	2.567E+04	9.064E+05	4.698E+01	2.567E+04	9.064E+05	1.104E-01	3.080E+01	1.088E+03
2039	1,413	1,554	21,188	23,307	6.804E+01	5.448E+04	1.924E+06	1.817E+01	2.724E+04	9.620E+05	4.986E+01	2.724E+04	9.620E+05	1.172E-01	3.269E+01	1.154E+03
2040	1,413	1,554	22,601	24,861	7.189E+01	5.756E+04	2.033E+06	1.920E+01	2.878E+04	1.016E+06	5.268E+01	2.878E+04	1.016E+06	1.238E-01	3.454E+01	1.220E+03
2041	1,413	1,554	24,013	26,414	7.566E+01	6.059E+04	2.140E+06	2.021E+01	3.029E+04	1.070E+06	5.545E+01	3.029E+04	1.070E+06	1.303E-01	3.635E+01	1.284E+03
2042	1,413	1,554	25,426	27,968	7.936E+01	6.355E+04	2.244E+06	2.120E+01	3.177E+04	1.122E+06	5.816E+01	3.177E+04	1.122E+06	1.367E-01	3.813E+01	1.347E+03
2043	1,413	1,554	26,838	29,522	8.299E+01	6.645E+04	2.347E+06	2.217E+01	3.323E+04	1.173E+06	6.082E+01	3.323E+04	1.173E+06	1.429E-01	3.987E+01	1.408E+03
2044	1,413	1,554	28,251	31,076	8.654E+01	6.930E+04	2.447E+06	2.312E+01	3.465E+04	1.224E+06	6.343E+01	3.465E+04	1.224E+06	1.490E-01	4.158E+01	1.468E+03
2045	1,413	1,554	29,663	32,630	9.003E+01	7.209E+04	2.546E+06	2.405E+01	3.604E+04	1.273E+06	6.598E+01	3.604E+04	1.273E+06	1.550E-01	4.325E+01	1.527E+03
2046	1,413	1,554	31,076	34,183	9.344E+01	7.482E+04	2.642E+06	2.496E+01	3.741E+04	1.321E+06	6.848E+01	3.741E+04	1.321E+06	1.609E-01	4.489E+01	1.585E+03
2047	1,413	1,554	32,488	35,737	9.679E+01	7.750E+04	2.737E+06	2.585E+01	3.875E+04	1.369E+06	7.093E+01	3.875E+04	1.369E+06	1.667E-01	4.650E+01	1.642E+03
2048	1,413	1,554	33,901	37,291	1.001E+02	8.013E+04	2.830E+06	2.673E+01	4.007E+04	1.415E+06	7.334E+01	4.007E+04	1.415E+06	1.723E-01	4.808E+01	1.698E+03
2049	1,413	1,554	35,313	38,845	1.033E+02	8.271E+04	2.921E+06	2.759E+01	4.135E+04	1.460E+06	7.570E+01	4.135E+04	1.460E+06	1.779E-01	4.962E+01	1.752E+03
2050	1,413	1,554	36,726	40,399	1.064E+02	8.523E+04	3.010E+06	2.843E+01	4.262E+04	1.505E+06	7.801E+01	4.262E+04	1.505E+06	1.833E-01	5.114E+01	1.806E+03
2051	1,413	1,554	38,139	41,952	1.095E+02	8.771E+04	3.097E+06	2.926E+01	4.385E+04	1.549E+06	8.027E+01	4.385E+04	1.549E+06	1.886E-01	5.262E+01	1.858E+03
2052	1,413	1,554	39,551	43,506	1.126E+02	9.013E+04	3.183E+06	3.007E+01	4.507E+04	1.591E+06	8.249E+01	4.507E+04	1.591E+06	1.938E-01	5.408E+01	1.910E+03
2053	1,413	1,554	40,964	45,060	1.155E+02	9.251E+04	3.267E+06	3.086E+01	4.625E+04	1.633E+06	8.467E+01	4.625E+04	1.633E+06	1.990E-01	5.551E+01	1.960E+03
2054	0	0	42,376	46,614	1.184E+02	9.484E+04	3.349E+06	3.164E+01	4.742E+04	1.675E+06	8.680E+01	4.742E+04	1.675E+06	2.040E-01	5.690E+01	2.010E+03
2055	0	0	42,376	46,614	1.161E+02	9.296E+04	3.283E+06	3.101E+01	4.648E+04	1.641E+06	8.508E+01	4.648E+04	1.641E+06	1.999E-01	5.578E+01	1.970E+03
2056	0	0	42,376	46,614	1.138E+02	9.112E+04	3.218E+06	3.040E+01	4.556E+04	1.609E+06	8.340E+01	4.556E+04	1.609E+06	1.960E-01	5.467E+01	1.931E+03
2057	0	0	42,376	46,614	1.115E+02	8.932E+04	3.154E+06	2.979E+01	4.466E+04	1.577E+06	8.175E+01	4.466E+04	1.577E+06	1.921E-01	5.359E+01	1.893E+03
2058	0	0	42,376	46,614	1.093E+02	8.755E+04	3.092E+06	2.920E+01	4.377E+04	1.546E+06	8.013E+01	4.377E+04	1.546E+06	1.883E-01	5.253E+01	1.855E+03
2059	0	0	42,376	46,614	1.072E+02	8.581E+04	3.031E+06	2.863E+01	4.291E+04	1.515E+06	7.854E+01	4.291E+04	1.515E+06	1.846E-01	5.149E+01	1.818E+03
2060	0	0	42,376	46,614	1.050E+02	8.411E+04	2.971E+06	2.806E+01	4.206E+04	1.485E+06	7.699E+01	4.206E+04	1.485E+06	1.809E-01	5.047E+01	1.782E+03
2061	0	0	42,376	46,614	1.030E+02	8.245E+04	2.912E+06	2.750E+01	4.122E+04	1.456E+06	7.546E+01	4.122E+04	1.456E+06	1.773E-01	4.947E+01	1.747E+03
2062	0	0	42,376	46,614	1.009E+02	8.082E+04	2.854E+06	2.696E+01	4.041E+04	1.427E+06	7.397E+01	4.041E+04	1.427E+06	1.738E-01	4.849E+01	1.712E+03
2063	0	0	42,376	46,614	9.893E+01	7.922E+04	2.798E+06	2.642E+01	3.961E+04	1.399E+06	7.250E+01	3.961E+04	1.399E+06	1.704E-01	4.753E+01	1.679E+03
2064	0	0	42,376	46,614	9.697E+01	7.765E+04	2.742E+06	2.590E+01	3.882E+04	1.371E+06	7.107E+01	3.882E+04	1.371E+06	1.670E-01	4.659E+01	1.645E+03
2065	0	0	42,376	46,614	9.505E+01	7.611E+04	2.688E+06	2.539E+01	3.805E+04	1.344E+06	6.966E+01	3.805E+04	1.344E+06	1.637E-01	4.567E+01	1.613E+03
2066	0	0	42,376	46,614	9.317E+01	7.460E+04	2.635E+06	2.489E+01	3.730E+04	1.317E+06	6.828E+01	3.730E+04	1.317E+06	1.604E-01	4.476E+01	1.581E+03
2067	0	0	42,376	46,614	9.132E+01	7.313E+04	2.582E+06	2.439E+01	3.656E+04	1.291E+06	6.693E+01	3.656E+04	1.291E+06	1.573E-01	4.388E+01	1.549E+03
2068	0	0	42,376	46,614	8.951E+01	7.168E+04	2.531E+06	2.391E+01	3.584E+04	1.266E+06	6.560E+01	3.584E+04	1.266E+06	1.542E-01	4.301E+01	1.519E+03
2069	0	0	42,376	46,614	8.774E+01	7.026E+04	2.481E+06	2.344E+01	3.513E+04	1.241E+06	6.430E+01	3.513E+04	1.241E+06	1.511E-01	4.216E+01	1.489E+03
2070	0	0	42,376	46,614	8.600E+01	6.887E+04	2.432E+06	2.297E+01	3.443E+04	1.216E+06	6.303E+01	3.443E+04	1.216E+06	1.481E-01	4.132E+01	1.459E+03
2071	0	0	42,376	46,614	8.430E+01	6.750E+04	2.384E+06	2.252E+01	3.375E+04	1.192E+06	6.178E+01	3.375E+04	1.192E+06	1.452E-01	4.050E+01	1.430E+03
2072	0	0	42,376	46,614	8.263E+01	6.617E+04	2.337E+06	2.207E+01	3.308E+04	1.168E+06	6.056E+01	3.308E+04	1.168E+06	1.423E-01	3.970E+01	1.402E+03
2073	0	0	42,376	46,614	8.099E+01	6.486E+04	2.290E+06	2.163E+01	3.243E+04	1.145E+06	5.936E+01	3.243E+04	1.145E+06	1.395E-01	3.891E+01	1.374E+03
2074	0	0	42,376	46,614	7.939E+01	6.357E+04	2.245E+06	2.121E+01	3.179E+04	1.123E+06	5.818E+01	3.179E+04	1.123E+06	1.367E-01	3.814E+01	1.347E+03
2075	0	0	42,376	46,614	7.782E+01	6.231E+04	2.201E+06	2.079E+01	3.116E+04	1.100E+06	5.703E+01	3.116E+04	1.100E+06	1.340E-01	3.739E+01	1.320E+03
2076	0	0	42,376	46,614	7.628E+01	6.108E+04	2.157E+06	2.037E+01	3.054E+04	1.079E+06	5.590E+01	3.054E+04	1.079E+06	1.314E-01	3.665E+01	1.294E+03
2077	0	0	42,376	46,614	7.477E+01	5.987E+04	2.114E+06	1.997E+01	2.994E+04	1.057E+06	5.480E+01	2.994E+04	1.057E+06	1.288E-01	3.592E+01	1.269E+03
2078	0	0	42,376	46,614	7.329E+01	5.868E+04	2.072E+06	1.958E+01	2.934E+04	1.036E+06	5.371E+01	2.934E+04	1.036E+06	1.262E-01	3.521E+01	1.243E+03
2079	0	0	42,376	46,614	7.184E+01	5.752E+04	2.031E+06	1.919E+01	2.876E+04	1.016E+06	5.265E+01	2.876E+04	1.016E+06	1.237E-01	3.451E+01	1.219E+03
2080	0	0	42,376	46,614	7.041E+01	5.638E+04	1.991E+06	1.881E+01	2.819E+04	9.956E+05	5.161E+01	2.819E+04	9.956E+05	1.213E-01	3.383E+01	1.195E+03
2081	0	0	42,376	46,614	6.902E+01	5.527E+04	1.952E+06	1.844E+01	2.763E+04	9.759E+05	5.058E+01	2.763E+04	9.759E+05	1.189E-01	3.316E+01	1.171E+03
2082	0	0	42,376	46,614	6.765E+01	5.417E+04	1.913E+06	1.807E+01	2.709E+04	9.566E+05	4.958E+01	2.709E+04	9.566E+05	1.165E-01	3.250E+01	1.148E+03
2083	0	0	42,376	46,614	6.631E+01	5.310E+04	1.875E+06	1.771E+01	2.655E+04	9.376E+05	4.860E+01	2.655E+04	9.376E+05	1.142E-01	3.186E+01	1.125E+03
2084	0	0	42,376	46,614	6.500E+01	5.205E+04	1.838E+06	1.736E+01	2.602E+04	9.190E+05	4.764E+01	2.602E+04	9.190E+05	1.119E-01	3.123E+01	1.103E+03
2085	0	0	42,376	46,614	6.371E+01	5.102E+04	1.802E+06	1.702E+01	2.551E+04	9.009E+05	4.669E+01	2.551E+04	9.009E+05	1.097E-01	3.061E+01	1.081E+03
2086	0	0	42,376	46,614	6.245E+01	5.001E+04	1.766E+06	1.668E+01	2.500E+04	8.830E+05	4.577E+01	2.500E+04	8.830E+05	1.076E-01	3.000E+01	1.060E+03
2087	0	0	42,376	46,614	6.121E+01	4.902E+04	1.731E+06	1.635E+01	2.451E+04	8.655E+05	4.486E+01	2.451E+04	8.655E+05	1.054E-01	2.941E+01	1.039E+03
2088	0	0	42,376	46,614	6.000E+01	4.805E+04	1.697E+06	1.603E+01	2.402E+04	8.484E+05	4.397E+01	2.402E+04	8.484E+05	1.033E-01	2.883E+01	1.018E+03
2089	0	0	42,376	46,614	5.881E+01	4.710E+04	1.663E+06	1.571E+01	2.355E+04	8.316E+05	4.310E+01	2.355E+04	8.316E+05	1.013E-01	2.826E+01	9.979E+02
2090	0	0	42,376	46,614	5.765E+01	4.616E+04	1.630E+06	1.540E+01	2.308E+04	8.151E+05	4.225E+01	2.308E+04	8.151E+05	9.928E-02	2.770E+01	9.781E+02
2091	0	0	42,376	46,614	5.651E+01	4.525E+04	1.598E+06	1.509E+01	2.262E+04	7.990E+05	4.141E+01	2.262E+04	7.990E+05	9.732E-02	2.715E+01	9.588E+02
2092	0	0	42,376	46,614	5.539E+01	4.435E+04	1.566E+06	1.480E+01	2.218E+04	7.832E+05	4.059E+01	2.218E+04	7.832E+05	9.539E-02	2.661E+01	9.398E+02
2093	0	0	42,376	46,614	5.429E+01	4.347E+04	1.535E+06	1.450E+01	2.174E+04	7.677E+05	3.979E+01	2.174E+04	7.677E+05	9.350E-02	2.608E+01	9.212E+02
2094	0	0	42,376	46,614	5.322E+01	4.261E+04	1.505E+06	1.421E+01	2.131E+04	7.525E+05	3.900E+01	2.131E+04	7.525E+05	9.165E-02	2.557E+01	9.029E+02

LANDGEM RESULTS **Landfill Name or Identifier:** All Landfills_Newspaper Waste

Closure Year (with 80-year limit) = 2054
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*
2095	0	0	42,376	46,614	5.216E+01	4.177E+04	1.475E+06	1.393E+01	2.089E+04	7.376E+05	3.823E+01	2.089E+04	7.376E+05	8.983E-02	2.506E+01	8.851E+02
2096	0	0	42,376	46,614	5.113E+01	4.094E+04	1.446E+06	1.366E+01	2.047E+04	7.230E+05	3.747E+01	2.047E+04	7.230E+05	8.806E-02	2.457E+01	8.675E+02
2097	0	0	42,376	46,614	5.012E+01	4.013E+04	1.417E+06	1.339E+01	2.007E+04	7.086E+05	3.673E+01	2.007E+04	7.086E+05	8.631E-02	2.408E+01	8.504E+02
2098	0	0	42,376	46,614	4.913E+01	3.934E+04	1.389E+06	1.312E+01	1.967E+04	6.946E+05	3.600E+01	1.967E+04	6.946E+05	8.460E-02	2.360E+01	8.335E+02
2099	0	0	42,376	46,614	4.815E+01	3.856E+04	1.362E+06	1.286E+01	1.928E+04	6.808E+05	3.529E+01	1.928E+04	6.808E+05	8.293E-02	2.314E+01	8.170E+02
2100	0	0	42,376	46,614	4.720E+01	3.780E+04	1.335E+06	1.261E+01	1.890E+04	6.674E+05	3.459E+01	1.890E+04	6.674E+05	8.129E-02	2.268E+01	8.008E+02
2101	0	0	42,376	46,614	4.626E+01	3.705E+04	1.308E+06	1.236E+01	1.852E+04	6.542E+05	3.391E+01	1.852E+04	6.542E+05	7.968E-02	2.223E+01	7.850E+02
2102	0	0	42,376	46,614	4.535E+01	3.631E+04	1.282E+06	1.211E+01	1.816E+04	6.412E+05	3.324E+01	1.816E+04	6.412E+05	7.810E-02	2.179E+01	7.694E+02
2103	0	0	42,376	46,614	4.445E+01	3.559E+04	1.257E+06	1.187E+01	1.780E+04	6.285E+05	3.258E+01	1.780E+04	6.285E+05	7.655E-02	2.136E+01	7.542E+02
2104	0	0	42,376	46,614	4.357E+01	3.489E+04	1.232E+06	1.164E+01	1.744E+04	6.161E+05	3.193E+01	1.744E+04	6.161E+05	7.504E-02	2.093E+01	7.393E+02
2105	0	0	42,376	46,614	4.271E+01	3.420E+04	1.208E+06	1.141E+01	1.710E+04	6.039E+05	3.130E+01	1.710E+04	6.039E+05	7.355E-02	2.052E+01	7.246E+02
2106	0	0	42,376	46,614	4.186E+01	3.352E+04	1.184E+06	1.118E+01	1.676E+04	5.919E+05	3.068E+01	1.676E+04	5.919E+05	7.209E-02	2.011E+01	7.103E+02
2107	0	0	42,376	46,614	4.103E+01	3.286E+04	1.160E+06	1.096E+01	1.643E+04	5.802E+05	3.007E+01	1.643E+04	5.802E+05	7.067E-02	1.971E+01	6.962E+02
2108	0	0	42,376	46,614	4.022E+01	3.221E+04	1.137E+06	1.074E+01	1.610E+04	5.687E+05	2.948E+01	1.610E+04	5.687E+05	6.927E-02	1.932E+01	6.824E+02
2109	0	0	42,376	46,614	3.942E+01	3.157E+04	1.115E+06	1.053E+01	1.578E+04	5.574E+05	2.889E+01	1.578E+04	5.574E+05	6.790E-02	1.894E+01	6.689E+02
2110	0	0	42,376	46,614	3.864E+01	3.094E+04	1.093E+06	1.032E+01	1.547E+04	5.464E+05	2.832E+01	1.547E+04	5.464E+05	6.655E-02	1.857E+01	6.557E+02
2111	0	0	42,376	46,614	3.788E+01	3.033E+04	1.071E+06	1.012E+01	1.517E+04	5.356E+05	2.776E+01	1.517E+04	5.356E+05	6.523E-02	1.820E+01	6.427E+02
2112	0	0	42,376	46,614	3.713E+01	2.973E+04	1.050E+06	9.917E+00	1.487E+04	5.250E+05	2.721E+01	1.487E+04	5.250E+05	6.394E-02	1.784E+01	6.300E+02
2113	0	0	42,376	46,614	3.639E+01	2.914E+04	1.029E+06	9.721E+00	1.457E+04	5.146E+05	2.667E+01	1.457E+04	5.146E+05	6.268E-02	1.749E+01	6.175E+02
2114	0	0	42,376	46,614	3.567E+01	2.856E+04	1.009E+06	9.529E+00	1.428E+04	5.044E+05	2.614E+01	1.428E+04	5.044E+05	6.143E-02	1.714E+01	6.053E+02
2115	0	0	42,376	46,614	3.497E+01	2.800E+04	9.888E+05	9.340E+00	1.400E+04	4.944E+05	2.563E+01	1.400E+04	4.944E+05	6.022E-02	1.680E+01	5.933E+02
2116	0	0	42,376	46,614	3.427E+01	2.744E+04	9.692E+05	9.155E+00	1.372E+04	4.846E+05	2.512E+01	1.372E+04	4.846E+05	5.903E-02	1.647E+01	5.815E+02
2117	0	0	42,376	46,614	3.360E+01	2.690E+04	9.500E+05	8.974E+00	1.345E+04	4.750E+05	2.462E+01	1.345E+04	4.750E+05	5.786E-02	1.614E+01	5.700E+02
2118	0	0	42,376	46,614	3.293E+01	2.637E+04	9.312E+05	8.796E+00	1.318E+04	4.656E+05	2.413E+01	1.318E+04	4.656E+05	5.671E-02	1.582E+01	5.587E+02
2119	0	0	42,376	46,614	3.228E+01	2.585E+04	9.128E+05	8.622E+00	1.292E+04	4.564E+05	2.366E+01	1.292E+04	4.564E+05	5.559E-02	1.551E+01	5.477E+02
2120	0	0	42,376	46,614	3.164E+01	2.533E+04	8.947E+05	8.451E+00	1.267E+04	4.473E+05	2.319E+01	1.267E+04	4.473E+05	5.449E-02	1.520E+01	5.368E+02
2121	0	0	42,376	46,614	3.101E+01	2.483E+04	8.770E+05	8.284E+00	1.242E+04	4.385E+05	2.273E+01	1.242E+04	4.385E+05	5.341E-02	1.490E+01	5.262E+02
2122	0	0	42,376	46,614	3.040E+01	2.434E+04	8.596E+05	8.120E+00	1.217E+04	4.298E+05	2.228E+01	1.217E+04	4.298E+05	5.235E-02	1.460E+01	5.158E+02
2123	0	0	42,376	46,614	2.980E+01	2.386E+04	8.426E+05	7.959E+00	1.193E+04	4.213E+05	2.184E+01	1.193E+04	4.213E+05	5.131E-02	1.432E+01	5.056E+02
2124	0	0	42,376	46,614	2.921E+01	2.339E+04	8.259E+05	7.801E+00	1.169E+04	4.130E+05	2.140E+01	1.169E+04	4.130E+05	5.030E-02	1.403E+01	4.955E+02
2125	0	0	42,376	46,614	2.863E+01	2.292E+04	8.096E+05	7.647E+00	1.146E+04	4.048E+05	2.098E+01	1.146E+04	4.048E+05	4.930E-02	1.375E+01	4.857E+02
2126	0	0	42,376	46,614	2.806E+01	2.247E+04	7.935E+05	7.495E+00	1.123E+04	3.968E+05	2.057E+01	1.123E+04	3.968E+05	4.833E-02	1.348E+01	4.761E+02
2127	0	0	42,376	46,614	2.751E+01	2.203E+04	7.778E+05	7.347E+00	1.101E+04	3.889E+05	2.016E+01	1.101E+04	3.889E+05	4.737E-02	1.322E+01	4.667E+02
2128	0	0	42,376	46,614	2.696E+01	2.159E+04	7.624E+05	7.202E+00	1.079E+04	3.812E+05	1.976E+01	1.079E+04	3.812E+05	4.643E-02	1.295E+01	4.574E+02
2129	0	0	42,376	46,614	2.643E+01	2.116E+04	7.473E+05	7.059E+00	1.058E+04	3.737E+05	1.937E+01	1.058E+04	3.737E+05	4.551E-02	1.270E+01	4.484E+02
2130	0	0	42,376	46,614	2.590E+01	2.074E+04	7.325E+05	6.919E+00	1.037E+04	3.663E+05	1.898E+01	1.037E+04	3.663E+05	4.461E-02	1.245E+01	4.395E+02
2131	0	0	42,376	46,614	2.539E+01	2.033E+04	7.180E+05	6.782E+00	1.017E+04	3.590E+05	1.861E+01	1.017E+04	3.590E+05	4.373E-02	1.220E+01	4.308E+02
2132	0	0	42,376	46,614	2.489E+01	1.993E+04	7.038E+05	6.648E+00	9.965E+03	3.519E+05	1.824E+01	9.965E+03	3.519E+05	4.286E-02	1.196E+01	4.223E+02
2133	0	0	42,376	46,614	2.440E+01	1.953E+04	6.899E+05	6.516E+00	9.767E+03	3.449E+05	1.788E+01	9.767E+03	3.449E+05	4.201E-02	1.172E+01	4.139E+02
2134	0	0	42,376	46,614	2.391E+01	1.915E+04	6.762E+05	6.387E+00	9.574E+03	3.381E+05	1.752E+01	9.574E+03	3.381E+05	4.118E-02	1.149E+01	4.057E+02
2135	0	0	42,376	46,614	2.344E+01	1.877E+04	6.628E+05	6.261E+00	9.384E+03	3.314E+05	1.718E+01	9.384E+03	3.314E+05	4.037E-02	1.126E+01	3.977E+02
2136	0	0	42,376	46,614	2.297E+01	1.840E+04	6.497E+05	6.137E+00	9.198E+03	3.248E+05	1.684E+01	9.198E+03	3.248E+05	3.957E-02	1.104E+01	3.898E+02
2137	0	0	42,376	46,614	2.252E+01	1.803E+04	6.368E+05	6.015E+00	9.016E+03	3.184E+05	1.650E+01	9.016E+03	3.184E+05	3.878E-02	1.082E+01	3.821E+02
2138	0	0	42,376	46,614	2.207E+01	1.768E+04	6.242E+05	5.896E+00	8.838E+03	3.121E+05	1.618E+01	8.838E+03	3.121E+05	3.801E-02	1.061E+01	3.745E+02
2139	0	0	42,376	46,614	2.164E+01	1.733E+04	6.119E+05	5.779E+00	8.663E+03	3.059E+05	1.586E+01	8.663E+03	3.059E+05	3.726E-02	1.040E+01	3.671E+02
2140	0	0	42,376	46,614	2.121E+01	1.698E+04	5.997E+05	5.665E+00	8.491E+03	2.999E+05	1.554E+01	8.491E+03	2.999E+05	3.652E-02	1.019E+01	3.598E+02
2141	0	0	42,376	46,614	2.079E+01	1.665E+04	5.879E+05	5.553E+00	8.323E+03	2.939E+05	1.524E+01	8.323E+03	2.939E+05	3.580E-02	9.988E+00	3.527E+02
2142	0	0	42,376	46,614	2.038E+01	1.632E+04	5.762E+05	5.443E+00	8.158E+03	2.881E+05	1.493E+01	8.158E+03	2.881E+05	3.509E-02	9.790E+00	3.457E+02
2143	0	0	42,376	46,614	1.997E+01	1.599E+04	5.648E+05	5.335E+00	7.997E+03	2.824E+05	1.464E+01	7.997E+03	2.824E+05	3.440E-02	9.596E+00	3.389E+02
2144	0	0	42,376	46,614	1.958E+01	1.568E+04	5.536E+05	5.229E+00	7.838E+03	2.768E+05	1.435E+01	7.838E+03	2.768E+05	3.372E-02	9.406E+00	3.322E+02
2145	0	0	42,376	46,614	1.919E+01	1.537E+04	5.427E+05	5.126E+00	7.683E+03	2.713E+05	1.406E+01	7.683E+03	2.713E+05	3.305E-02	9.220E+00	3.256E+02
2146	0	0	42,376	46,614	1.881E+01	1.506E+04	5.319E+05	5.024E+00	7.531E+03	2.660E+05	1.379E+01	7.531E+03	2.660E+05	3.239E-02	9.037E+00	3.192E+02
2147	0	0	42,376	46,614	1.844E+01	1.476E+04	5.214E+05	4.925E+00	7.382E+03	2.607E+05	1.351E+01	7.382E+03	2.607E+05	3.175E-02	8.858E+00	3.128E+02
2148	0	0	42,376	46,614	1.807E+01	1.447E+04	5.111E+05	4.827E+00	7.236E+03	2.555E+05	1.325E+01	7.236E+03	2.555E+05	3.112E-02	8.683E+00	3.066E+02
2149	0	0	42,376	46,614	1.771E+01	1.418E+04	5.009E+05	4.732E+00	7.092E+03	2.505E+05	1.298E+01	7.092E+03	2.505E+05	3.051E-02	8.511E+00	3.006E+02
2150	0	0	42,376	46,614	1.736E+01	1.390E+04	4.910E+05	4.638E+00	6.952E+03	2.455E+05	1.273E+01	6.952E+03	2.455E+05	2.990E-02	8.342E+00	2.946E+02
2151	0	0	42,376	46,614	1.702E+01	1.363E+04	4.813E+05	4.546E+00	6.814E+03	2.406E+05	1.247E+01	6.814E+03	2.406E+05	2.931E-02	8.177E+00	2.888E+02
2152	0	0	42,376	46,614	1.668E+01	1.336E+04	4.718E+05	4.456E+00	6.679E+03	2.359E+05	1.223E+01	6.679E+03	2.359E+05	2.873E-02	8.015E+00	2.831E+02
2153	0	0	42,376	46,614	1.635E+01	1.309E+04	4.624E+05	4.368E+00	6.547E+03	2.312E+05	1.198E+01	6.547E+03	2.312E+05	2.816E-02	7.857E+00	2.775E+02
2154	0	0	42,376	46,614	1.603E+01	1.284E+04	4.533E+05	4.281E+00	6.418E+03	2.266E+05	1.175E+01	6.418E+03	2.266E+05	2.760E-02	7.701E+00	2.720E+02
2155	0	0	42,376	46,614	1.571E+01	1.258E+04	4.443E+05	4.197E+00	6.290E+03	2.221E+05	1.151E+01	6.290E+03	2.221E+05	2.706E-02	7.549E+00	2.666E+02
2156	0	0	42,376	46,614	1.540E+01	1.233E+04	4.355E+05	4.114E+00	6.166E+03	2.177E+05	1.129E+01	6.166E+03	2.177E+05	2.652E-02	7.399E+00	2.613E+02
2157	0	0	42,376	46,614	1.510E+01	1.209E+04	4.269E+05	4.032E+00	6.044E+03	2.134E+05	1.106E+01	6.044E+03	2.134E+05	2.600E-02	7.253E+00	2.561E+02
2158	0	0	42,376	46,614	1.480E+01	1.185E+04	4.184E+05	3.952E+00	5.924E+03	2.092E+05	1.084E+01	5.924E+03	2.092E+05	2.548E-02	7.109E+00	2.511E+02
2159	0	0	42,376	46,614	1.450E+01	1.161E+04	4.101E+05	3.874E+00	5.807E+03	2.051E+05	1.063E+01	5.807E+03	2.051E+05	2.498E-02	6.968E+00	2.461E+02
2160	0	0	42,376	46,614	1.422E+01	1.138E+04	4.020E+05	3.797E+00	5.692E+03	2.010E+05	1.042E+01	5.692E+03	2.010E+05	2.448E-02	6.830E+00	2.412E+02
2161	0	0	42,376	46,614	1.393E+01	1.116E+04	3.941E+05	3.722E+00	5.579E+03	1.970E+05	1.021E+01	5.579E+03	1.970E+05	2.400E-02	6.695E+00	2.364E+02
2162	0	0	42,376	46,614	1.366E+01	1.094E+04	3.863E+05	3.648E+00	5.469E+03	1.931E+05	1.001E+01	5.469E+03	1.931E+05	2.352E-02	6.562E+00	2.318E+02
2163	0	0	42,376	46,614	1.339E+01	1.072E+04	3.786E+05	3.576E+00	5.360E+03	1.893E+05	9.812E+00	5.360E+03	1.893E+05	2.306E-02	6.432E+00	2.272E+02
2164	0	0	42,376	46,614	1.312E+01	1.051E+04	3.711E+05	3.505E+00	5.254E+03	1.856E+05	9.618E+00	5.254E+03	1.856E+05	2.260E-02	6.305E+00	2.227E+02

LANDGEM RESULTS **Landfill Name or Identifier:** All Landfills_Mixed Paper Waste

Closure Year (with 80-year limit) = 2054
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*
2024	15,356	16,891	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	15,356	16,891	15,356	16,891	6.416E+01	5.138E+04	1.814E+06	1.714E+01	2.569E+04	9.072E+05	4.702E+01	2.569E+04	9.072E+05	1.105E-01	3.083E+01	1.089E+03
2026	15,356	16,891	30,711	33,782	1.271E+02	1.017E+05	3.593E+06	3.394E+01	5.087E+04	1.796E+06	9.311E+01	5.087E+04	1.796E+06	2.188E-01	6.104E+01	2.156E+03
2027	15,356	16,891	46,067	50,673	1.887E+02	1.511E+05	5.336E+06	5.040E+01	7.555E+04	2.668E+06	1.383E+02	7.555E+04	2.668E+06	3.250E-01	9.066E+01	3.202E+03
2028	15,356	16,891	61,422	67,565	2.491E+02	1.995E+05	7.045E+06	6.654E+01	9.974E+04	3.522E+06	1.826E+02	9.974E+04	3.522E+06	4.290E-01	1.197E+02	4.227E+03
2029	15,356	16,891	76,778	84,456	3.083E+02	2.469E+05	8.720E+06	8.236E+01	1.235E+05	4.360E+06	2.260E+02	1.235E+05	4.360E+06	5.310E-01	1.481E+02	5.232E+03
2030	15,356	16,891	92,134	101,347	3.664E+02	2.934E+05	1.036E+07	9.787E+01	1.467E+05	5.181E+06	2.685E+02	1.467E+05	5.181E+06	6.310E-01	1.760E+02	6.217E+03
2031	15,356	16,891	107,489	118,238	4.233E+02	3.390E+05	1.197E+07	1.131E+02	1.695E+05	5.985E+06	3.102E+02	1.695E+05	5.985E+06	7.290E-01	2.034E+02	7.182E+03
2032	15,356	16,891	122,845	135,129	4.791E+02	3.836E+05	1.355E+07	1.280E+02	1.918E+05	6.774E+06	3.511E+02	1.918E+05	6.774E+06	8.251E-01	2.302E+02	8.129E+03
2033	15,356	16,891	138,200	152,020	5.338E+02	4.274E+05	1.509E+07	1.426E+02	2.137E+05	7.547E+06	3.912E+02	2.137E+05	7.547E+06	9.192E-01	2.564E+02	9.056E+03
2034	15,356	16,891	153,556	168,912	5.874E+02	4.703E+05	1.661E+07	1.569E+02	2.352E+05	8.305E+06	4.305E+02	2.352E+05	8.305E+06	1.012E+00	2.822E+02	9.966E+03
2035	15,356	16,891	168,912	185,803	6.399E+02	5.124E+05	1.809E+07	1.709E+02	2.562E+05	9.047E+06	4.690E+02	2.562E+05	9.047E+06	1.102E+00	3.074E+02	1.086E+04
2036	15,356	16,891	184,267	202,694	6.914E+02	5.536E+05	1.955E+07	1.847E+02	2.768E+05	9.776E+06	5.067E+02	2.768E+05	9.776E+06	1.191E+00	3.322E+02	1.173E+04
2037	15,356	16,891	199,623	219,585	7.418E+02	5.940E+05	2.098E+07	1.982E+02	2.970E+05	1.049E+07	5.437E+02	2.970E+05	1.049E+07	1.278E+00	3.564E+02	1.259E+04
2038	15,356	16,891	214,978	236,476	7.913E+02	6.336E+05	2.238E+07	2.114E+02	3.168E+05	1.119E+07	5.799E+02	3.168E+05	1.119E+07	1.363E+00	3.802E+02	1.343E+04
2039	15,356	16,891	230,334	253,367	8.398E+02	6.725E+05	2.375E+07	2.243E+02	3.362E+05	1.187E+07	6.155E+02	3.362E+05	1.187E+07	1.446E+00	4.035E+02	1.425E+04
2040	15,356	16,891	245,690	270,258	8.873E+02	7.105E+05	2.509E+07	2.370E+02	3.553E+05	1.255E+07	6.503E+02	3.553E+05	1.255E+07	1.528E+00	4.263E+02	1.506E+04
2041	15,356	16,891	261,045	287,150	9.339E+02	7.478E+05	2.641E+07	2.495E+02	3.739E+05	1.321E+07	6.845E+02	3.739E+05	1.321E+07	1.608E+00	4.487E+02	1.585E+04
2042	15,356	16,891	276,401	304,041	9.796E+02	7.844E+05	2.770E+07	2.617E+02	3.922E+05	1.385E+07	7.179E+02	3.922E+05	1.385E+07	1.687E+00	4.706E+02	1.662E+04
2043	15,356	16,891	291,756	320,932	1.024E+03	8.203E+05	2.897E+07	2.736E+02	4.101E+05	1.448E+07	7.507E+02	4.101E+05	1.448E+07	1.764E+00	4.922E+02	1.738E+04
2044	15,356	16,891	307,112	337,823	1.068E+03	8.554E+05	3.021E+07	2.853E+02	4.277E+05	1.510E+07	7.829E+02	4.277E+05	1.510E+07	1.840E+00	5.132E+02	1.812E+04
2045	15,356	16,891	322,467	354,714	1.111E+03	8.898E+05	3.142E+07	2.968E+02	4.449E+05	1.571E+07	8.144E+02	4.449E+05	1.571E+07	1.914E+00	5.339E+02	1.885E+04
2046	15,356	16,891	337,823	371,605	1.153E+03	9.236E+05	3.262E+07	3.081E+02	4.618E+05	1.631E+07	8.453E+02	4.618E+05	1.631E+07	1.986E+00	5.542E+02	1.957E+04
2047	15,356	16,891	353,179	388,497	1.195E+03	9.567E+05	3.379E+07	3.191E+02	4.783E+05	1.689E+07	8.756E+02	4.783E+05	1.689E+07	2.058E+00	5.740E+02	2.027E+04
2048	15,356	16,891	368,534	405,388	1.235E+03	9.891E+05	3.493E+07	3.299E+02	4.946E+05	1.747E+07	9.053E+02	4.946E+05	1.747E+07	2.127E+00	5.935E+02	2.096E+04
2049	15,356	16,891	383,890	422,279	1.275E+03	1.021E+06	3.605E+07	3.405E+02	5.105E+05	1.803E+07	9.344E+02	5.105E+05	1.803E+07	2.196E+00	6.125E+02	2.163E+04
2050	15,356	16,891	399,245	439,170	1.314E+03	1.052E+06	3.715E+07	3.509E+02	5.260E+05	1.858E+07	9.629E+02	5.260E+05	1.858E+07	2.263E+00	6.312E+02	2.229E+04
2051	15,356	16,891	414,601	456,061	1.352E+03	1.083E+06	3.823E+07	3.611E+02	5.413E+05	1.912E+07	9.909E+02	5.413E+05	1.912E+07	2.328E+00	6.496E+02	2.294E+04
2052	15,356	16,891	429,957	472,952	1.389E+03	1.113E+06	3.929E+07	3.711E+02	5.563E+05	1.964E+07	1.018E+03	5.563E+05	1.964E+07	2.393E+00	6.675E+02	2.357E+04
2053	15,356	16,891	445,312	489,843	1.426E+03	1.142E+06	4.033E+07	3.809E+02	5.709E+05	2.016E+07	1.045E+03	5.709E+05	2.016E+07	2.456E+00	6.851E+02	2.420E+04
2054	0	0	460,668	506,735	1.462E+03	1.171E+06	4.134E+07	3.905E+02	5.853E+05	2.067E+07	1.071E+03	5.853E+05	2.067E+07	2.518E+00	7.024E+02	2.481E+04
2055	0	0	460,668	506,735	1.433E+03	1.147E+06	4.052E+07	3.828E+02	5.737E+05	2.026E+07	1.050E+03	5.737E+05	2.026E+07	2.468E+00	6.885E+02	2.431E+04
2056	0	0	460,668	506,735	1.405E+03	1.125E+06	3.972E+07	3.752E+02	5.624E+05	1.986E+07	1.029E+03	5.624E+05	1.986E+07	2.419E+00	6.749E+02	2.383E+04
2057	0	0	460,668	506,735	1.377E+03	1.102E+06	3.893E+07	3.678E+02	5.512E+05	1.947E+07	1.009E+03	5.512E+05	1.947E+07	2.371E+00	6.615E+02	2.336E+04
2058	0	0	460,668	506,735	1.350E+03	1.081E+06	3.816E+07	3.605E+02	5.403E+05	1.908E+07	9.891E+02	5.403E+05	1.908E+07	2.324E+00	6.484E+02	2.290E+04
2059	0	0	460,668	506,735	1.323E+03	1.059E+06	3.741E+07	3.533E+02	5.296E+05	1.870E+07	9.695E+02	5.296E+05	1.870E+07	2.278E+00	6.356E+02	2.244E+04
2060	0	0	460,668	506,735	1.297E+03	1.038E+06	3.667E+07	3.463E+02	5.191E+05	1.833E+07	9.503E+02	5.191E+05	1.833E+07	2.233E+00	6.230E+02	2.200E+04
2061	0	0	460,668	506,735	1.271E+03	1.018E+06	3.594E+07	3.395E+02	5.089E+05	1.797E+07	9.315E+02	5.089E+05	1.797E+07	2.189E+00	6.106E+02	2.156E+04
2062	0	0	460,668	506,735	1.246E+03	9.976E+05	3.523E+07	3.328E+02	4.988E+05	1.761E+07	9.130E+02	4.988E+05	1.761E+07	2.145E+00	5.985E+02	2.114E+04
2063	0	0	460,668	506,735	1.221E+03	9.778E+05	3.453E+07	3.262E+02	4.889E+05	1.727E+07	8.949E+02	4.889E+05	1.727E+07	2.103E+00	5.867E+02	2.072E+04
2064	0	0	460,668	506,735	1.197E+03	9.585E+05	3.385E+07	3.197E+02	4.792E+05	1.692E+07	8.772E+02	4.792E+05	1.692E+07	2.061E+00	5.751E+02	2.031E+04
2065	0	0	460,668	506,735	1.173E+03	9.395E+05	3.318E+07	3.134E+02	4.697E+05	1.659E+07	8.599E+02	4.697E+05	1.659E+07	2.021E+00	5.637E+02	1.991E+04
2066	0	0	460,668	506,735	1.150E+03	9.209E+05	3.252E+07	3.072E+02	4.604E+05	1.626E+07	8.428E+02	4.604E+05	1.626E+07	1.981E+00	5.525E+02	1.951E+04
2067	0	0	460,668	506,735	1.127E+03	9.026E+05	3.188E+07	3.011E+02	4.513E+05	1.594E+07	8.261E+02	4.513E+05	1.594E+07	1.941E+00	5.416E+02	1.913E+04
2068	0	0	460,668	506,735	1.105E+03	8.848E+05	3.125E+07	2.951E+02	4.424E+05	1.562E+07	8.098E+02	4.424E+05	1.562E+07	1.903E+00	5.309E+02	1.875E+04
2069	0	0	460,668	506,735	1.083E+03	8.672E+05	3.063E+07	2.893E+02	4.336E+05	1.531E+07	7.937E+02	4.336E+05	1.531E+07	1.865E+00	5.203E+02	1.838E+04
2070	0	0	460,668	506,735	1.062E+03	8.501E+05	3.002E+07	2.836E+02	4.250E+05	1.501E+07	7.780E+02	4.250E+05	1.501E+07	1.828E+00	5.100E+02	1.801E+04
2071	0	0	460,668	506,735	1.041E+03	8.332E+05	2.943E+07	2.779E+02	4.166E+05	1.471E+07	7.626E+02	4.166E+05	1.471E+07	1.792E+00	4.999E+02	1.766E+04
2072	0	0	460,668	506,735	1.020E+03	8.167E+05	2.884E+07	2.724E+02	4.084E+05	1.442E+07	7.475E+02	4.084E+05	1.442E+07	1.757E+00	4.900E+02	1.731E+04
2073	0	0	460,668	506,735	9.998E+02	8.006E+05	2.827E+07	2.670E+02	4.003E+05	1.414E+07	7.327E+02	4.003E+05	1.414E+07	1.722E+00	4.803E+02	1.696E+04
2074	0	0	460,668	506,735	9.800E+02	7.847E+05	2.771E+07	2.618E+02	3.924E+05	1.386E+07	7.182E+02	3.924E+05	1.386E+07	1.688E+00	4.708E+02	1.663E+04
2075	0	0	460,668	506,735	9.606E+02	7.692E+05	2.716E+07	2.566E+02	3.846E+05	1.358E+07	7.040E+02	3.846E+05	1.358E+07	1.654E+00	4.615E+02	1.630E+04
2076	0	0	460,668	506,735	9.415E+02	7.539E+05	2.663E+07	2.515E+02	3.770E+05	1.331E+07	6.901E+02	3.770E+05	1.331E+07	1.622E+00	4.524E+02	1.598E+04
2077	0	0	460,668	506,735	9.229E+02	7.390E+05	2.610E+07	2.465E+02	3.695E+05	1.305E+07	6.764E+02	3.695E+05	1.305E+07	1.589E+00	4.434E+02	1.566E+04
2078	0	0	460,668	506,735	9.046E+02	7.244E+05	2.558E+07	2.416E+02	3.622E+05	1.279E+07	6.630E+02	3.622E+05	1.279E+07	1.558E+00	4.346E+02	1.535E+04
2079	0	0	460,668	506,735	8.867E+02	7.100E+05	2.508E+07	2.369E+02	3.550E+05	1.254E+07	6.499E+02	3.550E+05	1.254E+07	1.527E+00	4.260E+02	1.505E+04
2080	0	0	460,668	506,735	8.692E+02	6.960E+05	2.458E+07	2.322E+02	3.480E+05	1.229E+07	6.370E+02	3.480E+05	1.229E+07	1.497E+00	4.176E+02	1.475E+04
2081	0	0	460,668	506,735	8.519E+02	6.822E+05	2.409E+07	2.276E+02	3.411E+05	1.205E+07	6.244E+02	3.411E+05	1.205E+07	1.467E+00	4.093E+02	1.446E+04
2082	0	0	460,668	506,735	8.351E+02	6.687E+05	2.361E+07	2.231E+02	3.343E+05	1.181E+07	6.120E+02	3.343E+05	1.181E+07	1.438E+00	4.012E+02	1.417E+04
2083	0	0	460,668	506,735	8.185E+02	6.555E+05	2.315E+07	2.186E+02	3.277E+05	1.157E+07	5.999E+02	3.277E+05	1.157E+07	1.410E+00	3.933E+02	1.389E+04
2084	0	0	460,668	506,735	8.023E+02	6.425E+05	2.269E+07	2.143E+02	3.212E+05	1.134E+07	5.880E+02	3.212E+05	1.134E+07	1.382E+00	3.855E+02	1.361E+04
2085	0	0	460,668	506,735	7.864E+02	6.298E+05	2.224E+07	2.101E+02	3.149E+05	1.112E+07	5.764E+02	3.149E+05	1.112E+07	1.354E+00	3.779E+02	1.334E+04
2086	0	0	460,668	506,735	7.709E+02	6.173E+05	2.180E+07	2.059E+02	3.086E+05	1.090E+07	5.650E+02	3.086E+05	1.090E+07	1.328E+00	3.704E+02	1.308E+04
2087	0	0	460,668	506,735	7.556E+02	6.051E+05	2.137E+07	2.018E+02	3.025E+05	1.068E+07	5.538E+02	3.025E+05	1.068E+07	1.301E+00	3.630E+02	1.282E+04
2088	0	0	460,668	506,735	7.406E+02	5.931E+05	2.094E+07	1.978E+02	2.965E+05	1.047E+07	5.428E+02	2.965E+05	1.047E+07	1.276E+00	3.558E+02	1.257E+04
2089	0	0	460,668	506,735	7.260E+02	5.813E+05	2.053E+07	1.939E+02	2.907E+05	1.026E+07	5.321E+02	2.907E+05	1.026E+07	1.250E+00	3.488E+02	1.232E+04
2090	0	0	460,668	506,735	7.116E+02	5.698E+05	2.012E+07	1.901E+02	2.849E+05	1.006E+07	5.215E+02	2.849E+05	1.006E+07	1.226E+00	3.419E+02	1.207E+04
2091	0	0	460,668	506,735	6.975E+02	5.585E+05	1.972E+07	1.863E+02	2.793E+05	9.862E+06	5.112E+02	2.793E+05	9.862E+06	1.201E+00	3.351E+02	1.183E+04
2092	0	0	460,668	506,735	6.837E+02	5.475E+05	1.933E+07	1.826E+02	2.737E+05	9.667E+06	5.011E+02	2.737E+05	9.667E+06	1.177E+00	3.285E+02	1.160E+04
2093	0	0	460,668	506,735	6.702E+02	5.366E+05	1.895E+07	1.790E+02	2.683E+05	9.476E+06	4.912E+02	2.683E+05	9.476E+06	1.154E+00	3.220E+02	1.137E+04
2094	0	0	460,668	506,735	6.569E+02	5.260E+05	1.858E+07	1.755E+02	2.630E+05	9.288E+06	4.814E+02	2.630E+05	9.288E+06	1.131E+00	3.156E+02	1.115E+04

