Preferred Scenario Development and Finalization

Solid Waste Master Plan

Task 11

Pinellas County, FL

July 2019

FINAL

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1 Introduction

On May 30, 2019, Pinellas County (County) Solid Waste staff and the HDR team met to review Public Workshop (Task 9) comments, Regional Subcommittee (Task 10) comments and County staff comments regarding the strategies developed to date as detailed in the Task 8 Scenario Development report. As part of the May 30th meeting, County staff and the HDR Team reviewed each strategy in light of feedback received, the practicality of each strategy, and whether the strategy met the goals and values of the 30-year Solid Waste Master Plan (Plan). Other mitigating factors that affected whether the strategy should be recommend in the final Plan were also discussed. Of the thirty-five (35) identified strategies in the Task 8 report, seven (7) strategies were removed, leaving twenty-eight (28) total strategies recommended for inclusion in the Plan.

With the final strategies determined, assumptions and information regarding impacts of the remaining strategies were also reviewed with the County. Additional refinement of the impacts was identified and the HDR team revised strategy impacts accordingly, which are reflected in Section 3 of this report and builds upon the final Task 8 report. The revised estimates and assumptions are included in the financial return on investment (FROI) evaluation described in Section 5 of this report, as well as the diversion estimates described in Section 6 of this report.

2 Recommended Strategies (Short-list)

There are 28 strategies recommended for inclusion in the Plan. A summary of the recommended strategies and timing anticipated for each recommended strategy is summarized below. Short-term refers to current through 2024; mid-term refers to 2025 through 2033; and long-term refers to 2034 through 2048; the term “ongoing” refers to strategies that would continue with implementation efforts throughout the thirty-year planning period.

2.1 Regional Cooperation

Strategies related to regional cooperation were the result of discussions with jurisdictions in the surrounding areas of the County including Hillsborough County, Manatee County, Pasco County, Sarasota County, and the City of Tampa. Strategies recommended for the final Plan include:

1) Form a Regional Partners Committee (short term) to work together on:
   a) Legislative and regulatory monitoring and advocacy (ongoing)
   b) Information and resource sharing (ongoing)

2.2 Generation (Waste Prevention, Reduction and Reuse)

Strategies related to waste generation focus on prevention, reduction, and reuse of materials to minimize how much waste is generated. Six generation strategies recommended for the final Plan include:

1) Continue to promote waste prevention and reuse (ongoing)
2) Develop and implement an Environmentally Preferable Purchasing Guide (short-term)
3) Promote low waste / zero waste events at public venues (short-term, mid-term)

4) Promote commercial sector edible food waste prevention, reduction and reuse (ongoing)
5) Promote institutional sector food waste in-house composting programs (ongoing)
6) Promote commercial sector C&D debris recovery and recycling (ongoing)

2.3 Collection and Transfer

Strategies related to collection and transfer of materials focus on how material is collected and transported to processing or disposal locations. Six collection and transfer strategies recommended for the final Plan include:

1) Organize collection in unincorporated area with universal recycling (short-term, mid-term, add organics long-term)
2) Further standardize and expand recycling education efforts (short-term)
3) Expand Cutting Waste at Work (CWW) program (short-term)
4) Implement a universal recycling ordinance (short-term, mid-term)
5) Implement commercial sector food waste collection and processing program (mid-term, long-term)
6) Implement curbside collection of electronic waste (short-term, mid-term)

2.4 Processing

Strategies related to processing focus on the management of waste and recyclables after collection to either convert to energy or sort, process, and convert into raw materials, for use in the production of new products. Three processing strategies recommended for the final Plan include:

1) Increase the ability to process waste at the Waste-to-Energy (WTE) facility (short-term, mid-term, long-term)
2) Evaluate MRF processing capacities and address recycling contamination (short-term, mid-term, long-term)
3) Develop a residential sector food waste collection and processing program (long-term)

2.5 Disposal

Strategies related to disposal focus on maximizing the ability for long-term disposal availability at the Disposal Complex. Four disposal strategies recommended for the final Plan include:

1) Improve traffic movement at the Disposal Complex (short-term)
2) Extend the landfill life through bulky waste processing (short-term)
3) Expand the capacity of the existing disposal area (short-term)
4) Extend the landfill life through development of an on-site transfer station for off-site disposal of waste (short-term to mid-term)

2.6 Residuals Reuse and End Markets

Strategies related to residual reuse and end markets focus on developing markets and opportunities for the recovery of metal and reuse of ash from WTE processing. Three residuals reuse and end market strategies include:

