

BEAM*2022 - 9/9/2022

Processor:	Generic
Facility Name/Location:	Somewhere in the northeastern US
Date of calculation:	9/11/22
Calculations by:	Andrew Carpenter

Example Use of BEAM*2022, v. 1.0, Sept. 2022
by Andrew Carpenter, MS, Northern Tilth

Site-Specific Data	
Annual Production of de-watered biomass (wet tons)	40,000 (pre-digestion)
Location (from e-Grid)	NPCC New England
Weighted GHG Emissions for Power Generation by Province (g/kWh)	242
Global Warming Potential (GWP) time horizon (years)	100

CO ₂ eq Totals (Mg/year)	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
	Typ LF	Aq LF	Alk Land Ap	AD Land Ap	AD Typ LF	Pyrolysis	Combustion
Unit Process	Conditioning, Dewatering, Typical Landfill	Conditioning, Dewatering, Aggressive Landfill	Conditioning, Thickening, Class A Alkaline Stabilization, Land Application	Conditioning, Anaerobic Digestion (CHP), Dewatering, Land Application	Conditioning, Anaerobic Digestion (CHP), Dewatering, Typical Landfill	Conditioning, Anaerobic Digestion, Dewatering, Thermal Drying, Pyrolysis, Land Application	Conditioning, Dewatering, Combustion
Storage Prior to Processing	NA	NA	NA	NA	NA	NA	NA
Conditioning/Thickening	83	83	83	83	83	83	83
Aerobic Digestion	NA	NA	NA	NA	NA	NA	NA
Anaerobic Digestion	NA	NA	NA	-558	-558	-558	NA
Anaerobic Digestion 2	NA	NA	NA	NA	NA	NA	NA
De-watering	307	307	307	219	219	219	307
Thermal Drying	NA	NA	NA	NA	NA	3,838	NA
BioDrying	NA	NA	NA	NA	NA	NA	NA
Alkaline Stabilization	NA	NA	174	NA	NA	NA	NA
Composting	NA	NA	NA	NA	NA	NA	NA
Composting 2	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal - Typical	21,229	NA	NA	NA	5,615	NA	NA
Landfill Disposal - Worst Case	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal - Aggressive	NA	14,406	NA	NA	NA	NA	NA
Landfill Disposal - CA Regulatory	NA	NA	NA	NA	NA	NA	NA
Combustion	NA	NA	NA	NA	NA	NA	4,611
Pyrolysis	NA	NA	NA	NA	NA	178	NA
Land Application	NA	NA	-314	-115	NA	-1,895	NA
Land Application 2	NA	NA	NA	NA	NA	NA	NA
Miscellaneous Emissions	NA	NA	NA	NA	NA	NA	NA
Transportation	351	351	176	110	219	15	351
TOTALS	21,970	15,147	426	-261	5,578	1,881	5,353

Summary of Results

Wet Tons	40,000	40,000	40,000	25,000	25,000	25,000	40,000
Wet Mg	36,298	36,298	36,298	22,686	22,686	22,686	36,298
Dry Mg	9,074	9,074	9,074	5,672	5,672	5,672	9,074
CO ₂ eq/Dry Mg	2.42	1.67	0.05	-0.05	0.98	0.33	0.59

Emissions by Gas Type (Mg/year)	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7
	Typ LF	Aq LF	Alk Land Ap	AD Land Ap	AD Typ LF	Pyrolysis	Combustion
Total	Total	Total	Total	Total	Total	Total	Total
CO ₂	-2,343	-2,860	-2,279	-2,783	-4,983	1,405	1,045
CH ₄ (CO ₂ eq)	21,763.8	15,457	235	613	8,968	467	11
N ₂ O (CO ₂ eq)	2,549.6	2,550	2,470	1,909	1,594	9	4,296
Biogenic CO ₂	1,763	0	0	2,838	3,527	5,977	13,975

Scenarios Selected

Scenario 1 Title	Typ LF	Description	Conditioning, Dewatering, Typical Landfill																
Notes and Comments																			
Unit Process	Enter "x" for all applicable processes:	CO ₂ equivalents (Mg/yr)				Wet tons to each unit process/day	Mg (wet) to each unit process/day	Dry metric tons to each unit process/day	Metric tons CO ₂ eq/dry metric ton biomass	Mg per year									
		Scope 1	Scope 2	Scope 3	Total					CO ₂	CH ₄ (CO ₂ eq)	N ₂ O (CO ₂ eq)	Biogenic CO ₂						
Storage		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conditioning/Thickening	x	0	11	72	83	NA	NA	NA	NA	NA	NA	NA	NA	83	-	-	-	-	-
Aerobic Digestion		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Anaerobic Digestion		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Anaerobic Digestion 2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Dewatering	x	0	235	72	307	NA	NA	NA	NA	NA	NA	NA	NA	307	-	-	-	-	-
Thermal Drying		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
BFT Biodrying		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Alkaline Stabilization		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Composting		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Composting 2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Landfill Disposal Typical	x	21,519	-290	0	21,229	110	99	25	2.34	NA	NA	NA	NA	-3,085	21,764	2,550	1,763	-	-
Landfill Disposal Worst-case		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Landfill Disposal Aggressive		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Landfill Disposal CA Regulatory		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Combustion		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Pyrolysis		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Land Application		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Land Application 2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Miscellaneous Emissions		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Transportation	x	351	NA	NA	351	110	99	25	0.04	NA	NA	NA	NA	351	-	-	0	-	-
		21,870	(44)	145	21,970									-2,343	21,764	2,550	1,763		
Scope 1 - direct emissions																			
Scope 2 - purchased electricity, heat, or steam																			
Scope 3 - production of purchased materials and uses of end products																			
Scenario 2 Title	Ag LF	Description	Conditioning, Dewatering, Aggressive Landfill																
Notes and Comments																			
Unit Process	Enter "x" for all applicable processes:	CO ₂ equivalents (Mg/yr)				Wet tons to each unit process/day	Mg (wet) to each unit process/day	Dry metric tons to each unit process/day	Metric tons CO ₂ eq/dry metric ton biomass	Mg per year									
		Scope 1	Scope 2	Scope 3	Total					CO ₂	CH ₄ (CO ₂ eq)	N ₂ O (CO ₂ eq)	Biogenic CO ₂						
Storage		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conditioning/Thickening	x	0	11	72	83	NA	NA	NA	NA	NA	NA	NA	NA	83	-	-	-	-	-
Aerobic Digestion		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Anaerobic Digestion		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Anaerobic Digestion 2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Dewatering	x	0	235	72	307	NA	NA	NA	NA	NA	NA	NA	NA	307	-	-	-	-	-
Thermal Drying		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
BFT Biodrying		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Alkaline Stabilization		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Composting		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Composting 2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Landfill Disposal Typical		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Landfill Disposal Worst-case		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Landfill Disposal Aggressive	x	15,212	-806	0	14,406	110	99	25	1.59	NA	NA	NA	NA	-3,691	15,457	2,550	0	-	-
Landfill Disposal CA Regulatory		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Combustion		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Pyrolysis		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Land Application		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Land Application 2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Miscellaneous Emissions		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Transportation	x	351	NA	NA	351	110	99	25	0.04	NA	NA	NA	NA	351	-	-	0	-	-
		15,563	(561)	145	15,147									-2,860	15,457	2,550	0		
Scope 1 - direct emissions																			
Scope 2 - purchased electricity, heat, or steam																			
Scope 3 - production of purchased materials and uses of end products																			
Scenario 3 Title	Alk Land Ap	Description	Conditioning, Thickening, Class A Alkaline Stabilization, Land Application																
Notes and Comments																			
Unit Process	Enter "x" for all applicable processes:	CO ₂ equivalents (Mg/yr)				Wet tons to each unit process/day	Mg (wet) to each unit process/day	Dry metric tons to each unit process/day	Metric tons CO ₂ eq/dry metric ton biomass	Mg per year									
		Scope 1	Scope 2	Scope 3	Total					CO ₂	CH ₄ (CO ₂ eq)	N ₂ O (CO ₂ eq)	Biogenic CO ₂						
Storage		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conditioning/Thickening	x	0	11	72	83	NA	NA	NA	NA	NA	NA	NA	NA	83	-	-	-	-	-
Aerobic Digestion		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Anaerobic Digestion		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Anaerobic Digestion 2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Dewatering	x	0	235	72	307	NA	NA	NA	NA	NA	NA	NA	NA	307	-	-	-	-	-
Thermal Drying		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
BFT Biodrying		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Alkaline Stabilization	x	NA	NA	0	174	110	99	25	0.02	NA	NA	NA	NA	174	-	-	-	-	-
Composting		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Composting 2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Landfill Disposal Typical		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Landfill Disposal Worst-case		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Landfill Disposal Aggressive		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Landfill Disposal CA Regulatory		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Combustion		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Pyrolysis		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Land Application	x	1,410	0	-1,224	-314	110	99	25	-0.03	NA	NA	NA	NA	-3,019	235	2,470	-	-	-
Land Application 2		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Miscellaneous Emissions		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-	-	-	-	-
Transportation	x	176	NA	NA	176	110	99	25	0.02	NA	NA	NA	NA	176	-	-	0	-	-
		1,727	278	(1,579)	426									-2,279	235	2,470	0		
Scope 1 - direct emissions																			
Scope 2 - purchased electricity, heat, or steam																			
Scope 3 - production of purchased materials and uses of end products																			
Scenario 4 Title	AD Land Ap	Description	Conditioning, Anaerobic Digestion (CHP), Dewatering, Land Application																
Notes and Comments																			

Key	
Input	0
Default from reference values	0
Data used to calculate default (for info only)	0
Process output	0
Input with possible cell reference	0
Calculated result	0