LANDGEM RESULTS **Landfill Name or Identifier:** All Landfills_Mixed Paper Waste

Closure Year (with 80-year limit) = 2054
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*
2095	0	0	460,668	506,735	6.439E+02	5.156E+05	1.821E+07	1.720E+02	2.578E+05	9.104E+06	4.719E+02	2.578E+05	9.104E+06	1.109E+00	3.094E+02	1.092E+04
2096	0	0	460,668	506,735	6.311E+02	5.054E+05	1.785E+07	1.686E+02	2.527E+05	8.924E+06	4.626E+02	2.527E+05	8.924E+06	1.087E+00	3.032E+02	1.071E+04
2097	0	0	460,668	506,735	6.186E+02	4.954E+05	1.749E+07	1.652E+02	2.477E+05	8.747E+06	4.534E+02	2.477E+05	8.747E+06	1.065E+00	2.972E+02	1.050E+04
2098	0	0	460,668	506,735	6.064E+02	4.856E+05	1.715E+07	1.620E+02	2.428E+05	8.574E+06	4.444E+02	2.428E+05	8.574E+06	1.044E+00	2.913E+02	1.029E+04
2099	0	0	460,668	506,735	5.944E+02	4.760E+05	1.681E+07	1.588E+02	2.380E+05	8.404E+06	4.356E+02	2.380E+05	8.404E+06	1.024E+00	2.856E+02	1.009E+04
2100	0	0	460,668	506,735	5.826E+02	4.665E+05	1.648E+07	1.556E+02	2.333E+05	8.238E+06	4.270E+02	2.333E+05	8.238E+06	1.003E+00	2.799E+02	9.885E+03
2101	0	0	460,668	506,735	5.711E+02	4.573E+05	1.615E+07	1.525E+02	2.286E+05	8.075E+06	4.185E+02	2.286E+05	8.075E+06	9.835E-01	2.744E+02	9.690E+03
2102	0	0	460,668	506,735	5.598E+02	4.482E+05	1.583E+07	1.495E+02	2.241E+05	7.915E+06	4.102E+02	2.241E+05	7.915E+06	9.640E-01	2.689E+02	9.498E+03
2103	0	0	460,668	506,735	5.487E+02	4.394E+05	1.552E+07	1.466E+02	2.197E+05	7.758E+06	4.021E+02	2.197E+05	7.758E+06	9.449E-01	2.636E+02	9.310E+03
2104	0	0	460,668	506,735	5.378E+02	4.307E+05	1.521E+07	1.437E+02	2.153E+05	7.604E+06	3.942E+02	2.153E+05	7.604E+06	9.262E-01	2.584E+02	9.125E+03
2105	0	0	460,668	506,735	5.272E+02	4.221E+05	1.491E+07	1.408E+02	2.111E+05	7.454E+06	3.864E+02	2.111E+05	7.454E+06	9.079E-01	2.533E+02	8.945E+03
2106	0	0	460,668	506,735	5.167E+02	4.138E+05	1.461E+07	1.380E+02	2.069E+05	7.306E+06	3.787E+02	2.069E+05	7.306E+06	8.899E-01	2.483E+02	8.767E+03
2107	0	0	460,668	506,735	5.065E+02	4.056E+05	1.432E+07	1.353E+02	2.028E+05	7.162E+06	3.712E+02	2.028E+05	7.162E+06	8.723E-01	2.433E+02	8.594E+03
2108	0	0	460,668	506,735	4.965E+02	3.976E+05	1.404E+07	1.326E+02	1.988E+05	7.020E+06	3.639E+02	1.988E+05	7.020E+06	8.550E-01	2.385E+02	8.424E+03
2109	0	0	460,668	506,735	4.866E+02	3.897E+05	1.376E+07	1.300E+02	1.948E+05	6.881E+06	3.567E+02	1.948E+05	6.881E+06	8.381E-01	2.338E+02	8.257E+03
2110	0	0	460,668	506,735	4.770E+02	3.820E+05	1.349E+07	1.274E+02	1.910E+05	6.745E+06	3.496E+02	1.910E+05	6.745E+06	8.215E-01	2.292E+02	8.093E+03
2111	0	0	460,668	506,735	4.676E+02	3.744E+05	1.322E+07	1.249E+02	1.872E+05	6.611E+06	3.427E+02	1.872E+05	6.611E+06	8.052E-01	2.246E+02	7.933E+03
2112	0	0	460,668	506,735	4.583E+02	3.670E+05	1.296E+07	1.224E+02	1.835E+05	6.480E+06	3.359E+02	1.835E+05	6.480E+06	7.893E-01	2.202E+02	7.776E+03
2113	0	0	460,668	506,735	4.492E+02	3.597E+05	1.270E+07	1.200E+02	1.799E+05	6.352E+06	3.292E+02	1.799E+05	6.352E+06	7.736E-01	2.158E+02	7.622E+03
2114	0	0	460,668	506,735	4.403E+02	3.526E+05	1.245E+07	1.176E+02	1.763E+05	6.226E+06	3.227E+02	1.763E+05	6.226E+06	7.583E-01	2.116E+02	7.471E+03
2115	0	0	460,668	506,735	4.316E+02	3.456E+05	1.221E+07	1.153E+02	1.728E+05	6.103E+06	3.163E+02	1.728E+05	6.103E+06	7.433E-01	2.074E+02	7.323E+03
2116	0	0	460,668	506,735	4.231E+02	3.388E+05	1.196E+07	1.130E+02	1.694E+05	5.982E+06	3.101E+02	1.694E+05	5.982E+06	7.286E-01	2.033E+02	7.178E+03
2117	0	0	460,668	506,735	4.147E+02	3.321E+05	1.173E+07	1.108E+02	1.660E+05	5.863E+06	3.039E+02	1.660E+05	5.863E+06	7.142E-01	1.992E+02	7.036E+03
2118	0	0	460,668	506,735	4.065E+02	3.255E+05	1.149E+07	1.086E+02	1.627E+05	5.747E+06	2.979E+02	1.627E+05	5.747E+06	7.000E-01	1.953E+02	6.897E+03
2119	0	0	460,668	506,735	3.984E+02	3.190E+05	1.127E+07	1.064E+02	1.595E+05	5.633E+06	2.920E+02	1.595E+05	5.633E+06	6.862E-01	1.914E+02	6.760E+03
2120	0	0	460,668	506,735	3.905E+02	3.127E+05	1.104E+07	1.043E+02	1.564E+05	5.522E+06	2.862E+02	1.564E+05	5.522E+06	6.726E-01	1.876E+02	6.626E+03
2121	0	0	460,668	506,735	3.828E+02	3.065E+05	1.083E+07	1.023E+02	1.533E+05	5.413E+06	2.806E+02	1.533E+05	5.413E+06	6.593E-01	1.839E+02	6.495E+03
2122	0	0	460,668	506,735	3.752E+02	3.005E+05	1.061E+07	1.002E+02	1.502E+05	5.305E+06	2.750E+02	1.502E+05	5.305E+06	6.462E-01	1.803E+02	6.367E+03
2123	0	0	460,668	506,735	3.678E+02	2.945E+05	1.040E+07	9.824E+01	1.473E+05	5.200E+06	2.696E+02	1.473E+05	5.200E+06	6.334E-01	1.767E+02	6.240E+03
2124	0	0	460,668	506,735	3.605E+02	2.887E+05	1.019E+07	9.630E+01	1.443E+05	5.097E+06	2.642E+02	1.443E+05	5.097E+06	6.209E-01	1.732E+02	6.117E+03
2125	0	0	460,668	506,735	3.534E+02	2.830E+05	9.993E+06	9.439E+01	1.415E+05	4.996E+06	2.590E+02	1.415E+05	4.996E+06	6.086E-01	1.698E+02	5.996E+03
2126	0	0	460,668	506,735	3.464E+02	2.774E+05	9.795E+06	9.252E+01	1.387E+05	4.898E+06	2.539E+02	1.387E+05	4.898E+06	5.965E-01	1.664E+02	5.877E+03
2127	0	0	460,668	506,735	3.395E+02	2.719E+05	9.601E+06	9.069E+01	1.359E+05	4.801E+06	2.488E+02	1.359E+05	4.801E+06	5.847E-01	1.631E+02	5.761E+03
2128	0	0	460,668	506,735	3.328E+02	2.665E+05	9.411E+06	8.889E+01	1.332E+05	4.705E+06	2.439E+02	1.332E+05	4.705E+06	5.731E-01	1.599E+02	5.647E+03
2129	0	0	460,668	506,735	3.262E+02	2.612E+05	9.225E+06	8.713E+01	1.306E+05	4.612E+06	2.391E+02	1.306E+05	4.612E+06	5.618E-01	1.567E+02	5.535E+03
2130	0	0	460,668	506,735	3.197E+02	2.560E+05	9.042E+06	8.541E+01	1.280E+05	4.521E+06	2.343E+02	1.280E+05	4.521E+06	5.507E-01	1.536E+02	5.425E+03
2131	0	0	460,668	506,735	3.134E+02	2.510E+05	8.863E+06	8.372E+01	1.255E+05	4.431E+06	2.297E+02	1.255E+05	4.431E+06	5.398E-01	1.506E+02	5.318E+03
2132	0	0	460,668	506,735	3.072E+02	2.460E+05	8.687E+06	8.206E+01	1.230E+05	4.344E+06	2.251E+02	1.230E+05	4.344E+06	5.291E-01	1.476E+02	5.212E+03
2133	0	0	460,668	506,735	3.011E+02	2.411E+05	8.515E+06	8.043E+01	1.206E+05	4.258E+06	2.207E+02	1.206E+05	4.258E+06	5.186E-01	1.447E+02	5.109E+03
2134	0	0	460,668	506,735	2.952E+02	2.364E+05	8.347E+06	7.884E+01	1.182E+05	4.173E+06	2.163E+02	1.182E+05	4.173E+06	5.083E-01	1.418E+02	5.008E+03
2135	0	0	460,668	506,735	2.893E+02	2.317E+05	8.182E+06	7.728E+01	1.158E+05	4.091E+06	2.120E+02	1.158E+05	4.091E+06	4.983E-01	1.390E+02	4.909E+03
2136	0	0	460,668	506,735	2.836E+02	2.271E+05	8.020E+06	7.575E+01	1.135E+05	4.010E+06	2.078E+02	1.135E+05	4.010E+06	4.884E-01	1.363E+02	4.812E+03
2137	0	0	460,668	506,735	2.780E+02	2.226E+05	7.861E+06	7.425E+01	1.113E+05	3.930E+06	2.037E+02	1.113E+05	3.930E+06	4.787E-01	1.336E+02	4.716E+03
2138	0	0	460,668	506,735	2.725E+02	2.182E+05	7.705E+06	7.278E+01	1.091E+05	3.853E+06	1.997E+02	1.091E+05	3.853E+06	4.692E-01	1.309E+02	4.623E+03
2139	0	0	460,668	506,735	2.671E+02	2.139E+05	7.552E+06	7.134E+01	1.069E+05	3.776E+06	1.957E+02	1.069E+05	3.776E+06	4.599E-01	1.283E+02	4.531E+03
2140	0	0	460,668	506,735	2.618E+02	2.096E+05	7.403E+06	6.993E+01	1.048E+05	3.701E+06	1.919E+02	1.048E+05	3.701E+06	4.508E-01	1.258E+02	4.442E+03
2141	0	0	460,668	506,735	2.566E+02	2.055E+05	7.256E+06	6.854E+01	1.027E+05	3.628E+06	1.881E+02	1.027E+05	3.628E+06	4.419E-01	1.233E+02	4.354E+03
2142	0	0	460,668	506,735	2.515E+02	2.014E+05	7.113E+06	6.718E+01	1.007E+05	3.556E+06	1.843E+02	1.007E+05	3.556E+06	4.332E-01	1.208E+02	4.268E+03
2143	0	0	460,668	506,735	2.465E+02	1.974E+05	6.972E+06	6.585E+01	9.871E+04	3.486E+06	1.807E+02	9.871E+04	3.486E+06	4.246E-01	1.185E+02	4.183E+03
2144	0	0	460,668	506,735	2.417E+02	1.935E+05	6.834E+06	6.455E+01	9.675E+04	3.417E+06	1.771E+02	9.675E+04	3.417E+06	4.162E-01	1.161E+02	4.100E+03
2145	0	0	460,668	506,735	2.369E+02	1.897E+05	6.698E+06	6.327E+01	9.484E+04	3.349E+06	1.736E+02	9.484E+04	3.349E+06	4.079E-01	1.138E+02	4.019E+03
2146	0	0	460,668	506,735	2.322E+02	1.859E+05	6.566E+06	6.202E+01	9.296E+04	3.283E+06	1.702E+02	9.296E+04	3.283E+06	3.999E-01	1.116E+02	3.939E+03
2147	0	0	460,668	506,735	2.276E+02	1.822E+05	6.436E+06	6.079E+01	9.112E+04	3.218E+06	1.668E+02	9.112E+04	3.218E+06	3.919E-01	1.093E+02	3.861E+03
2148	0	0	460,668	506,735	2.231E+02	1.786E+05	6.308E+06	5.959E+01	8.932E+04	3.154E+06	1.635E+02	8.932E+04	3.154E+06	3.842E-01	1.072E+02	3.785E+03
2149	0	0	460,668	506,735	2.187E+02	1.751E+05	6.183E+06	5.841E+01	8.755E+04	3.092E+06	1.603E+02	8.755E+04	3.092E+06	3.766E-01	1.051E+02	3.710E+03
2150	0	0	460,668	506,735	2.143E+02	1.716E+05	6.061E+06	5.725E+01	8.581E+04	3.031E+06	1.571E+02	8.581E+04	3.031E+06	3.691E-01	1.030E+02	3.637E+03
2151	0	0	460,668	506,735	2.101E+02	1.682E+05	5.941E+06	5.612E+01	8.411E+04	2.970E+06	1.540E+02	8.411E+04	2.970E+06	3.618E-01	1.009E+02	3.565E+03
2152	0	0	460,668	506,735	2.059E+02	1.649E+05	5.823E+06	5.501E+01	8.245E+04	2.912E+06	1.509E+02	8.245E+04	2.912E+06	3.546E-01	9.894E+01	3.494E+03
2153	0	0	460,668	506,735	2.019E+02	1.616E+05	5.708E+06	5.392E+01	8.082E+04	2.854E+06	1.479E+02	8.082E+04	2.854E+06	3.476E-01	9.698E+01	3.425E+03
2154	0	0	460,668	506,735	1.979E+02	1.584E+05	5.595E+06	5.285E+01	7.922E+04	2.798E+06	1.450E+02	7.922E+04	2.798E+06	3.407E-01	9.506E+01	3.357E+03
2155	0	0	460,668	506,735	1.939E+02	1.553E+05	5.484E+06	5.180E+01	7.765E+04	2.742E+06	1.421E+02	7.765E+04	2.742E+06	3.340E-01	9.318E+01	3.291E+03
2156	0	0	460,668	506,735	1.901E+02	1.522E+05	5.376E+06	5.078E+01	7.611E+04	2.688E+06	1.393E+02	7.611E+04	2.688E+06	3.274E-01	9.133E+01	3.225E+03
2157	0	0	460,668	506,735	1.863E+02	1.492E+05	5.269E+06	4.977E+01	7.460E+04	2.635E+06	1.366E+02	7.460E+04	2.635E+06	3.209E-01	8.952E+01	3.162E+03
2158	0	0	460,668	506,735	1.826E+02	1.463E+05	5.165E+06	4.879E+01	7.313E+04	2.582E+06	1.339E+02	7.313E+04	2.582E+06	3.145E-01	8.775E+01	3.099E+03
2159	0	0	460,668	506,735	1.790E+02	1.434E+05	5.063E+06	4.782E+01	7.168E+04	2.531E+06	1.312E+02	7.168E+04	2.531E+06	3.083E-01	8.601E+01	3.038E+03
2160	0	0	460,668	506,735	1.755E+02	1.405E+05	4.962E+06	4.687E+01	7.026E+04	2.481E+06	1.286E+02	7.026E+04	2.481E+06	3.022E-01	8.431E+01	2.977E+03
2161	0	0	460,668	506,735	1.720E+02	1.377E+05	4.864E+06	4.594E+01	6.887E+04	2.432E+06	1.261E+02	6.887E+04	2.432E+06	2.962E-01	8.264E+01	2.918E+03
2162	0	0	460,668	506,735	1.686E+02	1.350E+05	4.768E+06	4.503E+01	6.750E+04	2.384E+06	1.236E+02	6.750E+04	2.384E+06	2.904E-01	8.100E+01	2.861E+03
2163	0	0	460,668	506,735	1.653E+02	1.323E+05	4.673E+06	4.414E+01	6.617E+04	2.337E+06	1.211E+02	6.617E+04	2.337E+06	2.846E-01	7.940E+01	2.804E+03
2164	0	0	460,668	506,735	1.620E+02	1.297E+05	4.581E+06	4.327E+01	6.486E+04	2.290E+06	1.187E+02	6.486E+04	2.290E+06	2.790E-01	7.783E+01	2.748E+03

LANDGEM RESULTS **Landfill Name or Identifier:** All Landfills_Mixed Organics Waste

Closure Year (with 80-year limit) = 2054
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*
2024	11,701	12,871	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	11,701	12,871	11,701	12,871	5.329E+01	4.267E+04	1.507E+06	1.424E+01	2.134E+04	7.535E+05	3.906E+01	2.134E+04	7.535E+05	9.178E-02	2.560E+01	9.042E+02
2026	11,701	12,871	23,402	25,742	1.055E+02	8.450E+04	2.984E+06	2.819E+01	4.225E+04	1.492E+06	7.734E+01	4.225E+04	1.492E+06	1.817E-01	5.070E+01	1.791E+03
2027	11,701	12,871	35,103	38,613	1.567E+02	1.255E+05	4.432E+06	4.187E+01	6.275E+04	2.216E+06	1.149E+02	6.275E+04	2.216E+06	2.699E-01	7.530E+01	2.659E+03
2028	11,701	12,871	46,804	51,484	2.069E+02	1.657E+05	5.851E+06	5.527E+01	8.285E+04	2.926E+06	1.517E+02	8.285E+04	2.926E+06	3.564E-01	9.942E+01	3.511E+03
2029	11,701	12,871	58,505	64,355	2.561E+02	2.051E+05	7.243E+06	6.841E+01	1.025E+05	3.621E+06	1.877E+02	1.025E+05	3.621E+06	4.411E-01	1.231E+02	4.346E+03
2030	11,701	12,871	70,206	77,226	3.043E+02	2.437E+05	8.606E+06	8.129E+01	1.219E+05	4.303E+06	2.230E+02	1.219E+05	4.303E+06	5.241E-01	1.462E+02	5.164E+03
2031	11,701	12,871	81,907	90,097	3.516E+02	2.816E+05	9.943E+06	9.392E+01	1.408E+05	4.971E+06	2.577E+02	1.408E+05	4.971E+06	6.055E-01	1.689E+02	5.966E+03
2032	11,701	12,871	93,608	102,969	3.979E+02	3.186E+05	1.125E+07	1.063E+02	1.593E+05	5.627E+06	2.916E+02	1.593E+05	5.627E+06	6.853E-01	1.912E+02	6.752E+03
2033	11,701	12,871	105,309	115,840	4.434E+02	3.550E+05	1.254E+07	1.184E+02	1.775E+05	6.269E+06	3.249E+02	1.775E+05	6.269E+06	7.635E-01	2.130E+02	7.522E+03
2034	11,701	12,871	117,010	128,711	4.879E+02	3.907E+05	1.380E+07	1.303E+02	1.953E+05	6.898E+06	3.576E+02	1.953E+05	6.898E+06	8.402E-01	2.344E+02	8.278E+03
2035	11,701	12,871	128,711	141,582	5.315E+02	4.256E+05	1.503E+07	1.420E+02	2.128E+05	7.515E+06	3.895E+02	2.128E+05	7.515E+06	9.153E-01	2.554E+02	9.018E+03
2036	11,701	12,871	140,412	154,453	5.743E+02	4.598E+05	1.624E+07	1.534E+02	2.299E+05	8.120E+06	4.209E+02	2.299E+05	8.120E+06	9.890E-01	2.759E+02	9.744E+03
2037	11,701	12,871	152,113	167,324	6.162E+02	4.934E+05	1.742E+07	1.646E+02	2.467E+05	8.712E+06	4.516E+02	2.467E+05	8.712E+06	1.061E+00	2.960E+02	1.045E+04
2038	11,701	12,871	163,814	180,195	6.573E+02	5.263E+05	1.859E+07	1.756E+02	2.632E+05	9.293E+06	4.817E+02	2.632E+05	9.293E+06	1.132E+00	3.158E+02	1.115E+04
2039	11,701	12,871	175,515	193,066	6.976E+02	5.586E+05	1.973E+07	1.863E+02	2.793E+05	9.863E+06	5.112E+02	2.793E+05	9.863E+06	1.201E+00	3.351E+02	1.184E+04
2040	11,701	12,871	187,215	205,937	7.370E+02	5.902E+05	2.084E+07	1.969E+02	2.951E+05	1.042E+07	5.402E+02	2.951E+05	1.042E+07	1.269E+00	3.541E+02	1.251E+04
2041	11,701	12,871	198,916	218,808	7.757E+02	6.212E+05	2.194E+07	2.072E+02	3.106E+05	1.097E+07	5.685E+02	3.106E+05	1.097E+07	1.336E+00	3.727E+02	1.316E+04
2042	11,701	12,871	210,617	231,679	8.137E+02	6.515E+05	2.301E+07	2.173E+02	3.258E+05	1.150E+07	5.963E+02	3.258E+05	1.150E+07	1.401E+00	3.909E+02	1.381E+04
2043	11,701	12,871	222,318	244,550	8.508E+02	6.813E+05	2.406E+07	2.273E+02	3.407E+05	1.203E+07	6.236E+02	3.407E+05	1.203E+07	1.465E+00	4.088E+02	1.444E+04
2044	11,701	12,871	234,019	257,421	8.873E+02	7.105E+05	2.509E+07	2.370E+02	3.553E+05	1.255E+07	6.503E+02	3.553E+05	1.255E+07	1.528E+00	4.263E+02	1.505E+04
2045	11,701	12,871	245,720	270,292	9.230E+02	7.391E+05	2.610E+07	2.465E+02	3.696E+05	1.305E+07	6.765E+02	3.696E+05	1.305E+07	1.590E+00	4.435E+02	1.566E+04
2046	11,701	12,871	257,421	283,163	9.580E+02	7.671E+05	2.709E+07	2.559E+02	3.836E+05	1.355E+07	7.021E+02	3.836E+05	1.355E+07	1.650E+00	4.603E+02	1.626E+04
2047	11,701	12,871	269,122	296,034	9.924E+02	7.946E+05	2.806E+07	2.651E+02	3.973E+05	1.403E+07	7.273E+02	3.973E+05	1.403E+07	1.709E+00	4.768E+02	1.684E+04
2048	11,701	12,871	280,823	308,906	1.026E+03	8.216E+05	2.901E+07	2.741E+02	4.108E+05	1.451E+07	7.519E+02	4.108E+05	1.451E+07	1.767E+00	4.929E+02	1.741E+04
2049	11,701	12,871	292,524	321,777	1.059E+03	8.480E+05	2.995E+07	2.829E+02	4.240E+05	1.497E+07	7.761E+02	4.240E+05	1.497E+07	1.824E+00	5.088E+02	1.797E+04
2050	11,701	12,871	304,225	334,648	1.091E+03	8.739E+05	3.086E+07	2.915E+02	4.369E+05	1.543E+07	7.998E+02	4.369E+05	1.543E+07	1.879E+00	5.243E+02	1.852E+04
2051	11,701	12,871	315,926	347,519	1.123E+03	8.992E+05	3.176E+07	3.000E+02	4.496E+05	1.588E+07	8.230E+02	4.496E+05	1.588E+07	1.934E+00	5.395E+02	1.905E+04
2052	11,701	12,871	327,627	360,390	1.154E+03	9.241E+05	3.263E+07	3.083E+02	4.621E+05	1.632E+07	8.458E+02	4.621E+05	1.632E+07	1.987E+00	5.545E+02	1.958E+04
2053	11,701	12,871	339,328	373,261	1.184E+03	9.485E+05	3.350E+07	3.164E+02	4.742E+05	1.675E+07	8.681E+02	4.742E+05	1.675E+07	2.040E+00	5.691E+02	2.010E+04
2054	0	0	351,029	386,132	1.214E+03	9.724E+05	3.434E+07	3.244E+02	4.862E+05	1.717E+07	8.900E+02	4.862E+05	1.717E+07	2.091E+00	5.834E+02	2.060E+04
2055	0	0	351,029	386,132	1.190E+03	9.531E+05	3.366E+07	3.179E+02	4.766E+05	1.683E+07	8.723E+02	4.766E+05	1.683E+07	2.050E+00	5.719E+02	2.020E+04
2056	0	0	351,029	386,132	1.167E+03	9.342E+05	3.299E+07	3.116E+02	4.671E+05	1.650E+07	8.551E+02	4.671E+05	1.650E+07	2.009E+00	5.605E+02	1.980E+04
2057	0	0	351,029	386,132	1.144E+03	9.157E+05	3.234E+07	3.055E+02	4.579E+05	1.617E+07	8.381E+02	4.579E+05	1.617E+07	1.969E+00	5.494E+02	1.940E+04
2058	0	0	351,029	386,132	1.121E+03	8.976E+05	3.170E+07	2.994E+02	4.488E+05	1.585E+07	8.215E+02	4.488E+05	1.585E+07	1.930E+00	5.386E+02	1.902E+04
2059	0	0	351,029	386,132	1.099E+03	8.798E+05	3.107E+07	2.935E+02	4.399E+05	1.554E+07	8.053E+02	4.399E+05	1.554E+07	1.892E+00	5.279E+02	1.864E+04
2060	0	0	351,029	386,132	1.077E+03	8.624E+05	3.046E+07	2.877E+02	4.312E+05	1.523E+07	7.893E+02	4.312E+05	1.523E+07	1.855E+00	5.174E+02	1.827E+04
2061	0	0	351,029	386,132	1.056E+03	8.453E+05	2.985E+07	2.820E+02	4.227E+05	1.493E+07	7.737E+02	4.227E+05	1.493E+07	1.818E+00	5.072E+02	1.791E+04
2062	0	0	351,029	386,132	1.035E+03	8.286E+05	2.926E+07	2.764E+02	4.143E+05	1.463E+07	7.584E+02	4.143E+05	1.463E+07	1.782E+00	4.972E+02	1.756E+04
2063	0	0	351,029	386,132	1.014E+03	8.122E+05	2.868E+07	2.709E+02	4.061E+05	1.434E+07	7.434E+02	4.061E+05	1.434E+07	1.747E+00	4.873E+02	1.721E+04
2064	0	0	351,029	386,132	9.942E+02	7.961E+05	2.811E+07	2.656E+02	3.981E+05	1.406E+07	7.286E+02	3.981E+05	1.406E+07	1.712E+00	4.777E+02	1.687E+04
2065	0	0	351,029	386,132	9.745E+02	7.803E+05	2.756E+07	2.603E+02	3.902E+05	1.378E+07	7.142E+02	3.902E+05	1.378E+07	1.678E+00	4.682E+02	1.653E+04
2066	0	0	351,029	386,132	9.552E+02	7.649E+05	2.701E+07	2.551E+02	3.824E+05	1.351E+07	7.001E+02	3.824E+05	1.351E+07	1.645E+00	4.589E+02	1.621E+04
2067	0	0	351,029	386,132	9.363E+02	7.497E+05	2.648E+07	2.501E+02	3.749E+05	1.324E+07	6.862E+02	3.749E+05	1.324E+07	1.612E+00	4.498E+02	1.589E+04
2068	0	0	351,029	386,132	9.178E+02	7.349E+05	2.595E+07	2.451E+02	3.675E+05	1.298E+07	6.726E+02	3.675E+05	1.298E+07	1.581E+00	4.409E+02	1.557E+04
2069	0	0	351,029	386,132	8.996E+02	7.203E+05	2.544E+07	2.403E+02	3.602E+05	1.272E+07	6.593E+02	3.602E+05	1.272E+07	1.549E+00	4.322E+02	1.526E+04
2070	0	0	351,029	386,132	8.818E+02	7.061E+05	2.494E+07	2.355E+02	3.530E+05	1.247E+07	6.462E+02	3.530E+05	1.247E+07	1.519E+00	4.237E+02	1.496E+04
2071	0	0	351,029	386,132	8.643E+02	6.921E+05	2.444E+07	2.309E+02	3.461E+05	1.222E+07	6.334E+02	3.461E+05	1.222E+07	1.488E+00	4.153E+02	1.466E+04
2072	0	0	351,029	386,132	8.472E+02	6.784E+05	2.396E+07	2.263E+02	3.392E+05	1.198E+07	6.209E+02	3.392E+05	1.198E+07	1.459E+00	4.070E+02	1.437E+04
2073	0	0	351,029	386,132	8.304E+02	6.650E+05	2.348E+07	2.218E+02	3.325E+05	1.174E+07	6.086E+02	3.325E+05	1.174E+07	1.430E+00	3.990E+02	1.409E+04
2074	0	0	351,029	386,132	8.140E+02	6.518E+05	2.302E+07	2.174E+02	3.259E+05	1.151E+07	5.966E+02	3.259E+05	1.151E+07	1.402E+00	3.911E+02	1.381E+04
2075	0	0	351,029	386,132	7.979E+02	6.389E+05	2.256E+07	2.131E+02	3.194E+05	1.128E+07	5.847E+02	3.194E+05	1.128E+07	1.374E+00	3.833E+02	1.354E+04
2076	0	0	351,029	386,132	7.821E+02	6.262E+05	2.212E+07	2.089E+02	3.131E+05	1.106E+07	5.732E+02	3.131E+05	1.106E+07	1.347E+00	3.757E+02	1.327E+04
2077	0	0	351,029	386,132	7.666E+02	6.138E+05	2.168E+07	2.048E+02	3.069E+05	1.084E+07	5.618E+02	3.069E+05	1.084E+07	1.320E+00	3.683E+02	1.301E+04
2078	0	0	351,029	386,132	7.514E+02	6.017E+05	2.125E+07	2.007E+02	3.008E+05	1.062E+07	5.507E+02	3.008E+05	1.062E+07	1.294E+00	3.610E+02	1.275E+04
2079	0	0	351,029	386,132	7.365E+02	5.898E+05	2.083E+07	1.967E+02	2.949E+05	1.041E+07	5.398E+02	2.949E+05	1.041E+07	1.268E+00	3.539E+02	1.250E+04
2080	0	0	351,029	386,132	7.219E+02	5.781E+05	2.042E+07	1.928E+02	2.890E+05	1.021E+07	5.291E+02	2.890E+05	1.021E+07	1.243E+00	3.469E+02	1.225E+04
2081	0	0	351,029	386,132	7.076E+02	5.666E+05	2.001E+07	1.890E+02	2.833E+05	1.001E+07	5.186E+02	2.833E+05	1.001E+07	1.219E+00	3.400E+02	1.201E+04
2082	0	0	351,029	386,132	6.936E+02	5.554E+05	1.961E+07	1.853E+02	2.777E+05	9.807E+06	5.084E+02	2.777E+05	9.807E+06	1.195E+00	3.333E+02	1.177E+04
2083	0	0	351,029	386,132	6.799E+02	5.444E+05	1.923E+07	1.816E+02	2.722E+05	9.613E+06	4.983E+02	2.722E+05	9.613E+06	1.171E+00	3.267E+02	1.154E+04
2084	0	0	351,029	386,132	6.664E+02	5.336E+05	1.885E+07	1.780E+02	2.668E+05	9.423E+06	4.884E+02	2.668E+05	9.423E+06	1.148E+00	3.202E+02	1.131E+04
2085	0	0	351,029	386,132	6.532E+02	5.231E+05	1.847E+07	1.745E+02	2.615E+05	9.236E+06	4.787E+02	2.615E+05	9.236E+06	1.125E+00	3.138E+02	1.108E+04
2086	0	0	351,029	386,132	6.403E+02	5.127E+05	1.811E+07	1.710E+02	2.564E+05	9.053E+06	4.693E+02	2.564E+05	9.053E+06	1.103E+00	3.076E+02	1.086E+04
2087	0	0	351,029	386,132	6.276E+02	5.026E+05	1.775E+07	1.676E+02	2.513E+05	8.874E+06	4.600E+02	2.513E+05	8.874E+06	1.081E+00	3.015E+02	1.065E+04
2088	0	0	351,029	386,132	6.152E+02	4.926E+05	1.740E+07	1.643E+02	2.463E+05	8.698E+06	4.509E+02	2.463E+05	8.698E+06	1.059E+00	2.956E+02	1.044E+04
2089	0	0	351,029	386,132	6.030E+02	4.829E+05	1.705E+07	1.611E+02	2.414E+05	8.526E+06	4.419E+02	2.414E+05	8.526E+06	1.038E+00	2.897E+02	1.023E+04
2090	0	0	351,029	386,132	5.911E+02	4.733E+05	1.671E+07	1.579E+02	2.367E+05	8.357E+06	4.332E+02	2.367E+05	8.357E+06	1.018E+00	2.840E+02	1.003E+04
2091	0	0	351,029	386,132	5.794E+02	4.639E+05	1.638E+07	1.548E+02	2.320E+05	8.192E+06	4.246E+02	2.320E+05	8.192E+06	9.978E-01	2.784E+02	9.830E+03
2092	0	0	351,029	386,132	5.679E+02	4.547E+05	1.606E+07	1.517E+02	2.274E+05	8.030E+06	4.162E+02	2.274E+05	8.030E+06	9.780E-01	2.728E+02	9.636E+03
2093	0	0	351,029	386,132	5.567E+02	4.457E+05	1.574E+07	1.487E+02	2.229E+05	7.871E+06	4.080E+02	2.229E+05	7.871E+06	9.586E-01	2.674E+02	9.445E+03
2094	0	0	351,029	386,132	5.456E+02	4.369E+05	1.543E+07	1.457E+02	2.185E+05	7.715E+06	3.999E+02	2.185E+05	7.715E+06	9.397E-01	2.621E+02	9.258E+03

