



MEMORANDUM

TO: Lee County **DATE:** February 1, 2024

FROM: RRT Design & Construction

SUBJECT: Facility and Equipment System Sizing

The purpose of this memo is to provide Lee County with information regarding the projected future tons for receipt, processing, and storage as a guide to sizing the proposed SR-82 MRF. Items such as the tipping floor should be sized using the 2046 projected inbound tonnage because it is a fixed size. However, other items such as equipment sizing will be based on a different approach because operating hours and days are flexible. RRT has projected the inbound tons to be received at the proposed SR-82 MRF for a twenty (20) - year period (2026-2046). Table 1 below presents the summary of the projected population and inbound residential single stream tons from 2026-2046.

Table 1. Projected Population and Inbound Tons (2026-2046)

Year	Projected Total Service Area Population	Projected Residential Single Stream Tons
2026	1,183,286	99,822
2027	1,206,276	101,761
2028	1,229,266	103,701
2029	1,252,257	105,640
2030	1,275,247	107,580
2031	1,298,013	109,500
2032	1,320,779	111,421
2033	1,343,544	113,341
2034	1,366,311	115,262
2035	1,389,077	117,183
2036	1,411,795	119,099
2037	1,434,514	121,016
2038	1,457,232	122,932
2039	1,479,950	124,849
2040	1,502,668	126,765
2041	1,525,406	128,683
2042	1,548,144	130,601
2043	1,570,881	132,520
2044	1,593,619	134,438
2045	1,616,347	136,355
2046	1,639,120	138,276

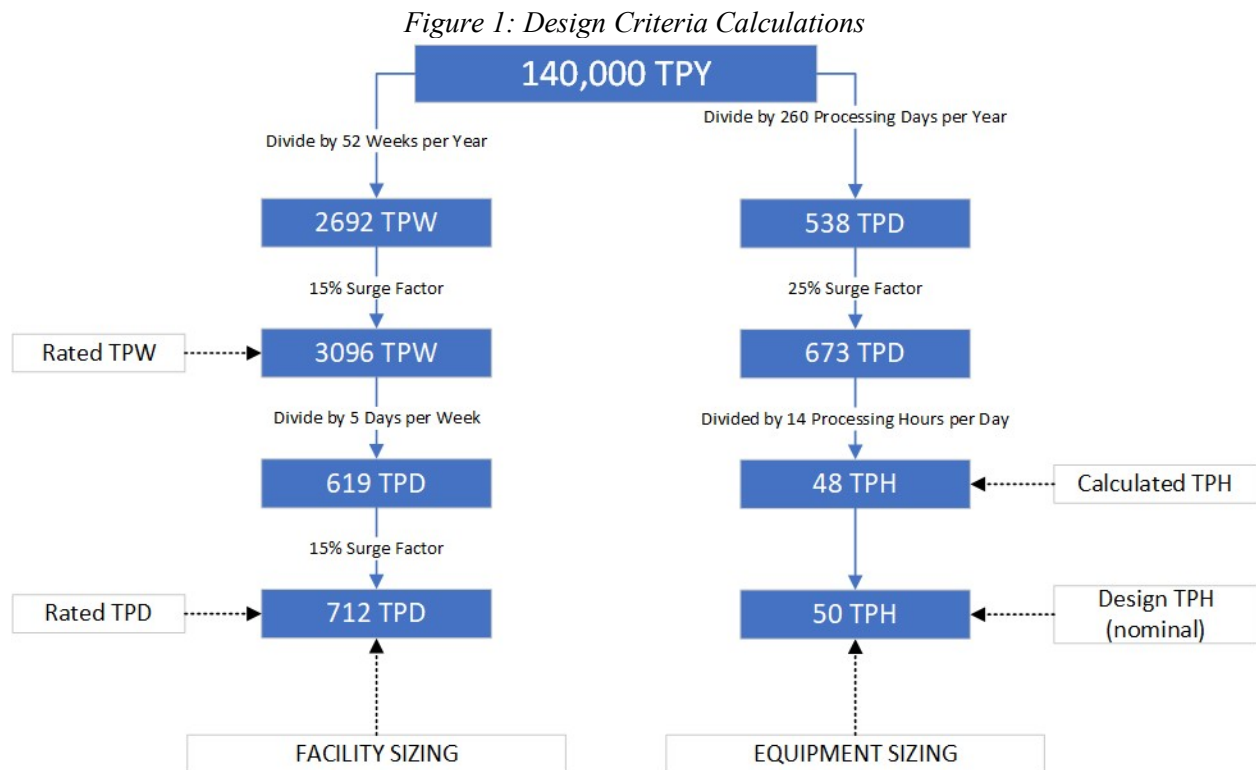
SUMMARY:

RRT recommends sizing the MRF to receive a total of 150,000 TPY of recyclable materials. A capacity of 140,000 TPY (projected single stream recyclable tons received in 2046, from Table 1) will be allocated for residential tons and 10,000 TPY will be allocated for commercial tons.

Utilizing the recommendation of 140,000 residential tons per year, the next step is to calculate the basis for the recommended receiving and processing capacity sizing and system processing capacity on tons per week, tons per day, and tons per hour basis. The Design Capacity of the processing system will be greater than this MRF’s Rated Capacity to account for operational and input material variables. This includes the design criteria as outlined in the Basis of Design matrix dated 01/29/2024 and reflected below.

Facility Sizing:

1. Rated Tons Per Year (TPY) – Based on year 2026 County projected tonnage rates and recycling participation, increased based on population growth in 20 years (2046), see Figure 1, plus adjustments considering expansion of services and potentially added streams of input material of 140,000 TPY.
2. Rated Tons Per Week (TPW) – Rated TPY value divided by 52 weeks and then increased by 15% to account for seasonal fluctuations, see Figure 1.

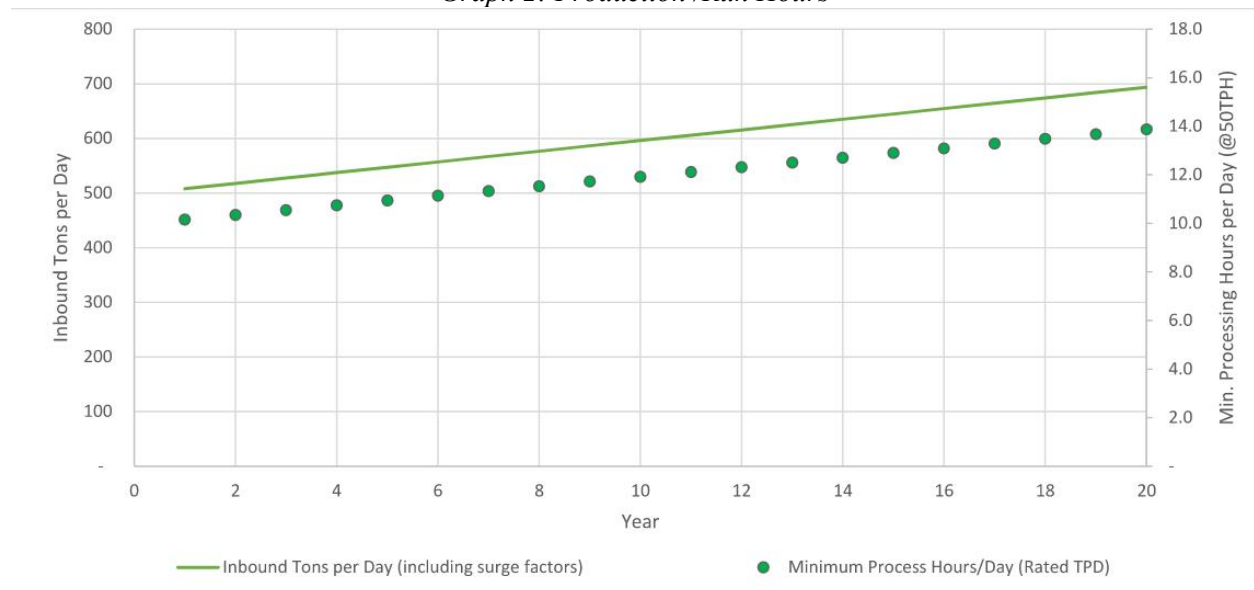


3. Rated Tons Per Day (TPD) – Rated TPW value divided by (5) processing days per week and increased by 15% to cover daily fluctuation (peak days), see Figure 1. This value will be used to establish tipping floor size accounting for inbound vehicles, maneuvering of loaders, and 100% containment of incoming material. The MRF’s capacity beyond the Rated TPD, would be through additional hours, additional third processing shifts, and/or additional equipment., all of which are not considered at this time.
4. Peak Truck/Trailer Delivery Ton – Overlap quantities on the historical hourly deliveries to determine in order to size the tipping floor and bale storage area to accommodate peak traffic periods. Relates to Queuing Analysis.