Unit Process	Enter "x" for all applicable processes:	CO ₂ equivalents (Mg/yr)				Wet tons to each unit process/day	Mg (wet) to each unit process/day	Dry metric tons to each unit process/day	Metric tons CO ₂ eq/dry metric ton biomass
		Scope 1	Scope 2	Scope 3	Total				
Storage		NA	NA	NA	NA	NA	NA	NA	NA
Conditioning/Thickening	x	0	11	72	83	NA	NA	NA	NA
Aerobic Digestion	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anaerobic Digestion	x	639	-1,197	0	-558	NA	NA	NA	NA
Anaerobic Digestion 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dewatering	x	0	147	72	219	NA	NA	NA	NA
Thermal Drying	NA	NA	NA	NA	NA	NA	NA	NA	NA
BF T Biodrying	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkaline Stabilization	NA	NA	NA	NA	NA	NA	NA	NA	NA
Composting	NA	NA	NA	NA	NA	NA	NA	NA	NA
Composting 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal Typical	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal Worst-case	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal Aggressive	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal CA Regulatory	NA	NA	NA	NA	NA	NA	NA	NA	NA
Combustion	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrolysis	NA	NA	NA	NA	NA	NA	NA	NA	NA
Land Application	x	1,246	0	-1,361	-115	68	62	16	-0.02
Land Application 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Miscellaneous Emissions	NA	NA	NA	NA	NA	NA	NA	NA	NA
Transportation	x	110	NA	NA	110	68	62	16	0.02
Scope 1 - direct emissions		1,995	(1,040)	(1,216)	(261)				
Scope 2 - purchased electricity, heat, or steam									
Scope 3 - production of purchased materials and uses of end products									

Mg per year				
CO ₂	CH ₄ (CO ₂ eq)	N ₂ O (CO ₂ eq)	Biogenic CO ₂	
NA	NA	-	NA	
83	-	-	NA	
NA	-	-	NA	
-1,024	466	-	2,838	
NA	NA	-	NA	
219	-	-	-	
NA	-	-	NA	
NA	-	-	NA	
NA	-	-	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
-2,171	147	1,909	-	
NA	NA	NA	NA	
110	-	-	NA	
-2,783	613	1,909	2,838	

Scenario 5 Title: **AD Typ LF** Description: **Conditioning, Anaerobic Digestion (CHP), Dewatering, Typical Landfill**

Notes and Comments

Unit Process	Enter "x" for all applicable processes:	CO ₂ equivalents (Mg/yr)				Wet tons to each unit process/day	Mg (wet) to each unit process/day	Dry metric tons to each unit process/day	Metric tons CO ₂ eq/dry metric ton biomass
		Scope 1	Scope 2	Scope 3	Total				
Storage		NA	NA	NA	NA	NA	NA	NA	NA
Conditioning/Thickening	x	0	11	72	83	NA	NA	NA	NA
Aerobic Digestion	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anaerobic Digestion	x	639	-1,197	0	-558	NA	NA	NA	NA
Anaerobic Digestion 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dewatering	x	0	147	72	219	NA	NA	NA	NA
Thermal Drying	NA	NA	NA	NA	NA	NA	NA	NA	NA
BF T Biodrying	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkaline Stabilization	NA	NA	NA	NA	NA	NA	NA	NA	NA
Composting	NA	NA	NA	NA	NA	NA	NA	NA	NA
Composting 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal Typical	x	5,729	-113	0	5,615	68	62	16	0.90
Landfill Disposal Worst-case	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal Aggressive	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal CA Regulatory	NA	NA	NA	NA	NA	NA	NA	NA	NA
Combustion	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrolysis	NA	NA	NA	NA	NA	NA	NA	NA	NA
Land Application	NA	NA	NA	NA	NA	NA	NA	NA	NA
Land Application 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Miscellaneous Emissions	NA	NA	NA	NA	NA	NA	NA	NA	NA
Transportation	x	219	NA	NA	219	68	62	16	0.04
Scope 1 - direct emissions		6,586	(1,153)	145	5,578				
Scope 2 - purchased electricity, heat, or steam									
Scope 3 - production of purchased materials and uses of end products									

Mg per year				
CO ₂	CH ₄ (CO ₂ eq)	N ₂ O (CO ₂ eq)	Biogenic CO ₂	
NA	NA	-	NA	
83	-	-	NA	
NA	-	-	NA	
-1,024	466	-	2,838	
NA	NA	-	NA	
219	-	-	-	
NA	-	-	NA	
NA	-	-	NA	
NA	-	-	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
-4,983	8,968	1,994	3,527	
219	-	-	0	
-4,983	8,968	1,994	3,527	

Scenario 6 Title: **Pyrolysis** Description: **Conditioning, Anaerobic Digestion, Dewatering, Thermal Drying, Pyrolysis, Land Application**

Notes and Comments

Unit Process	Enter "x" for all applicable processes:	CO ₂ equivalents (Mg/yr)				Wet tons to each unit process/day	Mg (wet) to each unit process/day	Dry metric tons to each unit process/day	Metric tons CO ₂ eq/dry metric ton biomass
		Scope 1	Scope 2	Scope 3	Total				
Storage		NA	NA	NA	NA	NA	NA	NA	NA
Conditioning/Thickening	x	0	11	72	83	NA	NA	NA	NA
Aerobic Digestion	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anaerobic Digestion	x	639	-1,197	0	-558	NA	NA	NA	NA
Anaerobic Digestion 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dewatering	x	0	147	72	219	NA	NA	NA	NA
Thermal Drying	x	3,545	0	0	3,538	68	62	16	0.68
BF T Biodrying	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkaline Stabilization	NA	NA	NA	NA	NA	NA	NA	NA	NA
Composting	NA	NA	NA	NA	NA	NA	NA	NA	NA
Composting 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal Typical	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal Worst-case	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal Aggressive	NA	NA	NA	NA	NA	NA	NA	NA	NA
Landfill Disposal CA Regulatory	NA	NA	NA	NA	NA	NA	NA	NA	NA
Combustion	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrolysis	x	9	169	0	178	18	16	16	0.03
Land Application	x	-1,227	0	-668	-1,895	10	9	9	-0.61
Land Application 2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Miscellaneous Emissions	NA	NA	NA	NA	NA	NA	NA	NA	NA
Transportation	x	15	NA	NA	15	68	62	16	0.00
Scope 1 - direct emissions		2,981	(578)	(523)	1,881				
Scope 2 - purchased electricity, heat, or steam									
Scope 3 - production of purchased materials and uses of end products									

Mg per year				
CO ₂	CH ₄ (CO ₂ eq)	N ₂ O (CO ₂ eq)	Biogenic CO ₂	
NA	NA	-	NA	
83	-	-	NA	
NA	-	-	NA	
-1,024	466	-	2,838	
NA	NA	-	NA	
219	-	-	-	
NA	-	-	NA	
NA	-	-	NA	
NA	-	-	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
NA	NA	NA	NA	
-1,895	0	0	-	
NA	NA	NA	NA	
15	-	-	0	
1,405	467	9	5,977	

Scenario 7 Title: **Combustion** Description: **Conditioning, Dewatering, Combustion**

Notes and Comments

CO₂ equivalents (Mg/yr)

Mg per year

Unit Process	Enter "x" for all applicable processes:	CO ₂ equivalents (Mg/yr)				Wet tons to each unit process/day	Mg (wet) to each unit process/day	Dry metric tons to each unit process/day	Metric tons CO ₂ eq/dry metric ton biomass
		Scope 1	Scope 2	Scope 3	Total				
Storage		NA	NA	NA	NA	NA	NA	NA	
Conditioning/Thickening	x	0	11	72	83	NA	NA	NA	
Aerobic Digestion		NA	NA	NA	NA	NA	NA	NA	
Anaerobic Digestion		NA	NA	NA	NA	NA	NA	NA	
Anaerobic Digestion 2		NA	NA	NA	NA	NA	NA	NA	
Dewatering	x	0	235	72	307	NA	NA	NA	
Thermal Drying		NA	NA	NA	NA	NA	NA	NA	
BFT Biodrying		NA	NA	NA	NA	NA	NA	NA	
Alkaline Stabilization		NA	NA	NA	NA	NA	NA	NA	
Composting		NA	NA	NA	NA	NA	NA	NA	
Composting 2		NA	NA	NA	NA	NA	NA	NA	
Landfill Disposal Typical		NA	NA	NA	NA	NA	NA	NA	
Landfill Disposal Worst-case		NA	NA	NA	NA	NA	NA	NA	
Landfill Disposal Aggressive		NA	NA	NA	NA	NA	NA	NA	
Landfill Disposal CA Regulatory		NA	NA	NA	NA	NA	NA	NA	
Combustion	x	4,172	439	0	4,611	110	99	0.51	
Pyrolysis		NA	NA	NA	NA	NA	NA	NA	
Land Application		NA	NA	NA	NA	NA	NA	NA	
Land Application 2		NA	NA	NA	NA	NA	NA	NA	
Miscellaneous Emissions		NA	NA	NA	NA	NA	NA	NA	
Transportation	x	351	NA	NA	351	110	25	0.04	
Scope 1 - direct emissions		4,523	685	145	5,353				
Scope 2 - purchased electricity, heat, or steam									
Scope 3 - production of purchased materials and uses of end products									

CO ₂	Mg per year			Biogenic CO ₂
	CH ₄ (CO ₂ eq)	N ₂ O (CO ₂ eq)		
NA	NA	-	-	NA
NA	-	-	-	NA
NA	-	-	-	NA
NA	NA	-	-	NA
NA	NA	-	-	NA
307	-	-	-	-
NA	-	-	-	NA
NA	-	-	-	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
304	11	4,296	13,975	-
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	-	-	-	NA
351	-	-	-	0
1,045	11	4,296	13,975	

Scenario 8 Title: Description

Notes and Comments

Unit Process	Enter "x" for all applicable processes:	CO ₂ equivalents (Mg/yr)				Wet tons to each unit process/day	Mg (wet) to each unit process/day	Dry metric tons to each unit process/day	Metric tons CO ₂ eq/dry metric ton biomass
		Scope 1	Scope 2	Scope 3	Total				
Storage		NA	NA	NA	NA	NA	NA	NA	
Conditioning/Thickening		NA	NA	NA	NA	NA	NA	NA	
Aerobic Digestion		NA	NA	NA	NA	NA	NA	NA	
Anaerobic Digestion		NA	NA	NA	NA	NA	NA	NA	
Anaerobic Digestion 2		NA	NA	NA	NA	NA	NA	NA	
Dewatering		NA	NA	NA	NA	NA	NA	NA	
Thermal Drying		NA	NA	NA	NA	NA	NA	NA	
BFT Biodrying		NA	NA	NA	NA	NA	NA	NA	
Alkaline Stabilization		NA	NA	NA	NA	NA	NA	NA	
Composting		NA	NA	NA	NA	NA	NA	NA	
Composting 2		NA	NA	NA	NA	NA	NA	NA	
Landfill Disposal Typical		NA	NA	NA	NA	NA	NA	NA	
Landfill Disposal Worst-case		NA	NA	NA	NA	NA	NA	NA	
Landfill Disposal Aggressive		NA	NA	NA	NA	NA	NA	NA	
Landfill Disposal CA Regulatory		NA	NA	NA	NA	NA	NA	NA	
Combustion		NA	NA	NA	NA	NA	NA	NA	
Pyrolysis		NA	NA	NA	NA	NA	NA	NA	
Land Application		NA	NA	NA	NA	NA	NA	NA	
Land Application 2		NA	NA	NA	NA	NA	NA	NA	
Miscellaneous Emissions		NA	NA	NA	NA	NA	NA	NA	
Transportation		NA	NA	NA	NA	0	0	NA	
Scope 1 - direct emissions		0	0	0	0				
Scope 2 - purchased electricity, heat, or steam									
Scope 3 - production of purchased materials and uses of end products									