LANDGEM RESULTS **Landfill Name or Identifier:** All Landfills_Mixed Organics Waste

Closure Year (with 80-year limit) = 2054
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*
2095	0	0	351,029	386,132	5.348E+02	4.283E+05	1.512E+07	1.429E+02	2.141E+05	7.562E+06	3.920E+02	2.141E+05	7.562E+06	9.211E-01	2.570E+02	9.074E+03
2096	0	0	351,029	386,132	5.242E+02	4.198E+05	1.482E+07	1.400E+02	2.099E+05	7.412E+06	3.842E+02	2.099E+05	7.412E+06	9.028E-01	2.519E+02	8.895E+03
2097	0	0	351,029	386,132	5.139E+02	4.115E+05	1.453E+07	1.373E+02	2.057E+05	7.266E+06	3.766E+02	2.057E+05	7.266E+06	8.849E-01	2.469E+02	8.719E+03
2098	0	0	351,029	386,132	5.037E+02	4.033E+05	1.424E+07	1.345E+02	2.017E+05	7.122E+06	3.691E+02	2.017E+05	7.122E+06	8.674E-01	2.420E+02	8.546E+03
2099	0	0	351,029	386,132	4.937E+02	3.953E+05	1.396E+07	1.319E+02	1.977E+05	6.981E+06	3.618E+02	1.977E+05	6.981E+06	8.502E-01	2.372E+02	8.377E+03
2100	0	0	351,029	386,132	4.839E+02	3.875E+05	1.368E+07	1.293E+02	1.938E+05	6.842E+06	3.547E+02	1.938E+05	6.842E+06	8.334E-01	2.325E+02	8.211E+03
2101	0	0	351,029	386,132	4.743E+02	3.798E+05	1.341E+07	1.267E+02	1.899E+05	6.707E+06	3.476E+02	1.899E+05	6.707E+06	8.169E-01	2.279E+02	8.048E+03
2102	0	0	351,029	386,132	4.650E+02	3.723E+05	1.315E+07	1.242E+02	1.862E+05	6.574E+06	3.408E+02	1.862E+05	6.574E+06	8.007E-01	2.234E+02	7.889E+03
2103	0	0	351,029	386,132	4.557E+02	3.649E+05	1.289E+07	1.217E+02	1.825E+05	6.444E+06	3.340E+02	1.825E+05	6.444E+06	7.849E-01	2.190E+02	7.733E+03
2104	0	0	351,029	386,132	4.467E+02	3.577E+05	1.263E+07	1.193E+02	1.789E+05	6.316E+06	3.274E+02	1.789E+05	6.316E+06	7.693E-01	2.146E+02	7.580E+03
2105	0	0	351,029	386,132	4.379E+02	3.506E+05	1.238E+07	1.170E+02	1.753E+05	6.191E+06	3.209E+02	1.753E+05	6.191E+06	7.541E-01	2.104E+02	7.430E+03
2106	0	0	351,029	386,132	4.292E+02	3.437E+05	1.214E+07	1.146E+02	1.718E+05	6.069E+06	3.146E+02	1.718E+05	6.069E+06	7.392E-01	2.062E+02	7.282E+03
2107	0	0	351,029	386,132	4.207E+02	3.369E+05	1.190E+07	1.124E+02	1.684E+05	5.949E+06	3.083E+02	1.684E+05	5.949E+06	7.245E-01	2.021E+02	7.138E+03
2108	0	0	351,029	386,132	4.124E+02	3.302E+05	1.166E+07	1.102E+02	1.651E+05	5.831E+06	3.022E+02	1.651E+05	5.831E+06	7.102E-01	1.981E+02	6.997E+03
2109	0	0	351,029	386,132	4.042E+02	3.237E+05	1.143E+07	1.080E+02	1.618E+05	5.715E+06	2.962E+02	1.618E+05	5.715E+06	6.961E-01	1.942E+02	6.858E+03
2110	0	0	351,029	386,132	3.962E+02	3.173E+05	1.120E+07	1.058E+02	1.586E+05	5.602E+06	2.904E+02	1.586E+05	5.602E+06	6.823E-01	1.904E+02	6.723E+03
2111	0	0	351,029	386,132	3.884E+02	3.110E+05	1.098E+07	1.037E+02	1.555E+05	5.491E+06	2.846E+02	1.555E+05	5.491E+06	6.688E-01	1.866E+02	6.589E+03
2112	0	0	351,029	386,132	3.807E+02	3.048E+05	1.076E+07	1.017E+02	1.524E+05	5.382E+06	2.790E+02	1.524E+05	5.382E+06	6.556E-01	1.829E+02	6.459E+03
2113	0	0	351,029	386,132	3.731E+02	2.988E+05	1.055E+07	9.967E+01	1.494E+05	5.276E+06	2.735E+02	1.494E+05	5.276E+06	6.426E-01	1.793E+02	6.331E+03
2114	0	0	351,029	386,132	3.657E+02	2.929E+05	1.034E+07	9.769E+01	1.464E+05	5.171E+06	2.681E+02	1.464E+05	5.171E+06	6.299E-01	1.757E+02	6.206E+03
2115	0	0	351,029	386,132	3.585E+02	2.871E+05	1.014E+07	9.576E+01	1.435E+05	5.069E+06	2.627E+02	1.435E+05	5.069E+06	6.174E-01	1.722E+02	6.083E+03
2116	0	0	351,029	386,132	3.514E+02	2.814E+05	9.937E+06	9.386E+01	1.407E+05	4.969E+06	2.575E+02	1.407E+05	4.969E+06	6.052E-01	1.688E+02	5.962E+03
2117	0	0	351,029	386,132	3.444E+02	2.758E+05	9.740E+06	9.201E+01	1.379E+05	4.870E+06	2.524E+02	1.379E+05	4.870E+06	5.932E-01	1.655E+02	5.844E+03
2118	0	0	351,029	386,132	3.376E+02	2.704E+05	9.548E+06	9.018E+01	1.352E+05	4.774E+06	2.474E+02	1.352E+05	4.774E+06	5.814E-01	1.622E+02	5.729E+03
2119	0	0	351,029	386,132	3.309E+02	2.650E+05	9.359E+06	8.840E+01	1.325E+05	4.679E+06	2.425E+02	1.325E+05	4.679E+06	5.699E-01	1.590E+02	5.615E+03
2120	0	0	351,029	386,132	3.244E+02	2.598E+05	9.173E+06	8.665E+01	1.299E+05	4.587E+06	2.377E+02	1.299E+05	4.587E+06	5.586E-01	1.559E+02	5.504E+03
2121	0	0	351,029	386,132	3.180E+02	2.546E+05	8.992E+06	8.493E+01	1.273E+05	4.496E+06	2.330E+02	1.273E+05	4.496E+06	5.476E-01	1.528E+02	5.395E+03
2122	0	0	351,029	386,132	3.117E+02	2.496E+05	8.814E+06	8.325E+01	1.248E+05	4.407E+06	2.284E+02	1.248E+05	4.407E+06	5.367E-01	1.497E+02	5.288E+03
2123	0	0	351,029	386,132	3.055E+02	2.446E+05	8.639E+06	8.160E+01	1.223E+05	4.320E+06	2.239E+02	1.223E+05	4.320E+06	5.261E-01	1.468E+02	5.183E+03
2124	0	0	351,029	386,132	2.994E+02	2.398E+05	8.468E+06	7.999E+01	1.199E+05	4.234E+06	2.195E+02	1.199E+05	4.234E+06	5.157E-01	1.439E+02	5.081E+03
2125	0	0	351,029	386,132	2.935E+02	2.350E+05	8.300E+06	7.840E+01	1.175E+05	4.150E+06	2.151E+02	1.175E+05	4.150E+06	5.055E-01	1.410E+02	4.980E+03
2126	0	0	351,029	386,132	2.877E+02	2.304E+05	8.136E+06	7.685E+01	1.152E+05	4.068E+06	2.109E+02	1.152E+05	4.068E+06	4.955E-01	1.382E+02	4.882E+03
2127	0	0	351,029	386,132	2.820E+02	2.258E+05	7.975E+06	7.533E+01	1.129E+05	3.987E+06	2.067E+02	1.129E+05	3.987E+06	4.857E-01	1.355E+02	4.785E+03
2128	0	0	351,029	386,132	2.764E+02	2.213E+05	7.817E+06	7.384E+01	1.107E+05	3.908E+06	2.026E+02	1.107E+05	3.908E+06	4.760E-01	1.328E+02	4.690E+03
2129	0	0	351,029	386,132	2.710E+02	2.170E+05	7.662E+06	7.237E+01	1.085E+05	3.831E+06	1.986E+02	1.085E+05	3.831E+06	4.666E-01	1.302E+02	4.597E+03
2130	0	0	351,029	386,132	2.656E+02	2.127E+05	7.510E+06	7.094E+01	1.063E+05	3.755E+06	1.946E+02	1.063E+05	3.755E+06	4.574E-01	1.276E+02	4.506E+03
2131	0	0	351,029	386,132	2.603E+02	2.085E+05	7.362E+06	6.954E+01	1.042E+05	3.681E+06	1.908E+02	1.042E+05	3.681E+06	4.483E-01	1.251E+02	4.417E+03
2132	0	0	351,029	386,132	2.552E+02	2.043E+05	7.216E+06	6.816E+01	1.022E+05	3.608E+06	1.870E+02	1.022E+05	3.608E+06	4.394E-01	1.226E+02	4.330E+03
2133	0	0	351,029	386,132	2.501E+02	2.003E+05	7.073E+06	6.681E+01	1.001E+05	3.537E+06	1.833E+02	1.001E+05	3.537E+06	4.307E-01	1.202E+02	4.244E+03
2134	0	0	351,029	386,132	2.452E+02	1.963E+05	6.933E+06	6.549E+01	9.816E+04	3.466E+06	1.797E+02	9.816E+04	3.466E+06	4.222E-01	1.178E+02	4.160E+03
2135	0	0	351,029	386,132	2.403E+02	1.924E+05	6.796E+06	6.419E+01	9.622E+04	3.398E+06	1.761E+02	9.622E+04	3.398E+06	4.139E-01	1.155E+02	4.077E+03
2136	0	0	351,029	386,132	2.356E+02	1.886E+05	6.661E+06	6.292E+01	9.431E+04	3.331E+06	1.726E+02	9.431E+04	3.331E+06	4.057E-01	1.132E+02	3.997E+03
2137	0	0	351,029	386,132	2.309E+02	1.849E+05	6.529E+06	6.167E+01	9.244E+04	3.265E+06	1.692E+02	9.244E+04	3.265E+06	3.976E-01	1.109E+02	3.918E+03
2138	0	0	351,029	386,132	2.263E+02	1.812E+05	6.400E+06	6.045E+01	9.061E+04	3.200E+06	1.659E+02	9.061E+04	3.200E+06	3.898E-01	1.087E+02	3.840E+03
2139	0	0	351,029	386,132	2.218E+02	1.776E+05	6.273E+06	5.925E+01	8.882E+04	3.137E+06	1.626E+02	8.882E+04	3.137E+06	3.820E-01	1.066E+02	3.764E+03
2140	0	0	351,029	386,132	2.174E+02	1.741E+05	6.149E+06	5.808E+01	8.706E+04	3.074E+06	1.594E+02	8.706E+04	3.074E+06	3.745E-01	1.045E+02	3.689E+03
2141	0	0	351,029	386,132	2.131E+02	1.707E+05	6.027E+06	5.693E+01	8.534E+04	3.014E+06	1.562E+02	8.534E+04	3.014E+06	3.671E-01	1.024E+02	3.616E+03
2142	0	0	351,029	386,132	2.089E+02	1.673E+05	5.908E+06	5.580E+01	8.365E+04	2.954E+06	1.531E+02	8.365E+04	2.954E+06	3.598E-01	1.004E+02	3.545E+03
2143	0	0	351,029	386,132	2.048E+02	1.640E+05	5.791E+06	5.470E+01	8.199E+04	2.895E+06	1.501E+02	8.199E+04	2.895E+06	3.527E-01	9.839E+01	3.475E+03
2144	0	0	351,029	386,132	2.007E+02	1.607E+05	5.676E+06	5.362E+01	8.037E+04	2.838E+06	1.471E+02	8.037E+04	2.838E+06	3.457E-01	9.644E+01	3.406E+03
2145	0	0	351,029	386,132	1.968E+02	1.575E+05	5.564E+06	5.255E+01	7.877E+04	2.782E+06	1.442E+02	7.877E+04	2.782E+06	3.388E-01	9.453E+01	3.338E+03
2146	0	0	351,029	386,132	1.929E+02	1.544E+05	5.454E+06	5.151E+01	7.721E+04	2.727E+06	1.413E+02	7.721E+04	2.727E+06	3.321E-01	9.266E+01	3.272E+03
2147	0	0	351,029	386,132	1.890E+02	1.514E+05	5.346E+06	5.049E+01	7.569E+04	2.673E+06	1.385E+02	7.569E+04	2.673E+06	3.256E-01	9.082E+01	3.207E+03
2148	0	0	351,029	386,132	1.853E+02	1.484E+05	5.240E+06	4.949E+01	7.419E+04	2.620E+06	1.358E+02	7.419E+04	2.620E+06	3.191E-01	8.902E+01	3.144E+03
2149	0	0	351,029	386,132	1.816E+02	1.454E+05	5.136E+06	4.851E+01	7.272E+04	2.568E+06	1.331E+02	7.272E+04	2.568E+06	3.128E-01	8.726E+01	3.082E+03
2150	0	0	351,029	386,132	1.780E+02	1.426E+05	5.034E+06	4.755E+01	7.128E+04	2.517E+06	1.305E+02	7.128E+04	2.517E+06	3.066E-01	8.553E+01	3.021E+03
2151	0	0	351,029	386,132	1.745E+02	1.397E+05	4.935E+06	4.661E+01	6.987E+04	2.467E+06	1.279E+02	6.987E+04	2.467E+06	3.005E-01	8.384E+01	2.961E+03
2152	0	0	351,029	386,132	1.710E+02	1.370E+05	4.837E+06	4.569E+01	6.848E+04	2.418E+06	1.254E+02	6.848E+04	2.418E+06	2.946E-01	8.218E+01	2.902E+03
2153	0	0	351,029	386,132	1.677E+02	1.343E+05	4.741E+06	4.478E+01	6.713E+04	2.371E+06	1.229E+02	6.713E+04	2.371E+06	2.887E-01	8.055E+01	2.845E+03
2154	0	0	351,029	386,132	1.643E+02	1.316E+05	4.647E+06	4.390E+01	6.580E+04	2.324E+06	1.204E+02	6.580E+04	2.324E+06	2.830E-01	7.896E+01	2.788E+03
2155	0	0	351,029	386,132	1.611E+02	1.290E+05	4.555E+06	4.303E+01	6.450E+04	2.278E+06	1.181E+02	6.450E+04	2.278E+06	2.774E-01	7.739E+01	2.733E+03
2156	0	0	351,029	386,132	1.579E+02	1.264E+05	4.465E+06	4.218E+01	6.322E+04	2.233E+06	1.157E+02	6.322E+04	2.233E+06	2.719E-01	7.586E+01	2.679E+03
2157	0	0	351,029	386,132	1.548E+02	1.239E+05	4.377E+06	4.134E+01	6.197E+04	2.188E+06	1.134E+02	6.197E+04	2.188E+06	2.665E-01	7.436E+01	2.626E+03
2158	0	0	351,029	386,132	1.517E+02	1.215E+05	4.290E+06	4.052E+01	6.074E+04	2.145E+06	1.112E+02	6.074E+04	2.145E+06	2.613E-01	7.289E+01	2.574E+03
2159	0	0	351,029	386,132	1.487E+02	1.191E+05	4.205E+06	3.972E+01	5.954E+04	2.103E+06	1.090E+02	5.954E+04	2.103E+06	2.561E-01	7.144E+01	2.523E+03
2160	0	0	351,029	386,132	1.458E+02	1.167E+05	4.122E+06	3.893E+01	5.836E+04	2.061E+06	1.068E+02	5.836E+04	2.061E+06	2.510E-01	7.003E+01	2.473E+03
2161	0	0	351,029	386,132	1.429E+02	1.144E+05	4.040E+06	3.816E+01	5.720E+04	2.020E+06	1.047E+02	5.720E+04	2.020E+06	2.460E-01	6.864E+01	2.424E+03
2162	0	0	351,029	386,132	1.400E+02	1.121E+05	3.960E+06	3.741E+01	5.607E+04	1.980E+06	1.026E+02	5.607E+04	1.980E+06	2.412E-01	6.728E+01	2.376E+03
2163	0	0	351,029	386,132	1.373E+02	1.099E+05	3.882E+06	3.667E+01	5.496E+04	1.941E+06	1.006E+02	5.496E+04	1.941E+06	2.364E-01	6.595E+01	2.329E+03
2164	0	0	351,029	386,132	1.346E+02	1.077E+05	3.805E+06	3.594E+01	5.387E+04	1.902E+06	9.861E+01	5.387E+04	1.902E+06	2.317E-01	6.465E+01	2.283E+03

LANDGEM RESULTS **Landfill Name or Identifier:** All Landfills_Corrugated Containers Waste

Closure Year (with 80-year limit) = 2054
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*
2024	13,726	15,098	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	13,726	15,098	13,726	15,098	1.035E+02	8.287E+04	2.927E+06	2.764E+01	4.144E+04	1.463E+06	7.585E+01	4.144E+04	1.463E+06	1.782E-01	4.972E+01	1.756E+03
2026	13,726	15,098	27,452	30,197	2.049E+02	1.641E+05	5.795E+06	5.474E+01	8.205E+04	2.898E+06	1.502E+02	8.205E+04	2.898E+06	3.529E-01	9.846E+01	3.477E+03
2027	13,726	15,098	41,178	45,295	3.044E+02	2.437E+05	8.607E+06	8.130E+01	1.219E+05	4.303E+06	2.231E+02	1.219E+05	4.303E+06	5.242E-01	1.462E+02	5.164E+03
2028	13,726	15,098	54,903	60,394	4.018E+02	3.218E+05	1.136E+07	1.073E+02	1.609E+05	5.682E+06	2.945E+02	1.609E+05	5.682E+06	6.920E-01	1.931E+02	6.818E+03
2029	13,726	15,098	68,629	75,492	4.974E+02	3.983E+05	1.406E+07	1.329E+02	1.991E+05	7.032E+06	3.645E+02	1.991E+05	7.032E+06	8.565E-01	2.390E+02	8.439E+03
2030	13,726	15,098	82,355	90,591	5.910E+02	4.732E+05	1.671E+07	1.579E+02	2.366E+05	8.356E+06	4.331E+02	2.366E+05	8.356E+06	1.018E+00	2.839E+02	1.003E+04
2031	13,726	15,098	96,081	105,689	6.828E+02	5.467E+05	1.931E+07	1.824E+02	2.734E+05	9.654E+06	5.004E+02	2.734E+05	9.654E+06	1.176E+00	3.280E+02	1.158E+04
2032	13,726	15,098	109,807	120,787	7.728E+02	6.188E+05	2.185E+07	2.064E+02	3.094E+05	1.093E+07	5.663E+02	3.094E+05	1.093E+07	1.331E+00	3.713E+02	1.311E+04
2033	13,726	15,098	123,533	135,886	8.609E+02	6.894E+05	2.435E+07	2.300E+02	3.447E+05	1.217E+07	6.310E+02	3.447E+05	1.217E+07	1.483E+00	4.136E+02	1.461E+04
2034	13,726	15,098	137,258	150,984	9.474E+02	7.586E+05	2.679E+07	2.531E+02	3.793E+05	1.340E+07	6.943E+02	3.793E+05	1.340E+07	1.632E+00	4.552E+02	1.607E+04
2035	13,726	15,098	150,984	166,083	1.032E+03	8.265E+05	2.919E+07	2.757E+02	4.132E+05	1.459E+07	7.564E+02	4.132E+05	1.459E+07	1.777E+00	4.959E+02	1.751E+04
2036	13,726	15,098	164,710	181,181	1.115E+03	8.930E+05	3.154E+07	2.979E+02	4.465E+05	1.577E+07	8.173E+02	4.465E+05	1.577E+07	1.921E+00	5.358E+02	1.892E+04
2037	13,726	15,098	178,436	196,280	1.197E+03	9.582E+05	3.384E+07	3.196E+02	4.791E+05	1.692E+07	8.770E+02	4.791E+05	1.692E+07	2.061E+00	5.749E+02	2.030E+04
2038	13,726	15,098	192,162	211,378	1.276E+03	1.022E+06	3.609E+07	3.409E+02	5.110E+05	1.805E+07	9.354E+02	5.110E+05	1.805E+07	2.198E+00	6.132E+02	2.166E+04
2039	13,726	15,098	205,888	226,477	1.355E+03	1.085E+06	3.831E+07	3.618E+02	5.423E+05	1.915E+07	9.928E+02	5.423E+05	1.915E+07	2.333E+00	6.508E+02	2.298E+04
2040	13,726	15,098	219,614	241,575	1.431E+03	1.146E+06	4.047E+07	3.823E+02	5.730E+05	2.024E+07	1.049E+03	5.730E+05	2.024E+07	2.465E+00	6.877E+02	2.428E+04
2041	13,726	15,098	233,339	256,673	1.506E+03	1.206E+06	4.260E+07	4.024E+02	6.031E+05	2.130E+07	1.104E+03	6.031E+05	2.130E+07	2.594E+00	7.238E+02	2.556E+04
2042	13,726	15,098	247,065	271,772	1.580E+03	1.265E+06	4.468E+07	4.221E+02	6.326E+05	2.234E+07	1.158E+03	6.326E+05	2.234E+07	2.721E+00	7.591E+02	2.681E+04
2043	13,726	15,098	260,791	286,870	1.652E+03	1.323E+06	4.672E+07	4.413E+02	6.615E+05	2.336E+07	1.211E+03	6.615E+05	2.336E+07	2.845E+00	7.938E+02	2.803E+04
2044	13,726	15,098	274,517	301,969	1.723E+03	1.380E+06	4.873E+07	4.602E+02	6.899E+05	2.436E+07	1.263E+03	6.899E+05	2.436E+07	2.967E+00	8.278E+02	2.924E+04
2045	13,726	15,098	288,243	317,067	1.792E+03	1.435E+06	5.069E+07	4.788E+02	7.176E+05	2.534E+07	1.314E+03	7.176E+05	2.534E+07	3.087E+00	8.612E+02	3.041E+04
2046	13,726	15,098	301,969	332,166	1.860E+03	1.490E+06	5.261E+07	4.969E+02	7.449E+05	2.630E+07	1.363E+03	7.449E+05	2.630E+07	3.204E+00	8.938E+02	3.157E+04
2047	13,726	15,098	315,695	347,264	1.927E+03	1.543E+06	5.449E+07	5.147E+02	7.716E+05	2.725E+07	1.412E+03	7.716E+05	2.725E+07	3.319E+00	9.259E+02	3.270E+04
2048	13,726	15,098	329,420	362,362	1.992E+03	1.595E+06	5.634E+07	5.322E+02	7.977E+05	2.817E+07	1.460E+03	7.977E+05	2.817E+07	3.431E+00	9.573E+02	3.381E+04
2049	13,726	15,098	343,146	377,461	2.056E+03	1.647E+06	5.815E+07	5.493E+02	8.233E+05	2.908E+07	1.507E+03	8.233E+05	2.908E+07	3.542E+00	9.880E+02	3.489E+04
2050	13,726	15,098	356,872	392,559	2.119E+03	1.697E+06	5.993E+07	5.661E+02	8.485E+05	2.996E+07	1.553E+03	8.485E+05	2.996E+07	3.650E+00	1.018E+03	3.596E+04
2051	13,726	15,098	370,598	407,658	2.181E+03	1.746E+06	6.167E+07	5.825E+02	8.731E+05	3.083E+07	1.598E+03	8.731E+05	3.083E+07	3.756E+00	1.048E+03	3.700E+04
2052	13,726	15,098	384,324	422,756	2.241E+03	1.795E+06	6.337E+07	5.986E+02	8.973E+05	3.169E+07	1.642E+03	8.973E+05	3.169E+07	3.859E+00	1.077E+03	3.802E+04
2053	13,726	15,098	398,050	437,855	2.300E+03	1.842E+06	6.505E+07	6.144E+02	9.209E+05	3.252E+07	1.686E+03	9.209E+05	3.252E+07	3.961E+00	1.105E+03	3.903E+04
2054	0	0	411,775	452,953	2.358E+03	1.888E+06	6.668E+07	6.299E+02	9.441E+05	3.334E+07	1.728E+03	9.441E+05	3.334E+07	4.061E+00	1.133E+03	4.001E+04
2055	0	0	411,775	452,953	2.311E+03	1.851E+06	6.536E+07	6.174E+02	9.254E+05	3.268E+07	1.694E+03	9.254E+05	3.268E+07	3.981E+00	1.111E+03	3.922E+04
2056	0	0	411,775	452,953	2.266E+03	1.814E+06	6.407E+07	6.052E+02	9.071E+05	3.203E+07	1.660E+03	9.071E+05	3.203E+07	3.902E+00	1.089E+03	3.844E+04
2057	0	0	411,775	452,953	2.221E+03	1.778E+06	6.280E+07	5.932E+02	8.891E+05	3.140E+07	1.628E+03	8.891E+05	3.140E+07	3.825E+00	1.067E+03	3.768E+04
2058	0	0	411,775	452,953	2.177E+03	1.743E+06	6.156E+07	5.814E+02	8.715E+05	3.078E+07	1.595E+03	8.715E+05	3.078E+07	3.749E+00	1.046E+03	3.693E+04
2059	0	0	411,775	452,953	2.134E+03	1.709E+06	6.034E+07	5.699E+02	8.543E+05	3.017E+07	1.564E+03	8.543E+05	3.017E+07	3.675E+00	1.025E+03	3.620E+04
2060	0	0	411,775	452,953	2.091E+03	1.675E+06	5.914E+07	5.586E+02	8.374E+05	2.957E+07	1.533E+03	8.374E+05	2.957E+07	3.602E+00	1.005E+03	3.549E+04
2061	0	0	411,775	452,953	2.050E+03	1.642E+06	5.797E+07	5.476E+02	8.208E+05	2.899E+07	1.502E+03	8.208E+05	2.899E+07	3.530E+00	9.849E+02	3.478E+04
2062	0	0	411,775	452,953	2.009E+03	1.609E+06	5.682E+07	5.367E+02	8.045E+05	2.841E+07	1.473E+03	8.045E+05	2.841E+07	3.461E+00	9.654E+02	3.409E+04
2063	0	0	411,775	452,953	1.970E+03	1.577E+06	5.570E+07	5.261E+02	7.886E+05	2.785E+07	1.444E+03	7.886E+05	2.785E+07	3.392E+00	9.463E+02	3.342E+04
2064	0	0	411,775	452,953	1.931E+03	1.546E+06	5.460E+07	5.157E+02	7.730E+05	2.730E+07	1.415E+03	7.730E+05	2.730E+07	3.325E+00	9.276E+02	3.276E+04
2065	0	0	411,775	452,953	1.892E+03	1.515E+06	5.352E+07	5.055E+02	7.577E+05	2.676E+07	1.387E+03	7.577E+05	2.676E+07	3.259E+00	9.092E+02	3.211E+04
2066	0	0	411,775	452,953	1.855E+03	1.485E+06	5.246E+07	4.955E+02	7.427E+05	2.623E+07	1.359E+03	7.427E+05	2.623E+07	3.195E+00	8.912E+02	3.147E+04
2067	0	0	411,775	452,953	1.818E+03	1.456E+06	5.142E+07	4.857E+02	7.280E+05	2.571E+07	1.333E+03	7.280E+05	2.571E+07	3.131E+00	8.736E+02	3.085E+04
2068	0	0	411,775	452,953	1.782E+03	1.427E+06	5.040E+07	4.760E+02	7.136E+05	2.520E+07	1.306E+03	7.136E+05	2.520E+07	3.069E+00	8.563E+02	3.024E+04
2069	0	0	411,775	452,953	1.747E+03	1.399E+06	4.940E+07	4.666E+02	6.994E+05	2.470E+07	1.280E+03	6.994E+05	2.470E+07	3.008E+00	8.393E+02	2.964E+04
2070	0	0	411,775	452,953	1.712E+03	1.371E+06	4.842E+07	4.574E+02	6.856E+05	2.421E+07	1.255E+03	6.856E+05	2.421E+07	2.949E+00	8.227E+02	2.905E+04
2071	0	0	411,775	452,953	1.678E+03	1.344E+06	4.746E+07	4.483E+02	6.720E+05	2.373E+07	1.230E+03	6.720E+05	2.373E+07	2.891E+00	8.064E+02	2.848E+04
2072	0	0	411,775	452,953	1.645E+03	1.317E+06	4.652E+07	4.394E+02	6.587E+05	2.326E+07	1.206E+03	6.587E+05	2.326E+07	2.833E+00	7.904E+02	2.791E+04
2073	0	0	411,775	452,953	1.613E+03	1.291E+06	4.560E+07	4.307E+02	6.457E+05	2.280E+07	1.182E+03	6.457E+05	2.280E+07	2.777E+00	7.748E+02	2.736E+04
2074	0	0	411,775	452,953	1.581E+03	1.266E+06	4.470E+07	4.222E+02	6.329E+05	2.235E+07	1.158E+03	6.329E+05	2.235E+07	2.722E+00	7.594E+02	2.682E+04
2075	0	0	411,775	452,953	1.549E+03	1.241E+06	4.381E+07	4.139E+02	6.203E+05	2.191E+07	1.136E+03	6.203E+05	2.191E+07	2.668E+00	7.444E+02	2.629E+04
2076	0	0	411,775	452,953	1.519E+03	1.216E+06	4.295E+07	4.057E+02	6.081E+05	2.147E+07	1.113E+03	6.081E+05	2.147E+07	2.615E+00	7.297E+02	2.577E+04
2077	0	0	411,775	452,953	1.489E+03	1.192E+06	4.210E+07	3.976E+02	5.960E+05	2.105E+07	1.091E+03	5.960E+05	2.105E+07	2.564E+00	7.152E+02	2.526E+04
2078	0	0	411,775	452,953	1.459E+03	1.168E+06	4.126E+07	3.898E+02	5.842E+05	2.063E+07	1.069E+03	5.842E+05	2.063E+07	2.513E+00	7.011E+02	2.476E+04
2079	0	0	411,775	452,953	1.430E+03	1.145E+06	4.045E+07	3.820E+02	5.726E+05	2.022E+07	1.048E+03	5.726E+05	2.022E+07	2.463E+00	6.872E+02	2.427E+04
2080	0	0	411,775	452,953	1.402E+03	1.123E+06	3.964E+07	3.745E+02	5.613E+05	1.982E+07	1.027E+03	5.613E+05	1.982E+07	2.414E+00	6.736E+02	2.379E+04
2081	0	0	411,775	452,953	1.374E+03	1.100E+06	3.886E+07	3.671E+02	5.502E+05	1.943E+07	1.007E+03	5.502E+05	1.943E+07	2.367E+00	6.602E+02	2.332E+04
2082	0	0	411,775	452,953	1.347E+03	1.079E+06	3.809E+07	3.598E+02	5.393E+05	1.905E+07	9.872E+02	5.393E+05	1.905E+07	2.320E+00	6.472E+02	2.285E+04
2083	0	0	411,775	452,953	1.320E+03	1.057E+06	3.734E+07	3.527E+02	5.286E+05	1.867E+07	9.676E+02	5.286E+05	1.867E+07	2.274E+00	6.343E+02	2.240E+04
2084	0	0	411,775	452,953	1.294E+03	1.036E+06	3.660E+07	3.457E+02	5.181E+05	1.830E+07	9.485E+02	5.181E+05	1.830E+07	2.229E+00	6.218E+02	2.196E+04
2085	0	0	411,775	452,953	1.269E+03	1.016E+06	3.587E+07	3.388E+02	5.079E+05	1.794E+07	9.297E+02	5.079E+05	1.794E+07	2.185E+00	6.095E+02	2.152E+04
2086	0	0	411,775	452,953	1.243E+03	9.957E+05	3.516E+07	3.321E+02	4.978E+05	1.758E+07	9.113E+02	4.978E+05	1.758E+07	2.141E+00	5.974E+02	2.110E+04
2087	0	0	411,775	452,953	1.219E+03	9.759E+05	3.447E+07	3.256E+02	4.880E+05	1.723E+07	8.932E+02	4.880E+05	1.723E+07	2.099E+00	5.856E+02	2.068E+04
2088	0	0	411,775	452,953	1.195E+03	9.566E+05	3.378E+07	3.191E+02	4.783E+05	1.689E+07	8.755E+02	4.783E+05	1.689E+07	2.057E+00	5.740E+02	2.027E+04
2089	0	0	411,775	452,953	1.171E+03	9.377E+05	3.311E+07	3.128E+02	4.688E+05	1.656E+07	8.582E+02	4.688E+05	1.656E+07	2.017E+00	5.626E+02	1.987E+04
2090	0	0	411,775	452,953	1.148E+03	9.191E+05	3.246E+07	3.066E+02	4.596E+05	1.623E+07	8.412E+02	4.596E+05	1.623E+07	1.977E+00	5.515E+02	1.948E+04
2091	0	0	411,775	452,953	1.125E+03	9.009E+05	3.182E+07	3.005E+02	4.505E+05	1.591E+07	8.246E+02	4.505E+05	1.591E+07	1.938E+00	5.405E+02	1.909E+04
2092	0	0	411,775	452,953	1.103E+03	8.831E+05	3.119E+07	2.946E+02	4.415E+05	1.559E+07	8.082E+02	4.415E+05	1.559E+07	1.899E+00	5.298E+02	1.871E+04
2093	0	0	411,775	452,953	1.081E+03	8.656E+05	3.057E+07	2.887E+02	4.328E+05	1.528E+07	7.922E+02	4.328E+05	1.528E+07	1.862E+00	5.194E+02	1.834E+04
2094	0	0	411,775	452,953	1.060E+03	8.484E+05	2.996E+07	2.830E+02	4.242E+05	1.498E+07	7.765E+02	4.242E+05	1.498E+07	1.825E+00	5.091E+02	1.798E+04

LANDGEM RESULTS **Landfill Name or Identifier:** All Landfills_Corrugated Containers Waste