Equipment System Sizing:

1. Design Tons Per Day (TPD) – Average TPD (Rated TPY divided by 260 work days) increased by 1.25 for delivery surges (quantities or densities), operating inefficiencies, outages, and compositional changes.
2. Design Tons per Hour (TPH) – Design TPD divided by average processing (run) hours per day (based on a two-shift operating day with 14 run hours per day. Under unusual circumstances, plant employees could be paid on a ten (10) hour basis per shift and the total daily run time would be 18 hours per day rather than 14 hours, thereby increasing the Design TPD by a factor of nearly 1/3, See Graph 2. System Design TPH excludes the commercial OCC that will not be processed through the system. Graph 2 will be fine-tuned with the proposed operating plan over the 20 plus years.

Graph 2: Production /Run Hours



RECOMMENDATION:

1. Tipping floor shall be sized for 57,000 square feet for the material pile, based on 5 days in accordance with the BOD matrix utilizing the Rated TPD, and includes space for segregating incoming direct bale material.
2. Bale storage area shall be sized for 20,000 square feet based on five (5) days of production for Fiber and two (2) full loads of container in accordance with the BOD matrix utilizing the Rated TPD.
3. Equipment system Design Capacity shall be 50 TPH based on a single paid 10-hour shift (8.5 run hours per day) in the year 2026 evolving to two paid 8-hour shifts (total of 14 run hours per day) at the tail end of the 20 year period.

ANALYSIS OF POPULATION AND TONNAGE:

MRF Service Area Population: 2010 – 2022

The Lee County material recovery facility (MRF) service area includes Lee County, Hendry County, and the City of Naples. RRT compiled the census population data for Lee County and Hendry County using the American Community Survey (ACS) and Decennial Census of Population and Housing conducted by the U.S. Census Bureau. RRT utilized the ACS yearly population estimates to project the population for the years between the Decennial Census of Population and Housing.

Lee County provided RRT with a population projection from 2022-2050, which included both permanent and seasonal populations. RRT used census data as a basis then added the seasonal population for the 2010-2022 historical population to correspond with Lee County’s 2022-2050 population projection. RRT used historical data to estimate the seasonal population (18.1%) and used this percentage to calculate the Adjusted w/ Seasonal population column in Table 2.

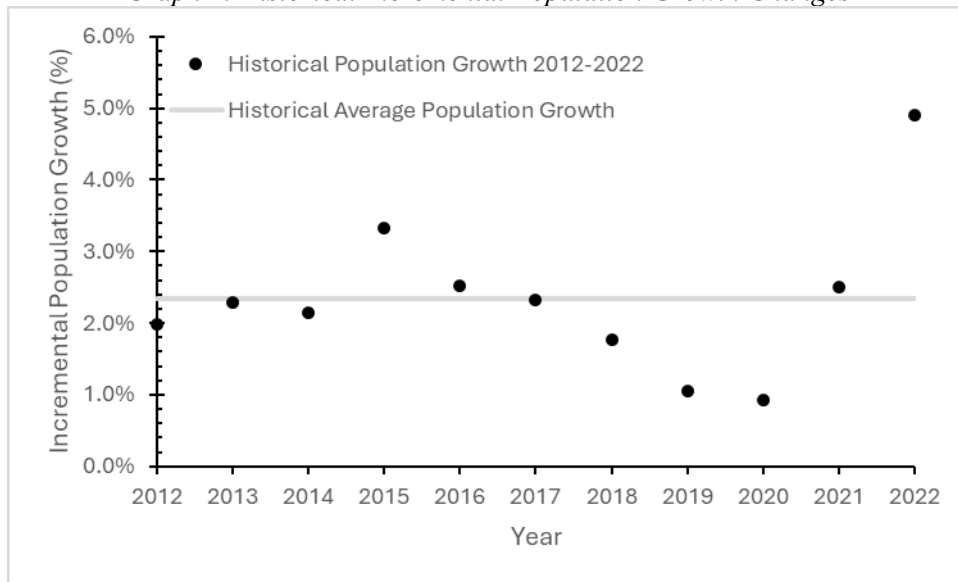
RRT utilized the City of Naples’ 2023 Comprehensive Plan for their population because their estimate includes seasonal population data. The Comprehensive Plan contained population data from 2014-2040. For years not included in the Comprehensive Plan (2010-2013, 2041-2043), the census population data was used and adjusted to account for seasonal population in the same manner as Lee County.