CO ₂	Mg per year			Biogenic CO ₂
	CH ₄ (CO ₂ eq)	N ₂ O (CO ₂ eq)		
NA	NA	-	-	NA
NA	-	-	-	NA
NA	-	-	-	NA
NA	NA	-	-	NA
NA	NA	-	-	NA
NA	-	-	-	NA
NA	-	-	-	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	-	-	-	NA
NA	-	-	-	NA
0	0	0	0	0

Scenario 9 Title: Description

Notes and Comments

Unit Process	Enter "x" for all applicable processes:	CO ₂ equivalents (Mg/yr)				Wet tons to each unit process/day	Mg (wet) to each unit process/day	Dry metric tons to each unit process/day	Metric tons CO ₂ eq/dry metric ton biomass
		Scope 1	Scope 2	Scope 3	Total				
Storage		NA	NA	NA	NA	NA	NA	NA	
Conditioning/Thickening		NA	NA	NA	NA	NA	NA	NA	
Aerobic Digestion		NA	NA	NA	NA	NA	NA	NA	
Anaerobic Digestion		NA	NA	NA	NA	NA	NA	NA	
Anaerobic Digestion 2		NA	NA	NA	NA	NA	NA	NA	
Dewatering		NA	NA	NA	NA	NA	NA	NA	
Thermal Drying		NA	NA	NA	NA	NA	NA	NA	
BFT Biodrying		NA	NA	NA	NA	NA	NA	NA	
Alkaline Stabilization		NA	NA	NA	NA	NA	NA	NA	
Composting		NA	NA	NA	NA	NA	NA	NA	
Composting 2		NA	NA	NA	NA	NA	NA	NA	
Landfill Disposal Typical		NA	NA	NA	NA	NA	NA	NA	
Landfill Disposal Worst-case		NA	NA	NA	NA	NA	NA	NA	
Landfill Disposal Aggressive		NA	NA	NA	NA	NA	NA	NA	
Landfill Disposal CA Regulatory		NA	NA	NA	NA	NA	NA	NA	
Combustion		NA	NA	NA	NA	NA	NA	NA	
Pyrolysis		NA	NA	NA	NA	NA	NA	NA	
Land Application		NA	NA	NA	NA	NA	NA	NA	
Land Application 2		NA	NA	NA	NA	NA	NA	NA	
Miscellaneous Emissions		NA	NA	NA	NA	NA	NA	NA	
Transportation		0	0	0	0	0	0	NA	
Scope 1 - direct emissions		0	0	0	0				
Scope 2 - purchased electricity, heat, or steam									
Scope 3 - production of purchased materials and uses of end products									

CO ₂	Mg per year			Biogenic CO ₂
	CH ₄ (CO ₂ eq)	N ₂ O (CO ₂ eq)		
NA	NA	-	-	NA
NA	-	-	-	NA
NA	-	-	-	NA
NA	NA	-	-	NA
NA	NA	-	-	NA
NA	-	-	-	NA
NA	-	-	-	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	NA	NA	NA	NA
NA	-	-	-	NA
NA	-	-	-	NA
0	0	0	0	0

Scenario 10 Title: Description

Notes and Comments

Unit Process	Enter "x" for all applicable processes:	CO ₂ equivalents (Mg/yr)				Wet tons to each unit process/day	Mg (wet) to each unit process/day	Dry metric tons to each unit process/day	Metric tons CO ₂ eq/dry metric ton biomass
		Scope 1	Scope 2	Scope 3	Total				

CO ₂	Mg per year			Biogenic CO ₂
	CH ₄ (CO ₂ eq)	N ₂ O (CO ₂ eq)		

Analyses

De-watered biomass

Note: Values from columns with yellow headers are used in formulas within this model.

Facility	Date	Sample ID	Wet Density (g/mL)	% Solids	% Organic Matter (TVS)	Organic C (%)	Total N (%)	Total P (%)
			0.95	25%	60%	33.6%	5.0%	2.0%

This is for the post-digested, de-watered biosolids

Percent solids after dewatering prior to drying and/or combustion:	25.0%
Percent solids after thermal drying:	95%
Percent solids after biodrying:	87%
Percent solids after combustion:	65%

Biochar (Pyrolyzed biomass)

Note: Values from columns with yellow headers are used in formulas within this model.

Facility	Date	Sample ID	Wet Density (g/mL)	% Solids	% Organic Matter (TVS)	Organic C (%)	Total N (%)	Total P (%)
			0.68	98%	12%	29.0%	2.4%	5.9%

Percent solids after pyrolysis:	98.0%
---------------------------------	-------

Conditioning/Thickening (if applicable)	
Amount of biomass to be thickened (m ³ /day)	1,243
Solids content of biomass prior to thickening (%)	2.0%
Solids content of biomass after thickening (%)	5.0%
Amount of thickened biomass (m ³ /day)	497

Aerobic Digestion (if applicable)	
Amount of biomass to be digested (m ³ /day)	497
Average retention time (SRT) in digesters (days)	
Solids content of biomass fed to digesters (%)	5.0%
Volatile solids content of biomass prior to digestion (%-dry wt)	
% Volatile solids reduction during aerobic digestion	
Solids content of biomass out of digesters (%)	
Volume Reduction During Aerobic Digestion	

Anaerobic Digestion (AD) (if applicable)	
Amount of solids to be digested (m ³ /day)	497
Average retention time (SRT) in digesters	22
Solids content of biomass fed to digesters (%)	5.0%
Volatile solids content of biomass prior to digestion (%-dry wt)	75.0%
Volatile solids reduction (VSR) - during digestion (%-dry wt)	50.0%
Solids content of biomass out of digesters (%)	3.1%
Volume Reduction During Anaerobic Digestion	0.0%

Dewatering (if applicable)	
Amount of biomass to be dewatered (m ³ /day)	497
Solids content of biomass prior to dewatering (%)	3.1%
Solids content of biomass after dewatering (%)	25.0%

40 days is default recommendation of the Scientific Review Team. To meet PSRP (Class B) standards, U. S. EPA requires >40 days @>20 deg. C and >60 days @>15 deg. C. Ontario design guidelines require 45 days SRT, but the 45 days includes the SRT achieved in the activated sludge system (i.e., if the SRT is 10 days for the aeration process, then only 35 days SRT is required for the aerobic digestion).

25% Recommended by Scientific Review Team for default VSR for aerobic digestion. "U. S. EPA Part 503 regulation requires >38% VSR for aerobic digestion to achieve Class B VAR standards, but most operating aerobic digesters do not achieve this much VSR (Wisconsin DNR, 2016 Biological Solids and Sludge- Handling, Processing, and Reuse Study Guide, Subclass C). Instead, they rely on SOLUR testing to document attaining Class B, if they wish to land apply the biosolids.

0% Scientific Review Team recommendation. If an aerobic digestion system is decanting/supernating, enter the estimated local value for volume reduction.

22 days is default recommendation of the Scientific Review Team

Volatile Solids Reduction (VSR) guidance from Scientific Review Team (based on Wilson, 2009, Muller et al., 2011 and Higgins, 2007)

38% WAS only, basic AD (minimum to meet EPA Class B land application standards for biosolids)

42% Primary and WAS, basic AD

55% Primary and WAS, longer SRT and/or thermophilic digestion

62% Primary only, or Primary and WAS 20 plus-day SRT, or 2-stage and/or hydrolysis

If local data is available, the Scientific Review Team recommends using the Van Kleeck equation 32 in Appendix A of the "White House" document (EPA Environmental Regulations and Technology, "Control of Pathogens and Vector Attraction in Sewage Sludge", 2003) for determining VSR

only required for de-watering info

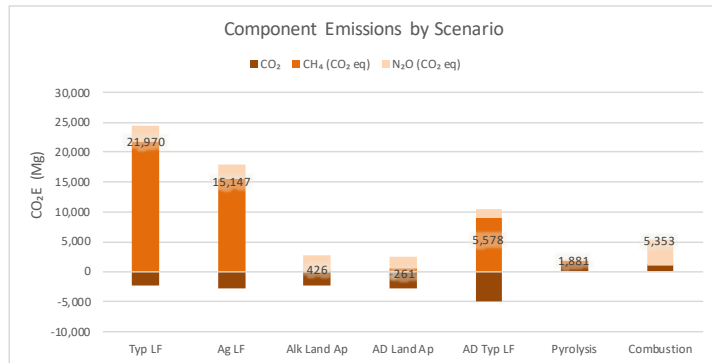
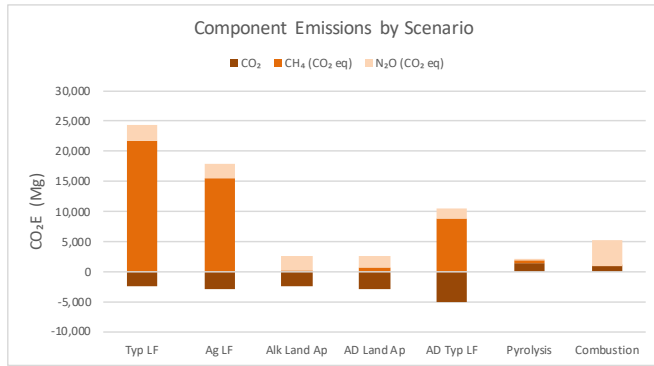
0% Scientific Review Team recommendation. If local data suggests a reduction in volume during digestion, use local data. If an AD system is decanting/supernating, enter the estimated local value for volume reduction.