Closure Year (with 80-year limit) = 2054
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon dioxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*
2095	0	0	411,775	452,953	1.039E+03	8.316E+05	2.937E+07	2.774E+02	4.158E+05	1.468E+07	7.612E+02	4.158E+05	1.468E+07	1.789E+00	4.990E+02	1.762E+04
2096	0	0	411,775	452,953	1.018E+03	8.152E+05	2.879E+07	2.719E+02	4.076E+05	1.439E+07	7.461E+02	4.076E+05	1.439E+07	1.753E+00	4.891E+02	1.727E+04
2097	0	0	411,775	452,953	9.979E+02	7.990E+05	2.822E+07	2.665E+02	3.995E+05	1.411E+07	7.313E+02	3.995E+05	1.411E+07	1.718E+00	4.794E+02	1.693E+04
2098	0	0	411,775	452,953	9.781E+02	7.832E+05	2.766E+07	2.613E+02	3.916E+05	1.383E+07	7.168E+02	3.916E+05	1.383E+07	1.684E+00	4.699E+02	1.660E+04
2099	0	0	411,775	452,953	9.587E+02	7.677E+05	2.711E+07	2.561E+02	3.839E+05	1.356E+07	7.026E+02	3.839E+05	1.356E+07	1.651E+00	4.606E+02	1.627E+04
2100	0	0	411,775	452,953	9.397E+02	7.525E+05	2.657E+07	2.510E+02	3.763E+05	1.329E+07	6.887E+02	3.763E+05	1.329E+07	1.618E+00	4.515E+02	1.594E+04
2101	0	0	411,775	452,953	9.211E+02	7.376E+05	2.605E+07	2.460E+02	3.688E+05	1.302E+07	6.751E+02	3.688E+05	1.302E+07	1.586E+00	4.426E+02	1.563E+04
2102	0	0	411,775	452,953	9.029E+02	7.230E+05	2.553E+07	2.412E+02	3.615E+05	1.277E+07	6.617E+02	3.615E+05	1.277E+07	1.555E+00	4.338E+02	1.532E+04
2103	0	0	411,775	452,953	8.850E+02	7.087E+05	2.503E+07	2.364E+02	3.543E+05	1.251E+07	6.486E+02	3.543E+05	1.251E+07	1.524E+00	4.252E+02	1.502E+04
2104	0	0	411,775	452,953	8.675E+02	6.947E+05	2.453E+07	2.317E+02	3.473E+05	1.227E+07	6.358E+02	3.473E+05	1.227E+07	1.494E+00	4.168E+02	1.472E+04
2105	0	0	411,775	452,953	8.503E+02	6.809E+05	2.405E+07	2.271E+02	3.404E+05	1.202E+07	6.232E+02	3.404E+05	1.202E+07	1.464E+00	4.085E+02	1.443E+04
2106	0	0	411,775	452,953	8.335E+02	6.674E+05	2.357E+07	2.226E+02	3.337E+05	1.178E+07	6.108E+02	3.337E+05	1.178E+07	1.435E+00	4.004E+02	1.414E+04
2107	0	0	411,775	452,953	8.170E+02	6.542E+05	2.310E+07	2.182E+02	3.271E+05	1.155E+07	5.988E+02	3.271E+05	1.155E+07	1.407E+00	3.925E+02	1.386E+04
2108	0	0	411,775	452,953	8.008E+02	6.412E+05	2.265E+07	2.139E+02	3.206E+05	1.132E+07	5.869E+02	3.206E+05	1.132E+07	1.379E+00	3.847E+02	1.359E+04
2109	0	0	411,775	452,953	7.849E+02	6.285E+05	2.220E+07	2.097E+02	3.143E+05	1.110E+07	5.753E+02	3.143E+05	1.110E+07	1.352E+00	3.771E+02	1.332E+04
2110	0	0	411,775	452,953	7.694E+02	6.161E+05	2.176E+07	2.055E+02	3.081E+05	1.088E+07	5.639E+02	3.081E+05	1.088E+07	1.325E+00	3.697E+02	1.305E+04
2111	0	0	411,775	452,953	7.542E+02	6.039E+05	2.133E+07	2.014E+02	3.020E+05	1.066E+07	5.527E+02	3.020E+05	1.066E+07	1.299E+00	3.623E+02	1.280E+04
2112	0	0	411,775	452,953	7.392E+02	5.919E+05	2.090E+07	1.975E+02	2.960E+05	1.045E+07	5.418E+02	2.960E+05	1.045E+07	1.273E+00	3.552E+02	1.254E+04
2113	0	0	411,775	452,953	7.246E+02	5.802E+05	2.049E+07	1.935E+02	2.901E+05	1.025E+07	5.310E+02	2.901E+05	1.025E+07	1.248E+00	3.481E+02	1.229E+04
2114	0	0	411,775	452,953	7.102E+02	5.687E+05	2.008E+07	1.897E+02	2.844E+05	1.004E+07	5.205E+02	2.844E+05	1.004E+07	1.223E+00	3.412E+02	1.205E+04
2115	0	0	411,775	452,953	6.962E+02	5.575E+05	1.969E+07	1.860E+02	2.787E+05	9.844E+06	5.102E+02	2.787E+05	9.844E+06	1.199E+00	3.345E+02	1.181E+04
2116	0	0	411,775	452,953	6.824E+02	5.464E+05	1.930E+07	1.823E+02	2.732E+05	9.649E+06	5.001E+02	2.732E+05	9.649E+06	1.175E+00	3.279E+02	1.158E+04
2117	0	0	411,775	452,953	6.689E+02	5.356E+05	1.892E+07	1.787E+02	2.678E+05	9.458E+06	4.902E+02	2.678E+05	9.458E+06	1.152E+00	3.214E+02	1.135E+04
2118	0	0	411,775	452,953	6.556E+02	5.250E+05	1.854E+07	1.751E+02	2.625E+05	9.270E+06	4.805E+02	2.625E+05	9.270E+06	1.129E+00	3.150E+02	1.112E+04
2119	0	0	411,775	452,953	6.427E+02	5.146E+05	1.817E+07	1.717E+02	2.573E+05	9.087E+06	4.710E+02	2.573E+05	9.087E+06	1.107E+00	3.088E+02	1.090E+04
2120	0	0	411,775	452,953	6.299E+02	5.044E+05	1.781E+07	1.683E+02	2.522E+05	8.907E+06	4.617E+02	2.522E+05	8.907E+06	1.085E+00	3.027E+02	1.069E+04
2121	0	0	411,775	452,953	6.175E+02	4.944E+05	1.746E+07	1.649E+02	2.472E+05	8.730E+06	4.525E+02	2.472E+05	8.730E+06	1.063E+00	2.967E+02	1.048E+04
2122	0	0	411,775	452,953	6.052E+02	4.846E+05	1.712E+07	1.617E+02	2.423E+05	8.558E+06	4.436E+02	2.423E+05	8.558E+06	1.042E+00	2.908E+02	1.027E+04
2123	0	0	411,775	452,953	5.932E+02	4.750E+05	1.678E+07	1.585E+02	2.375E+05	8.388E+06	4.348E+02	2.375E+05	8.388E+06	1.022E+00	2.850E+02	1.007E+04
2124	0	0	411,775	452,953	5.815E+02	4.656E+05	1.644E+07	1.553E+02	2.328E+05	8.222E+06	4.262E+02	2.328E+05	8.222E+06	1.001E+00	2.794E+02	9.866E+03
2125	0	0	411,775	452,953	5.700E+02	4.564E+05	1.612E+07	1.522E+02	2.282E+05	8.059E+06	4.177E+02	2.282E+05	8.059E+06	9.816E-01	2.739E+02	9.671E+03
2126	0	0	411,775	452,953	5.587E+02	4.474E+05	1.580E+07	1.492E+02	2.237E+05	7.900E+06	4.095E+02	2.237E+05	7.900E+06	9.622E-01	2.684E+02	9.480E+03
2127	0	0	411,775	452,953	5.476E+02	4.385E+05	1.549E+07	1.463E+02	2.193E+05	7.743E+06	4.014E+02	2.193E+05	7.743E+06	9.431E-01	2.631E+02	9.292E+03
2128	0	0	411,775	452,953	5.368E+02	4.298E+05	1.518E+07	1.434E+02	2.149E+05	7.590E+06	3.934E+02	2.149E+05	7.590E+06	9.244E-01	2.579E+02	9.108E+03
2129	0	0	411,775	452,953	5.262E+02	4.213E+05	1.488E+07	1.405E+02	2.107E+05	7.440E+06	3.856E+02	2.107E+05	7.440E+06	9.061E-01	2.528E+02	8.928E+03
2130	0	0	411,775	452,953	5.157E+02	4.130E+05	1.458E+07	1.378E+02	2.065E+05	7.292E+06	3.780E+02	2.065E+05	7.292E+06	8.882E-01	2.478E+02	8.751E+03
2131	0	0	411,775	452,953	5.055E+02	4.048E+05	1.430E+07	1.350E+02	2.024E+05	7.148E+06	3.705E+02	2.024E+05	7.148E+06	8.706E-01	2.429E+02	8.577E+03
2132	0	0	411,775	452,953	4.955E+02	3.968E+05	1.401E+07	1.324E+02	1.984E+05	7.006E+06	3.632E+02	1.984E+05	7.006E+06	8.534E-01	2.381E+02	8.408E+03
2133	0	0	411,775	452,953	4.857E+02	3.889E+05	1.374E+07	1.297E+02	1.945E+05	6.868E+06	3.560E+02	1.945E+05	6.868E+06	8.365E-01	2.334E+02	8.241E+03
2134	0	0	411,775	452,953	4.761E+02	3.812E+05	1.346E+07	1.272E+02	1.906E+05	6.732E+06	3.489E+02	1.906E+05	6.732E+06	8.199E-01	2.287E+02	8.078E+03
2135	0	0	411,775	452,953	4.667E+02	3.737E+05	1.320E+07	1.247E+02	1.868E+05	6.598E+06	3.420E+02	1.868E+05	6.598E+06	8.037E-01	2.242E+02	7.918E+03
2136	0	0	411,775	452,953	4.574E+02	3.663E+05	1.294E+07	1.222E+02	1.831E+05	6.468E+06	3.352E+02	1.831E+05	6.468E+06	7.878E-01	2.198E+02	7.761E+03
2137	0	0	411,775	452,953	4.484E+02	3.590E+05	1.268E+07	1.198E+02	1.795E+05	6.340E+06	3.286E+02	1.795E+05	6.340E+06	7.722E-01	2.154E+02	7.608E+03
2138	0	0	411,775	452,953	4.395E+02	3.519E+05	1.243E+07	1.174E+02	1.760E+05	6.214E+06	3.221E+02	1.760E+05	6.214E+06	7.569E-01	2.112E+02	7.457E+03
2139	0	0	411,775	452,953	4.308E+02	3.450E+05	1.218E+07	1.151E+02	1.725E+05	6.091E+06	3.157E+02	1.725E+05	6.091E+06	7.419E-01	2.070E+02	7.309E+03
2140	0	0	411,775	452,953	4.223E+02	3.381E+05	1.194E+07	1.128E+02	1.691E+05	5.970E+06	3.095E+02	1.691E+05	5.970E+06	7.272E-01	2.029E+02	7.164E+03
2141	0	0	411,775	452,953	4.139E+02	3.314E+05	1.170E+07	1.106E+02	1.657E+05	5.852E+06	3.033E+02	1.657E+05	5.852E+06	7.128E-01	1.989E+02	7.023E+03
2142	0	0	411,775	452,953	4.057E+02	3.249E+05	1.147E+07	1.084E+02	1.624E+05	5.736E+06	2.973E+02	1.624E+05	5.736E+06	6.987E-01	1.949E+02	6.884E+03
2143	0	0	411,775	452,953	3.977E+02	3.184E+05	1.125E+07	1.062E+02	1.592E+05	5.623E+06	2.914E+02	1.592E+05	5.623E+06	6.848E-01	1.911E+02	6.747E+03
2144	0	0	411,775	452,953	3.898E+02	3.121E+05	1.102E+07	1.041E+02	1.561E+05	5.511E+06	2.857E+02	1.561E+05	5.511E+06	6.713E-01	1.873E+02	6.614E+03
2145	0	0	411,775	452,953	3.821E+02	3.059E+05	1.080E+07	1.021E+02	1.530E+05	5.402E+06	2.800E+02	1.530E+05	5.402E+06	6.580E-01	1.836E+02	6.483E+03
2146	0	0	411,775	452,953	3.745E+02	2.999E+05	1.059E+07	1.000E+02	1.499E+05	5.295E+06	2.745E+02	1.499E+05	5.295E+06	6.450E-01	1.799E+02	6.354E+03
2147	0	0	411,775	452,953	3.671E+02	2.940E+05	1.038E+07	9.805E+01	1.470E+05	5.190E+06	2.690E+02	1.470E+05	5.190E+06	6.322E-01	1.764E+02	6.229E+03
2148	0	0	411,775	452,953	3.598E+02	2.881E+05	1.018E+07	9.611E+01	1.441E+05	5.088E+06	2.637E+02	1.441E+05	5.088E+06	6.197E-01	1.729E+02	6.105E+03
2149	0	0	411,775	452,953	3.527E+02	2.824E+05	9.974E+06	9.421E+01	1.412E+05	4.987E+06	2.585E+02	1.412E+05	4.987E+06	6.074E-01	1.695E+02	5.984E+03
2150	0	0	411,775	452,953	3.457E+02	2.768E+05	9.776E+06	9.234E+01	1.384E+05	4.888E+06	2.534E+02	1.384E+05	4.888E+06	5.954E-01	1.661E+02	5.866E+03
2151	0	0	411,775	452,953	3.389E+02	2.714E+05	9.583E+06	9.052E+01	1.357E+05	4.791E+06	2.484E+02	1.357E+05	4.791E+06	5.836E-01	1.628E+02	5.750E+03
2152	0	0	411,775	452,953	3.322E+02	2.660E+05	9.393E+06	8.872E+01	1.330E+05	4.696E+06	2.434E+02	1.330E+05	4.696E+06	5.720E-01	1.596E+02	5.636E+03
2153	0	0	411,775	452,953	3.256E+02	2.607E+05	9.207E+06	8.697E+01	1.304E+05	4.603E+06	2.386E+02	1.304E+05	4.603E+06	5.607E-01	1.564E+02	5.524E+03
2154	0	0	411,775	452,953	3.191E+02	2.555E+05	9.025E+06	8.524E+01	1.278E+05	4.512E+06	2.339E+02	1.278E+05	4.512E+06	5.496E-01	1.533E+02	5.415E+03
2155	0	0	411,775	452,953	3.128E+02	2.505E+05	8.846E+06	8.356E+01	1.252E+05	4.423E+06	2.293E+02	1.252E+05	4.423E+06	5.387E-01	1.503E+02	5.308E+03
2156	0	0	411,775	452,953	3.066E+02	2.455E+05	8.671E+06	8.190E+01	1.228E+05	4.335E+06	2.247E+02	1.228E+05	4.335E+06	5.281E-01	1.473E+02	5.202E+03
2157	0	0	411,775	452,953	3.005E+02	2.407E+05	8.499E+06	8.028E+01	1.203E+05	4.250E+06	2.203E+02	1.203E+05	4.250E+06	5.176E-01	1.444E+02	5.099E+03
2158	0	0	411,775	452,953	2.946E+02	2.359E+05	8.331E+06	7.869E+01	1.180E+05	4.165E+06	2.159E+02	1.180E+05	4.165E+06	5.073E-01	1.415E+02	4.998E+03
2159	0	0	411,775	452,953	2.888E+02	2.312E+05	8.166E+06	7.713E+01	1.156E+05	4.083E+06	2.116E+02	1.156E+05	4.083E+06	4.973E-01	1.387E+02	4.900E+03
2160	0	0	411,775	452,953	2.830E+02	2.267E+05	8.004E+06	7.560E+01	1.133E+05	4.002E+06	2.074E+02	1.133E+05	4.002E+06	4.875E-01	1.360E+02	4.803E+03
2161	0	0	411,775	452,953	2.774E+02	2.222E+05	7.846E+06	7.411E+01	1.111E+05	3.923E+06	2.033E+02	1.111E+05	3.923E+06	4.778E-01	1.333E+02	4.707E+03
2162	0	0	411,775	452,953	2.719E+02	2.178E+05	7.690E+06	7.264E+01	1.089E+05	3.845E+06	1.993E+02	1.089E+05	3.845E+06	4.683E-01	1.307E+02	4.614E+03
2163	0	0	411,775	452,953	2.666E+02	2.135E+05	7.538E+06	7.120E+01	1.067E+05	3.769E+06	1.954E+02	1.067E+05	3.769E+06	4.591E-01	1.281E+02	4.523E+03
2164	0	0	411,775	452,953	2.613E+02	2.092E+05	7.389E+06	6.979E+01	1.046E+05	3.694E+06	1.915E+02	1.046E+05	3.694E+06	4.500E-01	1.255E+02	4.433E+03

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Summary - CAP and OPOC Emissions Associated with Waste

	WTEF (short tons/year)	Roosevelt (short tons/year)			Finley Buttes (short tons/year)			Wenatchee (short tons/year)		
Pollutant	Combustion	Surface	Combustion	Total	Surface	Combustion	Total	Surface	Combustion	Total
VOC	1.18	8.44	0.507	8.95	8.44	0.81	9.2	8.44	6.33E-02	8.50
NOx	325	N/A	49.1	49.1	N/A	3.90	3.9	N/A	3.52	3.52
CO	25.7	2.02	35.77	37.8	2.02	29.5	31.5	2.02	6.77	8.79
SO2	8.30	N/A	0.74	0.74	N/A	0.75	0.75	N/A	2.85	2.85
PM10	12.9	N/A	1.02	1.02	N/A	1.02	1.02	N/A	0.140	0.140
PM2.5	10.3	N/A	1.02	1.02	N/A	1.02	1.02	N/A	0.140	0.140
H2S	N/A	0.179	N/A	0.179	0.179	N/A	0.179	0.179	N/A	0.179
NH3	7.66	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sulfuric Acid	4.90	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
HCl	7.77	N/A	0.948	0.948	N/A	0.948	0.948	N/A	0.948	0.948
HF	0.194	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cd	4.69E-04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hg	3.22E-03	9.54E-06	N/A	9.54E-06	9.54E-06	N/A	9.54E-06	9.54E-06	N/A	9.54E-06
Dioxin/Furans	2.23E-08	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead	5.91E-03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Washington Department of Ecology
Environmental Impact of Waste Disposal
WTEF - CAPs and OPOCs Emissions from Combustion

Emission Factors for CAPs and OPOCs

Pollutant	Emissions Rate	Unit	Notes
VOC	0.00942	lb/ton waste	From Emission Inventory, 5 year average 2018-2022.
NOx	2.60	lb/ton waste	From Emission Inventory, 5 year average 2018-2022.
CO	0.206	lb/ton waste	From Emission Inventory, 5 year average 2018-2022.
SO2	0.0664	lb/ton waste	From Emission Inventory, 5 year average 2018-2022.
PM10	0.103	lb/ton waste	From Emission Inventory, 5 year average 2018-2022.
PM2.5	0.0825	lb/ton waste	From Emission Inventory, 5 year average 2018-2022.
NH3	0.0613	lb/ton waste	From Emission Inventory, 5 year average 2018-2022.
Sulfuric Acid	0.0392	lb/ton waste	From Emission Inventory, 5 year average 2018-2022.
HCl	0.0622	lb/ton waste	From Emission Inventory, 5 year average 2018-2022.
HF	0.0016	lb/ton waste	From Emission Inventory, 5 year average 2018-2022.
Cd	3.75E-06	lb/ton waste	From Stack Testing. Unit conversions and assumptions shown below.
Hg	2.58E-05	lb/ton waste	From Stack Testing. Unit conversions and assumptions shown below.
Dioxin/Furans	1.79E-10	lb/ton waste	From Stack Testing. Unit conversions and assumptions shown below. Value is for PCDD/PCDF (TEQ).
Lead	4.73E-05	lb/ton waste	From Emission Inventory, 5 year average 2018-2022.

Note: H2S is not included but it is not expected to be a significant pollutant at waste to energy facilities.

Unit Conversions

short ton to lb	2,000
lb to ng	453,592,000,000
lb to ug	453,592,000
lb to mg	453,592
dscfm to dscf	35
MMBtu to Btu	1,000,000

Assumptions

For converting Stack Test data (mg/dscm) to lb/MMBtu: lb/MMBtu = mg/dscm x (conversion to lb/dscf) x Fd x 20.9/(20.9 - %O2)

Excess O2, %	7	%	Source: Stack test report
O2 %	20.9	%	
Fd	9,570	dscf/MMBtu	Source: AP-42 Section 2.1 "Refuse Combustion" (Oct 1996). Note that this is dscf of Exhaust Gas per MMBTU of natural gas input to the burner.
Heating Value	4,500	Btu/lb	Source: AP-42 Section 2.1 "Refuse Combustion" (Oct 1996). Table 2.1-2 for Mass Burn Combustors.
Waste Tonnage	246,167	tons/year	

Projected Emissions for WTEF

Assumptions

Waste Tonnage	250,000	tons/year

Pollutant	Annual Emissions	Unit
VOC	1.18	short ton/year
NOx	325	short ton/year
CO	25.7	short ton/year
SO2	8.30	short ton/year
PM10	12.9	short ton/year
PM2.5	10.3	short ton/year
NH3	7.66	short ton/year
Sulfuric Acid	4.90	short ton/year
HCl	7.77	short ton/year
HF	0.194	short ton/year
Cd	4.69E-04	short ton/year
Hg	3.22E-03	short ton/year
Dioxin/Furans	2.23E-08	short ton/year
Lead	0.00591	short ton/year

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Roosevelt - Surface Emissions - CAPs and OPOCs

LandGEM Input			
Landfill open year	2024		
Landfill closure year	2053		
Methane generation rate (k)	0.02	/year	
Potential methane generation capacity (L0)	100	m^3/Mg	*Source: Inventory conventional default*
NMOC	600	ppmv (hexane)	*Source: Inventory conventional default*
Methane content	50%	by volume	*Source: Regulatory default*

Assumptions		
GCCS collection efficiency	68.2%	*Source: Documentation for Greenhouse Gas Emission and Energy Factors Used in the WARM, Management Practices Chapters, Exhibit 6-10, "Typical collection", November 2020 https://www.epa.gov/sites/default/files/2020-12/documents/warm_management_practices_v15_10-29-2020.pdf*
VOC fraction of NMOC	99.7%	*Source: AP 42 Chapter 2.4 Municipal Solid Waste Landfills, DRAFT October 2008*

Based on discussions with Cynthia Hibbard from CDM Smith, CO emissions are not captured by the landfill collection system.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Roosevelt - Surface Emissions - CAPs and OPOCs

					Fugitive Emissions					Captured	
Years	Total Landfill Gas (ft^3/year)	Total Methane Gas (ft^3/year)	Captured Landfill Gas (ft^3/year)	Captured Methane Gas (ft^3/year)	NMOC (ton/year)	VOC (ton/year)	H_2S (ton/year)	Hg (ton/year)	CO (ton/year)	NMOC (ton/year)	VOC (ton/year)
2024	0	0	0	0	0	0	0	0	0	0	0
2025	31,817,426	15,908,713	21,699,484	10,849,742	0.678	0.676	0.014	7.64E-07	0.162	1.45	1.45
2026	63,004,824	31,502,412	42,969,290	21,484,645	1.34	1.34	0.028	1.51E-06	0.320	2.88	2.87
2027	93,574,671	46,787,336	63,817,926	31,908,963	1.99	1.99	0.042	2.25E-06	0.475	4.28	4.26
2028	123,539,194	61,769,597	84,253,731	42,126,865	2.63	2.62	0.056	2.96E-06	0.628	5.64	5.63
2029	152,910,380	76,455,190	104,284,879	52,142,440	3.26	3.25	0.069	3.67E-06	0.777	6.99	6.97
2030	181,699,978	90,849,989	123,919,385	61,959,692	3.87	3.86	0.082	4.36E-06	0.923	8.30	8.28
2031	209,919,503	104,959,752	143,165,101	71,582,551	4.47	4.46	0.094	5.04E-06	1.07	9.59	9.56
2032	237,580,244	118,790,122	162,029,727	81,014,863	5.06	5.05	0.107	5.70E-06	1.21	10.9	10.8
2033	264,693,266	132,346,633	180,520,808	90,260,404	5.64	5.62	0.119	6.35E-06	1.34	12.1	12.1
2034	291,269,414	145,634,707	198,645,740	99,322,870	6.20	6.19	0.131	6.99E-06	1.48	13.3	13.3
2035	317,319,319	158,659,660	216,411,776	108,205,888	6.76	6.74	0.143	7.62E-06	1.61	14.5	14.5
2036	342,853,402	171,426,701	233,826,020	116,913,010	7.30	7.28	0.154	8.23E-06	1.74	15.7	15.6
2037	367,881,875	183,940,938	250,895,439	125,447,719	7.84	7.81	0.166	8.83E-06	1.87	16.8	16.8
2038	392,414,752	196,207,376	267,626,861	133,813,430	8.36	8.33	0.177	9.42E-06	1.99	17.9	17.9
2039	416,461,845	208,230,923	284,026,978	142,013,489	8.87	8.85	0.187	9.99E-06	2.12	19.0	19.0
2040	440,032,774	220,016,387	300,102,352	150,051,176	9.37	9.35	0.198	1.06E-05	2.24	20.1	20.0
2041	463,136,967	231,568,484	315,859,412	157,929,706	9.87	9.8	0.208	1.11E-05	2.35	21.2	21.1
2042	485,783,667	242,891,833	331,304,461	165,652,230	10.35	10.3	0.219	1.17E-05	2.47	22.2	22.1
2043	507,981,931	253,990,966	346,443,677	173,221,839	10.82	10.8	0.229	1.22E-05	2.58	23.2	23.1
2044	529,740,641	264,870,321	361,283,117	180,641,559	11.3	11.3	0.238	1.27E-05	2.69	24.2	24.1
2045	551,068,499	275,534,250	375,828,717	187,914,358	11.7	11.7	0.248	1.32E-05	2.80	25.2	25.1
2046	571,974,038	285,987,019	390,086,294	195,043,147	12.2	12.1	0.257	1.37E-05	2.91	26.1	26.1
2047	592,465,619	296,232,809	404,061,552	202,030,776	12.6	12.6	0.267	1.42E-05	3.01	27.1	27.0
2048	612,551,440	306,275,720	417,760,082	208,880,041	13.0	13.0	0.276	1.47E-05	3.11	28.0	27.9
2049	632,239,534	316,119,767	431,187,362	215,593,681	13.5	13.4	0.284	1.52E-05	3.21	28.9	28.8
2050	651,537,779	325,768,889	444,348,765	222,174,382	13.9	13.8	0.293	1.56E-05	3.31	29.8	29.7
2051	670,453,892	335,226,946	457,249,554	228,624,777	14.3	14.2	0.302	1.61E-05	3.41	30.6	30.5
2052	688,995,441	344,497,721	469,894,891	234,947,445	14.7	14.6	0.310	1.65E-05	3.50	31.5	31.4
2053	707,169,843	353,584,922	482,289,833	241,144,917	15.1	15.0	0.318	1.70E-05	3.59	32.3	32.2
2054	724,984,368	362,492,184	494,439,339	247,219,670	15.4	15.4	0.326	1.74E-05	3.68	33.1	33.0
				AVERAGE	8.46	8.44	0.179	9.54E-06	2.02	18.2	18.1

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Roosevelt - HAP Emissions

LandGEM Input

Landfill open year	2024		
Landfill closure year	2053		
Methane generation rate (k)	0.02	/year	
Potential methane generation capacity (L0)	100	m3/Mg	*Source: Inventory conventional default*
NMOC	600	ppmv (hexane)	*Source: Inventory conventional default*
Methane content	50%	by volume	*Source: Regulatory default*

Assumptions

GCCS collection efficiency	68.2%	*Source: Documentation for Greenhouse Gas Emission and Energy Factors Used in the WARM, Exhibit 6-10, "Typical collection", October 2020 https://www.epa.gov/sites/default/files/2020-*
VOC fraction of NMOC	99.7%	*Source: AP 42 Chapter 2.4 Municipal Solid Waste Landfills, DRAFT October 2008*

Based on discussions with Cynthia Hibbard from CDM Smith, CO emissions are not captured by the landfill collection system.

Landfill Gas & Methane Gas

Years	Total Landfill Gas (ft^3/year)	Total Methane Gas (ft^3/year)	Captured Landfill Gas (ft^3/year)	Total Uncaptured Landfill Gas (ft^3/year)
2024	0	0	0	0
2025	31,817,426	15,908,713	21,699,484	10,117,941
2026	63,004,824	31,502,412	42,969,290	20,035,534
2027	93,574,671	46,787,336	63,817,926	29,756,745
2028	123,539,194	61,769,597	84,253,731	39,285,464
2029	152,910,380	76,455,190	104,284,879	48,625,501
2030	181,699,978	90,849,989	123,919,385	57,780,593
2031	209,919,503	104,959,752	143,165,101	66,754,402
2032	237,580,244	118,790,122	162,029,727	75,550,518
2033	264,693,266	132,346,633	180,520,808	84,172,459
2034	291,269,414	145,634,707	198,645,740	92,623,674
2035	317,319,319	158,659,660	216,411,776	100,907,544
2036	342,853,402	171,426,701	233,826,020	109,027,382
2037	367,881,875	183,940,938	250,895,439	116,986,436
2038	392,414,752	196,207,376	267,626,861	124,787,891
2039	416,461,845	208,230,923	284,026,978	132,434,867
2040	440,032,774	220,016,387	300,102,352	139,930,422
2041	463,136,967	231,568,484	315,859,412	147,277,556
2042	485,783,667	242,891,833	331,304,461	154,479,206
2043	507,981,931	253,990,966	346,443,677	161,538,254
2044	529,740,641	264,870,321	361,283,117	168,457,524
2045	551,068,499	275,534,250	375,828,717	175,239,783
2046	571,974,038	285,987,019	390,086,294	181,887,744
2047	592,465,619	296,232,809	404,061,552	188,404,067
2048	612,551,440	306,275,720	417,760,082	194,791,358
2049	632,239,534	316,119,767	431,187,362	201,052,172
2050	651,537,779	325,768,889	444,348,765	207,189,014
2051	670,453,892	335,226,946	457,249,554	213,204,338
2052	688,995,441	344,497,721	469,894,891	219,100,550
2053	707,169,843	353,584,922	482,289,833	224,880,010
2054	724,984,368	362,492,184	494,439,339	230,545,029

Fugitive HAPs

Pollutant ID	Pollutant Name	Concentration (ppmv)	Molecular Weight (lb/lbmol)	Emission Rate (short tons/year)																														
				2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
1	Hydrogen sulfide	32	34.08	0.00E+00	1.43E-02	2.83E-02	4.21E-02	5.56E-02	6.88E-02	8.17E-02	9.44E-02	1.07E-01	1.19E-01	1.31E-01	1.43E-01	1.54E-01	1.66E-01	1.77E-01	1.87E-01	1.98E-01	2.08E-01	2.19E-01	2.29E-01	2.38E-01	2.48E-01	2.57E-01	2.67E-01	2.76E-01	2.84E-01	2.93E-01	3.02E-01	3.10E-01	3.18E-01	3.26E-01
2	Mercury (total) - HAP	0.00029	200.61	0.00E+00	7.64E-07	1.51E-06	2.25E-06	2.96E-06	3.67E-06	4.36E-06	5.04E-06	5.70E-06	6.35E-06	6.99E-06	7.62E-06	8.23E-06	8.83E-06	9.42E-06	9.99E-06	1.06E-05	1.11E-05	1.17E-05	1.22E-05	1.27E-05	1.32E-05	1.37E-05	1.42E-05	1.47E-05	1.52E-05	1.56E-05	1.61E-05	1.65E-05	1.70E-05	1.74E-05

Concentrations of pollutants are from LandGem Model which cites AP-42 Table 2.4-1 Default concentrations for Landfill Gas Constituents (2008).

Unit Conversion

ppmv	1,000,000
short ton to lb	2,000

Assumptions - Ideal Gas Law

Gas Constant	R	0.73 ft^3*atm/(R*lbmol)	
Pressure	P	1 atm	
Temperature	T	68 F	528 R
Molar Volume	V/n	385.44 ft^3/lbmol	

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Roosevelt - Combustion Emissions (LFG Recovery for RNG) - CAPs and OPOCs

AP 42 Chapter 2.4 Municipal Solid Waste Landfills, DRAFT October 2008

IC Engine NMOC and VOC Control Eff.	97.2%	

Landfill Gas Properties

Heat content of methane	1000	Btu/cf	*Source: http://ipm.uconn.edu/documents/raw2/Approximate%20Heating%20Value%20of%20Common%20Fuels/Approximate%20Heating%20Value%20of%20Common%20Fuels.php?aid=230*

Engine Generator Emission Rates (NOx, CO, PM)

Pollutant	Emission Factor (lb/10^6 scf methane)
NOx	725
CO	528
PM10	15
PM2.5	15

Emission Factors for NOx, CO and PM10 from AP-42 Section 2.4, October 2008.

SO2 Emission Assumptions

H2S Concentration of Digester Gas	33	ppmv	Source: AP-42 Section 2.4, October 2008.

HCl Emission Assumptions

HCl Concentration of Digester Gas	74	ppmv	Source: AP-42 Section 2.4, October 2008.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Roosevelt - Combustion Emissions (LFG Recovery for RNG) - CAPs and OPOCs

Generator Emissions

Year	VOC [1]	NOx	CO	SO2	PM10	PM2.5	HCl
2024	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2025	0.04	3.93	2.86	0.06	0.081	0.081	0.076
2026	0.08	7.79	5.67	0.12	0.161	0.161	0.150
2027	0.12	11.6	8.42	0.18	0.239	0.239	0.223
2028	0.16	15.3	11.1	0.23	0.316	0.316	0.295
2029	0.20	18.9	13.8	0.29	0.391	0.391	0.365
2030	0.23	22.5	16.4	0.34	0.465	0.465	0.434
2031	0.27	25.9	18.9	0.39	0.537	0.537	0.501
2032	0.30	29.4	21.4	0.44	0.608	0.608	0.567
2033	0.34	32.7	23.8	0.50	0.677	0.677	0.632
2034	0.37	36.0	26.2	0.54	0.745	0.745	0.695
2035	0.40	39.2	28.6	0.59	0.812	0.812	0.757
2036	0.44	42.4	30.9	0.64	0.877	0.877	0.818
2037	0.47	45.5	33.1	0.69	0.941	0.941	0.878
2038	0.50	48.5	35.3	0.73	1.00	1.00	0.937
2039	0.53	51.5	37.5	0.78	1.07	1.07	0.994
2040	0.56	54.4	39.6	0.82	1.13	1.13	1.05
2041	0.59	57.2	41.7	0.87	1.18	1.18	1.11
2042	0.62	60.0	43.7	0.91	1.24	1.24	1.16
2043	0.65	62.8	45.7	0.95	1.30	1.30	1.21
2044	0.68	65.5	47.7	0.99	1.35	1.35	1.26
2045	0.70	68.1	49.6	1.03	1.41	1.41	1.32
2046	0.73	70.7	51.5	1.07	1.46	1.46	1.37
2047	0.76	73.2	53.3	1.11	1.52	1.52	1.41
2048	0.78	75.7	55.1	1.15	1.57	1.57	1.46
2049	0.81	78.2	56.9	1.18	1.62	1.62	1.51
2050	0.83	80.5	58.7	1.22	1.67	1.67	1.56
2051	0.86	82.9	60.4	1.25	1.71	1.71	1.60
2052	0.88	85.2	62.0	1.29	1.76	1.76	1.64
2053	0.90	87.4	63.7	1.32	1.81	1.81	1.69
2054	0.92	89.6	65.3	1.36	1.85	1.85	1.73
AVERAGE	0.507	49.1	35.8	0.74	1.02	1.02	0.948

1. VOC emissions are from LandGEM and based on control efficiencies from AP-42 Section 2.4, October 2008.

Unit Conversions

short ton to lb	2,000
ppmv	1,000,000

Assumptions

Molecular Weight SO2	64.07	lb/lbmol
Molecular Weight HCl	36.46	lb/lbmol
Molar Volume (standard conditions)	385.44	ft3/lbmol

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Finley Buttes - Surface Emissions - CAPs and OPOCs

LandGEM Input			
Landfill open year	2024		
Landfill closure year	2053		
Methane generation rate (k)	0.02	/year	
Potential methane generation capacity (L0)	100	m^3/Mg	*Source: Inventory conventional default*
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Methane content	50%	by volume	*Source: Regulatory default*

Assumptions		
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Washington Department of Ecology
Environmental Impacts of Waste Disposal
Finley Buttes - Surface Emissions - CAPs and OPOCs

					Fugitive Emissions					Captured	
Years	Total Landfill Gas (ft^3/year)	Total Methane Gas (ft^3/year)	Captured Landfill Gas (ft^3/year)	Captured Methane Gas (ft^3/year)	NMOC (ton/year)	VOC (ton/year)	H_2S (ton/year)	Hg (ton/year)	CO (ton/year)	NMOC (ton/year)	VOC (ton/year)
2024	0	0	0	0	0	0	0	0	0	0	0
2025	31,817,426	15,908,713	21,699,484	10,849,742	0.678	0.676	0.014	7.64E-07	0.162	1.45	1.45
2026	63,004,824	31,502,412	42,969,290	21,484,645	1.34	1.34	0.028	1.51E-06	0.320	2.88	2.87
2027	93,574,671	46,787,336	63,817,926	31,908,963	1.99	1.99	0.042	2.25E-06	0.475	4.28	4.26
2028	123,539,194	61,769,597	84,253,731	42,126,865	2.63	2.62	0.056	2.96E-06	0.628	5.64	5.63
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2035	317,319,319	158,659,660	216,411,776	108,205,888	6.76	6.74	0.143	7.62E-06	1.61	14.5	14.5
2036	342,853,402	171,426,701	233,826,020	116,913,010	7.30	7.28	0.154	8.23E-06	1.74	15.7	15.6
2037	367,881,875	183,940,938	250,895,439	125,447,719	7.84	7.81	0.166	8.83E-06	1.87	16.8	16.8
2038	392,414,752	196,207,376	267,626,861	133,813,430	8.36	8.33	0.177	9.42E-06	1.99	17.9	17.9
2039	416,461,845	208,230,923	284,026,978	142,013,489	8.87	8.85	0.187	9.99E-06	2.12	19.0	19.0
2040	440,032,774	220,016,387	300,102,352	150,051,176	9.37	9.35	0.198	1.06E-05	2.24	20.1	20.0
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2042	485,783,667	242,891,833	331,304,461	165,652,230	10.3	10.3	0.219	1.17E-05	2.47	22.2	22.1
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2048	612,551,440	306,275,720	417,760,082	208,880,041	13.0	13.0	0.276	1.47E-05	3.11	28.0	27.9
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2053	707,169,843	353,584,922	482,289,833	241,144,917	15.1	15.0	0.318	1.70E-05	3.59	32.3	32.2
2054	724,984,368	362,492,184	494,439,339	247,219,670	15.4	15.4	0.326	1.74E-05	3.68	33.1	33.0
				AVERAGE	8.46	8.44	0.179	9.54E-06	2.02	18.2	18.1

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Finley Buttes - HAP Emissions

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Methane content	50%	by volume	*Source: Regulatory default*

Assumptions

GCCS collection efficiency	68.2%	*Source: Documentation for Greenhouse Gas Emission and Energy Factors Used in the WARM, Exhibit 6-10, "Typical collection", October 2020 https://www.epa.gov/sites/default/files/2020-12/documents/warm_management_practices_v15_10-29-2020.pdf*
VOC fraction of NMOC	99.7%	*Source: AP 42 Chapter 2.4 Municipal Solid Waste Landfills, DRAFT October 2008*

Based on discussions with Cynthia Hibbard from CDM Smith, CO emissions are not captured by the landfill collection system.