Table 2 shows the individual populations for Lee County, Hendry County, the City of Naples, and a total population column. Years where the census was conducted are bolded.

Table 2. MRF Historical Service Area Population Census Data

Year	Lee County		Hendry County	City of Naples	Total Population
	Population	Adjusted w/ Seasonal	Population	Population	
2010	618,754	730,748	39,140	68,537	838,425
2011	624,773	737,857	38,429	69,085	845,371
2012	639,505	755,255	37,919	68,917	862,091
2013	656,444	775,260	37,599	68,956	881,815
2014	672,063	793,706	37,640	69,397	900,743
2015	696,450	822,507	37,763	70,385	930,655
2016	715,459	844,957	37,862	71,372	954,191
2017	732,837	865,480	38,605	72,360	976,445
2018	745,710	880,684	39,680	73,348	993,712
2019	753,265	889,606	40,202	74,335	1,004,143
2020	760,820	898,528	39,619	75,323	1,013,470
2021	780,540	921,818	40,808	76,161	1,038,787
2022	822,453	971,317	41,339	77,000	1,089,656

Graph 1. Historical Incremental Population Growth Changes



Graph 1 shows the historical incremental population growth changes from 2012-2022. The population growth has fluctuated over the last decade, but the average population growth was 2.3%. This growth rate is consistent with the County’s provided growth rate of 2.1% in 2023. There have been no decreases in the total population during this time period.

MRF Service Area Population Projection: 2023-2046

RRT created the population projection to be used to project inbound tons. The MRF services four (4) distinct areas: Lee County, Hendry County, the City of Naples, and Babcock Ranch.

At RRT’s request, the County provided a population projection report for Lee County (Service Area 1-7, City of Cape Coral, City of Fort Myers, and City of Sanibel). Lee County also

provided population data for Babcock Ranch; specifically, the section of the development that is in Charlotte County. The Lee County portion of Babcock Ranch is in Service Area 4. Lee County directed RRT to use a population of 7,292 to account for the population of Babcock Ranch in Charlotte County in 2022 and to apply the same growth rate as Service Area 4.

The projected population for Hendry County is based on the University of Florida’s Bureau of Economic and Business Research (BEBR) projections. RRT utilized the BEBR’s *Projections of Florida Population by County, 2025-2050, with Estimates for 2022* report.