if digestion, then should be the volume fed to digester adjusted for any volume reduction during digestion

if digestion, then should be the same as solids content coming out of digester

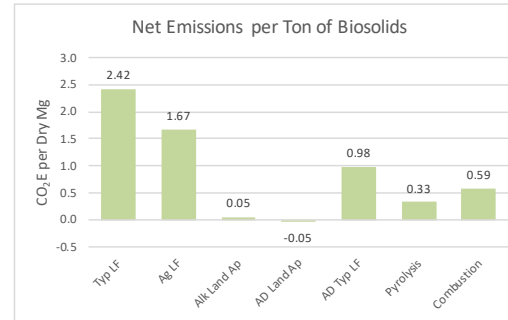
Component Emissions by Scenario

	Typ LF	Ag LF	Alk Land Ap	AD Land Ap	AD Typ LF	Pyrolysis	Combustion
CO ₂	-2,343	-2,860	-2,279	-2,783	-4,983	1,405	1,045
CH ₄ (CO ₂ eq)	21,764	15,457	235	613	8,968	467	11
N ₂ O (CO ₂ eq)	2,550	2,550	2,470	1,909	1,594	9	4,296
Net	21,970	15,147	426	-261	5,578	1,881	5,353



Emissions per Ton of Biosolids by Scenario

	Typ LF	Ag LF	Alk Land Ap	AD Land Ap	AD Typ LF	Pyrolysis	Combustion
CO ₂ e/dry ton	2.42	1.67	0.05	-0.05	0.98	0.33	0.59



Conditioning Thickening

Conditioning/Thickening	Scenario 1		Scenario 2	
	Typ LF		Ag LF	
Unit Processes & Inputs	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
Conditioning / Thickening Input				
Amount of biomass to be thickened (m ³ /day)	1,243		1,243	
Solids content of biomass (%)	2.0%	1.0%	2.0%	1.0%
Quantity (Mg/day-dry)	24.9		24.9	
Type of thickener	other	other	other	other
Polymer use (kg/day)	124	124	124	124
CO₂ equivalents in polymer used (Mg/day)	0.2		0.2	
Electricity Use				
Electricity Use (kWh/day)	122	122	122	122
CO₂ Emissions from electricity used (Mg/day)	0.030		0.030	
CO₂ equivalents (Mg/year)				
CO₂ equivalents (Mg/year)	83		83	
Scope 1	0		0	
Scope 2	11		11	
Scopes 1 & 2	11		11	
Scope 3	72		72	
Biomass combustion	-		-	

Instructions and Notes

General: Enter data for wastewater solids thickening, and conditioning for thickening (using polymers; ignore other conditioners such as ferric chloride or alum). Do not use this page for dewatering (separate sheet).

Key	
Input	0
Default from reference values	0
Data used to calculate default (for info only)	0
Process output	0
Input with possible cell reference	0
Calculated result	0

Conditioning Thickening

Scenario 3 Alk Land Ap		Scenario 4 AD Land Ap		Scenario 5 AD Typ LF		Scenario 6 Pyrolysis		Scen Combt
Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions
1,243		1,243		1,243		1,243		1,243
2.0%	1.0%	2.0%	1.0%	2.0%	1.0%	2.0%	1.0%	2.0%
24.9		24.9		24.9		24.9		24.9
other	other	other	other	other	other	other	other	other
124	124	124	124	124	124	124	124	124
0.2		0.2		0.2		0.2		0.2
122	122	122	122	122	122	122	122	122
0.030		0.030		0.030		0.030		0.030
83		83		83		83		83
0		0		0		0		0
11		11		11		11		11
11		11		11		11		11
72		72		72		72		72
-		-		-		-		-

Conditioning Thickening

Scenario 7	Scenario 8		Scenario 9		Scenario 10	
Question	0		0		0	
Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
	1,243		1,243		1,243	
1.0%	2.0%	1.0%	2.0%	1.0%	2.0%	1.0%
	24.9		24.9		24.9	
other		other		other		other
124		124		124		124
	0.0		0.0		0.0	
122		122		122		122
	0.000		0.000		0.000	
	0		0		0	
	0		0		0	
	0		0		0	
	0		0		0	
	0		0		0	
	-		-		-	

Anaerobic Digestion

Anaerobic Digestion	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	Typ LF		Ag LF		Alk Land Ap		AD Land Ap		AD Typ LF	
Unit Processes & Inputs	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
Digester Input										
Biomass (e.g. sludge/solids) to digesters (m ³ /day-wet)	497		497		497		497		497	
Biomass to digesters (Mg/day-wet)	497		497		497		497		497	
Biomass to digesters (Mg/day-dry)	24.9		24.9		24.9		24.9		24.9	
VS prior to digestion (% - dry wt.)	75.0%		75.0%		75.0%		75.0%		75.0%	
VS (Mg/day) - dry wt.	18.6		18.6		18.6		18.6		18.6	
Solids retention time (SRT) (days)	22	22	22	22	22	22	22	22	22	22
Digester Output										
Biomass quantity (m ³ /day)		497		497		497		497		497
% VS destruction	50.0%		50.0%		50.0%		50.0%		50.0%	
VS destroyed (kg/day) - dry wt.	9,323		9,323		9,323		9,323		9,323	
Biomass quantity (Mg/day-dry)	15.5		15.5		15.5		15.5		15.5	
Biomass TVS (% dry wt)	60%		60%		60%		60%		60%	
Energy Balance										
Biogas Yield (m ³ /day)		8,390		8,390		8,390		8,390		8,390
Methane Yield (m ³ /day)		0		0		0		5,454		5,454
Combined Heat and Power (CHP) Engines used (yes/no)								yes		yes
% Biogas combusted for energy recovery (boilers, CHP, etc.); do not include RNG to pipeline (that is covered below) (%)								95%		95%
Efficiency of combustion for energy recovery relative to methane emissions		Normal		Normal		Normal		Normal		Normal
Methane emissions from combustion for energy recovery (Mg CO ₂ eq/day)	N/A		N/A		N/A			0.27		0.27
% Combusted biogas generating heat (%)		100%		100%		100%		40%		40%
% Combusted biogas generating electricity generated at 100% efficiency (%)		N/A		N/A		N/A		33%		33%
Renewable natural gas (RNG) to pipeline (yes/no)								no		no
Renewable natural gas (RNG) to pipeline (% of biogas generated)		0%		0%		0%		0%		0%
Type of flare		Default		Default		Default		Default		Default
% Biogas Flared								4%		4%
Methane emissions from flaring (Mg CO ₂ eq/day)	N/A		N/A		N/A			0.04		0.04
Total percent of biogas combusted (%)	0%	0%	0%	0%	0%	0%		99%		99%
% Uncombusted Biogas Fugitive Emissions		0%		0%		0%		1%		1%
Natural gas equivalent generated (m ³ /day)		0		0		0		2,048		2,048
Electricity generated (kWh/day)		0		0		0		15,262		15,262
Heating requirements of the digesters (m ³ natural gas/day)		2,297		2,297		2,297		2,297		2,297
Electricity requirements of the digesters (kWh/day)		1,706		1,706		1,706		1,706		1,706
Net natural Gas used (m ³ /day)		0		0		0		249		249
Net electricity used (kWh/day)		0		0		0		-13,556		-13,556
CO ₂ emissions from natural gas (net) used (Mg/day)	0.00		0.00		0.00			0.47		0.47
CO ₂ Emissions from electricity (net) purchased (Mg/day)	0.00		0.00		0.00			-3.28		-3.28
CO ₂ eq emissions from fugitive methane (Mg/day)	#VALUE!		#VALUE!		#VALUE!			1.28		1.28
CO ₂ emissions (non-methane) from biomass (biogas) combustion (Mg/day)	0.0		0.0		0.0			7.8		7.8
CO₂ equivalents (Mg/year)										
Scope 1	#VALUE!		#VALUE!		#VALUE!			-558		-558
Scope 2	#VALUE!		#VALUE!		#VALUE!			639		639
Scope 3	0		0		0			-1,197		-1,197
Scopes 1 & 2	#VALUE!		#VALUE!		#VALUE!			-558		-558
Scope 3	0		0		0			0		0
Biomass combustion*	0		0		0			2,838		2,838

Instructions and Notes

General: Enter combined data from all anaerobic digesters. Be sure to enter in the green cells actual data from measurements at a facility, if available. Use defaults if necessary, especially when previous data inputs have resulted in a calculated default value.

*Biomass combustion emissions are not included in total CO₂ equivalents.

Key	
Input	0
Default from reference values	0
Data used to calculate default (for info only)	0
Process output	0
Input with possible cell reference	0
Calculated result	0

Anaerobic Digestion

Scenario 6 Pyrolysis		Scenario 7 Combustion		Scenario 8 0		Scenario 9 0		Scenario 10 0	
Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
497		497		497		497		497	
497		497		472		472		472	
24.9		24.9		23.6		23.6		23.6	
75.0%		75.0%		75.0%		75.0%		75.0%	
18.6		18.6		17.7		17.7		17.7	
22	22	22	22	22	22	22	22	22	22
497	497	497	497	497	497	497	497	497	497
50.0%		50.0%		50.0%		50.0%		50.0%	
9,323		9,323		8,856		8,856		8,856	
15.5		15.5		14.8		14.8		14.8	
60%		60%		60%		60%		60%	
8,390	8,390		8,390		7,971		7,971		7,971
5,454	5,454		0		0		0		0
yes									
95%									
Normal	Normal	N/A	Normal	N/A	Normal	N/A	Normal	N/A	Normal
0.27									
40%	40%		100%		100%		100%		100%
33%	33%		N/A		N/A		N/A		N/A
no									
0%	0%		0%		0%		0%		0%
Default	Default		Default		Default		Default		Default
4%									
0.04		N/A		N/A		N/A		N/A	
99%	99%		0%		0%		0%		0%
1%	1%		0%		0%		0%		0%
2,048	2,048		0		0		0		0
15,262	15,262		0		0		0		0
2,297	2,297		2,297		2,182		2,182		2,182
1,706	1,706		1,706		1,706		1,706		1,706
249	249		0		0		0		0
-13,556	-13,556		0		0		0		0
0.47		0.00		0.00		0.00		0.00	
-3.28		0.00		0.00		0.00		0.00	
1.28		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
7.8		0.0		0.0		0.0		0.0	
-558		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
639		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
-1,197		0		0		0		0	
-558		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
0		0		0		0		0	
2,838		0		0		0		0	

De-watering

De-watering	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	Typ LF		Ag LF		Alk Land Ap		AD Land Ap	
Unit Processes & Inputs	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
Amount of biomass to be de-watered (m ³ /day)	497		497		497		497	
Solids content of biomass prior to dewatering (%)	5.0%	4.0%	5.0%	4.0%	5.0%	4.0%	3.1%	4.0%
Solids content after de-watering	25.0%		25.0%		25.0%		25.0%	
Quantity (Mg/day-dry)	24.9		24.9		24.9		15.5	
Type of de-watering equipment	centrifuge	other	centrifuge	other	centrifuge	other	centrifuge	other
Polymer use (kg/day)	124	124	124	124	124	124	124	78
CO ₂ equivalents in polymers used (Mg/day)	0.2		0.2		0.2		0.2	
Electricity Use								
Energy use (kWh/day)	2,660	2,660	2,660	2,660	2,660	2,660	1,660	1,660
CO ₂ emissions from electricity used (Mg/day)	0.64		0.64		0.64		0.40	
CO₂ equivalents (Mg/year)								
Scope 1	0		0		0		0	
Scope 2	235		235		235		147	
Scopes 1 & 2	235		235		235		147	
Scope 3	72		72		72		72	
Biomass combustion	-		-		-		-	
Total	307		307		307		219	

Instructions and Notes

General: Enter combined data for all like dewatering units. If a passive drying system with no polymers is used (e.g. drying beds), either estimate the energy use (in kWh equivalents/day) or assume zero emissions.