Landfill Gas & Methane Gas

Years	Total Landfill Gas (ft^3/year)	Total Methane Gas (ft^3/year)	Captured Landfill Gas (ft^3/year)	Total Uncaptured Landfill Gas (ft^3/year)
2024	0	0	0	0
2025	31,817,426	15,908,713	21,699,484	10,117,941
2026	63,004,824	31,502,412	42,969,290	20,035,534
2027	93,574,671	46,787,336	63,817,926	29,756,745
2028	123,539,194	61,769,597	84,253,731	39,285,464
2029	152,910,380	76,455,190	104,284,879	48,625,501
2030	181,699,978	90,849,989	123,919,385	57,780,593
2031	209,919,503	104,959,752	143,165,101	66,754,402
2032	237,580,244	118,790,122	162,029,727	75,550,518
2033	264,693,266	132,346,633	180,520,808	84,172,459
2034	291,269,414	145,634,707	198,645,740	92,623,674
2035	317,319,319	158,659,660	216,411,776	100,907,544
2036	342,853,402	171,426,701	233,826,020	109,027,382
2037	367,881,875	183,940,938	250,895,439	116,986,436
2038	392,414,752	196,207,376	267,626,861	124,787,891
2039	416,461,845	208,230,923	284,026,978	132,434,867
2040	440,032,774	220,016,387	300,102,352	139,930,422
2041	463,136,967	231,568,484	315,859,412	147,277,556
2042	485,783,667	242,891,833	331,304,461	154,479,206
2043	507,981,931	253,990,966	346,443,677	161,538,254
2044	529,740,641	264,870,321	361,283,117	168,457,524
2045	551,068,499	275,534,250	375,828,717	175,239,783
2046	571,974,038	285,987,019	390,086,294	181,887,744
2047	592,465,619	296,232,809	404,061,552	188,404,067
2048	612,551,440	306,275,720	417,760,082	194,791,358
2049	632,239,534	316,119,767	431,187,362	201,052,172
2050	651,537,779	325,768,889	444,348,765	207,189,014
2051	670,453,892	335,226,946	457,249,554	213,204,338
2052	688,995,441	344,497,721	469,894,891	219,100,550
2053	707,169,843	353,584,922	482,289,833	224,880,010
2054	724,984,368	362,492,184	494,439,339	230,545,029

Fugitive HAPs

Pollutant ID	Pollutant Name	Concentration (ppmv)	Molecular Weight (lb/lbmol)	Emission Rate (short tons/year)																														
				2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
1	Hydrogen sulfide	32	34.08	0.00E+00	1.43E-02	2.83E-02	4.21E-02	5.56E-02	6.88E-02	8.17E-02	9.44E-02	1.07E-01	1.19E-01	1.31E-01	1.43E-01	1.54E-01	1.66E-01	1.77E-01	1.87E-01	1.98E-01	2.08E-01	2.19E-01	2.29E-01	2.38E-01	2.48E-01	2.57E-01	2.67E-01	2.76E-01	2.84E-01	2.93E-01	3.02E-01	3.10E-01	3.18E-01	3.26E-01
2	Mercury (total) - HAP	0.00029	200.61	0.00E+00	7.64E-07	1.51E-06	2.25E-06	2.96E-06	3.67E-06	4.36E-06	5.04E-06	5.70E-06	6.35E-06	6.99E-06	7.62E-06	8.23E-06	8.83E-06	9.42E-06	9.99E-06	1.06E-05	1.11E-05	1.17E-05	1.22E-05	1.27E-05	1.32E-05	1.37E-05	1.42E-05	1.47E-05	1.52E-05	1.56E-05	1.61E-05	1.65E-05	1.70E-05	1.74E-05

Concentrations of pollutants are from LandGem Model which cites AP-42 Table 2.4-1 Default concentrations for Landfill Gas Constituents (2008).

Unit Conversion

ppmv	1,000,000
short ton to lb	2,000

Assumptions - Ideal Gas Law

Gas Constant	R	0.73 ft^3*atm/(R*lbmol)	
Pressure	P	1 atm	
Temperature	T	68 F	528 R
Molar Volume	V/n	385.44 ft^3/lbmol	

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Finley Buttes - Combustion Emissions (LFG Recovery for On-Site Energy Production) - CAPs and OPOCs

Landfill Gas Properties

Heat content of methane	1000 Btu/cf	*Source: http://ipm.uconn.edu/documents/raw2/Approximate%20Heating%20Value%20of%20Common%20Fuels/Approximate%20Heating%20Value%20of%20Common%20Fuels.php?aid=230*

Emission Rates from February 2023 Stack Test

Pollutant	Emission Factor (lb/10^6 scf methane)
NOx	57.6
CO	435
VOC	11.9

Results are the sum of ICE 1, ICE 2, and ICE 3.

Pollutant	Emission Factor (lb/10^6 scf methane)
PM10	15
PM2.5	15

Emission Factors for NOx, CO and PM10 from AP-42 Section 2.4, October 2008.

SO2 Emission Assumptions

H2S Concentration of Digester Gas	33	ppmv	Source: AP-42 Section 2.4, October 2008.

HCl Emission Assumptions

HCl Concentration of Digester Gas	74	ppmv	Source: AP-42 Section 2.4, October 2008.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Finley Buttes - Combustion Emissions (LFG Recovery for On-Site Energy Production) - CAPs and OPOCs

Generator Emissions

Year	VOC [1]	NOx	CO	SO2	PM10	PM2.5	HCl
2024	0	0	0	0	0	0	0
2025	0.065	0.31	2.36	0.06	0.081	0.081	0.076
2026	0.128	0.62	4.7	0.12	0.161	0.161	0.150
2027	0.190	0.92	6.9	0.18	0.239	0.239	0.223
2028	0.251	1.21	9.2	0.23	0.316	0.316	0.295
2029	0.310	1.50	11.3	0.29	0.391	0.391	0.365
2030	0.37	1.78	13.5	0.34	0.465	0.465	0.434
2031	0.43	2.06	15.6	0.40	0.537	0.537	0.501
2032	0.48	2.33	17.6	0.45	0.608	0.608	0.567
2033	0.54	2.60	19.6	0.50	0.677	0.677	0.632
2034	0.59	2.86	21.6	0.55	0.745	0.745	0.695
2035	0.64	3.12	23.5	0.60	0.812	0.812	0.757
2036	0.70	3.4	25.4	0.65	0.877	0.877	0.818
2037	0.75	3.6	27.3	0.69	0.941	0.941	0.878
2038	0.80	3.9	29.1	0.74	1.00	1.00	0.937
2039	0.84	4.1	30.9	0.79	1.07	1.07	0.994
2040	0.89	4.3	32.6	0.83	1.13	1.13	1.05
2041	0.94	4.5	34	0.87	1.18	1.18	1.11
2042	0.99	4.8	36	0.92	1.24	1.24	1.16
2043	1.03	5.0	38	0.96	1.30	1.30	1.21
2044	1.07	5.2	39	1.00	1.35	1.35	1.26
2045	1.12	5.4	41	1.04	1.41	1.41	1.32
2046	1.16	5.6	42	1.08	1.46	1.46	1.37
2047	1.20	5.8	44	1.12	1.52	1.52	1.41
2048	1.24	6.0	45	1.16	1.57	1.57	1.46
2049	1.28	6.2	47	1.19	1.62	1.62	1.51
2050	1.32	6.4	48	1.23	1.67	1.67	1.56
2051	1.36	6.6	50	1.27	1.71	1.71	1.60
2052	1.40	6.8	51	1.30	1.76	1.76	1.64
2053	1.43	6.9	52	1.34	1.81	1.81	1.69
2054	1.47	7.1	54	1.37	1.85	1.85	1.73
AVERAGE	0.81	3.9	29.5	0.75	1.02	1.02	0.948

1. For this evaluation PM10 is considered equivalent to PM2.5

Unit Conversions

short ton to lb	2,000
ppmv	1,000,000

Assumptions

Molecular Weight SO2	64.7	lb/lbmol
Molecular Weight HCl	36.46	lb/lbmol
Molar Volume (standard conditions)	385.44	ft3/lbmol

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Wenatchee - Surface Emissions - CAPs and OPOCs

LandGEM Input			
Landfill open year	2024		
Landfill closure year	2053		
Methane generation rate (k)	0.02	/year	
Potential methane generation capacity (L0)	100	m^3/Mg	*Source: Inventory conventional default*
NMOC	600	ppmv (hexane)	*Source: Inventory conventional default*
Methane content	50%	by volume	*Source: Regulatory default*
Assumptions			
GCCS collection efficiency	68.2%		*Source: Documentation for Greenhouse Gas Emission and Energy Factors Used in the WARM, Management Practices Chapters, Exhibit 6-10, "Typical collection", November 2020 https://www.epa.gov/sites/default/files/2020-12/documents/warm_management_practices_v15_10-29-2020.pdf*
VOC fraction of NMOC	99.7%		*Source: AP 42 Chapter 2.4 Municipal Solid Waste Landfills, DRAFT October 2008*

Based on discussions with Cynthia Hibbard from CDM Smith, CO emissions are not captured by the landfill collection system.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Wenatchee - Surface Emissions - CAPs and OPOCs

					Fugitive Emissions					Captured	
Years	Total Landfill Gas (ft^3/year)	Total Methane Gas (ft^3/year)	Captured Landfill Gas (ft^3/year)	Captured Methane Gas (ft^3/year)	NMOC (ton/year)	VOC (ton/year)	H_2S (ton/year)	Hg (ton/year)	CO (ton/year)	NMOC (ton/year)	VOC (ton/year)
2024	0	0	0	0	0	0	0	0	0	0	0
2025	31,817,426	15,908,713	21,699,484	10,849,742	0.678	0.676	0.014	7.64E-07	0.162	1.45	1.45
2026	63,004,824	31,502,412	42,969,290	21,484,645	1.34	1.34	0.028	1.51E-06	0.320	2.88	2.87
2027	93,574,671	46,787,336	63,817,926	31,908,963	1.99	1.99	0.042	2.25E-06	0.475	4.28	4.26
2028	123,539,194	61,769,597	84,253,731	42,126,865	2.63	2.62	0.056	2.96E-06	0.628	5.64	5.63
2029	152,910,380	76,455,190	104,284,879	52,142,440	3.26	3.25	0.069	3.67E-06	0.777	6.99	6.97
2030	181,699,978	90,849,989	123,919,385	61,959,692	3.87	3.86	0.082	4.36E-06	0.923	8.30	8.28
2031	209,919,503	104,959,752	143,165,101	71,582,551	4.47	4.46	0.094	5.04E-06	1.07	9.59	9.56
2032	237,580,244	118,790,122	162,029,727	81,014,863	5.06	5.05	0.107	5.70E-06	1.21	10.9	10.8
2033	264,693,266	132,346,633	180,520,808	90,260,404	5.64	5.62	0.119	6.35E-06	1.34	12.1	12.1
2034	291,269,414	145,634,707	198,645,740	99,322,870	6.20	6.19	0.131	6.99E-06	1.48	13.3	13.3
2035	317,319,319	158,659,660	216,411,776	108,205,888	6.76	6.74	0.143	7.62E-06	1.61	14.5	14.5
2036	342,853,402	171,426,701	233,826,020	116,913,010	7.30	7.28	0.154	8.23E-06	1.74	15.7	15.6
2037	367,881,875	183,940,938	250,895,439	125,447,719	7.84	7.81	0.166	8.83E-06	1.87	16.8	16.8
2038	392,414,752	196,207,376	267,626,861	133,813,430	8.36	8.33	0.177	9.42E-06	1.99	17.9	17.9
2039	416,461,845	208,230,923	284,026,978	142,013,489	8.87	8.85	0.187	9.99E-06	2.12	19.0	19.0
2040	440,032,774	220,016,387	300,102,352	150,051,176	9.37	9.35	0.198	1.06E-05	2.24	20.1	20.0
2041	463,136,967	231,568,484	315,859,412	157,929,706	9.87	9.8	0.208	1.11E-05	2.35	21.2	21.1
2042	485,783,667	242,891,833	331,304,461	165,652,230	10.35	10.3	0.219	1.17E-05	2.47	22.2	22.1
2043	507,981,931	253,990,966	346,443,677	173,221,839	10.82	10.8	0.229	1.22E-05	2.58	23.2	23.1
2044	529,740,641	264,870,321	361,283,117	180,641,559	11.3	11.3	0.238	1.27E-05	2.69	24.2	24.1
2045	551,068,499	275,534,250	375,828,717	187,914,358	11.7	11.7	0.248	1.32E-05	2.80	25.2	25.1
2046	571,974,038	285,987,019	390,086,294	195,043,147	12.2	12.1	0.257	1.37E-05	2.91	26.1	26.1
2047	592,465,619	296,232,809	404,061,552	202,030,776	12.6	12.6	0.267	1.42E-05	3.01	27.1	27.0
2048	612,551,440	306,275,720	417,760,082	208,880,041	13.0	13.0	0.276	1.47E-05	3.11	28.0	27.9
2049	632,239,534	316,119,767	431,187,362	215,593,681	13.5	13.4	0.284	1.52E-05	3.21	28.9	28.8
2050	651,537,779	325,768,889	444,348,765	222,174,382	13.9	13.8	0.293	1.56E-05	3.31	29.8	29.7
2051	670,453,892	335,226,946	457,249,554	228,624,777	14.3	14.2	0.302	1.61E-05	3.41	30.6	30.5
2052	688,995,441	344,497,721	469,894,891	234,947,445	14.7	14.6	0.310	1.65E-05	3.50	31.5	31.4
2053	707,169,843	353,584,922	482,289,833	241,144,917	15.1	15.0	0.318	1.70E-05	3.59	32.3	32.2
2054	724,984,368	362,492,184	494,439,339	247,219,670	15.4	15.4	0.326	1.74E-05	3.68	33.1	33.0
				AVERAGE	8.46	8.44	0.179	9.54E-06	2.02	18.2	18.1

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Wenatchee - HAP Emissions

LandGEM Input

Landfill open year	2024		
Landfill closure year	2053		
Methane generation rate (k)	0.02	/year	
Potential methane generation capacity (L0)	100	m3/Mg	*Source: Inventory conventional default*
NMOC	600	ppmv (hexane)	*Source: Inventory conventional default*
Methane content	50%	by volume	*Source: Regulatory default*

Assumptions

GCCS collection efficiency	68.2%	*Source: Documentation for Greenhouse Gas Emission and Energy Factors Used in the WARM, Exhibit 6-10, "Typical collection", October 2020 https://www.epa.gov/sites/default/files/2020-12/documents/warm_management_practices_v15_10-29-2020.pdf*
VOC fraction of NMOC	99.7%	*Source: AP 42 Chapter 2.4 Municipal Solid Waste Landfills, DRAFT October 2008*

Based on discussions with Cynthia Hibbard from CDM Smith, CO emissions are not captured by the landfill collection system.

Landfill Gas & Methane Gas

Years	Total Landfill Gas (ft^3/year)	Total Methane Gas (ft^3/year)	Captured Landfill Gas (ft^3/year)	Total Uncaptured Landfill Gas (ft^3/year)
2024	0	0	0	0
2025	31,817,426	15,908,713	21,699,484	10,117,941
2026	63,004,824	31,502,412	42,969,290	20,035,534
2027	93,574,671	46,787,336	63,817,926	29,756,745
2028	123,539,194	61,769,597	84,253,731	39,285,464
2029	152,910,380	76,455,190	104,284,879	48,625,501
2030	181,699,978	90,849,989	123,919,385	57,780,593
2031	209,919,503	104,959,752	143,165,101	66,754,402
2032	237,580,244	118,790,122	162,029,727	75,550,518
2033	264,693,266	132,346,633	180,520,808	84,172,459
2034	291,269,414	145,634,707	198,645,740	92,623,674
2035	317,319,319	158,659,660	216,411,776	100,907,544
2036	342,853,402	171,426,701	233,826,020	109,027,382
2037	367,881,875	183,940,938	250,895,439	116,986,436
2038	392,414,752	196,207,376	267,626,861	124,787,891
2039	416,461,845	208,230,923	284,026,978	132,434,867
2040	440,032,774	220,016,387	300,102,352	139,930,422
2041	463,136,967	231,568,484	315,859,412	147,277,556
2042	485,783,667	242,891,833	331,304,461	154,479,206
2043	507,981,931	253,990,966	346,443,677	161,538,254
2044	529,740,641	264,870,321	361,283,117	168,457,524
2045	551,068,499	275,534,250	375,828,717	175,239,783
2046	571,974,038	285,987,019	390,086,294	181,887,744
2047	592,465,619	296,232,809	404,061,552	188,404,067
2048	612,551,440	306,275,720	417,760,082	194,791,358
2049	632,239,534	316,119,767	431,187,362	201,052,172
2050	651,537,779	325,768,889	444,348,765	207,189,014
2051	670,453,892	335,226,946	457,249,554	213,204,338
2052	688,995,441	344,497,721	469,894,891	219,100,550
2053	707,169,843	353,584,922	482,289,833	224,880,010
2054	724,984,368	362,492,184	494,439,339	230,545,029

Fugitive HAPs

Pollutant ID	Pollutant Name	Concentration (ppmv)	Molecular Weight (lb/lbmol)	Emission Rate (short tons/year)																														
				2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054
1	Hydrogen sulfide	32	34.08	0.00E+00	1.43E-02	2.83E-02	4.21E-02	5.56E-02	6.88E-02	8.17E-02	9.44E-02	1.07E-01	1.19E-01	1.31E-01	1.43E-01	1.54E-01	1.66E-01	1.77E-01	1.87E-01	1.98E-01	2.08E-01	2.19E-01	2.29E-01	2.38E-01	2.48E-01	2.57E-01	2.67E-01	2.76E-01	2.84E-01	2.93E-01	3.02E-01	3.10E-01	3.18E-01	3.26E-01
2	Mercury (total) - HAP	0.00029	200.61	0.00E+00	7.64E-07	1.51E-06	2.25E-06	2.96E-06	3.67E-06	4.36E-06	5.04E-06	5.70E-06	6.35E-06	6.99E-06	7.62E-06	8.23E-06	8.83E-06	9.42E-06	9.99E-06	1.06E-05	1.11E-05	1.17E-05	1.22E-05	1.27E-05	1.32E-05	1.37E-05	1.42E-05	1.47E-05	1.52E-05	1.56E-05	1.61E-05	1.65E-05	1.70E-05	1.74E-05

Concentrations of pollutants are from LandGem Model which cites AP-42 Table 2.4-1 Default concentrations for Landfill Gas Constituents (2008).

Unit Conversion

ppmv	1,000,000
short ton to lb	2,000

Assumptions - Ideal Gas Law

Gas Constant	R	0.73 ft^3*atm/(R*lbmol)	
Pressure	P	1 atm	
Temperature	T	68 F	528 R
Molar Volume	V/n	385.44 ft^3/lbmol	

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Wenatchee - Combustion Emissions (LFG Recovery for Flare) - CAPs and OPOCs

AP 42 Chapter 2.4 Municipal Solid Waste Landfills, DRAFT October 2008

Flare NMOC Destruction Efficiency	99.65%	%	*Source: Stack test data from April 2022*

Landfill Gas Properties

Heat content of methane	1,000	Btu/cf	*Source: http://ipm.uconn.edu/documents/raw2/Approximate%20Heating%20Value%20of%20Common%20Fuels/Approximate%20Heating%20Value%20of%20Common%20Fuels.php?aid=230*

Emission Rates from April 2022 Stack Test

Pollutant	Rate	Unit
NOx	0.052	lb/MMBtu
CO	0.1	lb/MMBtu
SO2	0.042	lb/MMBtu
PM10	0.0145	gr/dscf

HCl Emission Assumptions

HCl Concentration of Digester Gas	74	ppmv	Source: AP-42 Section 2.4, October 2008.

Generator Emissions

Year	VOC[1]	NOx	CO	SO2	PM10	PM2.5	HCl
2024	0.00E+00	0.0	0.0	0.0	0.0	0.0	0.0
2025	5.07E-03	0.28	0.54	0.228	0.011	0.0112	0.076
2026	1.00E-02	0.56	1.07	0.451	0.022	0.0223	0.150
2027	1.49E-02	0.83	1.60	0.670	0.033	0.0330	0.223
2028	1.97E-02	1.10	2.11	0.885	0.044	0.0436	0.295
2029	2.44E-02	1.36	2.61	1.09	0.054	0.054	0.365
2030	2.90E-02	1.61	3.10	1.30	0.064	0.064	0.434
2031	3.35E-02	1.86	3.58	1.50	0.074	0.074	0.501
2032	3.79E-02	2.11	4.05	1.70	0.084	0.084	0.567
2033	4.22E-02	2.35	4.51	1.90	0.093	0.093	0.632
2034	4.64E-02	2.58	4.97	2.09	0.103	0.103	0.695
2035	5.06E-02	2.81	5.41	2.27	0.112	0.112	0.757
2036	5.47E-02	3.04	5.85	2.46	0.121	0.121	0.818
2037	5.86E-02	3.26	6.27	2.63	0.130	0.130	0.878
2038	6.26E-02	3.48	6.69	2.81	0.139	0.139	0.937
2039	6.64E-02	3.69	7.10	2.98	0.147	0.147	0.99
2040	7.02E-02	3.90	7.50	3.15	0.155	0.155	1.05
2041	7.38E-02	4.11	7.90	3.32	0.164	0.164	1.11
2042	7.74E-02	4.31	8.28	3.48	0.172	0.172	1.16
2043	8.10E-02	4.50	8.66	3.64	0.179	0.179	1.21
2044	8.45E-02	4.70	9.03	3.79	0.187	0.187	1.26
2045	8.79E-02	4.89	9.40	3.95	0.195	0.195	1.32
2046	9.12E-02	5.07	9.75	4.10	0.202	0.202	1.37
2047	9.45E-02	5.25	10.1	4.24	0.209	0.209	1.41
2048	9.77E-02	5.43	10.4	4.39	0.216	0.216	1.46
2049	1.01E-01	5.61	10.8	4.53	0.223	0.223	1.51
2050	1.04E-01	5.78	11.1	4.67	0.230	0.230	1.56
2051	1.07E-01	5.94	11.4	4.80	0.237	0.237	1.60
2052	1.10E-01	6.11	11.7	4.93	0.243	0.243	1.64
2053	1.13E-01	6.27	12.1	5.06	0.250	0.250	1.69
2054	1.16E-01	6.43	12.4	5.19	0.256	0.256	1.73
AVERAGE	6.33E-02	3.52	6.77	2.85	0.140	0.140	0.948

1. VOC emissions are from LandGEM and based on control efficiencies from stack test data.
2. For this evaluation PM10 is considered equivalent to PM2.5.

Unit Conversions

short ton to lb	2,000
ppmv	1,000,000
lb to grain	7,000

Assumptions

Molecular Weight SO2	64.7	lb/lbmol
Molecular Weight HCl	36.46	lb/lbmol
Molar Volume (standard conditions)	385.44	ft3/lbmol

Washington Department of Ecology
Environmental Impacts of Waste Disposal
LandGem Results for CAP and OPOC Emissions Calculations

RESULTS

Landfill Name or Identifier: Roosevelt, Finley Buttes, Wenatchee

Closure Year (with 80-year limit) = 2053
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.

User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon monoxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(short tons/year)*	*(Mg/year)*	*(m^3/year)*	*(short tons/year)*
2024	227,273	250,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2025	227,273	250,000	227,273	250,000	1.125E+03	9.010E+05	3.182E+07	3.005E+02	4.505E+05	1.591E+07	1.469E-01	1.261E+02	1.616E-01	1.938E+00	5.406E+02	2.131E+00
2026	227,273	250,000	454,545	500,000	2.228E+03	1.784E+06	6.300E+07	5.951E+02	8.920E+05	3.150E+07	2.910E-01	2.498E+02	3.201E-01	3.837E+00	1.070E+03	4.221E+00
2027	227,273	250,000	681,818	750,000	3.309E+03	2.650E+06	9.357E+07	8.839E+02	1.325E+06	4.679E+07	4.322E-01	3.710E+02	4.754E-01	5.699E+00	1.590E+03	6.269E+00
2028	227,273	250,000	909,091	1,000,000	4.369E+03	3.498E+06	1.235E+08	1.167E+03	1.749E+06	6.177E+07	5.706E-01	4.897E+02	6.276E-01	7.524E+00	2.099E+03	8.276E+00
2029	227,273	250,000	1,136,364	1,250,000	5.407E+03	4.330E+06	1.529E+08	1.444E+03	2.165E+06	7.646E+07	7.062E-01	6.062E+02	7.768E-01	9.312E+00	2.598E+03	1.024E+01
2030	227,273	250,000	1,363,636	1,500,000	6.425E+03	5.145E+06	1.817E+08	1.716E+03	2.573E+06	9.085E+07	8.392E-01	7.203E+02	9.231E-01	1.107E+01	3.087E+03	1.217E+01
2031	227,273	250,000	1,590,909	1,750,000	7.423E+03	5.944E+06	2.099E+08	1.983E+03	2.972E+06	1.050E+08	9.695E-01	8.322E+02	1.066E+00	1.278E+01	3.567E+03	1.406E+01
2032	227,273	250,000	1,818,182	2,000,000	8.401E+03	6.727E+06	2.376E+08	2.244E+03	3.364E+06	1.188E+08	1.097E+00	9.418E+02	1.207E+00	1.447E+01	4.036E+03	1.592E+01
2033	227,273	250,000	2,045,455	2,250,000	9.360E+03	7.495E+06	2.647E+08	2.500E+03	3.748E+06	1.323E+08	1.222E+00	1.049E+03	1.345E+00	1.612E+01	4.497E+03	1.773E+01
2034	227,273	250,000	2,272,727	2,500,000	1.030E+04	8.248E+06	2.913E+08	2.751E+03	4.124E+06	1.456E+08	1.345E+00	1.155E+03	1.480E+00	1.774E+01	4.949E+03	1.951E+01
2035	227,273	250,000	2,500,000	2,750,000	1.122E+04	8.985E+06	3.173E+08	2.997E+03	4.493E+06	1.587E+08	1.466E+00	1.258E+03	1.612E+00	1.932E+01	5.391E+03	2.126E+01
2036	227,273	250,000	2,727,273	3,000,000	1.212E+04	9.708E+06	3.429E+08	3.238E+03	4.854E+06	1.714E+08	1.583E+00	1.359E+03	1.742E+00	2.088E+01	5.825E+03	2.297E+01
2037	227,273	250,000	2,954,545	3,250,000	1.301E+04	1.042E+07	3.679E+08	3.475E+03	5.209E+06	1.839E+08	1.699E+00	1.458E+03	1.869E+00	2.240E+01	6.250E+03	2.464E+01
2038	227,273	250,000	3,181,818	3,500,000	1.388E+04	1.111E+07	3.924E+08	3.707E+03	5.556E+06	1.962E+08	1.812E+00	1.556E+03	1.994E+00	2.390E+01	6.667E+03	2.629E+01
2039	227,273	250,000	3,409,091	3,750,000	1.473E+04	1.179E+07	4.165E+08	3.934E+03	5.896E+06	2.082E+08	1.923E+00	1.651E+03	2.116E+00	2.536E+01	7.076E+03	2.790E+01
2040	227,273	250,000	3,636,364	4,000,000	1.556E+04	1.246E+07	4.400E+08	4.156E+03	6.230E+06	2.200E+08	2.032E+00	1.744E+03	2.236E+00	2.680E+01	7.476E+03	2.948E+01
2041	227,273	250,000	3,863,636	4,250,000	1.638E+04	1.311E+07	4.631E+08	4.375E+03	6.557E+06	2.316E+08	2.139E+00	1.836E+03	2.353E+00	2.820E+01	7.869E+03	3.103E+01
2042	227,273	250,000	4,090,909	4,500,000	1.718E+04	1.376E+07	4.858E+08	4.589E+03	6.878E+06	2.429E+08	2.244E+00	1.926E+03	2.468E+00	2.958E+01	8.253E+03	3.254E+01
2043	227,273	250,000	4,318,182	4,750,000	1.796E+04	1.438E+07	5.080E+08	4.798E+03	7.192E+06	2.540E+08	2.346E+00	2.014E+03	2.581E+00	3.094E+01	8.631E+03	3.403E+01
2044	227,273	250,000	4,545,455	5,000,000	1.873E+04	1.500E+07	5.297E+08	5.004E+03	7.500E+06	2.649E+08	2.447E+00	2.100E+03	2.691E+00	3.226E+01	9.000E+03	3.549E+01
2045	227,273	250,000	4,772,727	5,250,000	1.949E+04	1.560E+07	5.511E+08	5.205E+03	7.802E+06	2.755E+08	2.545E+00	2.185E+03	2.800E+00	3.356E+01	9.363E+03	3.692E+01
2046	227,273	250,000	5,000,000	5,500,000	2.023E+04	1.620E+07	5.720E+08	5.403E+03	8.098E+06	2.860E+08	2.642E+00	2.267E+03	2.906E+00	3.483E+01	9.718E+03	3.832E+01
2047	227,273	250,000	5,227,273	5,750,000	2.095E+04	1.678E+07	5.925E+08	5.596E+03	8.388E+06	2.962E+08	2.736E+00	2.349E+03	3.010E+00	3.608E+01	1.007E+04	3.969E+01
2048	227,273	250,000	5,454,545	6,000,000	2.166E+04	1.735E+07	6.126E+08	5.786E+03	8.673E+06	3.063E+08	2.829E+00	2.428E+03	3.112E+00	3.730E+01	1.041E+04	4.103E+01
2049	227,273	250,000	5,681,818	6,250,000	2.236E+04	1.790E+07	6.322E+08	5.972E+03	8.951E+06	3.161E+08	2.920E+00	2.506E+03	3.212E+00	3.850E+01	1.074E+04	4.235E+01
2050	227,273	250,000	5,909,091	6,500,000	2.304E+04	1.845E+07	6.515E+08	6.154E+03	9.225E+06	3.258E+08	3.009E+00	2.583E+03	3.310E+00	3.968E+01	1.107E+04	4.365E+01
2051	227,273	250,000	6,136,364	6,750,000	2.371E+04	1.898E+07	6.705E+08	6.333E+03	9.492E+06	3.352E+08	3.096E+00	2.658E+03	3.406E+00	4.083E+01	1.139E+04	4.491E+01
2052	227,273	250,000	6,363,636	7,000,000	2.436E+04	1.951E+07	6.890E+08	6.508E+03	9.755E+06	3.445E+08	3.182E+00	2.731E+03	3.500E+00	4.196E+01	1.171E+04	4.616E+01
2053	227,273	250,000	6,590,909	7,250,000	2.501E+04	2.002E+07	7.072E+08	6.680E+03	1.001E+07	3.536E+08	3.266E+00	2.803E+03	3.593E+00	4.307E+01	1.201E+04	4.737E+01
2054	0	0	6,818,182	7,500,000	2.564E+04	2.053E+07	7.250E+08	6.848E+03	1.026E+07	3.625E+08	3.348E+00	2.874E+03	3.683E+00	4.415E+01	1.232E+04	4.857E+01
2055	0	0	6,818,182	7,500,000	2.513E+04	2.012E+07	7.106E+08	6.712E+03	1.006E+07	3.553E+08	3.282E+00	2.817E+03	3.610E+00	4.328E+01	1.207E+04	4.760E+01
2056	0	0	6,818,182	7,500,000	2.463E+04	1.972E+07	6.966E+08	6.579E+03	9.862E+06	3.483E+08	3.217E+00	2.761E+03	3.539E+00	4.242E+01	1.183E+04	4.666E+01
2057	0	0	6,818,182	7,500,000	2.414E+04	1.933E+07	6.828E+08	6.449E+03	9.667E+06	3.414E+08	3.153E+00	2.707E+03	3.469E+00	4.158E+01	1.160E+04	4.574E+01
2058	0	0	6,818,182	7,500,000	2.367E+04	1.895E+07	6.692E+08	6.321E+03	9.475E+06	3.346E+08	3.091E+00	2.653E+03	3.400E+00	4.076E+01	1.137E+04	4.483E+01
2059	0	0	6,818,182	7,500,000	2.320E+04	1.858E+07	6.560E+08	6.196E+03	9.288E+06	3.280E+08	3.030E+00	2.601E+03	3.333E+00	3.995E+01	1.115E+04	4.394E+01
2060	0	0	6,818,182	7,500,000	2.274E+04	1.821E+07	6.430E+08	6.074E+03	9.104E+06	3.215E+08	2.970E+00	2.549E+03	3.267E+00	3.916E+01	1.092E+04	4.307E+01
2061	0	0	6,818,182	7,500,000	2.229E+04	1.785E+07	6.303E+08	5.953E+03	8.924E+06	3.151E+08	2.911E+00	2.499E+03	3.202E+00	3.838E+01	1.071E+04	4.222E+01
2062	0	0	6,818,182	7,500,000	2.185E+04	1.749E+07	6.178E+08	5.835E+03	8.747E+06	3.089E+08	2.853E+00	2.449E+03	3.139E+00	3.762E+01	1.050E+04	4.139E+01
2063	0	0	6,818,182	7,500,000	2.141E+04	1.715E+07	6.056E+08	5.720E+03	8.574E+06	3.028E+08	2.797E+00	2.401E+03	3.076E+00	3.688E+01	1.029E+04	4.057E+01
2064	0	0	6,818,182	7,500,000	2.099E+04	1.681E+07	5.936E+08	5.607E+03	8.404E+06	2.968E+08	2.741E+00	2.353E+03	3.016E+00	3.615E+01	1.008E+04	3.976E+01
2065	0	0	6,818,182	7,500,000	2.057E+04	1.647E+07	5.818E+08	5.496E+03	8.237E+06	2.909E+08	2.687E+00	2.306E+03	2.956E+00	3.543E+01	9.885E+03	3.898E+01
2066	0	0	6,818,182	7,500,000	2.017E+04	1.615E+07	5.703E+08	5.387E+03	8.074E+06	2.851E+08	2.634E+00	2.261E+03	2.897E+00	3.473E+01	9.689E+03	3.820E+01
2067	0	0	6,818,182	7,500,000	1.977E+04	1.583E+07	5.590E+08	5.280E+03	7.914E+06	2.795E+08	2.582E+00	2.216E+03	2.840E+00	3.404E+01	9.497E+03	3.745E+01
2068	0	0	6,818,182	7,500,000	1.938E+04	1.552E+07	5.479E+08	5.176E+03	7.758E+06	2.740E+08	2.531E+00	2.172E+03	2.784E+00	3.337E+01	9.309E+03	3.671E+01
2069	0	0	6,818,182	7,500,000	1.899E+04	1.521E+07	5.371E+08	5.073E+03	7.604E+06	2.685E+08	2.481E+00	2.129E+03	2.729E+00	3.271E+01	9.125E+03	3.598E+01
2070	0	0	6,818,182	7,500,000	1.862E+04	1.491E+07	5.264E+08	4.973E+03	7.454E+06	2.632E+08	2.431E+00	2.087E+03	2.675E+00	3.206E+01	8.944E+03	3.527E+01
2071	0	0	6,818,182	7,500,000	1.825E+04	1.461E+07	5.160E+08	4.874E+03	7.306E+06	2.580E+08	2.383E+00	2.046E+03	2.622E+00	3.143E+01	8.767E+03	3.457E+01
2072	0	0	6,818,182	7,500,000	1.789E+04	1.432E+07	5.058E+08	4.778E+03	7.161E+06	2.529E+08	2.336E+00	2.005E+03	2.570E+00	3.080E+01	8.594E+03	3.388E+01
2073	0	0	6,818,182	7,500,000	1.753E+04	1.404E+07	4.958E+08	4.683E+03	7.020E+06	2.479E+08	2.290E+00	1.965E+03	2.519E+00	3.019E+01	8.423E+03	3.321E+01
2074	0	0	6,818,182	7,500,000	1.719E+04	1.376E+07	4.860E+08	4.590E+03	6.881E+06	2.430E+08	2.244E+00	1.927E+03	2.469E+00	2.960E+01	8.257E+03	3.256E+01
2075	0	0	6,818,182	7,500,000	1.684E+04	1.349E+07	4.763E+08	4.499E+03	6.744E+06	2.382E+08	2.200E+00	1.888E+03	2.420E+00	2.901E+01	8.093E+03	3.191E+01
2076	0	0	6,818,182	7,500,000	1.651E+04	1.322E+07	4.669E+08	4.410E+03	6.611E+06	2.335E+08	2.156E+00	1.851E+03	2.372E+00	2.844E+01	7.933E+03	3.128E+01
2077	0	0	6,818,182	7,500,000	1.618E+04	1.296E+07	4.577E+08	4.323E+03	6.480E+06	2.288E+08	2.114E+00	1.814E+03	2.325E+00	2.787E+01	7.776E+03	3.066E+01
2078	0	0	6,818,182	7,500,000	1.586E+04	1.270E+07	4.486E+08	4.237E+03	6.352E+06	2.243E+08	2.072E+00	1.778E+03	2.279E+00	2.732E+01	7.622E+03	3.005E+01
2079	0	0	6,818,182	7,500,000	1.555E+04	1.245E+07	4.397E+08	4.154E+03	6.226E+06	2.199E+08	2.031E+00	1.743E+03	2.234E+00	2.678E+01	7.471E+03	2.946E+01
2080	0	0	6,818,182	7,500,000	1.524E+04	1.220E+07	4.310E+08	4.071E+03	6.102E+06	2.155E+08	1.991E+00	1.709E+03	2.190E+00	2.625E+01	7.323E+03	2.887E+01
2081	0	0	6,818,182	7,500,000	1.494E+04	1.196E+07	4.225E+08	3.991E+03	5.982E+06	2.112E+08	1.951E+00	1.675E+03	2.146E+00	2.573E+01	7.178E+03	2.830E+01
2082	0	0	6,818,182	7,500,000	1.464E+04	1.173E+07	4.141E+08	3.912E+03	5.863E+06	2.071E+08	1.913E+00	1.642E+03	2.104E+00	2.522E+01	7.036E+03	2.774E+01
2083	0	0	6,818,182	7,500,000	1.435E+04	1.149E+07	4.059E+08	3.834E+03	5.747E+06	2.030E+08	1.875E+00	1.609E+03	2.062E+00	2.472E+01	6.897E+03	2.719E+01
2084	0	0	6,818,182	7,500,000	1.407E+04	1.127E+07	3.979E+08	3.758E+03	5.633E+06	1.989E+08	1.838E+00	1.577E+03	2.021E+00	2.423E+01	6.760E+03	2.665E+01
2085	0	0	6,818,182	7,500,000	1.379E+04	1.104E+07	3.900E+08	3.684E+03	5.522E+06	1.950E+08	1.801E+00	1.546E+03	1.981E+00	2.375E+01	6.626E+03	2.613E+01
2086	0	0	6,818,182	7,500,000	1.352E+04	1.082E+07	3.823E+08	3.611E+03	5.412E+06	1.911E+08	1.766E+00	1.515E+03	1.942E+00	2.328E+01	6.495E+03	2.561E+01
2087	0	0	6,818,182	7,500,000	1.325E+04	1.061E+07	3.747E+08	3.539E+03	5.305E+06	1.874E+08	1.731E+00	1.485E+03	1.904E+00	2.282E+01	6.366E+03	2.510E+01
2088	0	0	6,818,182	7,500,000	1.299E+04	1.040E+07	3.673E+08	3.469E+03	5.200E+06	1.836E+08	1.696E+00	1.456E+03	1.866E+00	2.237E+01	6.240E+03	2.460E+01
2089	0	0	6,818,182	7,500,000	1.273E+04	1.019E+07	3.600E+08	3.401E+03	5.097E+06	1.800E+08	1.663E+00	1.427E+03	1.829E+00	2.192E+01	6.117E+03	2.412E+01
2090	0	0	6,818,182	7,500,000	1.248E+04	9.993E+06	3.529E+08	3.333E+03	4.996E+06	1.764E+08	1.630E+00	1.399E+03	1.793E+00	2.149E+01	5.996E+03	2.364E+01
2091	0	0	6,818,182	7,500,000	1.223E+04	9.795E+06	3.459E+08	3.267E+03	4.897E+06	1.730E+08	1.598E+00	1.371E+03	1.757E+00	2.107E+01	5.877E+03	2.317E+01
2092	0	0	6,818,182	7,500,000	1.199E+04	9.601E+06	3.391E+08	3.203E+03	4.800E+06	1.695E+08	1.566E+00	1.344E+03	1.722E+00	2.065E+01	5.760E+03	2.271E+01
2093	0	0	6,818,182	7,500,000	1.175E+04	9.411E+06	3.323E+08	3.139E+03	4.705E+06	1.662E+08	1.535E+00	1.317E+03	1.688E+00	2.024E+01	5.646E+03	2.226E+01
2094	0	0	6,818,182	7,500,000	1.152E+04	9.224E+06	3.258E+08	3.077E+03	4.612E+06	1.629E+08	1.505E+00	1.291E+03	1.655E+00	1.984E+01	5.535E+03	2.182E+01
2095	0	0	6,818,182	7,500,000	1.129E+04	9.042E+06	3.193E+08	3.016E+03	4.521E+06	1.597E+08	1.475E+00	1.266E+03	1.622E+00	1.945E+01	5.425E+03	2.139E+01
2096	0	0	6,818,182	7,500,000	1.107E+04	8.863E+06	3.130E+08	2.956E+03	4.431E+06	1.565E+08	1.446E+00	1.241E+03	1.590E+00	1.906E+01	5.318E+03	2.097E+01
2097	0	0	6,818,182	7,500,000	1.085E+04	8.687E+06	3.068E+08	2.898E+03	4.344E+06	1.534E+08	1.417E+00	1.216E+03	1.559E+00	1.868E+01	5.212E+03	2.055E+01
2098	0	0	6,818,182	7,500,000	1.063E+04	8.515E+06	3.007E+08	2.840E+03	4.258E+06	1.504E+08	1.389E+00	1.192E+03	1.528E+00	1.831E+01	5.109E+03	2.014E+01
2099	0	0	6,818,182	7,500,000	1.042E+04	8.347E+06	2.948E+08	2.784E+03	4.173E+06	1.474E+08	1.361E+00	1.169E+03	1.497E+00	1.795E+01	5.008E+03	1.975E+01
2100	0	0	6,818,182	7,500,000	1.022E+04	8.181E+06	2.889E+08	2.729E+03	4.091E+06	1.445E+08	1.334E+00	1.145E+03	1.468E+00	1.760E+01	4.909E+03	1.935E+01
2101	0	0	6,818,182	7,500,000	1.001E+04	8.019E+06	2.832E+08	2.675E+03	4.010E+06	1.416E+08	1.308E+00	1.123E+03	1.439E+00	1.725E+01	4.812E+03	1.897E+01
2102	0	0	6,818,182	7,500,000	9.816E+03	7.860E+06	2.776E+08	2.622E+03	3.930E+06	1.388E+08	1.282E+00	1.100E+03	1.410E+00	1.691E+01	4.716E+03	1.860E+01
2103	0	0	6,818,182	7,500,000	9.622E+03	7.705E+06	2.721E+08	2.570E+03	3.852E+06	1.360E+08	1.257E+00	1.079E+03	1.382E+00	1.657E+01	4.623E+03	1.823E+01
2104	0	0	6,818,182	7,500,000	9.431E+03	7.552E+06	2.667E+08	2.519E+03	3.776E+06	1.334E+08	1.232E+00	1.057E+03	1.355E+00	1.624E+01	4.531E+03	1.787E+01