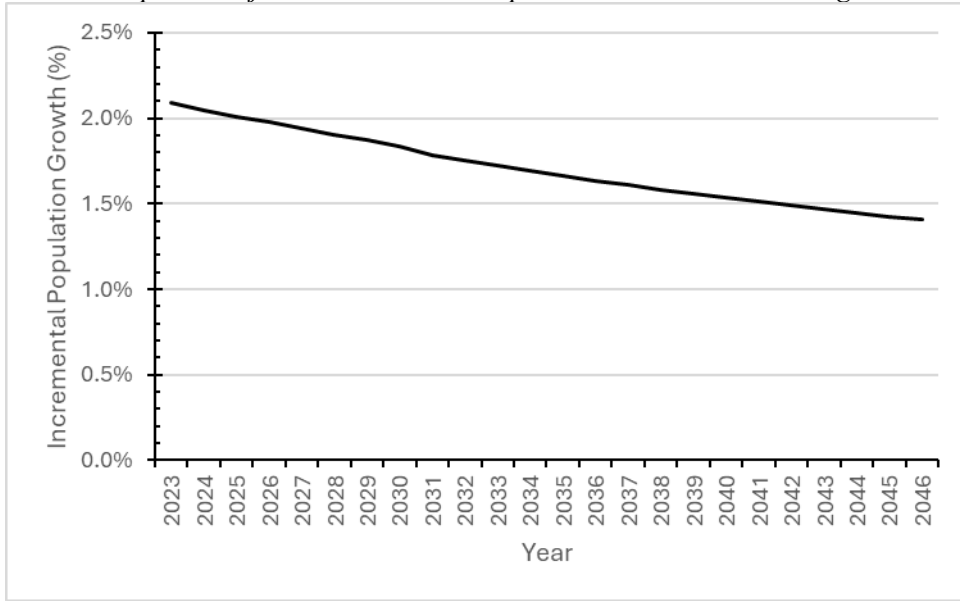
The City of Naples population projection is based on the City’s 2023 Comprehensive Plan. The Comprehensive Plan population projection is based on census data and the BEBR projections. As stated in the Comprehensive Plan, the seasonal population is accounted for in the estimate.

Table 3. MRF Service Area Projected Population 2023-2046

Year	Lee County	Hendry County	City of Naples	Charlotte County - Babcock Ranch	Total Population
	Population	Population	Population	Population	
2023	987,712	41,435	77,838	7,674	1,114,660
2024	1,009,213	41,532	78,677	8,057	1,137,478
2025	1,030,714	41,628	79,515	8,439	1,160,296
2026	1,052,215	41,896	80,353	8,821	1,183,286
2027	1,073,716	42,165	81,192	9,204	1,206,276
2028	1,095,217	42,433	82,030	9,586	1,229,266
2029	1,116,718	42,702	82,869	9,968	1,252,257
2030	1,138,219	42,970	83,707	10,351	1,275,247
2031	1,159,720	43,176	84,384	10,733	1,298,013
2032	1,181,221	43,382	85,061	11,115	1,320,779
2033	1,202,722	43,588	85,737	11,497	1,343,544
2034	1,224,223	43,794	86,414	11,880	1,366,311
2035	1,245,724	44,000	87,091	12,262	1,389,077
2036	1,267,225	44,158	87,768	12,644	1,411,795
2037	1,288,726	44,316	88,445	13,027	1,434,514
2038	1,310,227	44,474	89,122	13,409	1,457,232
2039	1,331,728	44,632	89,799	13,791	1,479,950
2040	1,353,229	44,790	90,475	14,174	1,502,668
2041	1,374,730	44,921	91,199	14,556	1,525,406
2042	1,396,231	45,052	91,923	14,938	1,548,144
2043	1,417,732	45,182	92,646	15,321	1,570,881
2044	1,439,233	45,313	93,370	15,703	1,593,619
2045	1,460,724	45,444	94,094	16,085	1,616,347
2046	1,482,225	45,580	94,847	16,468	1,639,120

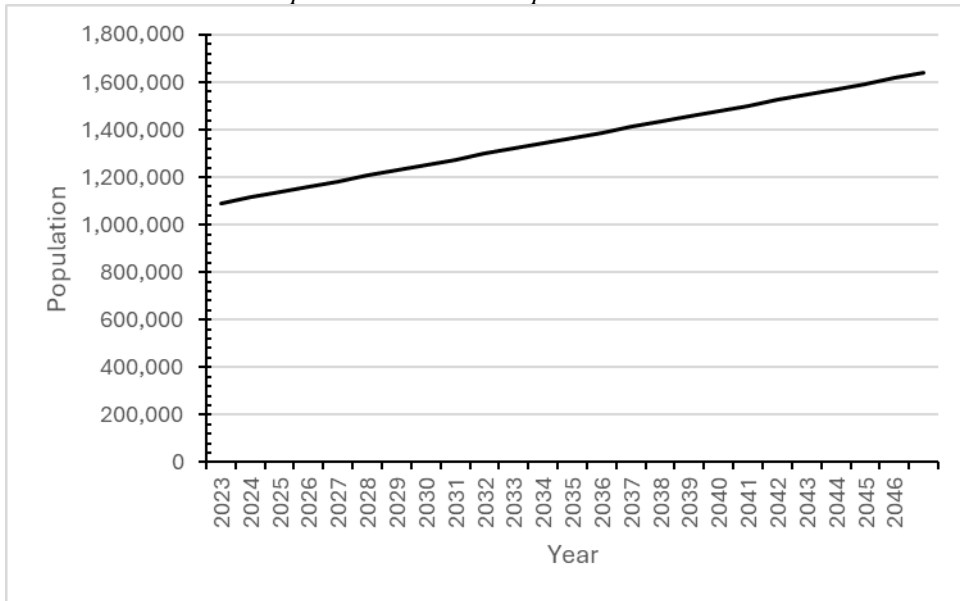
Table 3 shows the individual populations for Lee County, Hendry County, the City of Naples, Babcock Ranch in Charlotte County, and a total population column which is the sum of the listed populations. The seven (7) service areas, City of Cape Coral, City of Fort Myers, and City of Sanibel are all combined into the Lee County column.