Key	
Input	0
Default from reference values	0
Data used to calculate default (for info only)	0
Process output	0
Input with possible cell reference	0
Calculated result	0

De-watering

Scenario 5 AD Typ LF		Scenario 6 Pyrolysis		Scenario 7 Combustion		Scenario 8 0		Scenario 9 0		Scenario 10 0	
Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
497		497		497							
3.1%	4.0%	3.1%	4.0%	5.0%	4.0%	3.1%	4.0%	3.1%	4.0%	3.1%	4.0%
25.0%		25.0%		25.0%		25.0%		25.0%		25.0%	
15.5		15.5		24.9		0.0		0.0		0.0	
centrifuge	other	centrifuge	other	centrifuge	other		other		other		other
124	78	124	78	124	124		0		0		0
0.2		0.2		0.2		0.0		0.0		0.0	
1,660	1,660	1,660	1,660	2,660	2,660		0		0		0
0.40		0.40		0.64		0.00		0.00		0.00	
219		219		307		0		0		0	
0		0		0		0		0		0	
147		147		235		0		0		0	
147		147		235		0		0		0	
72		72		72		0		0		0	
-		-		-		-		-		-	

Alkaline Stabilization

Alkaline Stabilization	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	Typ LF		Ag LF		Alk Land Ap		AD Land Ap	
Unit Processes & Inputs	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
Alkaline Stabilization Input								
Mass of biomass to be stabilized-wet (Mg/day)	0		0		99		0	
Solids content of biomass to be stabilized (%)	25.0%		25.0%		25.0%		25.0%	
Mass of biomass-dry (Mg/day)	0.0		0.0		24.9		0.0	
Degree of stabilization					Class A			
Is the lime in biosolids derived from a waste product (e.g. cement kiln dust)?		no		no	yes	no		no
Amount of alkaline product added (Mg lime or lime equivalent/day)		0.0		0.0	7.5	7.5		0.0
CO ₂ emissions equivalents from lime production (Mg/day)	0.0		0.0		0.0		0.0	
Fuel Use								
Fuel use (kg CO ₂ eq/day)		0		0	388	388		0
CO ₂ emissions from natural gas used (Mg/day)	0.0		0.0		0.4		0.0	
Electricity Use								
Electricity requirements of alkaline stabilization (kWh/day)		0		0	368	368		0
CO ₂ emissions from electricity used (Mg/day)	0.00		0.00		0.09		0.00	
CO₂ equivalents (Mg/yr)								
	0		0		174		0	
Scope 1	0		0		142		0	
Scope 2	0		0		33		0	
Scopes 1 & 2	0		0		174		0	
Scope 3	0		0		0		0	
Biomass combustion	-		-		-		-	

Instructions and Notes

General: Enter data from alkaline stabilization processes, regardless of whether this happens before or after dewatering. Some advanced alkaline stabilization systems may use supplemental heat from natural gas combustion to achieve Class A; if so, enter amount of natural gas used. If electricity is used for supplemental heat for achieving Class A, this is included in the Class A calculation.

Key	
Input	0
Default from reference values	0
Data used to calculate default (for info only)	0
Process output	0
Input with possible cell reference	0
Calculated result	0

Alkaline Stabilization

Scenario 5 AD Typ LF		Scenario 6 Pyrolysis		Scenario 7 Combustion		Scenario 8 0		Scenario 9 0		Scenario 10 0	
Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
0		0		0		0		0		0	
25.0%		25.0%		25.0%		25.0%		25.0%		25.0%	
0.0		0.0		0.0		0.0		0.0		0.0	
	no		no		no		no		no		no
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0		0		0		0		0		0
0.0		0.0		0.0		0.0		0.0		0.0	
	0		0		0		0		0		0
0.00		0.00		0.00		0.00		0.00		0.00	
0		0		0		0		0		0	
0		0		0		0		0		0	
0		0		0		0		0		0	
0		0		0		0		0		0	
-		-		-		-		-		-	

Landfill Disposal Typical

Landfill Disposal - Typical	Scenario 1		Scenario 2		Scenario 3	
	Typ LF		Ag LF		Alk Land Ap	
Unit Processes & Inputs	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
Biomass Characteristics Input						
Quantity going to landfill (Mg/day-wet)	99.4		0.0		0.0	
Solids content (%)	25.0%		25.0%		25.0%	
Quantity going to landfill (Mg/day-dry)	24.9		0.0		0.0	
Has the biomass (e.g. sludge/solids) been digested prior to disposal?	no					
Total nitrogen (%-dry weight)	4.0%	4.0%	5.0%	5.0%	5.0%	5.0%
Total volatile solids (TVS) of solids going to landfill (%-dry weight)	75.0%	78.0%	60.0%	65.0%	60.0%	65.0%
Organic carbon in solids going to landfill (%-dry weight)	42.0%	42.0%	33.6%	33.6%	33.6%	33.6%
Organic carbon (Mg/day-dry weight)	10.4		0.0		0.0	
Methane correction factor for landfill (DOC _i that will decompose in landfill)	1.0	1.0		1.0		1.0
Quality of soil cover at landfill (high = good organic matter content, supports vegetation well)	low	low		low		low
Oxidation of methane by soil cover - applies three years after placement of wastewater solids in landfill	10%		25%		25%	
Methane captured at landfill and flared, combusted or otherwise used - after capping	90%		90%		90%	
Percent of captured methane used to generate electricity	50%	50%		50%		50%
Level of Digestion/Processing	Undigested/Raw					
DOC _i - fraction of degradable organic carbon that can decompose	80%		N/A		N/A	
Landfill climate zone (see Reference sheet cells A171:A175 for climate criteria)	cool wet					
K-decay rate	0.185		N/A		N/A	
Methane Emissions						
CH ₄ released from first two years after landfilling (Mg/day)	1.4024		N/A		N/A	
CH ₄ released from years 2-4 after landfilling (Mg/day)	0.6362		N/A		N/A	
CH ₄ released from years 5-14 after landfilling (Mg/day)	0.3269		N/A		N/A	
CH ₄ released after capping (Mg/day)	0.0017		N/A		N/A	
Fugitive CH ₄ from combusted CH ₄ (Mg/day)	0.0178		N/A		N/A	
CO ₂ Emissions equivalents from released CH ₄ (Mg/day)	59.63		0.00		0.00	
Nitrous Oxide Emissions						
N ₂ O emitted from landfilled biomass (Mg/day)	0.02344		0.00000		0.00000	
CO ₂ emissions equivalents from released N ₂ O (Mg/day)	6.99		0.00		0.00	
Carbon Sequestration						
From undecomposed carbon from landfilled biomass (Mg CO ₂ /day)	-7.66		#VALUE!		#VALUE!	
Electricity Generation Credit						
Electricity generated (kWh/day)	3,280.740		N/A		N/A	
CO ₂ emissions avoided from electricity generated (Mg/day)	-0.79		#VALUE!		#VALUE!	
CO ₂ emissions from biomass (biogas) combustion (Mg/day)	4.83		#VALUE!		#VALUE!	
CO₂ equivalents (Mg/year)						
Scope 1	21,519		#VALUE!		#VALUE!	
Scope 2	-290		#VALUE!		#VALUE!	
Scopes 1 & 2	21,229		#VALUE!		#VALUE!	
Scope 3	0		0		0	
Biomass combustion*	1,763		#VALUE!		#VALUE!	

Instructions and Notes

General: Enter data for all biomass sent to a landfill for disposal.

*Biomass combustion emissions are not included in total CO₂ equivalents.

Key	
Input	0
Default from reference values	0
Data used to calculate default (for info only)	0
Process output	0
Input with possible cell reference	0
Calculated result	0

Landfill Disposal Typical

Scenario 4 AD Land Ap		Scenario 5 AD Typ LF		Scenario 6 Pyrolysis		Scenario 7 Combustion		Scenario 8 0		Scenario 0
Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions
0.0		62.2		0.0		0.0		0.0		0.0
25.0%		25.0%		25.0%		25.0%		25.0%		25.0%
0.00		15.5		0.0		0.00		0.0		0.0
		no								
5.0%	5.0%	4.0%	4.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
60.0%	65.0%	75.0%	78.0%	60.0%	65.0%	60.0%	65.0%	60.0%	65.0%	60.0%
33.6%	33.6%	42.0%	42.0%	33.6%	33.6%	33.6%	33.6%	33.6%	33.6%	33.6%
0.00		6.5		0.0		0.00		0.0		0.0
	1.0	1.0	1.0		1.0		1.0		1.0	
	low	low	low		low		low		low	
25%		10%		25%		25%		25%		25%
90%		90%		90%		90%		90%		90%
	50%	50%	50%		50%		50%		50%	
		Complete Digestion								
N/A		50%		N/A		N/A		N/A		N/A
		cool wet								
N/A		0.185		N/A		N/A		N/A		N/A
N/A		0.5478		N/A		N/A		N/A		N/A
N/A		0.2485		N/A		N/A		N/A		N/A
N/A		0.1277		N/A		N/A		N/A		N/A
N/A		0.0007		N/A		N/A		N/A		N/A
N/A		0.0070		N/A		N/A		N/A		N/A
0.00		23.29		0.00		0.00		0.00		0.00
0.00000		0.01465		0.00000		0.00000		0.00000		0.00000
0.00		4.37		0.00		0.00		0.00		0.00
#VALUE!		-11.96		#VALUE!		#VALUE!		#VALUE!		#VALUE!
N/A		1,281.539		N/A		N/A		N/A		N/A
#VALUE!		-0.31		#VALUE!		#VALUE!		#VALUE!		#VALUE!
#VALUE!		1.89		#VALUE!		#VALUE!		#VALUE!		#VALUE!
#VALUE!		5,615		#VALUE!		#VALUE!		#VALUE!		#VALUE!
#VALUE!		5,728		#VALUE!		#VALUE!		#VALUE!		#VALUE!
#VALUE!		-113		#VALUE!		#VALUE!		#VALUE!		#VALUE!
#VALUE!		5,615		#VALUE!		#VALUE!		#VALUE!		#VALUE!
0		0		0		0		0		0
#VALUE!		689		#VALUE!		#VALUE!		#VALUE!		#VALUE!