Washington Department of Ecology
Environmental Impacts of Waste Disposal
LandGem Results for CAP and OPOC Emissions Calculations

RESULTS

Landfill Name or Identifier: Roosevelt, Finley Buttes, Wenatchee

Closure Year (with 80-year limit) = 2053
Methane = 50 *% by volume*

Please choose a third unit of measure to represent all of the emission rates below.
User-specified Unit: ft^3/year

Year	Waste Accepted		Waste-In-Place		Total landfill gas			Methane			Carbon monoxide			NMOC		
	(Mg/year)	*(short tons/year)*	*(Mg)*	*(short tons)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(ft^3/year)*	*(Mg/year)*	*(m^3/year)*	*(short tons/year)*	*(Mg/year)*	*(m^3/year)*	*(short tons/year)*
2105	0	0	6,818,182	7,500,000	9.245E+03	7.403E+06	2.614E+08	2.469E+03	3.701E+06	1.307E+08	1.207E+00	1.036E+03	1.328E+00	1.592E+01	4.442E+03	1.751E+01
2106	0	0	6,818,182	7,500,000	9.062E+03	7.256E+06	2.562E+08	2.420E+03	3.628E+06	1.281E+08	1.183E+00	1.016E+03	1.302E+00	1.561E+01	4.354E+03	1.717E+01
2107	0	0	6,818,182	7,500,000	8.882E+03	7.112E+06	2.512E+08	2.373E+03	3.556E+06	1.256E+08	1.160E+00	9.957E+02	1.276E+00	1.530E+01	4.267E+03	1.683E+01
2108	0	0	6,818,182	7,500,000	8.706E+03	6.972E+06	2.462E+08	2.326E+03	3.486E+06	1.231E+08	1.137E+00	9.760E+02	1.251E+00	1.499E+01	4.183E+03	1.649E+01
2109	0	0	6,818,182	7,500,000	8.534E+03	6.834E+06	2.413E+08	2.279E+03	3.417E+06	1.207E+08	1.115E+00	9.567E+02	1.226E+00	1.470E+01	4.100E+03	1.617E+01
2110	0	0	6,818,182	7,500,000	8.365E+03	6.698E+06	2.365E+08	2.234E+03	3.349E+06	1.183E+08	1.092E+00	9.378E+02	1.202E+00	1.441E+01	4.019E+03	1.585E+01
2111	0	0	6,818,182	7,500,000	8.199E+03	6.566E+06	2.319E+08	2.190E+03	3.283E+06	1.159E+08	1.071E+00	9.192E+02	1.178E+00	1.412E+01	3.939E+03	1.553E+01
2112	0	0	6,818,182	7,500,000	8.037E+03	6.436E+06	2.273E+08	2.147E+03	3.218E+06	1.136E+08	1.050E+00	9.010E+02	1.155E+00	1.384E+01	3.861E+03	1.522E+01
2113	0	0	6,818,182	7,500,000	7.878E+03	6.308E+06	2.228E+08	2.104E+03	3.154E+06	1.114E+08	1.029E+00	8.831E+02	1.132E+00	1.357E+01	3.785E+03	1.492E+01
2114	0	0	6,818,182	7,500,000	7.722E+03	6.183E+06	2.184E+08	2.063E+03	3.092E+06	1.092E+08	1.008E+00	8.657E+02	1.109E+00	1.330E+01	3.710E+03	1.463E+01
2115	0	0	6,818,182	7,500,000	7.569E+03	6.061E+06	2.140E+08	2.022E+03	3.030E+06	1.070E+08	9.885E-01	8.485E+02	1.087E+00	1.303E+01	3.636E+03	1.434E+01
2116	0	0	6,818,182	7,500,000	7.419E+03	5.941E+06	2.098E+08	1.982E+03	2.970E+06	1.049E+08	9.690E-01	8.317E+02	1.066E+00	1.278E+01	3.564E+03	1.405E+01
2117	0	0	6,818,182	7,500,000	7.272E+03	5.823E+06	2.056E+08	1.942E+03	2.912E+06	1.028E+08	9.498E-01	8.152E+02	1.045E+00	1.252E+01	3.494E+03	1.378E+01
2118	0	0	6,818,182	7,500,000	7.128E+03	5.708E+06	2.016E+08	1.904E+03	2.854E+06	1.008E+08	9.310E-01	7.991E+02	1.024E+00	1.228E+01	3.425E+03	1.350E+01
2119	0	0	6,818,182	7,500,000	6.987E+03	5.595E+06	1.976E+08	1.866E+03	2.797E+06	9.879E+07	9.125E-01	7.833E+02	1.004E+00	1.203E+01	3.357E+03	1.324E+01
2120	0	0	6,818,182	7,500,000	6.849E+03	5.484E+06	1.937E+08	1.829E+03	2.742E+06	9.683E+07	8.945E-01	7.678E+02	9.839E-01	1.179E+01	3.290E+03	1.297E+01
2121	0	0	6,818,182	7,500,000	6.713E+03	5.375E+06	1.898E+08	1.793E+03	2.688E+06	9.492E+07	8.767E-01	7.526E+02	9.644E-01	1.156E+01	3.225E+03	1.272E+01
2122	0	0	6,818,182	7,500,000	6.580E+03	5.269E+06	1.861E+08	1.758E+03	2.635E+06	9.304E+07	8.594E-01	7.377E+02	9.453E-01	1.133E+01	3.161E+03	1.247E+01
2123	0	0	6,818,182	7,500,000	6.450E+03	5.165E+06	1.824E+08	1.723E+03	2.582E+06	9.120E+07	8.424E-01	7.231E+02	9.266E-01	1.111E+01	3.099E+03	1.222E+01
2124	0	0	6,818,182	7,500,000	6.322E+03	5.062E+06	1.788E+08	1.689E+03	2.531E+06	8.939E+07	8.257E-01	7.087E+02	9.083E-01	1.089E+01	3.037E+03	1.198E+01
2125	0	0	6,818,182	7,500,000	6.197E+03	4.962E+06	1.752E+08	1.655E+03	2.481E+06	8.762E+07	8.093E-01	6.947E+02	8.903E-01	1.067E+01	2.977E+03	1.174E+01
2126	0	0	6,818,182	7,500,000	6.074E+03	4.864E+06	1.718E+08	1.622E+03	2.432E+06	8.588E+07	7.933E-01	6.809E+02	8.726E-01	1.046E+01	2.918E+03	1.151E+01
2127	0	0	6,818,182	7,500,000	5.954E+03	4.768E+06	1.684E+08	1.590E+03	2.384E+06	8.418E+07	7.776E-01	6.675E+02	8.554E-01	1.025E+01	2.861E+03	1.128E+01
2128	0	0	6,818,182	7,500,000	5.836E+03	4.673E+06	1.650E+08	1.559E+03	2.337E+06	8.252E+07	7.622E-01	6.542E+02	8.384E-01	1.005E+01	2.804E+03	1.106E+01
2129	0	0	6,818,182	7,500,000	5.720E+03	4.581E+06	1.618E+08	1.528E+03	2.290E+06	8.088E+07	7.471E-01	6.413E+02	8.218E-01	9.852E+00	2.748E+03	1.084E+01
2130	0	0	6,818,182	7,500,000	5.607E+03	4.490E+06	1.586E+08	1.498E+03	2.245E+06	7.928E+07	7.323E-01	6.286E+02	8.056E-01	9.656E+00	2.694E+03	1.062E+01
2131	0	0	6,818,182	7,500,000	5.496E+03	4.401E+06	1.554E+08	1.468E+03	2.201E+06	7.771E+07	7.178E-01	6.161E+02	7.896E-01	9.465E+00	2.641E+03	1.041E+01
2132	0	0	6,818,182	7,500,000	5.387E+03	4.314E+06	1.523E+08	1.439E+03	2.157E+06	7.617E+07	7.036E-01	6.039E+02	7.740E-01	9.278E+00	2.588E+03	1.021E+01
2133	0	0	6,818,182	7,500,000	5.281E+03	4.228E+06	1.493E+08	1.411E+03	2.114E+06	7.466E+07	6.897E-01	5.920E+02	7.586E-01	9.094E+00	2.537E+03	1.000E+01
2134	0	0	6,818,182	7,500,000	5.176E+03	4.145E+06	1.464E+08	1.383E+03	2.072E+06	7.319E+07	6.760E-01	5.803E+02	7.436E-01	8.914E+00	2.487E+03	9.805E+00
2135	0	0	6,818,182	7,500,000	5.074E+03	4.063E+06	1.435E+08	1.355E+03	2.031E+06	7.174E+07	6.626E-01	5.688E+02	7.289E-01	8.738E+00	2.438E+03	9.611E+00
2136	0	0	6,818,182	7,500,000	4.973E+03	3.982E+06	1.406E+08	1.328E+03	1.991E+06	7.032E+07	6.495E-01	5.575E+02	7.145E-01	8.565E+00	2.389E+03	9.421E+00
2137	0	0	6,818,182	7,500,000	4.875E+03	3.903E+06	1.378E+08	1.302E+03	1.952E+06	6.892E+07	6.366E-01	5.465E+02	7.003E-01	8.395E+00	2.342E+03	9.234E+00
2138	0	0	6,818,182	7,500,000	4.778E+03	3.826E+06	1.351E+08	1.276E+03	1.913E+06	6.756E+07	6.240E-01	5.357E+02	6.864E-01	8.229E+00	2.296E+03	9.052E+00
2139	0	0	6,818,182	7,500,000	4.683E+03	3.750E+06	1.324E+08	1.251E+03	1.875E+06	6.622E+07	6.117E-01	5.250E+02	6.729E-01	8.066E+00	2.250E+03	8.872E+00
2140	0	0	6,818,182	7,500,000	4.591E+03	3.676E+06	1.298E+08	1.226E+03	1.838E+06	6.491E+07	5.996E-01	5.146E+02	6.595E-01	7.906E+00	2.206E+03	8.697E+00
2141	0	0	6,818,182	7,500,000	4.500E+03	3.603E+06	1.272E+08	1.202E+03	1.802E+06	6.362E+07	5.877E-01	5.045E+02	6.465E-01	7.749E+00	2.162E+03	8.524E+00
2142	0	0	6,818,182	7,500,000	4.411E+03	3.532E+06	1.247E+08	1.178E+03	1.766E+06	6.236E+07	5.761E-01	4.945E+02	6.337E-01	7.596E+00	2.119E+03	8.356E+00
2143	0	0	6,818,182	7,500,000	4.323E+03	3.462E+06	1.223E+08	1.155E+03	1.731E+06	6.113E+07	5.647E-01	4.847E+02	6.211E-01	7.446E+00	2.077E+03	8.190E+00
2144	0	0	6,818,182	7,500,000	4.238E+03	3.393E+06	1.198E+08	1.132E+03	1.697E+06	5.992E+07	5.535E-01	4.751E+02	6.088E-01	7.298E+00	2.036E+03	8.028E+00
2145	0	0	6,818,182	7,500,000	4.154E+03	3.326E+06	1.175E+08	1.110E+03	1.663E+06	5.873E+07	5.425E-01	4.657E+02	5.968E-01	7.154E+00	1.996E+03	7.869E+00
2146	0	0	6,818,182	7,500,000	4.072E+03	3.260E+06	1.151E+08	1.088E+03	1.630E+06	5.757E+07	5.318E-01	4.565E+02	5.850E-01	7.012E+00	1.956E+03	7.713E+00
2147	0	0	6,818,182	7,500,000	3.991E+03	3.196E+06	1.129E+08	1.066E+03	1.598E+06	5.643E+07	5.212E-01	4.474E+02	5.734E-01	6.873E+00	1.917E+03	7.560E+00
2148	0	0	6,818,182	7,500,000	3.912E+03	3.133E+06	1.106E+08	1.045E+03	1.566E+06	5.531E+07	5.109E-01	4.386E+02	5.620E-01	6.737E+00	1.880E+03	7.411E+00
2149	0	0	6,818,182	7,500,000	3.835E+03	3.071E+06	1.084E+08	1.024E+03	1.535E+06	5.422E+07	5.008E-01	4.299E+02	5.509E-01	6.604E+00	1.842E+03	7.264E+00
2150	0	0	6,818,182	7,500,000	3.759E+03	3.010E+06	1.063E+08	1.004E+03	1.505E+06	5.314E+07	4.909E-01	4.214E+02	5.400E-01	6.473E+00	1.806E+03	7.120E+00
2151	0	0	6,818,182	7,500,000	3.684E+03	2.950E+06	1.042E+08	9.841E+02	1.475E+06	5.209E+07	4.812E-01	4.130E+02	5.293E-01	6.345E+00	1.770E+03	6.979E+00
2152	0	0	6,818,182	7,500,000	3.611E+03	2.892E+06	1.021E+08	9.646E+02	1.446E+06	5.106E+07	4.716E-01	4.048E+02	5.188E-01	6.219E+00	1.735E+03	6.841E+00
2153	0	0	6,818,182	7,500,000	3.540E+03	2.834E+06	1.001E+08	9.455E+02	1.417E+06	5.005E+07	4.623E-01	3.968E+02	5.085E-01	6.096E+00	1.701E+03	6.706E+00
2154	0	0	6,818,182	7,500,000	3.470E+03	2.778E+06	9.812E+07	9.268E+02	1.389E+06	4.906E+07	4.531E-01	3.890E+02	4.985E-01	5.975E+00	1.667E+03	6.573E+00
2155	0	0	6,818,182	7,500,000	3.401E+03	2.723E+06	9.617E+07	9.084E+02	1.362E+06	4.809E+07	4.442E-01	3.813E+02	4.886E-01	5.857E+00	1.634E+03	6.443E+00
2156	0	0	6,818,182	7,500,000	3.334E+03	2.669E+06	9.427E+07	8.904E+02	1.335E+06	4.713E+07	4.354E-01	3.737E+02	4.789E-01	5.741E+00	1.602E+03	6.315E+00
2157	0	0	6,818,182	7,500,000	3.268E+03	2.617E+06	9.240E+07	8.728E+02	1.308E+06	4.620E+07	4.268E-01	3.663E+02	4.694E-01	5.627E+00	1.570E+03	6.190E+00
2158	0	0	6,818,182	7,500,000	3.203E+03	2.565E+06	9.057E+07	8.555E+02	1.282E+06	4.529E+07	4.183E-01	3.591E+02	4.601E-01	5.516E+00	1.539E+03	6.067E+00
2159	0	0	6,818,182	7,500,000	3.139E+03	2.514E+06	8.878E+07	8.386E+02	1.257E+06	4.439E+07	4.100E-01	3.519E+02	4.510E-01	5.407E+00	1.508E+03	5.947E+00
2160	0	0	6,818,182	7,500,000	3.077E+03	2.464E+06	8.702E+07	8.220E+02	1.232E+06	4.351E+07	4.019E-01	3.450E+02	4.421E-01	5.300E+00	1.478E+03	5.830E+00
2161	0	0	6,818,182	7,500,000	3.016E+03	2.415E+06	8.530E+07	8.057E+02	1.208E+06	4.265E+07	3.939E-01	3.381E+02	4.333E-01	5.195E+00	1.449E+03	5.714E+00
2162	0	0	6,818,182	7,500,000	2.957E+03	2.368E+06	8.361E+07	7.897E+02	1.184E+06	4.180E+07	3.861E-01	3.315E+02	4.248E-01	5.092E+00	1.421E+03	5.601E+00
2163	0	0	6,818,182	7,500,000	2.898E+03	2.321E+06	8.195E+07	7.741E+02	1.160E+06	4.098E+07	3.785E-01	3.249E+02	4.164E-01	4.991E+00	1.392E+03	5.490E+00
2164	0	0	6,818,182	7,500,000	2.841E+03	2.275E+06	8.033E+07	7.588E+02	1.137E+06	4.017E+07	3.710E-01	3.185E+02	4.081E-01	4.892E+00	1.365E+03	5.381E+00

Appendix A.3 Waste Hauling

Table of Contents

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Total Hauling Emissions Summary

GHG Emissions based on 20-Year Global Warming Potential

Hauling Material Type	Destination			
	Spokane Waste-to-Energy Facility - Hauling Emissions (metric tons CO2e)	Roosevelt Regional Landfill - Hauling Emissions (metric tons CO2e)	Total Finley Buttes Landfill - Hauling Emissions (metric tons CO2e)	Total Greater Wenatchee Regional Landfill - Hauling Emissions (metric tons CO2e)
Waste	6,017.21	51,684.87	253,573.14	208,786.80
Ash	11,947.00	N/A	N/A	N/A
Total	17,964.22	51,684.87	253,573.14	208,786.80

GHG Emissions based on 100-Year Global Warming Potential

Hauling Material Type	Destination			
	Spokane Waste-to-Energy Facility - Hauling Emissions (metric tons CO2e)	Roosevelt Regional Landfill - Hauling Emissions (metric tons CO2e)	Total Finley Buttes Landfill - Hauling Emissions (metric tons CO2e)	Total Greater Wenatchee Regional Landfill - Hauling Emissions (metric tons CO2e)
Waste	6,013.30	51,529.61	253,408.12	208,650.92
Ash	11,910.52	N/A	N/A	N/A
Total	17,923.82	51,529.61	253,408.12	208,650.92

CAP Emissions Annual Average

Hauling Material Type	Destination			
	Spokane Waste-to-Energy Facility - Hauling CAPs (short tons/year)	Roosevelt Regional Landfill - Hauling CAPs (short tons/year)	Total Finley Buttes Landfill - Hauling CAPs (short tons/year)	Total Greater Wenatchee Regional Landfill - Hauling CAPs (short tons/year)
CO	1.22	4.05	11.77	9.69
NOx	4.98	18.86	23.38	19.25
SO2	4.01E-03	0.01	0.03	0.03
PM10	0.16	0.58	1.02	0.84
PM2.5	0.14	0.53	0.47	0.38
VOC	0.23	0.86	1.04	0.86

Other Pollutants of Concern Emissions Annual Average

Hauling Material Type	Destination			
	Spokane Waste-to-Energy Facility - Hauling Other Pollutants of Concern (short tons/year)	Roosevelt Regional Landfill - Hauling Other Pollutants of Concern (short tons/year)	Total Finley Buttes Landfill - Hauling Other Pollutants of Concern (short tons/year)	Total Greater Wenatchee Regional Landfill - Hauling Other Pollutants of Concern (short tons/year)
NH3	0.01	0.01	0.19	0.16
Hg	8.66E-09	3.06E-08	6.29E-08	5.18E-08
Dioxins/Furans	2.23E-11	8.77E-11	6.84E-11	5.63E-11

Note: Dioxin/furans are expressed as a sum of each constituent and not as toxicity equivalents (TEQ).

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Hauling Route VMTs

Type	Name	Address
Waste to Energy	Spokane WTEF	2900 S Geiger Blvd, Spokane, WA 99224
Landfill	Republic Services Roosevelt Regional Landfill	500 Roosevelt Grade Rd, Roosevelt, WA 99356
Landfill	Waste Connection Finley Butte Landfill	73221 Bombing Range Rd, Boardman, OR 97818
Landfill	Waste Management Greater Wenatchee Regional Landfill	191 Webb Road East Wenatchee, WA 98802
Transfer Station	North County Recycling & Transfer Station	22123 N. Elk-Chattaroy Road Colbert, WA 99005
Transfer Station	Valley Recycling & Transfer Station	3941 N Sullivan Rd Spokane Valley, WA 99216
Rail Spur	BNSF Rail Spur	1800 N Dickey Rd, Spokane Valley, WA 99212

Potential Routes	Miles
North County to WTEF	22.1
Valley to WTEF	17.7
WTEF to BNSF Railspur	12.4
North County to BNSF Railspur	17.6
Valley to BNSF Railspur	6.7
BNSF Railspur to Roosevelt	227
WTEF to Finley Buttes	193
North County to Finley Buttes	214
Valley to Finley Buttes	209
WTEF to Wenatchee	158
North County to Wenatchee	179
Valley to Wenatchee	175

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Waste Hauling Emissions

Annual Waste Information

Transfer Station Contribution	2022 Statistics		Waste Contribution %
Self Haulers	189,682	tons/year	76%
North County	23,411	tons/year	9%
Valley	36,907	tons/year	15%
Total	250,000	tons/year	100%
Lifespan	30	Years	

Vehicle Information

Waste Hauling Vehicle	Kenworth T880	
MOVES Vehicle Equivalent	Combination Long-haul Truck	
Fuel Type	Diesel	
Truck Load Size	19	tons/truck
Total Annual Waste	250,000	tons/year

Emission Rate Year for Select Metals and Dioxins/Furans: 2010 and later

Rail Information

Rail type (Line-haul/Switch)	Line-Haul	
Railroad Transport	Tier 1+	
BNSF Fuel Efficiency	500	ton-miles/gallon

https://www.bnsf.com/ship-with-bnsf/sustainability-customers/pdf/orange-is-new-green-cp.pdf

Railroad Factor 0.5

Note: A factor of 0.5 is applied to the waste to account for the average load of the round trip which is assumed to have 250,000 tons on the way there and 0 tons on the way back.

Unit Conversion

1 metric ton (MT) =	1,000,000	grams
1 metric ton (MT) =	1,000	kilograms
1 metric ton (MT) =	1,000,000,000	milligram
1 metric ton (MT) =	1.102	short tons

Global Warming Potentials to Convert to CO2e

	CO2	CH4	N2O
Global Warming Potential - 20-year time horizon	1	81.2	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Global Warming Potentials to Convert to CO2e

	CO2	CH4	N2O
Global Warming Potential - 100-year time horizon	1	27.9	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Hauling Waste GHG Emission Calculations

Scenario 1 - WTEF	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	CO2 Emission Factor (grams/VMT)	CH4 Emission Factor (grams/VMT)	N2O Emission Factor (grams/VMT)
Truck Emissions	North County	WTEF	9%	22.1	44.2	1,232	4	1,626	0.0199	0.00198
	Valley	WTEF	15%	17.7	35.4	1,942	6	1,626	0.0199	0.00198

Scenario 2 - Roosevelt Regional	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	CO2 Emission Factor (grams/VMT)	CH4 Emission Factor (grams/VMT)	N2O Emission Factor (grams/VMT)
Truck Emissions	WTEF	BNSF Railspur	76%	12.4	24.8	9,983	28	1,626	0.0199	0.00198
	North County	BNSF Railspur	9%	17.6	35.2	1,232	4	1,626	0.0199	0.00198
	Valley	BNSF Railspur	15%	6.7	13.4	1,942	6	1,626	0.0199	0.00198

	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	CO2 Emission Factor (kg/ton-mile)	CH4 Emission Factor (g/ton-mile)	N2O Emission Factor (g/ton-mile)
Rail Emissions	BNSF Railspur	Roosevelt	100%	227	454	N/A	N/A	0.021	0.0016	0.0005

Scenario 3 - Finley Buttes	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	CO2 Emission Factor (grams/VMT)	CH4 Emission Factor (grams/VMT)	N2O Emission Factor (grams/VMT)
Truck Emissions	WTEF	Finley Buttes	76%	193	386	9,983	28	1,626	0.0199	0.00198
	North County	Finley Buttes	9%	214	428	1,232	4	1,626	0.0199	0.00198
	Valley	Finley Buttes	15%	209	418	1,942	6	1,626	0.0199	0.00198

Scenario 4 - Greater Wenatchee	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	CO2 Emission Factor (grams/VMT)	CH4 Emission Factor (grams/VMT)	N2O Emission Factor (grams/VMT)
Truck Emissions	WTEF	Wenatchee	76%	158	316	9,983	28	1,626	0.0199	0.00198
	North County	Wenatchee	9%	179	358	1,232	4	1,626	0.0199	0.00198
	Valley	Wenatchee	15%	175	350	1,942	6	1,626	0.0199	0.00198

Hauling Waste GHG Emission Calculations

Scenario 1 - WTEF	Annual CO2 Emission Rate (Metric tons/year)	Annual CH4 Emission Rate (Metric tons/year)	Annual N2O Emission Rate (Metric tons/year)	Total 30-year emissions of CO2 (Metric tons)	Total 30-year emissions of CH4 (Metric tons)	Total 30-year emissions of N2O (Metric tons)	Annual 20-yr GWP CO2e Emission Rate (Metric tons/year)	Annual 100-yr GWP CO2e Emission Rate (Metric tons/year)
Truck Emissions	88.53	1.08E-03	1.08E-04	2,656	3.25E-02	3.24E-03	2,659	2,658
	111.78	1.37E-03	1.36E-04	3,353	4.10E-02	4.09E-03	3,358	3,356

Scenario 2 - Roosevelt Regional	Annual CO2 Emission Rate (Metric tons/year)	Annual CH4 Emission Rate (Metric tons/year)	Annual N2O Emission Rate (Metric tons/year)	Total 30-year emissions of CO2 (Metric tons)	Total 30-year emissions of CH4 (Metric tons)	Total 30-year emissions of N2O (Metric tons)	Annual 20-yr GWP CO2e Emission Rate (Metric tons/year)	Annual 100-yr GWP CO2e Emission Rate (Metric tons/year)
Truck Emissions	402	4.92E-03	4.91E-04	12,074	1.48E-01	1.47E-02	12,090	12,082
	70.5	8.62E-04	8.59E-05	2,115	2.59E-02	2.58E-03	2,118	2,117
	42.3	5.17E-04	5.16E-05	1,269	1.55E-02	1.55E-03	1,271	1,270

	Annual CO2 Emission Rate (Metric tons/year)	Annual CH4 Emission Rate (Metric tons/year)	Annual N2O Emission Rate (Metric tons/year)	Total 30-year emissions of CO2 (Metric tons)	Total 30-year emissions of CH4 (Metric tons)	Total 30-year emissions of N2O (Metric tons)	Annual 20-yr GWP CO2e Emission Rate (Metric	Annual 100-yr GWP CO2e Emission Rate (Metric tons/year)
Rail Emissions	1,192	0.091	0.028	35,753	2.72	0.85	36,206	36,061

Scenario 3 - Finley Buttes	Annual CO2 Emission Rate (Metric tons/year)	Annual CH4 Emission Rate (Metric tons/year)	Annual N2O Emission Rate (Metric tons/year)	Total 30-year emissions of CO2 (Metric tons)	Total 30-year emissions of CH4 (Metric tons)	Total 30-year emissions of N2O (Metric tons)	Annual 20-yr GWP CO2e Emission Rate (Metric tons/year)	Annual 100-yr GWP CO2e Emission Rate (Metric tons/year)
Truck Emissions	6,264	7.66E-02	7.64E-03	187,924	2.30	0.23	188,173	188,050
	857	1.05E-02	1.04E-03	25,718	0.31	0.03	25,752	25,735
	1,320	1.61E-02	1.61E-03	39,596	0.48	0.05	39,649	39,623

Scenario 4 - Greater Wenatchee	Annual CO2 Emission Rate (Metric tons/year)	Annual CH4 Emission Rate (Metric tons/year)	Annual N2O Emission Rate (Metric tons/year)	Total 30-year emissions of CO2 (Metric tons)	Total 30-year emissions of CH4 (Metric tons)	Total 30-year emissions of N2O (Metric tons)	Annual 20-yr GWP CO2e Emission Rate (Metric tons/year)	Annual 100-yr GWP CO2e Emission Rate (Metric tons/year)
Truck Emissions	5,128	6.27E-02	6.25E-03	153,844	1.88	0.19	154,048	153,948
	717	8.77E-03	8.74E-04	21,512	0.26	0.03	21,540	21,526
	1,105	1.35E-02	1.35E-03	33,155	0.41	0.04	33,199	33,177

Hauling Waste CAP Emission Calculations

Scenario 1 - WTEF	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	VOC Emission Factor (grams/VMT)	NOx Emission Factor (grams/VMT)	CO Emission Factor (grams/VMT)
Truck Emissions	North County	WTEF	9%	22.1	44.2	1,232	4	0.183	4.09	2.06
	Valley	WTEF	15%	17.7	35.4	1,942	6	0.183	4.09	2.06

Scenario 2 - Roosevelt Regional	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	VOC Emission Factor (grams/VMT)	NOx Emission Factor (grams/VMT)	CO Emission Factor (grams/VMT)
Truck Emissions	WTEF	BNSF Railspur	76%	12.4	24.8	9,983	28	0.183	4.09	2.06
	North County	BNSF Railspur	9%	17.6	35.2	1,232	4	0.183	4.09	2.06
	Valley	BNSF Railspur	15%	6.7	13.4	1,942	6	0.183	4.09	2.06

	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	VOC Emission Factor (grams/ton-mile)	NOx Emission Factor (grams/ton-mile)	CO Emission Factor (grams/ton-mile)
Rail Emissions	BNSF Railspur	Roosevelt	100%	227	454	N/A	N/A	0.0127	0.279	0.0532

Scenario 3 - Finley Buttes	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	VOC Emission Factor (grams/VMT)	NOx Emission Factor (grams/VMT)	CO Emission Factor (grams/VMT)
Truck Emissions	WTEF	Finley Buttes	76%	193	386	9,983	28	0.183	4.09	2.06
	North County	Finley Buttes	9%	214	428	1,232	4	0.183	4.09	2.06
	Valley	Finley Buttes	15%	209	418	1,942	6	0.183	4.09	2.06

Scenario 4 - Greater Wenatchee	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	VOC Emission Factor (grams/VMT)	NOx Emission Factor (grams/VMT)	CO Emission Factor (grams/VMT)
Truck Emissions	WTEF	Wenatchee	76%	158	316	9,983	28	0.183	4.09	2.06
	North County	Wenatchee	9%	179	358	1,232	4	0.183	4.09	2.06
	Valley	Wenatchee	15%	175	350	1,942	6	0.183	4.09	2.06

Hauling Waste CAP Emission Calculations

Scenario 1 - WTEF	SO2 Emission Factor (grams/VMT)	Total_PM10 Emission Factor (grams/VMT)	TotalPM_25 Emission Factor (grams/VMT)	Annual VOC Emission Rate (Short tons/year)	Annual NOx Emission Rate (Short tons/year)	Annual CO Emission Rate (Short tons/year)	Annual SO2 Emission Rate (Short tons/year)	Annual Total_PM10 Emission Rate (Short tons/year)	Annual TotalPM_25 Emission Rate (Short tons/year)
Truck Emissions	0.00545	0.178	0.0813	1.10E-02	2.45E-01	1.23E-01	3.27E-04	1.07E-02	4.88E-03
	0.00545	0.178	0.0813	1.38E-02	3.10E-01	1.56E-01	4.13E-04	1.35E-02	6.16E-03

Scenario 2 - Roosevelt Regional	SO2 Emission Factor (grams/VMT)	Total_PM10 Emission Factor (grams/VMT)	TotalPM_25 Emission Factor (grams/VMT)	Annual VOC Emission Rate (Short tons/year)	Annual NOx Emission Rate (Short tons/year)	Annual CO Emission Rate (Short tons/year)	Annual SO2 Emission Rate (Short tons/year)	Annual Total_PM10 Emission Rate (Short tons/year)	Annual TotalPM_25 Emission Rate (Short tons/year)
Truck Emissions	0.00545	0.178	0.0813	4.98E-02	1.11E+00	5.61E-01	1.49E-03	4.85E-02	2.22E-02
	0.00545	0.178	0.0813	8.72E-03	1.95E-01	9.83E-02	2.60E-04	8.49E-03	3.89E-03
	0.00545	0.178	0.0813	5.24E-03	1.17E-01	5.90E-02	1.56E-04	5.10E-03	2.33E-03

	SO2 Emission Factor (grams/ton-mile)	Total_PM10 Emission Factor (grams/ton-mile)	TotalPM_25 Emission Factor (grams/ton-mile)	Annual VOC Emission Rate (Short tons/year)	Annual NOx Emission Rate (Short tons/year)	Annual CO Emission Rate (Short tons/year)	Annual SO2 Emission Rate (Short tons/year)	Annual Total_PM10 Emission Rate (Short tons/year)	Annual TotalPM_25 Emission Rate (Short tons/year)
Rail Emissions	0.000193	0.00832	0.00807	7.94E-01	1.74E+01	3.33E+00	1.21E-02	5.20E-01	5.05E-01

Scenario 3 - Finley Buttes	SO2 Emission Factor (grams/VMT)	Total_PM10 Emission Factor (grams/VMT)	TotalPM_25 Emission Factor (grams/VMT)	Annual VOC Emission Rate (Short tons/year)	Annual NOx Emission Rate (Short tons/year)	Annual CO Emission Rate (Short tons/year)	Annual SO2 Emission Rate (Short tons/year)	Annual Total_PM10 Emission Rate (Short tons/year)	Annual TotalPM_25 Emission Rate (Short tons/year)
Truck Emissions	0.00545	0.178	0.0813	7.75E-01	1.74E+01	8.74E+00	2.31E-02	7.54E-01	3.45E-01
	0.00545	0.178	0.0813	1.06E-01	2.37E+00	1.20E+00	3.17E-03	1.03E-01	4.72E-02
	0.00545	0.178	0.0813	1.63E-01	3.66E+00	1.84E+00	4.87E-03	1.59E-01	7.27E-02

Scenario 4 - Greater Wenatchee	SO2 Emission Factor (grams/VMT)	Total_PM10 Emission Factor (grams/VMT)	TotalPM_25 Emission Factor (grams/VMT)	Annual VOC Emission Rate (Short tons/year)	Annual NOx Emission Rate (Short tons/year)	Annual CO Emission Rate (Short tons/year)	Annual SO2 Emission Rate (Short tons/year)	Annual Total_PM10 Emission Rate (Short tons/year)	Annual TotalPM_25 Emission Rate (Short tons/year)
Truck Emissions	0.00545	0.178	0.0813	6.34E-01	1.42E+01	7.15E+00	1.89E-02	6.18E-01	2.83E-01
	0.00545	0.178	0.0813	8.87E-02	1.99E+00	1.00E+00	2.65E-03	8.64E-02	3.95E-02
	0.00545	0.178	0.0813	1.37E-01	3.06E+00	1.54E+00	4.08E-03	1.33E-01	6.09E-02

Hauling Waste Other Pollutants of Concern Emission Calculations

Scenario 1 - WTEF	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	Ammonia Emission Factor (grams/VMT)	Mercury Emission Factor (grams/VMT)	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Factor (milligrams/VMT)
Truck Emissions	North County	WTEF	9%	22.1	44.2	1,232	4	3.35E-02	1.10E-08	0.00E+00
	Valley	WTEF	15%	17.7	35.4	1,942	6	3.35E-02	1.10E-08	0.00E+00

Scenario 2 - Roosevelt Regional	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	Ammonia Emission Factor (grams/VMT)	Mercury Emission Factor (grams/VMT)	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Factor (milligrams/VMT)
Truck Emissions	WTEF	BNSF Railspur	76%	12.4	24.8	9,983	28	3.35E-02	1.10E-08	0.00E+00
	North County	BNSF Railspur	9%	17.6	35.2	1,232	4	3.35E-02	1.10E-08	0.00E+00
	Valley	BNSF Railspur	15%	6.7	13.4	1,942	6	3.35E-02	1.10E-08	0.00E+00

	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	Ammonia Emission Factor (grams/ton-mile)	Mercury Emission Factor (grams/ton-mile)	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Factor (grams/ton-mile)
Rail Emissions	BNSF Railspur	Roosevelt	100%	227	454	N/A	N/A	N/A	4.28E-10	8.08E-15

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Scenario 3 - Finley Buttes	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	Ammonia Emission Factor (grams/VMT)	Mercury Emission Factor (grams/VMT)	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Factor (milligrams/VMT)
Truck Emissions	WTEF	Finley Buttes	76%	193	386	9,983	28	3.35E-02	1.10E-08	0.00E+00
	North County	Finley Buttes	9%	214	428	1,232	4	3.35E-02	1.10E-08	0.00E+00
	Valley	Finley Buttes	15%	209	418	1,942	6	3.35E-02	1.10E-08	0.00E+00

Scenario 4 - Greater Wenatchee	Origin	Destination	Transfer Station(s) Contribution	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	Ammonia Emission Factor (grams/VMT)	Mercury Emission Factor (grams/VMT)	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Factor (milligrams/VMT)
Truck Emissions	WTEF	Wenatchee	76%	158	316	9,983	28	3.35E-02	1.10E-08	0.00E+00
	North County	Wenatchee	9%	179	358	1,232	4	3.35E-02	1.10E-08	0.00E+00
	Valley	Wenatchee	15%	175	350	1,942	6	3.35E-02	1.10E-08	0.00E+00