Graph 2. Projected Incremental Population Growth Rate Changes



Graph 2 shows the year over year change in the projected population growth rate from 2023-2046. Based on the data provided by Lee County, population growth is projected to decrease over the next twenty years.

Graph 3. Cumulative Population Growth



Graph 3 shows the cumulative population growth from 2023-2046. The population growth remains linear over the next twenty years, accounting for the decrease in the population growth rate.

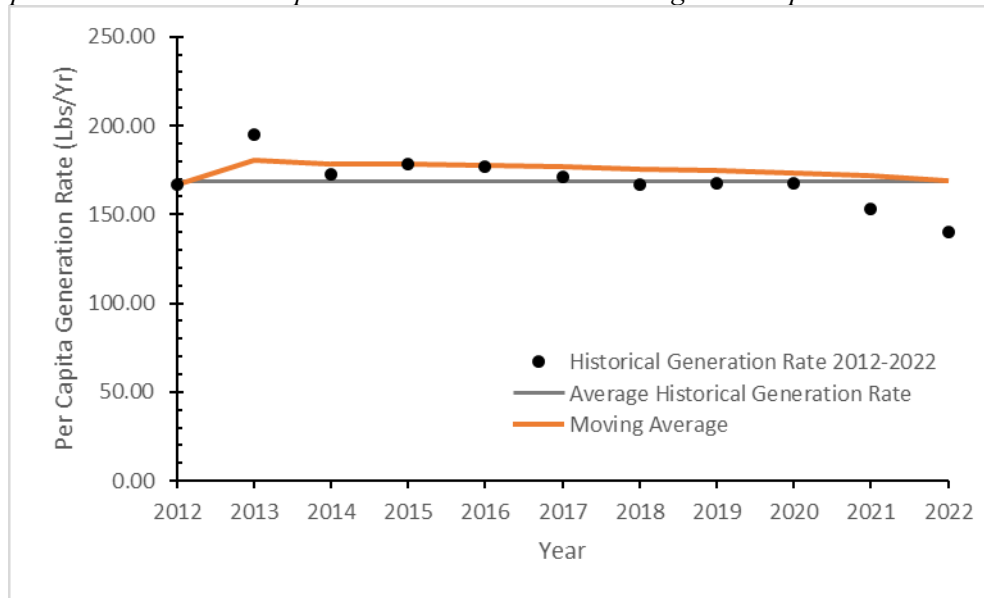
Historical Inbound Tons at the Lee County MRF

Table 4 shows the actual inbound tons received at the MRF between 2012-2022 based on data provided by Lee County. The Per Capita Generation Rate (Lbs./Yr) is calculated by dividing the Residential Single Stream by the Total Service Area Population. The Commercial Single Stream tons are being excluded from the Per Capita Generation Rate calculation because it does not directly correlate with the population. Rather, it relies on the strength of the local economy and the available choices preferred by haulers to bring their commercial recyclables.