Landfill Disposal Typical

Scenario 10		
0		
Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
	0.0	
	25.0%	
	0.0	
5.0%	5.0%	5.0%
65.0%	60.0%	65.0%
33.6%	33.6%	33.6%
	0.0	
1.0		1.0
low		low
	25%	
	90%	
50%		50%
	N/A	
	N/A	
	N/A	
	N/A	
	N/A	
	0.00	
	0.00000	
	0.00	
	#VALUE!	
	N/A	
	#VALUE!	
	#VALUE!	
	#VALUE!	
	#VALUE!	
	#VALUE!	
	#VALUE!	
	0	
	#VALUE!	

Landfill Disposal Aggressive

Landfill Disposal - Aggressive	Scenario 1		Scenario 2		Scenario 3	
	Typ LF		Ag LF		Alk Land Ap	
Unit Processes & Inputs	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
Biomass Characteristics Input						
Quantity going to landfill (Mg/day-wet)	0		99		0	
Solids content (%)	25.0%		25.0%		25.0%	
Quantity going to landfill (Mg/day-dry)	0.0		24.9		0.0	
Has the biomass (e.g. sludge/solids) been digested prior to disposal?			no			
Total nitrogen (%-dry weight)	5.0%	5.0%	4.0%	4.0%	5.0%	5.0%
Total volatile solids (TVS) of solids going to landfill (%-dry weight)	60.0%	65.0%	75.0%	78.0%	60.0%	65.0%
Organic carbon in solids going to landfill (%-dry weight)	33.6%	33.6%	42.0%	42.0%	33.6%	33.6%
Organic carbon (Mg/day-dry weight)	0.0		10.4		0.0	
Methane correction factor for landfill (DOC _f that will decompose in landfill)		1.0	1.0	1.0		1.0
Quality of soil cover at landfill (high = good organic matter content, supports vegetation well)		high	high	high		high
Oxidation of methane by soil cover - applies three years after placement of wastewater solids in landfill	25%		25%		25%	
Methane captured at landfill and flared, combusted or otherwise used - after capping	90%		90%		90%	
Percent of captured methane used to generate electricity		100%	100%	100%		100%
Level of Digestion/Processing			Undigested/Raw			
DOC _f - fraction of degradable organic carbon that can decompose	N/A		80%		N/A	
Landfill climate zone (see Reference sheet cells A171:A175 for climate criteria)			cool wet			
K-decay rate	N/A		0.185		N/A	
Methane Emissions						
CH ₄ released from first half year after landfilling (Mg/day)	N/A		0.39		N/A	
CH ₄ released from years 0.5-2 after landfilling (Mg/day)	N/A		0.76		N/A	
CH ₄ released from years 3-14 after landfilling (Mg/day)	N/A		0.52		N/A	
CH ₄ released after capping (Mg/day)	N/A		0.00		N/A	
Fugitive CH ₄ from combusted CH ₄ (Mg/day)	N/A		0.02		N/A	
CO ₂ Emissions equivalents from released CH ₄ (Mg/day)	0.00		42.35		0.00	
Nitrous Oxide Emissions						
N ₂ O emitted from landfilled biomass (Mg/day)	0.000		0.023		0.000	
CO ₂ emissions equivalents from released N ₂ O (Mg/day)	0.00		6.99		0.00	
Carbon Sequestration						
From undecomposed carbon from landfilled biomass (Mg CO ₂ /day)	#VALUE!		-7.66		#VALUE!	
Electricity Generation Credit						
Electricity generated (kWh/day)	N/A		9,129		N/A	
CO ₂ emissions avoided from electricity generated (Mg/day)	#VALUE!		-2.21		#VALUE!	
CO ₂ emissions from biomass (biogas) combustion (Mg/day)	#VALUE!		0		#VALUE!	
CO₂ equivalents (Mg/year)						
Scope 1	#VALUE!		14,406		#VALUE!	
Scope 2	#VALUE!		-806		#VALUE!	
Scopes 1 & 2	#VALUE!		14,406		#VALUE!	
Scope 3	0		0		0	
Biomass combustion*	#VALUE!		0		#VALUE!	

Instructions and Notes

General: Enter data for all wastewater solids sent to a landfill for disposal.

*Biomass combustion emissions are not included in total CO₂ equivalents.

Key	
Input	0
Default from reference values	0
Data used to calculate default (for info only)	0
Process output	0
Input with possible cell reference	0
Calculated result	0

Landfill Disposal Aggressive

Scenario 4 AD Land Ap		Scenario 5 AD Typ LF		Scenario 6 Pyrolysis		Scenario 7 Combustion		Scenario 8 0		Scenario 9 0	
Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
0		0		0		0		0		0	
25.0%		25.0%		25.0%		25.0%		25.0%		25.0%	
0.0		0.0		0.0		0.0		0.0		0.0	
5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
60.0%	65.0%	60.0%	65.0%	60.0%	65.0%	60.0%	65.0%	60.0%	65.0%	60.0%	65.0%
33.6%	33.6%	33.6%	33.6%	33.6%	33.6%	33.6%	33.6%	33.6%	33.6%	33.6%	33.6%
0.0		0.0		0.0		0.0		0.0		0.0	
	1.0		1.0		1.0		1.0		1.0		1.0
	high		high		high		high		high		high
25%		25%		25%		25%		25%		25%	
90%		90%		90%		90%		90%		90%	
	100%		100%		100%		100%		100%		100%
N/A		N/A		N/A		N/A		N/A		N/A	
N/A		N/A		N/A		N/A		N/A		N/A	
N/A		N/A		N/A		N/A		N/A		N/A	
0.00		0.00		0.00		0.00		0.00		0.00	
0.000		0.000		0.000		0.000		0.000		0.000	
0.00		0.00		0.00		0.00		0.00		0.00	
#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
N/A		N/A		N/A		N/A		N/A		N/A	
#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
0		0		0		0		0		0	
#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	

Scenario 10	
0	
Inputs & Daily Emissions	Default Input (Optional)
0	
25.0%	
0.0	
5.0%	5.0%
60.0%	65.0%
33.6%	33.6%
0.0	
	1.0
	high
25%	
90%	
	100%
N/A	
N/A	
N/A	
N/A	
N/A	
0.00	
0.000	
0.00	
#VALUE!	
N/A	
#VALUE!	
#VALUE!	
#VALUE!	
#VALUE!	
#VALUE!	
#VALUE!	
0	
#VALUE!	

Combustion

Combustion	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	Typ LF		Ag LF		Alk Land Ap		AD Land Ap		AD Typ LF	
Unit Processes & Inputs	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
Solids Input (to incinerator)										
Type of incinerator		Fluidized Bed		Fluidized Bed		Fluidized Bed		Fluidized Bed		Fluidized Bed
Quantity of solids/sludge going into incinerator(s) (Mg/day-wet)	#N/A		#N/A		#N/A		#N/A		#N/A	
Solids content of solids/sludge going into incinerator(s) (%)	25.0%		25.0%		25.0%		25.0%		25.0%	
Quantity (Mg/day-dry)	N/A		N/A		N/A		N/A		N/A	
Is solids/sludge digested prior to incineration?		no		no		no		no		no
Total nitrogen (%-dry weight)	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Total phosphorus (%-dry weight)	2.0%	1.9%	2.0%	1.9%	2.0%	1.9%	2.0%	1.9%	2.0%	1.9%
Total volatile solids (TVS) (%-dry weight)	60.0%	65.0%	60.0%	65.0%	60.0%	65.0%	60.0%	65.0%	60.0%	65.0%
Quantity after combustion (Mg/day-dry)	N/A		N/A		N/A		N/A		N/A	
Quantity after combustion (Mg/day-wet)	N/A		N/A		N/A		N/A		N/A	
Recovered energy to electricity (%)										
Recovered energy as heat (%)										
Disposition of ash - Is it used to replace phosphorus fertilizer or in cement or brick?		none		none		none		none		none
Is a urea-based selective noncatalytic reduction emissions system being used?		no		no		no		no		no
Average high temperature in the combustion zone and freeboard area (°C)		850		850		850		850		850
Energy Balance										
Energy requirements of the incinerator-evaporating water (BTU/day)		N/A		N/A		N/A		N/A		N/A
Energy potential of sludge (Btu/day)		N/A		N/A		N/A		N/A		N/A
Fuel Use										
Natural gas needed to evaporate water in sludge (m ³ /day)		N/A		N/A		N/A		N/A		N/A
Avoided gas use from recovered energy (m ³ /day)		N/A		N/A		N/A		N/A		N/A
Net natural gas used (m ³ /day)		N/A		N/A		N/A		N/A		N/A
CO ₂ emissions from natural gas used (Mg/day)	0.00		0.00		0.00		0.00		0.00	
Electricity Use										
Electricity requirements of incinerator (kWh/day)		N/A		N/A		N/A		N/A		N/A
Electricity generated (kWh/day)		N/A		N/A		N/A		N/A		N/A
Net Electricity used (kWh/day)		N/A		N/A		N/A		N/A		N/A
CO ₂ emissions from electricity used (Mg/day)	0.00		0.00		0.00		0.00		0.00	
Methane emissions										
CO ₂ emissions equivalents from released methane (Mg/day)	#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
Nitrous Oxide Emissions										
N ₂ O emitted during incineration (Mg/day)		N/A		N/A		N/A		N/A		N/A
N ₂ O emission adjustment for SNCR based on urea (Mg/day)	0.000		0.000		0.000		0.000		0.000	
N ₂ O emission adjustment for moisture content of biomass (Mg/day)	0.000		0.000		0.000		0.000		0.000	
CO ₂ emissions equivalents from released N ₂ O (Mg/day)	0.00		0.00		0.00		0.00		0.00	
Cement Replacement Value										
CO ₂ replacement value from cement manufacture (Mg CO ₂ /day)	0.00		0.00		0.00		0.00		0.00	
Fertilizer Off-set Credits										
From phosphorus applied to soil (Mg CO ₂ /day)	0.00		0.00		0.00		0.00		0.00	
Biomass Combustion										
CO ₂ Emissions equivalents from burning biomass (Mg/day)	#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
CO₂ equivalents (Mg/year)										
Scope 1	#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
Scope 2	0		0		0		0		0	
Scopes 1 & 2	#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	
Scope 3	0		0		0		0		0	
Biomass combustion*	#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!	