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Hauling Waste Other Pollutants of Concern Emission Calculations

Scenario 1 - WTEF	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Octachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	2,3,7,8-Tetrachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)
Truck Emissions	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-09	6.98E-09	5.09E-11	1.07E-10
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-09	6.98E-09	5.09E-11	1.07E-10

Scenario 2 - Roosevelt Regional	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Octachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	2,3,7,8-Tetrachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)
Truck Emissions	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-09	6.98E-09	5.09E-11	1.07E-10
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-09	6.98E-09	5.09E-11	1.07E-10
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-09	6.98E-09	5.09E-11	1.07E-10

	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Factor (grams/ton-mile)	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (grams/ton-mile)	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (grams/ton-mile)	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Factor (grams/ton-mile)	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Factor (grams/ton-mile)	Octachlorodibenzo-p-dioxin Emission Factor (grams/ton-mile)	2,3,7,8-Tetrachlorodibenzofuran Emission Factor (grams/ton-mile)	1,2,3,7,8-Pentachlorodibenzofuran Emission Factor (grams/ton-mile)
Rail Emissions	0.00E+00	0.00E+00	3.76E-15	1.74E-14	1.52E-13	5.86E-13	2.36E-13	5.04E-14

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Scenario 3 - Finley Buttes	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Octachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	2,3,7,8-Tetrachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)
Truck Emissions	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-09	6.98E-09	5.09E-11	1.07E-10
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-09	6.98E-09	5.09E-11	1.07E-10
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-09	6.98E-09	5.09E-11	1.07E-10

Scenario 4 - Greater Wenatchee	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Octachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	2,3,7,8-Tetrachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)
Truck Emissions	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-09	6.98E-09	5.09E-11	1.07E-10
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-09	6.98E-09	5.09E-11	1.07E-10
	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-09	6.98E-09	5.09E-11	1.07E-10

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Hauling Waste Other Pollutants of Concern Emission Calculations

Scenario 1 - WTEF	2,3,4,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,7,8,9-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	2,3,4,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)
Truck Emissions	3.24E-10	2.20E-10	2.43E-10	0.00E+00	1.80E-10	9.94E-10
	3.24E-10	2.20E-10	2.43E-10	0.00E+00	1.80E-10	9.94E-10

Scenario 2 - Roosevelt Regional	2,3,4,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,7,8,9-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	2,3,4,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)
Truck Emissions	3.24E-10	2.20E-10	2.43E-10	0.00E+00	1.80E-10	9.94E-10
	3.24E-10	2.20E-10	2.43E-10	0.00E+00	1.80E-10	9.94E-10
	3.24E-10	2.20E-10	2.43E-10	0.00E+00	1.80E-10	9.94E-10

	2,3,4,7,8-Pentachlorodibenzofuran Emission Factor (grams/ton-mile)	1,2,3,4,7,8-Hexachlorodibenzofuran Emission Factor (grams/ton-mile)	1,2,3,6,7,8-Hexachlorodibenzofuran Emission Factor (grams/ton-mile)	1,2,3,7,8,9-Hexachlorodibenzofuran Emission Factor (grams/ton-mile)	2,3,4,6,7,8-Hexachlorodibenzofuran Emission Factor (grams/ton-mile)	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Factor (grams/ton-mile)
Rail Emissions	8.06E-14	2.92E-14	1.54E-14	1.10E-14	0.00E+00	7.86E-14

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Scenario 3 - Finley Buttes	2,3,4,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,7,8,9-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	2,3,4,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)
Truck Emissions	3.24E-10	2.20E-10	2.43E-10	0.00E+00	1.80E-10	9.94E-10
	3.24E-10	2.20E-10	2.43E-10	0.00E+00	1.80E-10	9.94E-10
	3.24E-10	2.20E-10	2.43E-10	0.00E+00	1.80E-10	9.94E-10

Scenario 4 - Greater Wenatchee	2,3,4,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,7,8,9-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	2,3,4,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)
Truck Emissions	3.24E-10	2.20E-10	2.43E-10	0.00E+00	1.80E-10	9.94E-10
	3.24E-10	2.20E-10	2.43E-10	0.00E+00	1.80E-10	9.94E-10
	3.24E-10	2.20E-10	2.43E-10	0.00E+00	1.80E-10	9.94E-10

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Hauling Waste Other Pollutants of Concern Emission Calculations

Scenario 1 - WTEF	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)	Octachlorodibenzofuran Emission Factor (milligrams/VMT)	Annual Ammonia Emission Rate (Short tons/year)	Annual Mercury Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)
Truck Emissions	5.81E-11	1.74E-09	2.01E-03	6.60E-10	0.00E+00	0.00E+00	0.00E+00
	5.81E-11	1.74E-09	2.54E-03	8.34E-10	0.00E+00	0.00E+00	0.00E+00

Scenario 2 - Roosevelt Regional	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)	Octachlorodibenzofuran Emission Factor (milligrams/VMT)	Annual Ammonia Emission Rate (Short tons/year)	Annual Mercury Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)
Truck Emissions	5.81E-11	1.74E-09	9.14E-03	3.00E-09	0.00E+00	0.00E+00	0.00E+00
	5.81E-11	1.74E-09	1.60E-03	5.26E-10	0.00E+00	0.00E+00	0.00E+00
	5.81E-11	1.74E-09	9.61E-04	3.16E-10	0.00E+00	0.00E+00	0.00E+00

	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Factor (grams/ton-mile)	Octachlorodibenzofuran Emission Factor (grams/ton-mile)	Annual Ammonia Emission Rate (Short tons/year)	Annual Mercury Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)
Rail Emissions	0.00E+00	6.74E-14	N/A	2.68E-08	5.05E-13	0.00E+00	0.00E+00

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Scenario 3 - Finley Buttes	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)	Octachlorodibenzofuran Emission Factor (milligrams/VMT)	Annual Ammonia Emission Rate (Short tons/year)	Annual Mercury Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)
Truck Emissions	5.81E-11	1.74E-09	1.42E-01	4.67E-08	0.00E+00	0.00E+00	0.00E+00
	5.81E-11	1.74E-09	1.95E-02	6.39E-09	0.00E+00	0.00E+00	0.00E+00
	5.81E-11	1.74E-09	3.00E-02	9.84E-09	0.00E+00	0.00E+00	0.00E+00

Scenario 4 - Greater Wenatchee	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)	Octachlorodibenzofuran Emission Factor (milligrams/VMT)	Annual Ammonia Emission Rate (Short tons/year)	Annual Mercury Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)
Truck Emissions	5.81E-11	1.74E-09	1.16E-01	3.82E-08	0.00E+00	0.00E+00	0.00E+00
	5.81E-11	1.74E-09	1.63E-02	5.35E-09	0.00E+00	0.00E+00	0.00E+00
	5.81E-11	1.74E-09	2.51E-02	8.24E-09	0.00E+00	0.00E+00	0.00E+00

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Hauling Waste Other Pollutants of Concern Emission Calculations

Scenario 1 - WTEF	Annual 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual Octachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)	Annual 2,3,4,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)
Truck Emissions	0.00E+00	0.00E+00	6.30E-14	4.19E-13	3.05E-15	6.42E-15	1.94E-14
	0.00E+00	0.00E+00	7.96E-14	5.29E-13	3.86E-15	8.11E-15	2.46E-14

Scenario 2 - Roosevelt Regional	Annual 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual Octachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)	Annual 2,3,4,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)
Truck Emissions	0.00E+00	0.00E+00	2.86E-13	1.90E-12	1.39E-14	2.92E-14	8.84E-14
	0.00E+00	0.00E+00	5.02E-14	3.34E-13	2.43E-15	5.11E-15	1.55E-14
	0.00E+00	0.00E+00	3.01E-14	2.00E-13	1.46E-15	3.07E-15	9.29E-15

	Annual 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual Octachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)	Annual 2,3,4,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)
Rail Emissions	2.35E-13	1.09E-12	9.49E-12	3.66E-11	1.48E-11	3.15E-12	5.04E-12

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Scenario 3 - Finley Buttes	Annual 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual Octachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)	Annual 2,3,4,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)
Truck Emissions	0.00E+00	0.00E+00	4.46E-12	2.96E-11	2.16E-13	4.54E-13	1.38E-12
	0.00E+00	0.00E+00	6.10E-13	4.06E-12	2.96E-14	6.22E-14	1.88E-13
	0.00E+00	0.00E+00	9.40E-13	6.25E-12	4.55E-14	9.57E-14	2.90E-13

Scenario 4 - Greater Wenatchee	Annual 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual Octachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)	Annual 2,3,4,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)
Truck Emissions	0.00E+00	0.00E+00	3.65E-12	2.43E-11	1.77E-13	3.72E-13	1.13E-12
	0.00E+00	0.00E+00	5.10E-13	3.39E-12	2.47E-14	5.20E-14	1.57E-13
	0.00E+00	0.00E+00	7.87E-13	5.23E-12	3.81E-14	8.02E-14	2.43E-13

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Hauling Waste Other Pollutants of Concern Emission Calculations

Scenario 1 - WTEF	Annual 1,2,3,4,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 2,3,4,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Rate (Short tons/year)	Annual Octachlorodibenzofuran Emission Rate (Short tons/year)
Truck Emissions	1.32E-14	1.46E-14	0.00E+00	1.08E-14	5.97E-14	3.49E-15	1.04E-13
	1.67E-14	1.84E-14	0.00E+00	1.36E-14	7.53E-14	4.40E-15	1.32E-13

Scenario 2 - Roosevelt Regional	Annual 1,2,3,4,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 2,3,4,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Rate (Short tons/year)	Annual Octachlorodibenzofuran Emission Rate (Short tons/year)
Truck Emissions	6.00E-14	6.63E-14	0.00E+00	4.91E-14	2.71E-13	1.59E-14	4.75E-13
	1.05E-14	1.16E-14	0.00E+00	8.60E-15	4.75E-14	2.78E-15	8.32E-14
	6.31E-15	6.97E-15	0.00E+00	5.16E-15	2.85E-14	1.67E-15	4.99E-14

	Annual 1,2,3,4,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 2,3,4,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Rate (Short tons/year)	Annual Octachlorodibenzofuran Emission Rate (Short tons/year)
Rail Emissions	1.83E-12	9.64E-13	6.89E-13	0.00E+00	4.92E-12	0.00E+00	4.22E-12

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Scenario 3 - Finley Buttes	Annual 1,2,3,4,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 2,3,4,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Rate (Short tons/year)	Annual Octachlorodibenzofuran Emission Rate (Short tons/year)
Truck Emissions	9.34E-13	1.03E-12	0.00E+00	7.64E-13	4.22E-12	2.47E-13	7.39E-12
	1.28E-13	1.41E-13	0.00E+00	1.05E-13	5.78E-13	3.38E-14	1.01E-12
	1.97E-13	2.17E-13	0.00E+00	1.61E-13	8.89E-13	5.20E-14	1.56E-12

Scenario 4 - Greater Wenatchee	Annual 1,2,3,4,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 2,3,4,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Rate (Short tons/year)	Annual Octachlorodibenzofuran Emission Rate (Short tons/year)
Truck Emissions	7.65E-13	8.45E-13	0.00E+00	6.26E-13	3.46E-12	2.02E-13	6.05E-12
	1.07E-13	1.18E-13	0.00E+00	8.75E-14	4.83E-13	2.82E-14	8.46E-13
	1.65E-13	1.82E-13	0.00E+00	1.35E-13	7.45E-13	4.35E-14	1.30E-12

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Ash Hauling Emissions

Annual Ash Information

Minimum Ash Hauling	58,000	tons/year
Maximum Ash Hauling	60,000	tons/year
Average Total Annual Waste	59,000	tons/year
Lifespan	30	Years

Vehicle Information

Ash Hauling Vehicle	Peterbilt 367
MOVES Vehicle Equivalent	Combination Long-haul Truck
Fuel Type	Diesel
Truck Load Size	21 tons/truck

Rail Information

Rail type (Line-haul/Switch)	Line-Haul	
Railroad Transport	Tier 1+	
BNSF Fuel Efficiency	500	ton-miles/gallon

https://www.bnsf.com/ship-with-bnsf/sustainability-customers/pdf/orange-is-new-green-cp.pdf

Railroad VMT Factor 0.5

Note: A factor of 0.5 is applied to the waste to account for the average load of the round trip which is assumed to have 59,000 tons on the way there and 0 tons on the way back.

Unit Conversion

1 metric ton (MT) =	1,000,000	grams
1 metric ton (MT) =	1,000	kilograms
1 metric ton (MT) =	1,000,000,000	milligram
1 metric ton (MT) =	1.102	short tons

Global Warming Potentials to Convert to CO2e

	CO2	CH4	N2O
Global Warming Potential - 20-year time horizon	1	81.2	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Global Warming Potentials to Convert to CO2e

	CO2	CH4	N2O
Global Warming Potential - 100-year time horizon	1	27.9	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Hauling Ash GHG Emission Calculations

Scenario 1 - WTEF	Origin	Destination	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	CO2 Emission Factor (grams/VMT)	CH4 Emission Factor (grams/VMT)	N2O Emission Factor (grams/VMT)
Truck Emissions	WTEF	BNSF Railspur	12.4	24.8	2,810	8	1,626	0.0199	0.00198

	Origin	Destination	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	CO2 Emission Factor (kg/ton-mile)	CH4 Emission Factor (g/ton-mile)	N2O Emission Factor (g/ton-mile)
Rail Emissions	BNSF Railspur	Roosevelt	227	454	N/A	N/A	0.021	0.0016	0.0005

Hauling Ash CAP Emission Calculations

Scenario 1 - WTEF	Origin	Destination	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	VOC Emission Factor (grams/VMT)	NOx Emission Factor (grams/VMT)	CO Emission Factor (grams/VMT)
Truck Emissions	WTEF	BNSF Railspur	12.4	24.8	2,810	8	0.183	4.09	2.06

	Origin	Destination	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	VOC Emission Factor (grams/ton-mile)	NOx Emission Factor (grams/ton-mile)	CO Emission Factor (grams/ton-mile)
Rail Emissions	BNSF Railspur	Roosevelt	227	454	N/A	N/A	0.0127	0.279	0.0532

Hauling Ash GHG Emission Calculations

Scenario 1 - WTEF	Annual CO2 Emission Rate (Metric tons/year)	Annual CH4 Emission Rate (Metric tons/year)	Annual N2O Emission Rate (Metric tons/year)	Total 30-year emissions of CO2 (Metric tons)	Total 30-year emissions of CH4 (Metric tons)	Total 30-year emissions of N2O (Metric tons)	Annual 20-yr GWP CO2e Emission Rate (Metric tons/year)	Annual 100-yr GWP CO2e Emission Rate (Metric tons/year)
Truck Emissions	113	1.38E-03	1.38E-04	3,398	0.0415	0.00414	3,402	3,400

	Annual CO2 Emission Rate (Metric tons/year)	Annual CH4 Emission Rate (Metric tons/year)	Annual N2O Emission Rate (Metric tons/year)	Total 30-year emissions of CO2 (Metric tons)	Total 30-year emissions of CH4 (Metric tons)	Total 30-year emissions of N2O (Metric tons)	Annual 20-yr GWP CO2e Emission Rate (Metric tons/year)	Annual 100-yr GWP CO2e Emission Rate (Metric tons/year)
Rail Emissions	281	0.0214	0.0067	8,438	0.643	0.201	8,545	8,510

Hauling Ash CAP Emission Calculations

Scenario 1 - WTEF	SO2 Emission Factor (grams/VMT)	Total_PM10 Emission Factor (grams/VMT)	TotalPM_25 Emission Factor (grams/VMT)	Annual VOC Emission Rate (Short tons/year)	Annual NOx Emission Rate (Short tons/year)	Annual CO Emission Rate (Short tons/year)	Annual SO2 Emission Rate (Short tons/year)	Annual Total_PM10 Emission Rate (Short tons/year)	Annual TotalPM_25 Emission Rate (Short tons/year)
Truck Emissions	0.00545	0.178	0.0813	0.01	0.31	0.16	0.00	0.01	0.01

	SO2 Emission Factor (grams/ton-mile)	Total_PM10 Emission Factor (grams/ton-mile)	TotalPM_25 Emission Factor (grams/ton-mile)	Annual VOC Emission Rate (Short tons/year)	Annual NOx Emission Rate (Short tons/year)	Annual CO Emission Rate (Short tons/year)	Annual SO2 Emission Rate (Short tons/year)	Annual Total_PM10 Emission Rate (Short tons/year)	Annual TotalPM_25 Emission Rate (Short tons/year)
Rail Emissions	0.000193	0.00832	0.00807	0.19	4.11	0.79	0.00	0.12	0.12

Hauling Ash Other Pollutants of Concern Emission Calculations

Scenario 1 - WTEF	Origin	Destination	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	Ammonia Emission Factor (grams/VMT)	Mercury Emission Factor (grams/VMT)	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Factor (milligrams/VMT)	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)
Truck Emissions	WTEF	BNSF Railspur	12.4	24.8	2,810	8	0.0335	1.10E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00

	Origin	Destination	One-way VMT (miles)	Round-way VMT (miles)	Number of annual round-way trips	Number of Trips per Day	Ammonia Emission Factor (grams/ton-mile)	Mercury Emission Factor (grams/ton-mile)	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Factor (grams/ton-mile)	1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Factor (grams/ton-mile)	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (grams/ton-mile)	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Factor (grams/ton-mile)
Rail Emissions	BNSF Railspur	Roosevelt	227	454	N/A	N/A	N/A	4.28E-10	8.08E-15	0.00E+00	0.00E+00	3.76E-15

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Hauling Ash Other Pollutants of Concern Emission Calculations

Scenario 1 - WTEF	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	Octachlorodibenzo-p-dioxin Emission Factor (milligrams/VMT)	2,3,7,8-Tetrachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)	2,3,4,7,8-Pentachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,7,8,9-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	2,3,4,6,7,8-Hexachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Factor (milligrams/VMT)
Truck Emissions	0.00E+00	1.05E-09	6.98E-09	5.09E-11	1.07E-10	3.24E-10	2.20E-10	2.43E-10	0.00E+00	1.80E-10	9.94E-10	5.81E-11
	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Factor (grams/ton-mile)	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Factor (grams/ton-mile)	Octachlorodibenzo-p-dioxin Emission Factor (grams/ton-mile)	2,3,7,8-Tetrachlorodibenzofuran Emission Factor (grams/ton-mile)	1,2,3,7,8-Pentachlorodibenzofuran Emission Factor (grams/ton-mile)	2,3,4,7,8-Pentachlorodibenzofuran Emission Factor (grams/ton-mile)	1,2,3,4,7,8-Hexachlorodibenzofuran Emission Factor (grams/ton-mile)	1,2,3,6,7,8-Hexachlorodibenzofuran Emission Factor (grams/ton-mile)	1,2,3,7,8,9-Hexachlorodibenzofuran Emission Factor (grams/ton-mile)	2,3,4,6,7,8-Hexachlorodibenzofuran Emission Factor (grams/ton-mile)	1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Factor (grams/ton-mile)	1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Factor (grams/ton-mile)
Rail Emissions	1.74E-14	1.52E-13	5.86E-13	2.36E-13	5.04E-14	8.06E-14	2.92E-14	1.54E-14	1.10E-14	0.00E+00	7.86E-14	0.00E+00

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Hauling Ash Other Pollutants of Concern Emission Calculations

Scenario 1 - WTEF	Octachlorodibenzofuran Emission Factor (milligrams/VMT)	Annual Ammonia Emission Rate (Short tons/year)	Annual Mercury Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Rate	Annual Octachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)
Truck Emissions	1.74E-09	2.57E-03	8.45E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.06E-14	5.36E-13	3.91E-15	8.22E-15
	Octachlorodibenzofuran Emission Factor (grams/ton-mile)	Annual Ammonia Emission Rate (Short tons/year)	Annual Mercury Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin Emission Rate	Annual Octachlorodibenzo-p-dioxin Emission Rate (Short tons/year)	Annual 2,3,7,8-Tetrachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)
Rail Emissions	6.74E-14	N/A	6.32E-09	1.19E-13	0.00E+00	0.00E+00	5.55E-14	2.56E-13	2.24E-12	8.65E-12	3.48E-12	7.44E-13

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Hauling Ash Other Pollutants of Concern Emission Calculations

Scenario 1 - WTEF	Annual 2,3,4,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 2,3,4,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Rate (Short	Annual 1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Rate (Short	Annual Octachlorodibenzofuran Emission Rate (Short tons/year)
Truck Emissions	2.49E-14	1.69E-14	1.87E-14	0.00E+00	1.38E-14	7.63E-14	4.46E-15	1.34E-13
	Annual 2,3,4,7,8-Pentachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,7,8,9-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 2,3,4,6,7,8-Hexachlorodibenzofuran Emission Rate (Short tons/year)	Annual 1,2,3,4,6,7,8-Heptachlorodibenzofuran Emission Rate (Short	Annual 1,2,3,4,7,8,9-Heptachlorodibenzofuran Emission Rate (Short	Annual Octachlorodibenzofuran Emission Rate (Short tons/year)
Rail Emissions	1.19E-12	4.31E-13	2.28E-13	1.63E-13	0.00E+00	1.16E-12	0.00E+00	9.95E-13

Note: Ammonia is excluded from the emission calculations for rail due to lack of data availability.

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Locomotive Emission Factors

CAP Factors

EPA Technical Highlights

Table 1 - Line-Haul Emission Factors (g/bhp-hr)					Other Pollutants (g/bhp-hr)		SO2 (g/gal)
	PM10	HC	NOx	CO	VOC	PM2.5	SO2
Uncontrolled	0.32	0.48	13	1.28	0.505	0.3104	0.0966168
Tier 0	0.32	0.48	8.6	1.28	0.505	0.3104	0.0966168
Tier 0+	0.2	0.3	7.2	1.28	0.316	0.194	0.0966168
Tier 1	0.32	0.47	6.7	1.28	0.495	0.3104	0.0966168
Tier 1+	0.2	0.29	6.7	1.28	0.305	0.194	0.0966168
Tier 2	0.18	0.26	4.95	1.28	0.274	0.1746	0.0966168
Tier 2+ & Tier 3	0.08	0.13	4.95	1.28	0.137	0.0776	0.0966168
Tier 4	0.015	0.04	1	1.28	0.0421	0.01455	0.0966168
+ Indicates that these are the revised standards in 40 CFR Part 1033.					VOC assumed to be equal to 1.053 times the HC Emissions. PM2.5 estimated to be 0.97 times the PM10 Emissions.		Gram per gallon emissions of SO2 and CO2 are largely independent of engine parameters and are primarily dependent on fuel properties. See derivation of SO2 emission factors below.

Table 3	
Conversion Factors (bhp-hr/gal)	
Locomotive Application	Conversion Factor (bhp-hr/gal)
Large Line-Haul and Passenger	20.8
Small Line-Haul	18.2
Switching	15.2
Source: EPA Office of Transportation and Air Quality	
https://nepis.epa.gov/Exe/ZyPDF.cgi/P100500B.PDF?Dockey=P100500B.PDF	

SO_2 (g/gal) = (fuel density) × (conversion factor) × (64 g SO_2/32 g S) × (S content of fuel)

Consider the example where the density of diesel fuel is 3200 g/gal, the fraction of fuel sulfur converted to SO_2 is 97.8 percent, and the sulfur content of the fuel is 300 ppm.

SO_2 (g/gal) = (3200) × (0.978) × (2.00) × (300 x 10^{-6}) = 1.88 g/gal

Calculating SO2 Emissions
https://nepis.epa.gov/Exe/ZyPDF.cgi/P100500B.PDF?Dockey=P100500B.PDF

Average diesel density (lb/gallon)	7.1
https://www3.epa.gov/ttnchie1/ap42/ch03/final/c03s04.pdf	
Sulfur Content of fuel (ppm)	15
https://www.epa.gov/diesel-fuel-standards/diesel-fuel-standards-and-rulemakings	
Molecular Weight	
SO2 (g/mol)	64
S (g/mol)	32
Conversion Factor	
gram/lb	453.6
parts per million notation	0.000001
Assumed Percent of fuel Sulfur converted to SO2	100%

GHG Factors

EPA Emissions Hub

Table 8				
Vehicle Type	CO2 Emission factor (kg/unit)	CH4 Emission factor (g/unit)	N2O Emission factor (g/unit)	Units
Medium- and Heavy-Duty Truck	1.387	0.013	0.038	vehicle-mile
Passenger Car	0.313	0.008	0.007	vehicle-mile
Light-Duty Truck	0.467	0.013	0.012	vehicle-mile
Medium- and Heavy-Duty Truck	0.17	0.0016	0.0047	ton-mile
Rail	0.021	0.0016	0.0005	ton-mile
Waterborne Craft	0.044	0.0254	0.0011	ton-mile
Aircraft	0.698	0	0.0215	ton-mile
Source: EPA GHG Emission Factors Hub				
https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf				

OPOC Factors

Speciation Profiles and Toxic Emission Factors for Nonroad Engines in MOVES3

Table 3-6. Metal Emission Factors for Nonroad Diesel Engines		
Engine Tier & Power	**Pollutant**	**Emission Factor (g/gal)**
Tier 0 - Tier 3, Tier 4: no DPF (Diesel particulate filter)	Chromium 6	7.78E-08
	Manganese	3.46E-05
	Nickel	6.05E-05
	Elemental Gas-Phase Hg	1.20E-07
	Reactive Gas-Phase Hg	6.20E-08
	Particulate Hg	3.20E-08
	Arsenic	1.61E-05
Tier 4: DPF, no SCR (Selective catalytic reduction)	Chromium 6	3.19E-08
	Manganese	4.09E-06
	Nickel	4.15E-06
	Elemental Gas-Phase Hg	1.20E-07
	Reactive Gas-Phase Hg	6.20E-08
	Particulate Hg	3.20E-08
	Arsenic	1.61E-05
Tier 4: DPF+SCR	Chromium 6	1.16E-08
	Manganese	1.20E-06
	Nickel	1.58E-06
	Elemental Gas-Phase Hg	1.20E-07
	Reactive Gas-Phase Hg	6.20E-08
	Particulate Hg	3.20E-08
	Arsenic	1.61E-05

Source: EPA MOVES, Speciation Profiles and Toxic Emission Factors for Nonroad Engines in MOVES3
https://www.epa.gov/system/files/documents/2022-07/420r22015.pdf

Table 3-7. Dioxin and Furan Emission Factors (g/gallon) for Nonroad Diesel Engines				
Pollutant ID	CAS Number	Pollutant	Tier 0 - Tier 2 (all hp categories), Tier 3 and Tier 4 (<56 kW)[1]	Diesel >= 56 kW Tiers 3 and 4[2]
142	17466016	2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD)	4.04E-12	ND[3]
135	40321764	1,2,3,7,8-Pentachlorodibenzo-p-Dioxin	ND	ND
134	39227286	1,2,3,4,7,8-Hexachlorodibenzo-p-Dioxin	ND	ND
141	57653857	1,2,3,6,7,8-Hexachlorodibenzo-p-Dioxin	1.88E-12	ND
130	19408743	1,2,3,7,8,9-Hexachlorodibenzo-p-Dioxin	8.68E-12	ND
132	35822469	1,2,3,4,6,7,8-Heptachlorodibenzo-p-Dioxin	7.59E-11	1.9E-11
131	3268879	Octachlorodibenzo-p-dioxin	2.93E-10	1.27E-10
136	51207319	2,3,7,8-Tetrachlorodibenzofuran	1.18E-10	9.24E-13
139	57117416	1,2,3,7,8-Pentachlorodibenzofuran	2.52E-11	1.95E-12
138	57117314	2,3,4,7,8-Pentachlorodibenzofuran	4.03E-11	5.86E-12
145	70648269	1,2,3,4,7,8-Hexachlorodibenzofuran	1.46E-11	4E-12
140	57117449	1,2,3,6,7,8-Hexachlorodibenzofuran	7.71E-12	4.41E-12
146	60851345	1,2,3,7,8,9-Hexachlorodibenzofuran	5.51E-12	3.27E-12
143	72918219	2,3,4,6,7,8-Hexachlorodibenzofuran	ND	ND
144	67562394	1,2,3,4,6,7,8-Heptachlorodibenzofuran	3.93E-11	1.8E-11
137	55673897	1,2,3,4,7,8,9-Heptachlorodibenzofuran	ND	1.06E-12
133	39001020	Octachlorodibenzofuran	3.37E-11	3.15E-11
Notes:				
1. Used an average of the onroad pre-2007 legacy engines, converted pg/L to g/gal.				
2. Used the emission factors from representing an onroad 2010 engine, converted pg/L to g/gal.				
3. ND - non-detect, fractions set to zero. Detection limits ranged from 2 to 18 pg/L, depending on the compound.				

Source: EPA MOVES, Speciation Profiles and Toxic Emission Factors for Nonroad Engines in MOVES3
https://www.epa.gov/system/files/documents/2022-07/420r22015.pdf

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Hauling Truck Emission Factors

EPA MOVES Emission Factors

Year	Source	Fuel	CO2 (grams)	CH4 (grams)	N2O (grams)	VOC (grams)	NOx (grams)	CO (grams)	SO2 (grams)
2024	Single Unit Short-haul Truck	Gasoline	2,093,978,368	93,200	55,321	1,511,523	889,374	17,506,352	13,910
2024	Single Unit Short-haul Truck	Diesel Fuel	7,155,476,480	406,316	35,718	1,298,248	13,717,348	8,842,185	23,973
2024	Single Unit Short-haul Truck	Compressed Natural Gas (CNG)	135,146,928	1,790,216	26,729	71,339	92,156	2,553,856	716
2024	Single Unit Long-haul Truck	Gasoline	132,372,552	3,108	1,133	70,885	38,894	907,705	879
2024	Single Unit Long-haul Truck	Diesel Fuel	443,901,920	7,690	1,559	53,251	777,422	523,971	1,487
2024	Single Unit Long-haul Truck	Compressed Natural Gas (CNG)	8,557,659	108,519	525	4,323	5,621	161,925	45
2024	Combination Short-haul Truck	Gasoline	14,416	3	0	55	54	981	0
2024	Combination Short-haul Truck	Diesel Fuel	4,744,557,056	70,235	8,533	525,813	11,287,963	5,578,114	15,871
2024	Combination Short-haul Truck	Compressed Natural Gas (CNG)	143,595,872	1,435,400	7,823	57,072	70,632	2,633,309	760
2024	Combination Long-haul Truck	Diesel Fuel	17,596,528,640	215,128	21,450	1,975,631	44,235,676	22,266,994	58,966

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Hauling Truck Emission Factors

EPA MOVES Emission Factors

Year	Source	Fuel	Total_PM10 - Primary Exhaust (grams)	TotalPM_25 - Primary Exhaust (grams)	Brake_PM10 (grar	Tire_PM10 (grams	Brake_PM25 (gran	Tire_PM25 (grams	Ammonia (grams)
2024	Single Unit Short-haul Truck	Gasoline	43,918	38,851	102,388	25,202	12,799	3,780	105,513
2024	Single Unit Short-haul Truck	Diesel Fuel	282,169	259,595	626,912	118,093	78,364	17,714	231,720
2024	Single Unit Short-haul Truck	Compressed Natural Gas (CNG)	800	708	14,215	1,617	1,777	243	5,159
2024	Single Unit Long-haul Truck	Gasoline	1,675	1,482	5,549	1,623	694	243	6,826
2024	Single Unit Long-haul Truck	Diesel Fuel	18,709	17,212	33,813	7,599	4,227	1,140	15,106
2024	Single Unit Long-haul Truck	Compressed Natural Gas (CNG)	48	42	767	106	96	16	350
2024	Combination Short-haul Truck	Gasoline	1	0	1	0	0	0	0
2024	Combination Short-haul Truck	Diesel Fuel	187,918	172,884	263,640	76,400	32,955	11,460	102,623
2024	Combination Short-haul Truck	Compressed Natural Gas (CNG)	661	584	7,218	1,518	902	228	5,584
2024	Combination Long-haul Truck	Diesel Fuel	794,918	731,323	823,692	304,308	102,962	45,646	362,681

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Hauling Truck Emission Factors

EPA MOVES Emission Factors

Year	Source	Fuel	Distance (VMT)	CO2 Emission Factor (grams/VMT)	CH4 Emission Factor (grams/VMT)	N2O Emission Factor (grams/VMT)	VOC Emission Factor (grams/VMT)	NOx Emission Factor (grams/VMT)	CO Emission Factor (grams/VMT)
2024	Single Unit Short-haul Truck	Gasoline	1,902,134	1,100.86	0.05	0.03	0.79	0.47	9.20
2024	Single Unit Short-haul Truck	Diesel Fuel	7,057,308	1,013.91	0.06	0.01	0.18	1.94	1.25
2024	Single Unit Short-haul Truck	Compressed Natural Gas (CNG)	94,332	1,432.67	18.98	0.28	0.76	0.98	27.07
2024	Single Unit Long-haul Truck	Gasoline	128,973	1,026.36	0.02	0.01	0.55	0.30	7.04
2024	Single Unit Long-haul Truck	Diesel Fuel	477,824	929.01	0.02	0.003	0.11	1.63	1.10
2024	Single Unit Long-haul Truck	Compressed Natural Gas (CNG)	6,496	1,317.37	16.71	0.08	0.67	0.87	24.93
2024	Combination Short-haul Truck	Gasoline	9	1,601.78	0.33	0.0	6.11	6.00	109.00
2024	Combination Short-haul Truck	Diesel Fuel	2,920,430	1,624.61	0.02	0.003	0.18	3.87	1.91
2024	Combination Short-haul Truck	Compressed Natural Gas (CNG)	96,374	1,489.99	14.89	0.08	0.59	0.73	27.32
2024	Combination Long-haul Truck	Diesel Fuel	10,824,969	1,625.55	0.02	0.002	0.18	4.09	2.06

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Hauling Truck Emission Factors

EPA MOVES Emission Factors

Year	Source	Fuel	SO2 Emission Factor (grams/VMT)	Total_PM10 Emission Factor (grams/VMT)	TotalPM_25 Emission Factor (grams/VMT)	Ammonia Emission Factor (grams/VMT)
2024	Single Unit Short-haul Truck	Gasoline	0.01	0.09	0.03	0.06
2024	Single Unit Short-haul Truck	Diesel Fuel	0.003	0.15	0.05	0.03
2024	Single Unit Short-haul Truck	Compressed Natural Gas (CNG)	0.01	0.18	0.03	0.05
2024	Single Unit Long-haul Truck	Gasoline	0.01	0.07	0.02	0.05
2024	Single Unit Long-haul Truck	Diesel Fuel	0.003	0.13	0.05	0.03
2024	Single Unit Long-haul Truck	Compressed Natural Gas (CNG)	0.01	0.14	0.02	0.05
2024	Combination Short-haul Truck	Gasoline	0.0	0.22	0.00	0.00
2024	Combination Short-haul Truck	Diesel Fuel	0.01	0.18	0.07	0.04
2024	Combination Short-haul Truck	Compressed Natural Gas (CNG)	0.01	0.10	0.02	0.06
2024	Combination Long-haul Truck	Diesel Fuel	0.01	0.18	0.08	0.03

Table 3-6 Emission Rates for Selected Metals for Diesel Vehicles			
Pollutant	Emission Rate for 1960-2006 (g/mi)	Emission Rate for 2007-2009 (g/mi)	Emission Rate for 2010 and later (g/mi)
Chromium VI	2.00E-08	5.93E-09	2.16E-09
Manganese	8.00E-06	6.82E-07	2.00E-07
Nickel	1.40E-05	6.92E-07	2.63E-07
Mercury, Elemental Gaseous Phase	6.20E-09	6.20E-09	6.20E-09
Mercury, Reactive Gaseous Phase	3.20E-09	3.20E-09	3.20E-09
Mercury, Particulate Phase	1.60E-09	1.60E-09	1.60E-09
Arsenic	2.30E-06	2.30E-06	2.30E-06

Table 3-7 Emission Rates for Dioxin/Furan Congeners for Diesel Vehicles (mg/mi)			
Congener	**1970-2006**	**2007-2009**	**2010 and later**
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	2.23E-10	ND	ND
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	ND	ND	ND
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	ND	ND	ND
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	1.03E-10	ND	ND
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	4.78E-10	4.11E-11	ND
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	4.18E-09	2.58E-10	1.05E-09
Octachlorodibenzo-p-dioxin	1.61E-08	9.30E-10	6.98E-09
2,3,7,8-Tetrachlorodibenzofuran	6.50E-09	ND	5.09E-11
1,2,3,7,8-Pentachlorodibenzofuran	1.39E-09	ND	1.07E-10
2,3,4,7,8-Pentachlorodibenzofuran	2.23E-09	6.30E-11	3.24E-10
1,2,3,4,7,8-Hexachlorodibenzofuran	8.02E-10	ND	2.20E-10
1,2,3,6,7,8-Hexachlorodibenzofuran	4.24E-10	ND	2.43E-10
1,2,3,7,8,9-Hexachlorodibenzofuran	ND	ND	ND
2,3,4,6,7,8-Hexachlorodibenzofuran	3.03E-10	ND	1.80E-10
1,2,3,4,6,7,8-Heptachlorodibenzofuran	2.16E-09	3.00E-10	9.94E-10
1,2,3,4,7,8,9-Heptachlorodibenzofuran	ND	ND	5.81E-11
Octachlorodibenzofuran	1.85E-09	7.06E-10	1.74E-09
Note: ND = non-detected, fractions set to 0.			