Table 4. Actual Inbound Tons at the MRF

Year	Total Single Stream Tons	Commercial Single Stream Tons	Residential Single Stream Tons	Total Service Area Population	Per Capita Generation Rate (Lbs./Yr)
2012	72,443	640	71,803	862,091	166.58
2013	86,775	843	85,932	881,815	194.90
2014	78,438	730	77,707	900,743	172.54
2015	83,643	599	83,044	930,655	178.46
2016	84,896	411	84,485	954,191	177.08
2017	83,716	178	83,537	976,445	171.11
2018	83,167	227	82,940	993,712	166.93
2019	84,516	231	84,286	1,004,143	167.88
2020	87,107	2,257	84,849	1,013,470	167.44
2021	87,399	7,808	79,590	1,038,787	153.24
2022	83,679	7,537	76,142	1,089,656	139.75
Average Generation Rate:					168.72

Graph 4. 2012-2022 Per Capita Generation Rate and Average Per Capita Generation Rate



Graph 4 shows the historical and average per capita generation rates of inbound residential single stream tons from 2012-2022. RRT will be utilizing the average per capita historical generation rate (168.72 Lbs./Yr) to project the residential single stream tons.

Projected Inbound Tons of Proposed SR-82 MRF

Table 5 shows the residential inbound tons projected to be received at the proposed SR-82 MRF between 2026-2046. Table 5 displays three (3) different scenarios: Scenario 1 utilizes the historical average per capita generation rate calculated in Table 4 to project inbound residential tons, Scenario 2 utilizes a 5% reduction in the historical average per capita generation rate to project inbound residential tons, and Scenario 3 utilizes a 10% reduction in the historical average per capita generation rate to project inbound residential tons. Scenarios 2 and 3 are used to represent recycling trends including packaging light weighting per container and packaging changes away from heavier materials.

Based on the historical commercial data in Table 4, RRT suggests the proposed MRF include an additional 10,000 TPY design capacity beyond the tons listed in Table 5 below to account for commercial recyclables. Lee County has stated that commercial recycling is an open market, and that the County has no plans to expand commercial recycling. However, Lee County may want to consider greater capacity beyond the 10,000 TPY given the quantity of commercial recyclables available in the market.

Table 5. Projected Residential Inbound Tons at the MRF

Year	Population	Scenario 1 - Historical Generation Rate		Scenario 2 - 5% Reduction in Generation Rate		Scenario 3 - 10% Reduction in Generation Rate	
		Per Capita Generation Rate (Lbs./Yr)	Projected Resid. Single Stream Tons	Per Capita Generation Rate (Lbs./Yr)	Projected Resid. Single Stream Tons	Per Capita Generation Rate (Lbs./Yr)	Projected Resid. Single Stream Tons
2026	1,183,286	168.72	99,822	160.28	94,831	151.85	89,840
2027	1,206,276	168.72	101,761	160.28	96,673	151.85	91,585
2028	1,229,266	168.72	103,701	160.28	98,516	151.85	93,331
2029	1,252,257	168.72	105,640	160.28	100,358	151.85	95,076
2,030	1,275,247	168.72	107,580	160.28	102,201	151.85	96,822
2031	1,298,013	168.72	109,500	160.28	104,025	151.85	98,550
2032	1,320,779	168.72	111,421	160.28	105,850	151.85	100,279
2033	1,343,544	168.72	113,341	160.28	107,674	151.85	102,007
2034	1,366,311	168.72	115,262	160.28	109,499	151.85	103,736
2035	1,389,077	168.72	117,183	160.28	111,323	151.85	105,464
2036	1,411,795	168.72	119,099	160.28	113,144	151.85	107,189
2037	1,434,514	168.72	121,016	160.28	114,965	151.85	108,914
2038	1,457,232	168.72	122,932	160.28	116,785	151.85	110,639
2039	1,479,950	168.72	124,849	160.28	118,606	151.85	112,364
2040	1,502,668	168.72	126,765	160.28	120,427	151.85	114,089
2041	1,525,406	168.72	128,683	160.28	122,249	151.85	115,815
2042	1,548,144	168.72	130,601	160.28	124,071	151.85	117,541
2043	1,570,881	168.72	132,520	160.28	125,894	151.85	119,268
2044	1,593,619	168.72	134,438	160.28	127,716	151.85	120,994
2045	1,616,347	168.72	136,355	160.28	129,537	151.85	122,720
2046	1,639,120	168.72	138,276	160.28	131,362	151.85	124,449