Instructions and Notes

General: Enter combined data for all operating incinerators. The data input with the most impact is the average high (freeboard) temperature of combustion. Electricity and natural gas used should include energy to operate the incinerator and to operate any pollution control systems associated with the incinerator. Also important is whether or not a urea-based selective non-catalytic reduction air emissions control system is used.

*Biomass combustion emissions are not included in total CO₂ equivalents.

Key	
Input	0
Default from reference values	0
Data used to calculate default (for info only)	0
Process output	0
Input with possible cell reference	0
Calculated result	0

Combustion

Scenario 6 Pyrolysis		Scenario 7 Combustion		Scenario 8 0		Scenario 9 0		Scenario 10 0	
Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
	Fluidized Bed	Fluidized Bed	Fluidized Bed		Fluidized Bed		Fluidized Bed		Fluidized Bed
#N/A		99.4		#N/A		#N/A		#N/A	
25.0%		25.0%		25.0%		25.0%		25.0%	
N/A		24.9		N/A		N/A		N/A	
	no		no		no		no		no
5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
2.0%	1.9%	2.0%	1.9%	2.0%	1.9%	2.0%	1.9%	2.0%	1.9%
60.0%	65.0%	75.0%	65.0%	60.0%	65.0%	60.0%	65.0%	60.0%	65.0%
N/A		6		N/A		N/A		N/A	
N/A		10		N/A		N/A		N/A	
		0%							
		75%							
	none	none	none		none		none		none
	no	no	no		no		no		no
	850	850	850		850		850		850
	N/A		318,114,748		N/A		N/A		N/A
	N/A		541,973,274		N/A		N/A		N/A
	N/A		8,772		N/A		N/A		N/A
	N/A		8,967		N/A		N/A		N/A
	N/A	-195	-195		N/A		N/A		N/A
0.00		-0.37		0.00		0.00		0.00	
	N/A		4,972		N/A		N/A		N/A
	N/A		0		N/A		N/A		N/A
	N/A	4,972	4,972		N/A		N/A		N/A
0.00		1.20		0.00		0.00		0.00	
#VALUE!		0.03		#VALUE!		#VALUE!		#VALUE!	
	N/A	0.079	0.079		N/A		N/A		N/A
0.000		0.000		0.000		0.000		0.000	
0.000		-0.040		0.000		0.000		0.000	
0.00		11.77		0.00		0.00		0.00	
0.00		0.00		0.00		0.00		0.00	
0.00		0.00		0.00		0.00		0.00	
#VALUE!		38.29		#VALUE!		#VALUE!		#VALUE!	
#VALUE!		4,611		#VALUE!		#VALUE!		#VALUE!	
#VALUE!		4,172		#VALUE!		#VALUE!		#VALUE!	
0		439		0		0		0	
#VALUE!		4,611		#VALUE!		#VALUE!		#VALUE!	
0		0		0		0		0	
#VALUE!		13,975		#VALUE!		#VALUE!		#VALUE!	

Pyrolysis

Pyrolysis	Scenario 1		Scenario 2		Scenario 3		Scenario 4
	Typ LF		Ag LF		Alk Land Ap		AD Land
Unit Processes & Inputs	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions
Solids Input (to pyrolysis unit)							
Is the biomass coming from a biodryer?							
Quantity of solids/sludge going to pyrolysis (Mg/day-wet)							
Solids content of solids/sludge going to pyrolysis (%)	87.0%		87.0%		87.0%		87.0%
Quantity (Mg/day-dry)	N/A		N/A		N/A		N/A
Is biomass digested prior to pyrolysis?		no		no		no	yes
Total nitrogen (%-dry weight)	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Total phosphorus (%-dry weight)	2.0%	1.9%	2.0%	1.9%	2.0%	1.9%	2.0%
Total volatile solids (TVS) (%-dry weight)	60.0%	65.0%	60.0%	65.0%	60.0%	65.0%	60.0%
Type of pyrolysis unit (mass reduction as a %)							
Mass loss during pyrolysis (%-dry weight)	#N/A		#N/A		#N/A		#N/A
Solids content after pyrolysis (%)	98.0%		98.0%		98.0%		98.0%
Quantity of biochar generated (Mg/day-dry)	N/A		N/A		N/A		N/A
Fuel Use							
Natural gas used (m ³ /day)							
CO ₂ emissions from natural gas used (Mg/day)	0.00		0.00		0.00		0.00
Electricity Use							
Electricity required for ancillary equipment (kWh/day)	N/A		N/A		N/A		N/A
Electricity generated during pyrolysis used for ancillary equipment (kWh/day)							
Net electrical energy use (kWh/day)	N/A		N/A		N/A		N/A
CO ₂ emissions from electricity used (Mg/day)	#VALUE!		#VALUE!		#VALUE!		#VALUE!
Methane emissions							
CO ₂ emissions equivalents from released methane (Mg/day)	#VALUE!		#VALUE!		#VALUE!		#VALUE!
Nitrous Oxide Emissions							
CO ₂ emissions equivalents from released N ₂ O (Mg/day)	#VALUE!		#VALUE!		#VALUE!		#VALUE!
Biomass Oxidation							
CO ₂ Emissions equivalents from pyrolysing biomass (Mg/day)	#VALUE!		#VALUE!		#VALUE!		#VALUE!
CO₂ equivalents (Mg/year)							
Scope 1	#VALUE!		#VALUE!		#VALUE!		#VALUE!
Scope 2	#VALUE!		#VALUE!		#VALUE!		#VALUE!
Scopes 1 & 2	#VALUE!		#VALUE!		#VALUE!		#VALUE!
Scope 3	0		0		0		0
Biomass combustion*	#VALUE!		#VALUE!		#VALUE!		#VALUE!

Instructions and Notes

Key	
Input	0
Default from reference values	0
Data used to calculate default (for info only)	0
Process output	0
Input with possible cell reference	0
Calculated result	0

Pyrolysis

Scenario 4 nd Ap	Scenario 5 AD Typ LF		Scenario 6 Pyrolysis		Scenario 7 Combustion		Scenario 8 0		Scenario 9 0	
Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
			no						yes	
			16.3						0.0	
	87.0%		95.0%		87.0%		87.0%		87.0%	
	N/A		15.5		N/A		N/A		0.0	
no		no	yes	no		no		no	yes	no
5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
1.9%	2.0%	1.9%	2.0%	1.9%	2.0%	1.9%	2.0%	1.9%	2.0%	1.9%
65.0%	60.0%	65.0%	60.0%	65.0%	60.0%	65.0%	60.0%	65.0%	60.0%	65.0%
			User-defined 1						BFT	
	#N/A		45.0%		#N/A		#N/A		50.0%	
	98.0%		98.0%		98.0%		98.0%		98.0%	
	N/A		8.5		N/A		N/A		0.0	
			0							
	0.00		0.00		0.00		0.00		0.00	
	N/A		1,915		N/A		N/A		0	
			0							
	N/A		1,915		N/A		N/A		0	
	#VALUE!		0.46		#VALUE!		#VALUE!		0.00	
	#VALUE!		0.00		#VALUE!		#VALUE!		0.00	
	#VALUE!		0.02		#VALUE!		#VALUE!		0.00	
	#VALUE!		8.60		#VALUE!		#VALUE!		0.00	
	#VALUE!		178		#VALUE!		#VALUE!		0	
	#VALUE!		9		#VALUE!		#VALUE!		0	
	#VALUE!		169		#VALUE!		#VALUE!		0	
	#VALUE!		178		#VALUE!		#VALUE!		0	
	0		0		0		0		0	
	#VALUE!		3,139		#VALUE!		#VALUE!		0	

Pyrolysis

Scenario 10	
0	
Inputs & Daily Emissions	Default Input (Optional)
87.0%	
N/A	
	no
5.0%	5.0%
2.0%	1.9%
60.0%	65.0%
#N/A	
98.0%	
N/A	
0.00	
N/A	
N/A	
#VALUE!	
#VALUE!	
#VALUE!	
#VALUE!	
#VALUE!	
#VALUE!	
#VALUE!	
0	
#VALUE!	