Source: EPA MOVES, Air Toxic Emissions from Onroad Vehicles in MOVES3
https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1010TJM.pdf

Washington Department of Ecology
Environmental Impacts of Waste Disposal
MOVES Inputs

Description		Spokane MOVES Run
Scale	Model	Onroad
	Domain	Default
	Calculation	Inventory
Time Spans	Year	2024
	Months	All
	Days	All
	Hours	All
Geographic Bounds		Spokane County, WA
Vehicles		Combination Long-haul Truck - Diesel Fuel
		Combination Short-haul Truck - Compressed Natural Gas (CNG)
		Combination Short-haul Truck - Diesel Fuel
		Combination Short-haul Truck - Gasoline
Road Type		All
Pollutants		CO2, CH4, N2O, VOC, NOx, CO, SO2, PM10, PM2.5, NH3, Hg, Dioxins/Furans
General Output	Database	spokane_2024_onroad_out
	Units	g, J, mi
	Activity	Distance Traveled
		Population
Output Emissions Detail	Output Aggregation	Hour
		County
	for All Vehicle/Equipment Categories	
		Fuel Type
		Emission Process
	Onroad	Source Use Type

Appendix A.4 Site Fuel and Electricity Use

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Washington Department of Ecology
Environmental Impacts of Waste Disposal
Emissions Associated with Fuel and Electricity Summary

	Greenhouse Gas Emissions - 100 year - Fuels	
Facility	Annual Greenhouse Gas (CO2e) (MT CO2e/yr)	Total Greenhouse Gas - 30 Years (CO2e) (MT CO2e)
Spokane WTEF	2,017	60,519.39
Roosevelt Landfill	591	17,721.06
Finley Buttes Landfill	477	14,316.62
Wenatchee Landfill	802	24,053.37

	Greenhouse Gas Emissions - 20 year - Fuels	
Facility	Annual Greenhouse Gas (CO2e) (MT CO2e/yr)	Total Greenhouse Gas - 30 Years (CO2e) (MT CO2e)
Spokane WTEF	2,021	60,617.60
Roosevelt Landfill	594	17,813.90
Finley Buttes Landfill	480	14,391.61
Wenatchee Landfill	806	24,182.41

	Greenhouse Gas Emissions - 100 year - Electricity	
Facility	Annual Greenhouse Gas (CO2e) (MT CO2e/yr)	Total Greenhouse Gas - 30 Years (CO2e) (MT CO2e)
Spokane WTEF	285	8,541.95
Roosevelt Landfill	54.3	1,628.86
Finley Buttes Landfill	31.5	944.16
Wenatchee Landfill	83.3	2,500.30

	Greenhouse Gas Emissions - 20 year - Electricity	
Facility	Annual Greenhouse Gas (CO2e) (MT CO2e/yr)	Total Greenhouse Gas - 30 Years (CO2e) (MT CO2e)
Spokane WTEF	286	8,583.31
Roosevelt Landfill	54.6	1,636.74
Finley Buttes Landfill	31.6	948.74
Wenatchee Landfill	83.7	2,512.41

	Criteria Air Pollutants - Fuel - Annual					
Facility	NOx (short tons/yr)	SOx (short tons/yr)	CO (short tons/yr)	PM (short tons/yr)	VOC (short tons/yr)	Lead (short tons/yr)
Spokane WTEF	11.44	0.57	3.14	0.71	0.78	7.79E-06
Roosevelt Landfill	15.87	1.04	3.45	1.11	1.39	N/A
Finley Buttes Landfill	13.69	0.90	2.97	0.96	0.10	N/A
Wenatchee Landfill	22.84	1.50	4.99	1.60	2.18	N/A

	Other Pollutants of Concern - Fuel - Annual	
Facility	Cadmium (short tons/yr)	Mercury (short tons/yr)
Spokane WTEF	1.71E-05	4.05E-06
Roosevelt Landfill	N/A	N/A
Finley Buttes Landfill	N/A	N/A
Wenatchee Landfill	N/A	N/A

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WTEF - Emissions Associated with Fuel and Electricity

Normalization of Fuel & Electricity Usage based on Waste Quantity

Fuel/Electricity	Annual Quantity	Unit	Source
Diesel	27,536	gallons/year	Jen Lennon, City of Spokane Solid Waste Disposal
Propane	1,479	gallons/year	Jen Lennon, City of Spokane Solid Waste Disposal
Natural Gas	317,945	therms/year	Jen Lennon, City of Spokane Solid Waste Disposal
Electricity	968,200	kWh/year	Jen Lennon, City of Spokane Solid Waste Disposal

Quantity of Waste Combusted	246,167	tons/year	Jen Lennon, City of Spokane Solid Waste Disposal
Normalized Waste Quantity for Evaluation Purposes	250,000	tons/year	Quantity agreed upon for evaluation purposes

Greenhouse Gas Emissions - 100 year - Annual

Fuel	Normalized Annual Quantity	Unit	Annual CO_2e Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Diesel	27,964	gallons/year	10.49	kg CO2e/gal	293	MT CO2e/year	Quantities are a 5 year average.
Propane	1,502	gallons/year	5.83	kg CO2e/gal	8.76	MT CO2e/year	Quantities are a 5 year average.
Natural Gas	322,896	therms/year	53.12	kg CO2e/MMBtu	1,715	MT CO2e/year	Quantities are a 5 year average.
				Total	2,017	MT CO2e/year	

Electricity	Normalized Annual Quantity	Unit	Annual CO_2e Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Electricity	983,276	kWh/year	638.4	lb/MWh	285	MT CO2e/year	Quantities are a 5 year average.
				Total	285	MT CO2e/year	

Note: All quantities are normalized to the 250,000 tons/year waste quantity.

Greenhouse Gas Emissions - 100 year - Total

Fuel	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Diesel	293	MT CO2e/year	30	8,804	MT CO2e
Propane	8.76	MT CO2e/year	30	263	MT CO2e
Natural Gas	1,715	MT CO2e/year	30	51,452	MT CO2e
			Total	60,519	MT CO2e

Fuel	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Electricity	285	MT CO2e/year	30	8,542	MT CO2e
			Total	8,542	MT CO2e

Greenhouse Gas Emissions - 20 year - Annual

Fuel	Normalized Annual Quantity	Unit	Annual CO_2e Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Diesel	27,964	gallons/year	10.55	kg CO2e/gal	295	MT CO2e/year	Quantities are a 5 year average.
Propane	1,502	gallons/year	5.86	kg CO2e/gal	8.81	MT CO2e/year	Quantities are a 5 year average.
Natural Gas	322,896	therms/year	53.17	kg CO2e/MMBtu	1,717	MT CO2e/year	Quantities are a 5 year average.
				Total	2,021	MT CO2e/year	

Electricity	Normalized Annual Quantity	Unit	Annual CO_2e Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Electricity	983,276	kWh/year	641.5	lb/MWh	286	MT CO2e/year	Quantities are a 5 year average.
				Total	286	MT CO2e/year	

Note: All quantities are normalized to the 250,000 tons/year waste quantity.

Greenhouse Gas Emissions - 20 year - Total

Fuel	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Diesel	295	MT CO2e/year	30	8,850	MT CO2e
Propane	8.81	MT CO2e/year	30	264	MT CO2e
Natural Gas	1,717	MT CO2e/year	30	51,504	MT CO2e
			Total	60,618	MT CO2e

Fuel	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Electricity	286	MT CO2e/year	30	8,583	MT CO2e
			Total	8,583	MT CO2e

Washington Department of Ecology
Environmental Impacts of Waste Disposal
WTEF - Emissions Associated with Fuel and Electricity

Criteria Air Pollutant Emissions - Annual

Fuel	Annual Quantity	Unit
Diesel	27,964	gallons/year
Propane	1,502	gallons/year
Natural Gas	322,896	therms/year

NOx

Fuel	NOx Emissions Factor	Unit	Annual NOx Emissions	Unit	Notes
Diesel	4.41	lb/MMBtu	8.47	short ton/year	
Propane	13	lb/1000 gal	0.0098	short ton/year	
Natural Gas	190	lb/10^6 scf	3.0	short ton/year	
		Total	11.4	short ton/year	

SOx

Fuel	SOx Emissions Factor	Unit	Annual SOx Emissions	Unit	Notes
Diesel	0.29	lb/MMBtu	0.56	short ton/year	
Propane	0.054	lb/1000 gal	0.000041	short ton/year	Emission factor is calculated based on the average sulfur content of propane.
Natural Gas	0.6	lb/10^6 scf	0.0094	short ton/year	
		Total	0.6	short ton/year	

CO

Fuel	CO Emissions Factor	Unit	Annual CO Emissions	Unit	Notes
Diesel	0.95	lb/MMBtu	1.82	short ton/year	
Propane	7.5	lb/1000 gal	0.0056	short ton/year	
Natural Gas	84	lb/10^6 scf	1.31	short ton/year	
		Total	3.1	short ton/year	

PM

Fuel	PM Emissions Factor	Unit	Annual PM Emissions	Unit	Notes
Diesel	0.31	lb/MMBtu	0.60	short ton/year	Value is for PM-10.
Propane	0.7	lb/1000 gal	0.00053	short ton/year	Value is for PM, Total.
Natural Gas	7.6	lb/10^6 scf	0.12	short ton/year	Value is for PM, Total.
		Total	0.7	short ton/year	

VOC

Fuel	VOC Emissions Factor	Unit	Annual VOC Emissions	Unit	Notes
Diesel	3.60E-01	lb/MMBtu	0.69	short ton/year	TOC is considered equivalent to VOC.
Propane	1.0	lb/1000 gal	0.00075	short ton/year	TOC is considered equivalent to VOC.
Natural Gas	5.5	lb/10^6 scf	0.09	short ton/year	TOC is considered equivalent to VOC.
		Total	0.8	short ton/year	

Cadmium

Fuel	Cadmium Emissions Factor	Unit	Annual Cadmium Emissions	Unit	Notes
Natural Gas	1.10E-03	lb/10^6 scf	0.000017	short ton/year	

Mercury

Fuel	Mercury Emissions Factor	Unit	Annual Mercury Emissions	Unit	Notes
Natural Gas	2.60E-04	lb/10^6 scf	0.0000041	short ton/year	

Lead

Fuel	Emissions Factor	Unit	Annual Emissions	Unit	Notes
Natural Gas	0.0005	lb/10^6 scf	0.0000078	short ton/year	

Unit Conversion Table

1 metric ton (MT) =	1,000	kilogram
1 kilogram (kg) =	1,000	grams
1 MMBtu =	10	therms
1 MWh =	1,000	kWh
1 kg =	2.20	lb
1 MMBtu =	1,000,000	Btu
1 short ton =	2,000	lb

Assumptions

Energy Content		
Diesel	137,381	Btu/gal
Propane	91,452	Btu/gal
Natural Gas	1,036	Btu/cf
Gasoline	120,214	Btu/gal

https://www.eia.gov/energyexplained/units-and-calculators/british-thermal-units.php

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Roosevelt - Emissions Associated with Fuel and Electricity

Normalization of Fuel & Electricity Usage based on Waste Quantity

Fuel/Electricity	Annual Quantity	Unit	Source
Diesel	500,000	gallons/year	Art Mains, Republic Services
Propane	64,639	gallons/year	Art Mains, Republic Services
Gasoline	5,000	gallons/year	Art Mains, Republic Services
Electricity	1,800,000	kWh/year	Art Mains, Republic Services

Quantity of Waste Received	2,400,000	tons/year	Art Mains Republic Services
Normalized Waste Quantity for Evaluation Purposes	250,000	tons/year	Quantity agreed upon for evaluation purposes

Greenhouse Gas Emissions - 100 year - Annual

Fuel	Normalized Annual Quantity	Unit	Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Diesel	52,083	gallons/year	10.49	kg CO2e/gal	547	MT CO2e/year	Quantities are a 5 year average.
Propane	6,733	gallons/year	5.83	kg CO2e/gal	39.3	MT CO2e/year	Quantities are a 5 year average.
Gasoline	521	gallons/year	9.26	kg CO2e/gal	4.82	MT CO2e/year	Quantities are a 5 year average. Assumes 4-stroke engine.
				Total	591	MT CO2e/year	

Electricity	Normalized Annual Quantity	Unit	Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Electricity	187,500	kWh/year	638.4	lb/MWh	54.3	MT CO2e/year	Quantities are a 5 year average.
				Total	54.3	MT CO2e/year	

Note: All quantities are normalized to the 250,000 tons/year waste quantity.

Greenhouse Gas Emissions - 100 year - Total

Fuel	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Diesel	547	MT CO2e/year	30	16,398	MT CO2e
Propane	39.3	MT CO2e/year	30	1,178	MT CO2e
Gasoline	5	MT CO2e/year	30	145	MT CO2e
			Total	17,721	MT CO2e

Electricity	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Electricity	54.3	MT CO2e/year	30	1,629	MT CO2e
			Total	1,629	MT CO2e

Greenhouse Gas Emissions - 20 year - Annual

Fuel	Normalized Annual Quantity	Unit	Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Diesel	52,083	gallons/year	10.55	kg CO2e/gal	549	MT CO2e/year	Quantities are a 5 year average.
Propane	6,733	gallons/year	5.86	kg CO2e/gal	39.5	MT CO2e/year	Quantities are a 5 year average.
Gasoline	521	gallons/year	9.41	kg CO2e/gal	4.90	MT CO2e/year	Quantities are a 5 year average. Assumes 4-stroke engine.
				Total	594	MT CO2e/year	

Electricity	Normalized Annual Quantity	Unit	Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Electricity	187,500	kWh/year	641.5	lb/MWh	54.6	MT CO2e/year	Quantities are a 5 year average.
				Total	54.6	MT CO2e/year	

Note: All quantities are normalized to the 250,000 tons/year waste quantity.

Greenhouse Gas Emissions - 20 year - Total

Fuel	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Diesel	549	MT CO2e/year	30	16,482	MT CO2e
Propane	39.5	MT CO2e/year	30	1,185	MT CO2e
Gasoline	5	MT CO2e/year	30	147	MT CO2e
			Total	17,814	MT CO2e

Electricity	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Electricity	54.6	MT CO2e/year	30	1,637	MT CO2e
			Total	1,637	MT CO2e

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Roosevelt - Emissions Associated with Fuel and Electricity

Criteria Air Pollutant Emissions - Annual

Fuel	Annual Quantity	Unit
Diesel	52,083	gallons/year
Propane	6,733	gallons/year
Gasoline	521	gallons/year

NOx

Fuel	NOx Emissions Factor	Unit	Annual NOx Emissions	Unit	Notes
Diesel	4.41	lb/MMBtu	15.78	short ton/year	
Propane	13	lb/1000 gal	0.0438	short ton/year	
Gasoline	1.63	lb/MMBtu	0.05	short ton/year	
		Total	15.9	short ton/year	

SOx

Fuel	SOx Emissions Factor	Unit	Annual SOx Emissions	Unit	Notes
Diesel	0.29	lb/MMBtu	1.04	short ton/year	
Propane	0.054	lb/1000 gal	0.000182	short ton/year	Emission factor is calculated based on the average sulfur content of propane.
Gasoline	0.084	lb/MMBtu	0.00	short ton/year	
		Total	1.0	short ton/year	

CO

Fuel	CO Emissions Factor	Unit	Annual CO Emissions	Unit	Notes
Diesel	0.95	lb/MMBtu	3.40	short ton/year	
Propane	7.5	lb/1000 gal	0.0252	short ton/year	
Gasoline	0.99	lb/MMBtu	0.03	short ton/year	
		Total	3.5	short ton/year	

PM

Fuel	PM Emissions Factor	Unit	Annual PM Emissions	Unit	Notes
Diesel	0.31	lb/MMBtu	1.11	short ton/year	Value is for PM-10.
Propane	0.7	lb/1000 gal	0.002	short ton/year	Value is for PM, Total.
Gasoline	0.1	lb/MMBtu	0.003	short ton/year	Value is for PM-10.
		Total	1.1	short ton/year	

VOC

Fuel	VOC Emissions Factor	Unit	Annual VOC Emissions	Unit	Notes
Diesel	3.60E-01	lb/MMBtu	1.29	short ton/year	TOC is considered equivalent to VOC.
Propane	1.00	lb/1000 gal	0.003	short ton/year	TOC is considered equivalent to VOC.
Gasoline	3.03	lb/MMBtu	0.09	short ton/year	TOC is considered equivalent to VOC.
		Total	1.4	short ton/year	

Unit Conversion Table

1 metric ton (MT) =	1,000	kilogram
1 kilogram (kg) =	1,000	grams
1 MMBtu =	10	therms
1 MWh =	1,000	kWh
1 kg =	2.20	lb
1 MMBtu =	1,000,000	Btu
1 short ton =	2,000	lb

Assumptions

Energy Content		
Diesel	137,381	Btu/gal
Propane	91,452	Btu/gal
Natural Gas	1,036	Btu/cf
Gasoline	120,214	Btu/gal

https://www.eia.gov/energyexplained/units-and-calculators/british-thermal-units.php

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Finley Buttes - Emissions Associated with Fuel and Electricity

Normalization of Fuel & Electricity Usage based on Waste Quantity

Fuel/Electricity	Annual Quantity	Unit	Source
Diesel	145,184	gallons/year	Brian Evola, Waste Connections
Gasoline	1,608	gallons/year	Brian Evola, Waste Connections
Electricity	350,400	kWh/year	Brian Evola, Waste Connections

Quantity of Waste Received	806,005	tons/year	Brian Evola, Waste Connections
Normalized Waste Quantity for Evaluation Purposes	250,000	tons/year	Quantity agreed upon for evaluation purposes

Greenhouse Gas Emissions - 100 year - Annual

Fuel	Normalized Annual Quantity	Unit	Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Diesel	45,032	gallons/year	10.49	kg CO2e/gal	473	MT CO2e/year	Quantities are a 5 year average.
Gasoline	499	gallons/year	9.26	kg CO2e/gal	4.62	MT CO2e/year	Quantities are a 5 year average. Assumes 4-stroke engine.
				Total	477	MT CO2e/year	

Electricity	Normalized Annual Quantity	Unit	Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Electricity	108,684	kWh/year	638.4	lb/MWh	31.5	MT CO2e/year	Quantities are a 5 year average.
				Total	31.5	MT CO2e/year	

Note: All quantities are normalized to the 250,000 tons/year waste quantity.

Greenhouse Gas Emissions - 100 year - Total

Fuel	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Diesel	473	MT CO2e/year	30	14,178	MT CO2e
Gasoline	5	MT CO2e/year	30	139	MT CO2e
			Total	14,317	MT CO2e

Electricity	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Electricity	31	MT CO2e/year	30	944	MT CO2e
			Total	944	MT CO2e

Greenhouse Gas Emissions - 20 year - Annual

Fuel	Normalized Annual Quantity	Unit	Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Diesel	45,032	gallons/year	10.55	kg CO2e/gal	475	MT CO2e/year	Quantities are a 5 year average.
Gasoline	499	gallons/year	9.41	kg CO2e/gal	4.69	MT CO2e/year	Quantities are a 5 year average. Assumes 4-stroke engine.
				Total	480	MT CO2e/year	

Electricity	Normalized Annual Quantity	Unit	Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Electricity	108,684	kWh/year	641.5	lb/MWh	31.6	MT CO2e/year	Quantities are a 5 year average.
				Total	31.6	MT CO2e/year	

Note: All quantities are normalized to the 250,000 tons/year waste quantity.

Greenhouse Gas Emissions - 20 year - Total

Fuel	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Diesel	475	MT CO2e/year	30	14,251	MT CO2e
Gasoline	5	MT CO2e/year	30	141	MT CO2e
			Total	14,392	MT CO2e

Electricity	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Electricity	31.6	MT CO2e/year	30	949	MT CO2e
			Total	949	MT CO2e

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Finley Buttes - Emissions Associated with Fuel and Electricity

Criteria Air Pollutant Emissions - Annual

Fuel	Annual Quantity	Unit
Diesel	45,032	gallons/year
Gasoline	499	gallons/year

NOx

Fuel	NOx Emissions Factor	Unit	Annual NOx Emissions	Unit	Notes
Diesel	4.41	lb/MMBtu	13.6	short ton/year	
Gasoline	1.63	lb/MMBtu	0.05	short ton/year	
		Total	13.7	short ton/year	

SOx

Fuel	SOx Emissions Factor	Unit	Annual SOx Emissions	Unit	Notes
Diesel	0.29	lb/MMBtu	0.90	short ton/year	
Gasoline	0.084	lb/MMBtu	0.00	short ton/year	
		Total	0.9	short ton/year	

CO

Fuel	CO Emissions Factor	Unit	Annual CO Emissions	Unit	Notes
Diesel	0.95	lb/MMBtu	2.94	short ton/year	
Gasoline	0.99	lb/MMBtu	0.03	short ton/year	
		Total	3.0	short ton/year	

PM

Fuel	PM Emissions Factor	Unit	Annual PM Emissions	Unit	Notes
Diesel	0.31	lb/MMBtu	0.96	short ton/year	Value is for PM-10.
Gasoline	0.1	lb/MMBtu	0.003	short ton/year	Value is for PM-10.
		Total	1.0	short ton/year	

VOC

Fuel	VOC Emissions Factor	Unit	Annual VOC Emissions	Unit	Notes
Diesel	3.60E-01	lb/MMBtu	0.01	short ton/year	VOCs value includes aldehyde and total PAHs.
Gasoline	3.03	lb/MMBtu	0.09	short ton/year	VOCs value is for aldeyde.
		Total	0.1	short ton/year	

Unit Conversion Table

1 metric ton (MT) =	1,000	kilogram
1 kilogram (kg) =	1,000	grams
1 MMBtu =	10	therms
1 MWh =	1,000	kWh
1 kg =	2.20	lb
1 MMBtu =	1,000,000	Btu
1 short ton =	2,000	lb

Assumptions

Energy Content		
Diesel	137,381	Btu/gal
Propane	91,452	Btu/gal
Natural Gas	1,036	Btu/cf
Gasoline	120,214	Btu/gal

https://www.eia.gov/energyexplained/units-and-calculators/british-thermal-units.php

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Wenatchee - Emissions Associated with Fuel and Electricity

Normalization of Fuel & Electricity Usage based on Waste Quantity

	Annual Quantity	Unit	Source
Diesel	87,486	gallons/year	Jim Denson, Waste Management
Gasoline	2,114	gallons/year	Eric Keogh, Waste Management
Electricity	336,614	kWh/year	Utility Bills for September 2022 to 2023

Quantity of Waste Received	292,389	tons/year	Eric Keogh, Waste Management
Normalized Waste Quantity for Evaluation Purposes	250,000	tons/year	Quantity agreed upon for evaluation purposes

Greenhouse Gas Emissions - 100 year - Annual

Fuel	Normalized Annual Quantity	Unit	Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Diesel	74,803	gallons/year	10.49	kg CO2e/gal	785	MT CO2e/year	Quantities are a 5 year average.
Gasoline	1,808	gallons/year	9.26	kg CO2e/gal	16.7	MT CO2e/year	Quantities are a 5 year average. Assumes 4-stroke engine.
				Total	802	MT CO2e/year	

Electricity	Normalized Annual Quantity	Unit	Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Electricity	287,814	kWh/year	638.4	lb/MWh	83.3	MT CO2e/year	Quantities are a 5 year average.
				Total	83.3	MT CO2e/year	

Note: All quantities are normalized to the 250,000 tons/year waste quantity.

Greenhouse Gas Emissions - 100 year - Total

Fuel	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Diesel	785	MT CO2e/year	30	23,551	MT CO2e
Gasoline	17	MT CO2e/year	30	502	MT CO2e
			Total	24,053	MT CO2e

Electricity	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Electricity	83.3	MT CO2e/year	30	2,500	MT CO2e
			Total	2,500	MT CO2e

Greenhouse Gas Emissions - 20 year - Annual

Fuel	Normalized Annual Quantity	Unit	Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Diesel	74,803	gallons/year	10.55	kg CO2e/gal	789	MT CO2e/year	Quantities are a 5 year average.
Gasoline	1,808	gallons/year	9.41	kg CO2e/gal	17.0	MT CO2e/year	Quantities are a 5 year average. Assumes 4-stroke engine.
				Total	806	MT CO2e/year	

Electricity	Normalized Annual Quantity	Unit	Emission Factor	Unit	Annual CO_2e Emissions	Unit	Notes
Electricity	287,814	kWh/year	641.5	lb/MWh	83.7	MT CO2e/year	Quantities are a 5 year average.
				Total	83.7	MT CO2e/year	

Note: All quantities are normalized to the 250,000 tons/year waste quantity.

Greenhouse Gas Emissions - 20 year - Total

Fuel	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Diesel	789	MT CO2e/year	30	23,672	MT CO2e
Gasoline	17	MT CO2e/year	30	510	MT CO2e
			Total	24,182	MT CO2e

Electricity	Annual CO_2e Emissions	Unit	Years	Total CO_2e Emissions	Unit
Electricity	83.7	MT CO2e/year	30	2,512	MT CO2e
			Total	2,512	MT CO2e

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Wenatchee - Emissions Associated with Fuel and Electricity

Criteria Air Pollutant Emissions - Annual

Fuel	Annual Quantity	Unit
Diesel	74,803	gallons/year
Gasoline	1,808	gallons/year

NOx

Fuel	NOx Emissions Factor	Unit	Annual NOx Emissions	Unit	Notes
Diesel	4.41	lb/MMBtu	22.66	short ton/year	
Gasoline	1.63	lb/MMBtu	0.18	short ton/year	
		Total	22.8	short ton/year	

SOx

Fuel	SOx Emissions Factor	Unit	Annual SOx Emissions	Unit	Notes
Diesel	0.29	lb/MMBtu	1.49	short ton/year	
Gasoline	0.084	lb/MMBtu	0.009	short ton/year	
		Total	1.5	short ton/year	

CO

Fuel	CO Emissions Factor	Unit	Annual CO Emissions	Unit	Notes
Diesel	0.95	lb/MMBtu	4.88	short ton/year	
Gasoline	0.99	lb/MMBtu	0.11	short ton/year	
		Total	5.0	short ton/year	

PM

	PM Emissions Factor	Unit	Annual PM Emissions	Unit	Notes
Diesel	0.31	lb/MMBtu	1.59	short ton/year	Value is for PM-10.
Gasoline	0.1	lb/MMBtu	0.011	short ton/year	Value is for PM-10.
		Total	1.6	short ton/year	

VOC

	VOC Emissions Factor	Unit	Annual VOC Emissions	Unit	Notes
Diesel	3.60E-01	lb/MMBtu	1.85	short ton/year	VOCs value includes aldehyde and total PAHs.
Gasoline	3.03	lb/MMBtu	0.329	short ton/year	VOCs value is for aldeyde.
		Total	2.2	short ton/year	

Note: No VOC emission factor is provided in AP-42 for propane.

Unit Conversion Table

1 metric ton (MT) =	1,000	kilogram
1 kilogram (kg) =	1,000	grams
1 MMBtu =	10	therms
1 MWh =	1,000	kWh
1 kg =	2.20	lb
1 MMBtu =	1,000,000	Btu
1 short ton =	2,000	lb

Assumptions

Energy Content		
Diesel	137,381	Btu/gal
Propane	91,452	Btu/gal
Natural Gas	1,036	Btu/cf
Gasoline	120,214	Btu/gal

https://www.eia.gov/energyexplained/units-and-calculators/british-thermal-units.php

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Fuel Emission Factors

Greenhouse Gas Emissions - 100 year GWP Emission Factors

Fuel	CO_2 Emission Factor	Unit	Source	CH_4 Emission Factor	Unit	Source	N_2O Emission Factor	Unit	Source	CO_2e Emission Factor	Unit
Diesel	10.21	kg CO_2/gal	a	1.01	g CH_4/gal	b	0.94	g N_2O/gal	b	10.49	kg CO_2e/gal
Liquified Petroleum Gases (LPG) (Propane)	5.68	kg CO_2/gal	a	0.59	g CH_4/gal	b	0.50	g N_2O/gal	b	5.83	kg CO_2e/gal
Natural Gas	53.06	kg CO_2/MMBtu	c	1	g CH_4/MMBtu	c	0.10	g N_2O/MMBtu	c	53.12	kg CO_2e/MMBtu
Motor Gasoline	8.78	kg CO_2/gal	a	2.85	g CH_4/gal	b	1.47	g N_2O/gal	b	9.26	kg CO_2e/gal

a: Table 2 Mobile Combustion Source EPA Emission Factor Hub (https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf)
b: Table 5 Mobile Combustion CH4 and N2O for Non-Road Vehicles - Construction/Mining Equipment (https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf)
For gasoline, 4-stroke engine values were used. For diesel, diesel equipment was used instead of diesel trucks.
c: Table 1 Stationary Combustion (https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf)

Global Warming Potentials to Convert to CO2e

	CO_2	CH_4	N_2O
Global Warming Potential - 100-year time horizon	1	27.9	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Greenhouse Gas Emissions - 20 year GWP Emission Factors

Fuel	CO_2 Emission Factor	Unit	Source	CH_4 Emission Factor	Unit	Source	N_2O Emission Factor	Unit	Source	CO_2e Emission Factor	Unit
Diesel	10.21	kg CO_2/gal	a	1.01	g CH_4/gal	b	0.94	g N_2O/gal	b	10.55	kg CO_2e/gal
Liquified Petroleum Gases (LPG) (Propane)	5.68	kg CO_2/gal	a	0.59	g CH_4/gal	b	0.50	g N_2O/gal	b	5.86	kg CO_2e/gal
Natural Gas	53.06	kg CO_2/MMBtu	c	1	g CH_4/MMBtu	c	0.10	g N_2O/MMBtu	c	53.17	kg CO_2e/MMBtu
Motor Gasoline	8.78	kg CO_2/gal	a	2.85	g CH_4/gal	b	1.47	g N_2O/gal	b	9.41	kg CO_2e/gal

a: Table 2 Mobile Combustion Source EPA Emission Factor Hub (https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf)
b: Table 5 Mobile Combustion CH4 and N2O for Non-Road Vehicles - Construction/Mining Equipment (https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf)
For gasoline, 4-stroke engine values were used. For diesel, diesel equipment was used instead of diesel trucks.
c: Table 1 Stationary Combustion (https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf)

Global Warming Potentials to Convert to CO2e

	CO_2	CH_4	N_2O
Global Warming Potential - 20-year time horizon	1	81.2	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Fuel Emission Factors

Criteria Air Pollutants

Fuel	Combustion Type	Equipment	Pollutant	Emission Factor	Unit	Source	Notes
Diesel	Internal Combustion	Industrial Engines	NOx	4.41	lb/MMBtu	d	
Diesel	Internal Combustion	Industrial Engines	CO	0.95	lb/MMBtu	d	
Diesel	Internal Combustion	Industrial Engines	SOx	0.29	lb/MMBtu	d	
Diesel	Internal Combustion	Industrial Engines	PM-10	0.31	lb/MMBtu	d	
Diesel	Internal Combustion	Industrial Engines	TOC	0.36	lb/MMBtu	d	Value is the sum of "exhuaust, evaporative, crankcase, and refueling". For prurposes of this evaluation, TOC is considered equivalent to VOC.
Gasoline	Internal Combustion	Industrial Engines	NOx	1.63	lb/MMBtu	d	
Gasoline	Internal Combustion	Industrial Engines	CO	0.99	lb/MMBtu	d	
Gasoline	Internal Combustion	Industrial Engines	SOx	0.084	lb/MMBtu	d	
Gasoline	Internal Combustion	Industrial Engines	PM-10	0.1	lb/MMBtu	d	
Gasoline	Internal Combustion	Industrial Engines	TOC	3.03	lb/MMBtu	d	Value is the sum of "exhuaust, evaporative, crankcase, and refueling". For prurposes of this evaluation, TOC is considered equivalent to VOC.
Liquified Petroleum Gas (Propane)	External Combustion	Industrial Boilers	PM, Fitlerable	0.2	lb/1000 gal	e	All PM is considered less than 10 um for propane.
Liquified Petroleum Gas (Propane)	External Combustion	Industrial Boilers	PM, Condensable	0.5	lb/1000 gal	e	All PM is considered less than 10 um for propane.
Liquified Petroleum Gas (Propane)	External Combustion	Industrial Boilers	PM, Total	0.7	lb/1000 gal	e	All PM is considered less than 10 um for propane.
Liquified Petroleum Gas (Propane)	External Combustion	Industrial Boilers	SO2	0.054	lb/1000 gal	e	Emission factor is calculated based on average sulfur content of propane.
Liquified Petroleum Gas (Propane)	External Combustion	Industrial Boilers	NOx	13	lb/1000 gal	e	
Liquified Petroleum Gas (Propane)	External Combustion	Industrial Boilers	CO	7.5	lb/1000 gal	e	
Liquified Petroleum Gas (Propane)	External Combustion	Industrial Boilers	TOC	1.0	lb/1000 gal	e	TOC is considered equivalent to VOC.
Natural Gas	External Combustion	Large Wall-Fired Boilers - Uncontrolled (Post-NSPS)	NOx	190	lb/10^6 scf	f	
Natural Gas	External Combustion	Large Wall-Fired Boilers - Uncontrolled (Post-NSPS)	CO	84	lb/10^6 scf	f	
Natural Gas	External Combustion	Generic Boiler	Lead	0.0005	lb/10^6 scf	f	
Natural Gas	External Combustion	Generic Boiler	PM, Total	7.6	lb/10^6 scf	f	All PM is less than 10 um for natural gas.
Natural Gas	External Combustion	Generic Boiler	PM, Condensable	5.7	lb/10^6 scf	f	All PM is less than 10 um for natural gas.
Natural Gas	External Combustion	Generic Boiler	PM, Filterable	1.9	lb/10^6 scf	f	All PM is less than 10 um for natural gas.
Natural Gas	External Combustion	Generic Boiler	SO2	0.6	lb/10^6 scf	f	
Natural Gas	External Combustion	Generic Boiler	VOC	5.5	lb/10^6 scf	f	
Natural Gas	External Combustion	Generic Boiler	Cadmium	1.10E-03	lb/10^6 scf	f	
Natural Gas	External Combustion	Generic Boiler	Mercury	2.60E-04	lb/10^6 scf	f	

d: AP-42 Chapter 3.3 Gasoline and Diesel Industrial Engines (https://www.epa.gov/sites/default/files/2020-10/documents/c03s03.pdf)
e: AP-42 Chapter 1.5 Liquefied Petroleum Gas Combustion (https://www.epa.gov/sites/default/files/2020-09/documents/1.5_liquefied_petroleum_gas_combustion.pdf)
f: AP-42 Chapter 1.4 Natural Gas Combustion (https://www.epa.gov/sites/default/files/2020-09/documents/1.4_natural_gas_combustion.pdf)

Unit Conversion Table

1 metric ton (MT) =	1,000	kilogram
1 kilogram (kg) =	1,000	grams
1 MMBTU =	10	therms

Assumptions	Value	Unit	Source
Sulfur Content of Propane	0.54	gr/100 ft3	Page 4, National Methodology and Emission Inventory for Residential Fuel Combustion

https://www3.epa.gov/ttnchie1/conference/ei12/area/haneke.pdf

Washington Department of Ecology
Environmental Impacts of Waste Disposal
Electricity Emission Factors

eGRID subregion acronym	eGRID subregion name	Total output emission rates		
		lb/MWh		
		CO_2	CH_4	N_2O
NWPP	WECC Northwest	634.6	0.058	0.008

Source: 2021 EPA e-GRID Data, https://www.epa.gov/egrid/summary-data

Global Warming Potentials to Convert to CO_2e

	CO_2	CH_4	N_2O
Global Warming Potential - 100-year time horizon	1	27.9	273

Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

Global Warming Potentials to Convert to CO2e

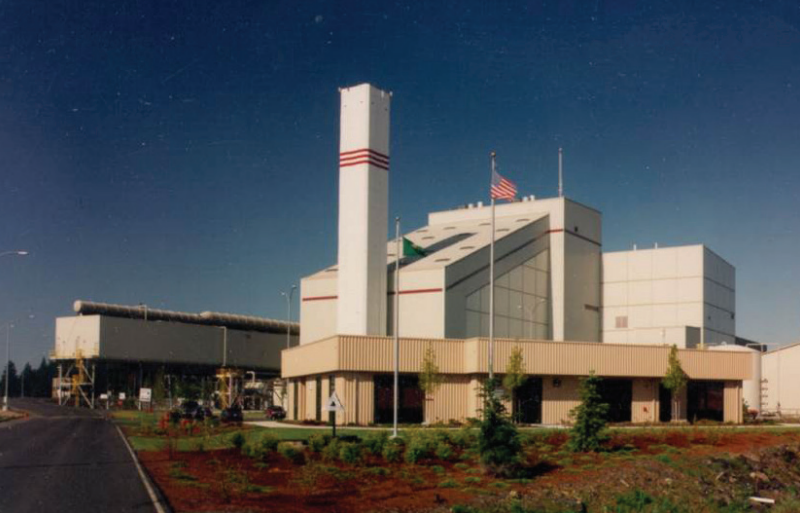
	CO_2	CH_4	N_2O
Global Warming Potential - 20-year time horizon	1	81.2	273

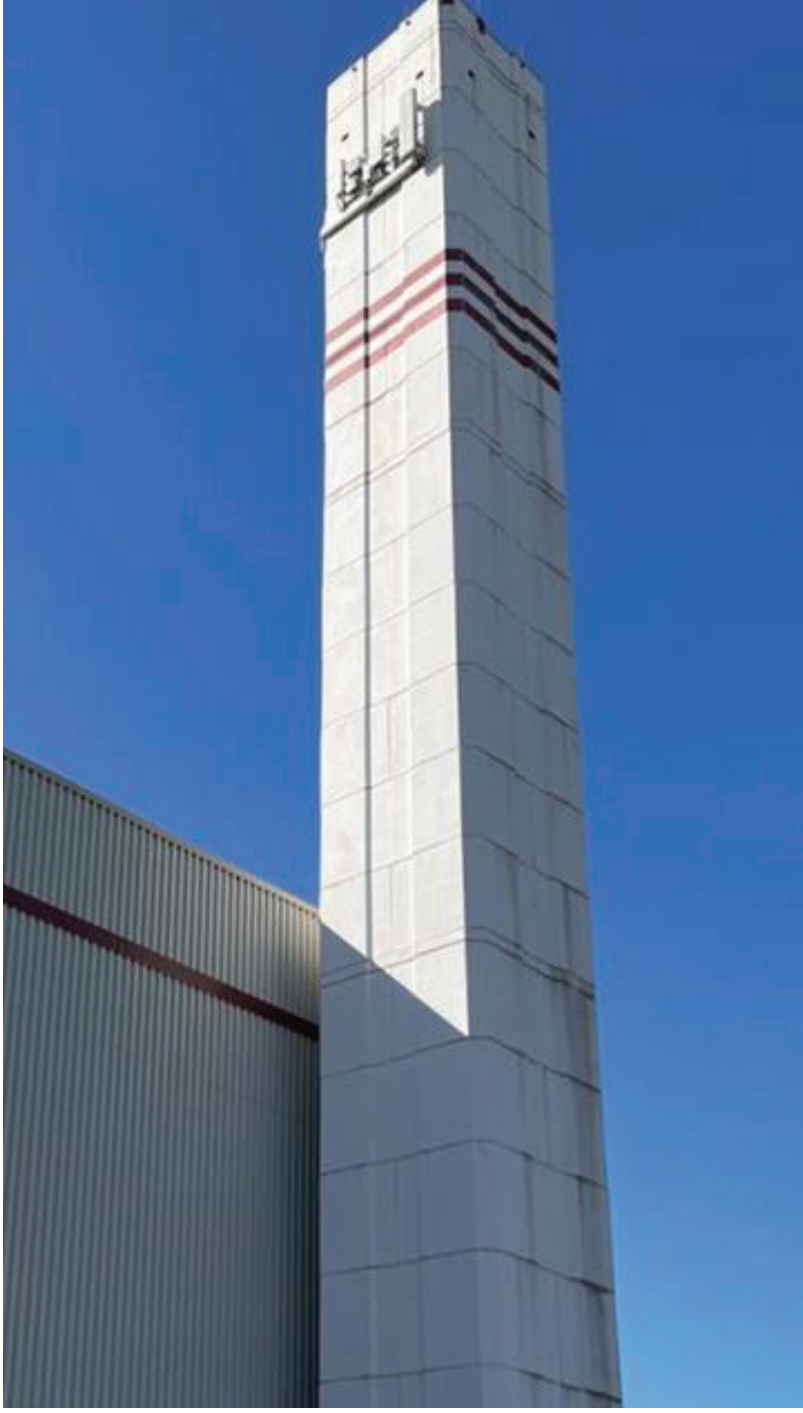
Source: IPCC Sixth Assessment Report Global Warming Potentials (Table 7.SM.7)

https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter07_SM.pdf

NWPP - CO_2e Emission Factor - 100 year	638.4	lb/MWh

NWPP - CO_2e Emission Factor - 20 year	641.5	lb/MWh





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