Land Application

Land Application	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5	
	Typ LF		Aq LF		Alk Land Ap		AD Land Ap		AD Typ LF	
	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
Biomass characteristics										
Processing prior to land application					Alk Stab		Other			
Quantity of treated biosolids going to land application (Mg/day-wet)	#N/A		#N/A		99		62		#N/A	
Solids content of treated biosolids going to land application (%)	25.0%		25.0%		25.0%		25.0%		25.0%	
Quantity going to land application (Mg/day-dry)	N/A		N/A		24.9		15.5		N/A	
Density of treated biosolids (kg/m ³)		950		950	950	950	950	950		950
Type of biosolids to be land applied					limed		digested			
Total nitrogen (%-dry weight)	5.0%	N/A	5.0%	N/A	4.0%	3.2%	5.0%	5.0%	5.0%	N/A
Total phosphorus (%-dry weight)	2.0%	N/A	2.0%	N/A	1.5%	1.2%	2.0%	1.9%	2.0%	N/A
Total volatile solids (TVS) (%-dry weight)	60.0%	N/A	60.0%	N/A	75.0%	52.0%	60.0%	65.0%	60.0%	N/A
Organic carbon (%-dry weight)	34%	33.6%	34%	33.6%	42%	42.0%	34%	33.6%	34%	33.6%
CaCO ₃ equivalence (%-dry weight)		0.0%		0.0%	35.0%	25.0%	0.0%	0.0%		0.0%
Average number of days biosolids are stored prior to land application					30		30			
Climate at land application sites					Humid		Humid			
Is lime in biosolids derived from a waste product? (e.g. cement kiln dust)		no		no		no		no		no
Will the lime in biosolids replace purchased lime where it is applied?		yes		yes		yes		yes		yes
Soil Texture at land application sites (total)										
Fine-textured (% of land application area)		50%		50%	50%	50%	50%	50%	50%	50%
Coarse-textured (% of land application area)	100%		100%		50%		50%		100%	
Fuel Use										
Applying biomass to land (L-diesel fuel/day)		N/A		N/A	67	67	42	42		N/A
CO ₂ emissions from diesel used (Mg/day)	0.00		0.00		0.18		0.11		0.00	
Methane Emissions										
CH ₄ emitted from storage of biomass prior to land application (Mg/day)	N/A		N/A		0.0		0.0161		N/A	
CO ₂ Emissions equivalents from released CH ₄ (Mg/day)	#VALUE!		#VALUE!		0.64		0.40		#VALUE!	
Nitrous Oxide Emissions										
N ₂ O emitted from land application - fine-textured soils (Mg/day)	N/A		N/A		0.0215		0.0168		N/A	
N ₂ O emission adjustment for dry biomass on fine-textured soil (Mg/day)	0.000		0.000		0.000		0.000		0.000	
N ₂ O emitted from storage of biomass prior to land application (Mg/day)	N/A		N/A		0.0012		0.0008		N/A	
CO ₂ emissions equivalents from released N ₂ O (Mg/day)	#VALUE!		#VALUE!		6.77		5.23		#VALUE!	
Carbon Sequestration										
Carbon sequestration as result of land application (Mg CO ₂ /dry Mg biosolids)		Current Default		Current Default	Current Default	Current Default	Current Default	Current Default		Current Default
From biosolids applied to soil (Mg CO ₂ /day)	#VALUE!		#VALUE!		-3.73		-2.33		#VALUE!	
Fertilizer Off-set Credits										
From nitrogen applied to soil (Mg CO ₂ /day)	#VALUE!		#VALUE!		-3.98		-3.11		#VALUE!	
From phosphorus applied to soil (Mg CO ₂ /day)	#VALUE!		#VALUE!		-0.75		-0.62		#VALUE!	
Calcium Carbonate Debit										
From CaCO ₃ applied to soil (Mg CO ₂ /day)	#VALUE!		#VALUE!		0.00		0.00		#VALUE!	
CO₂ equivalents (Mg/year)	#VALUE!		#VALUE!		-314		-115		#VALUE!	
Scope 1	#VALUE!		#VALUE!		1,410		1,246		#VALUE!	
Scope 2	0		0		0		0		0	
Scopes 1 & 2	#VALUE!		#VALUE!		1,410		1,246		#VALUE!	
Scope 3	#VALUE!		#VALUE!		-1,724		-1,361		#VALUE!	
Biomass combustion	-		-		-		-		-	

Instructions and Notes

On this page, enter data for all biosolids that are applied to land, but have not been composted. This may include alkaline stabilized biosolids (complete the alkaline stabilized page) or other Class A or Class B biosolids.

Key	
Input	0
Default from reference values	0
Data used to calculate default (for info only)	0
Process output	0
Input with possible cell reference	0
Calculated result	0

Land Application

Scenario 6		Scenario 7		Scenario 8		Scenario 9		Scenario 10	
Pyrolysis		Combustion		0		0		0	
Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)	Inputs & Daily Emissions	Default Input (Optional)
Pyrolysis LA						Pyrolysis LA			
9		#N/A		#N/A		0		#N/A	
98.0%		25.0%		25.0%		98.0%		25.0%	
8.5		N/A		N/A		0.0		N/A	
680	950		950		950		950		950
pyrolyzed									
2.4%	N/A	5.0%	N/A	5.0%	N/A	2.4%	N/A	5.0%	N/A
5.9%	N/A	2.0%	N/A	2.0%	N/A	5.9%	N/A	2.0%	N/A
12.0%	N/A	60.0%	N/A	60.0%	N/A	12.0%	N/A	60.0%	N/A
29%	6.7%	34%	33.6%	34%	33.6%	29%	6.7%	34%	33.6%
0.0%	0.0%		0.0%		0.0%		0.0%		0.0%
30									
Humid									
no	no		no		no		no		no
no	yes		yes		yes		yes		yes
50%	50%		50%		50%		50%		50%
50%		100%		100%		100%		100%	
8	8		N/A		N/A		N/A		N/A
0.02		0.00		0.00		0.00		0.00	
0.0000		N/A		N/A		0.0000		N/A	
0.00		#VALUE!		#VALUE!		0.00		#VALUE!	
0.0044		N/A		N/A		0.0000		N/A	
-0.004		0.000		0.000		0.000		0.000	
0.0000		N/A		N/A		0.0000		N/A	
0.00		#VALUE!		#VALUE!		0.00		#VALUE!	
User-defined	Current Default		Current Default		Current Default		Current Default		Current Default
-3.38		#VALUE!		#VALUE!		0.00		#VALUE!	
-0.82		#VALUE!		#VALUE!		0.00		#VALUE!	
-1.01		#VALUE!		#VALUE!		0.00		#VALUE!	
0.00		#VALUE!		#VALUE!		0.00		#VALUE!	
-1,895		#VALUE!		#VALUE!		0		#VALUE!	
-1,227		#VALUE!		#VALUE!		0		#VALUE!	
0		0		0		0		0	
-1,227		#VALUE!		#VALUE!		0		#VALUE!	
-668		#VALUE!		#VALUE!		0		#VALUE!	
-		-		-		-		-	

Destination 25	Total			
0				
0		CO ₂ equivalents (Mg/year)	351	Transport CO ₂ equivalents
0		Scope 1	351.1	(kg/Mg wet to final locations)
2.5		Scope 2	NA	
0.0		Scope 3	NA	
N/A		Biomass combustion	0	
0	130,162	Trucking CO ₂ equivalents (Mg/year)	351	10
0%		Rail CO ₂ equivalents (Mg/year)	0	0
N/A	351			
Destination 25	Total			
0				
0		CO ₂ equivalents (Mg/year)	351	Transport CO ₂ equivalents
0		Scope 1	351.1	(kg/Mg wet to final locations)
2.5		Scope 2	NA	
0.0		Scope 3	NA	
N/A		Biomass combustion	0	
0	130,162	Trucking CO ₂ equivalents (Mg/year)	351	10
0%		Rail CO ₂ equivalents (Mg/year)	0	0
N/A	351			
Destination 25	Total			
0				
0		CO ₂ equivalents (Mg/year)	176	Transport CO ₂ equivalents
0		Scope 1	175.5	(kg/Mg wet to final locations)
2.5		Scope 2	NA	
0.0		Scope 3	NA	
N/A		Biomass combustion	0	
0	85,081	Trucking CO ₂ equivalents (Mg/year)	176	5
0%		Rail CO ₂ equivalents (Mg/year)	0	0
N/A	176			
Destination 25	Total			
0				
0		CO ₂ equivalents (Mg/year)	110	Transport CO ₂ equivalents
0		Scope 1	108.7	(kg/Mg wet to final locations)
2.5		Scope 2	NA	
0.0		Scope 3	NA	
N/A		Biomass combustion	0	
0	40,875	Trucking CO ₂ equivalents (Mg/year)	110	5
0%		Rail CO ₂ equivalents (Mg/year)	0	0
N/A	110			
Destination 25	Total			
0				
0		CO ₂ equivalents (Mg/year)	219	Transport CO ₂ equivalents
0		Scope 1	218.4	(kg/Mg wet to final locations)
2.5		Scope 2	NA	
0.0		Scope 3	NA	
N/A		Biomass combustion	0	
0	81,350	Trucking CO ₂ equivalents (Mg/year)	219	10
0%		Rail CO ₂ equivalents (Mg/year)	0	0
N/A	219			
Destination 25	Total			
0				
0		CO ₂ equivalents (Mg/year)	15	Transport CO ₂ equivalents
0		Scope 1	15.4	(kg/Mg wet to final locations)
2.5		Scope 2	NA	
0.0		Scope 3	NA	
N/A		Biomass combustion	0	
0	5,707	Trucking CO ₂ equivalents (Mg/year)	15	
0%		Rail CO ₂ equivalents (Mg/year)	0	0
N/A	15			
Destination 25	Total			
0				
0		CO ₂ equivalents (Mg/year)	351	Transport CO ₂ equivalents
0		Scope 1	351.1	(kg/Mg wet to final locations)
2.5		Scope 2	NA	
0.0		Scope 3	NA	
N/A		Biomass combustion	0	
0	130,162	Trucking CO ₂ equivalents (Mg/year)	351	10
0%		Rail CO ₂ equivalents (Mg/year)	0	0
N/A	351			
Destination 25	Total			
0				
0		CO ₂ equivalents (Mg/year)	0	Transport CO ₂ equivalents
0		Scope 1	0.0	(kg/Mg wet to final locations)
2.5		Scope 2	NA	
0.0		Scope 3	NA	
N/A		Biomass combustion	0	
0	0	Trucking CO ₂ equivalents (Mg/year)	0	#DIV/0!
0%		Rail CO ₂ equivalents (Mg/year)	0	#DIV/0!
N/A	0			
Destination 240	Total			
0				
0		CO ₂ equivalents (Mg/year)	0	Transport CO ₂ equivalents
0		Scope 1	0.0	(kg/Mg wet to final locations)
2.5		Scope 2	NA	
0.0		Scope 3	NA	
N/A		Biomass combustion	0	
0	0	Trucking CO ₂ equivalents (Mg/year)	0	#DIV/0!
0%		Rail CO ₂ equivalents (Mg/year)	0	#DIV/0!
N/A	0			
Destination 25	Total			
0				
0		CO ₂ equivalents (Mg/year)	0	Transport CO ₂ equivalents
0		Scope 1	0.0	(kg/Mg wet to final locations)
2.5		Scope 2	NA	
0.0		Scope 3	NA	
N/A		Biomass combustion	0	
0	0	Trucking CO ₂ equivalents (Mg/year)	0	#DIV/0!
0%		Rail CO ₂ equivalents (Mg/year)	0	#DIV/0!
N/A	0			