1) Develop an advanced metals recovery facility at the Disposal Complex (short-term)
2) Develop ash recycling methods and specifications (short-term, mid-term)

3) Develop cooperative agreements with Tampa Bay area WTE plants for recycling ash through construction products (short-term)

2.7 Flow and Management of Waste

Three strategies recommended for the final Plan that relate to how and where waste generated in the County is managed include:

1) Revise the flow control ordinance and evaluate the need to expand licensing of haulers (mid-term)
2) Explore the possible utilization of the surface of the closed Toytown landfill (ongoing)
3) Monitor and evaluate the potential availability of contiguous properties for purchase (ongoing)

3 Refinements to Recommended Strategies

Through continued discussions with County staff, it was determined that certain strategies needed additional information or further refinement. These changes include modifications to existing strategies and additional estimates or assumptions, which are detailed below.

3.1 Information and Resource Sharing

In this strategy (see Section 3.2 of the Task 8 report), diversion of MSW as part of interlocal agreements was presented. This would cause 60,000 tons annually as needed to be diverted from landfill disposal at the Bridgeway Acres Landfill. Diversion would not be reasonable if material was directed for landfill disposal elsewhere. This strategy is clarified to assume the diversion of 60,000 tons per year due to scheduled outages would occur by transferring the tons to another WTE facility in the region. For the purpose of estimating financial and environmental impacts, it is assumed the tons would be delivered to the Hillsborough County WTE facility if capacity is available.

Financial Impacts

- Transfer cost is estimated at $12 per ton assuming trucking operational costs on the order of $120 per hour for personnel, equipment operating and maintenance costs
- The tipping fee at the Hillsborough WTE, which is currently $58.33
- Avoided disposal costs of $4.42 per ton that would not be landfilled at BWA

Environmental Impacts

While there are vehicle mile environmental costs of fuel consumption and truck emissions, processing through WTE provides energy benefits, additional metals recovery, and avoidance of MSW landfill disposal and resulting landfill emissions.

Implementation Timing

Transferring of MSW during scheduled outrages could not begin until a transfer station is constructed at the Complex, which is anticipated to occur by 2028 (see Section 7.4 – Onsite Transfer Station - in the Task 8 report).

3.2 Organize Collection in Unincorporated Area with Universal Recycling

In this strategy (see Section 5.1 in the Task 8 report), the County moves toward exclusively franchising collection in the unincorporated areas using a phased approach with exclusive franchises in place by 2026. The strategy states curbside recycling would be part of the basic service but leaves the determination of whether yard waste and/or bulky waste would be offered as separate collection services. After further discussions, the modification to this strategy includes the assumption that yard waste would be included as a separate collection beginning in 2026. Food waste would be added to the separate yard waste collection, to become curbside organics collection including yard waste and food waste, by 2034. The estimated financial and environmental impacts of this modification are described in Section 3.5– Residential Food Waste Collection and Processing.

3.3 Universal Recycling Ordinance

In this strategy (see Section 5.7 in the Task 8 report), the County implements a universal recycling ordinance. Because the organized collection in the unincorporated area strategy would include universal recycling for the residential sector of the unincorporated area, this strategy primarily focuses on the commercial sector. The assumptions for tons diverted, and corresponding impacts on tipping fee revenues lost, have been refined based on the following factors detailed in the Baseline Report, Appendix A and the 2014 Composition Study:

- 2017 commercial waste tons delivered to the Complex were 535,114 (per sheet 11 of Appendix A, Baseline Report);
- 2017 commercial units in the unincorporated area are estimated at 106,879 and incorporated commercial units at 18,121, indicating 86 percent of commercial units are located in the unincorporated area of the County (per sheet 7 of Appendix A, Baseline Report);
- 86 percent of the total commercial tons delivered to the Complex in 2017 is therefore estimated at 460,198;
- The 2014 waste composition study of materials coming into the Complex shows 22.6 percent recyclable paper and 10.1 percent recyclable containers for total of 32.7 percent traditional recyclables left in the waste stream delivered to the Complex;
- 32.7 percent of 460,198 tons equals 150,485 tons of recyclables in the waste stream delivered by the commercial sector from the unincorporated area available to be diverted.

The estimated 150,485 tons of recyclables (2017 tons) in the waste delivered to the Complex from the unincorporated area commercial sector would be targeted for diversion with the implementation and enforcement of a Universal Recycling Ordinance beginning in 2024. The diversion estimates assume 25 percent of the recyclable tons would be diverted from waste delivered to the Complex beginning in 2024, and the percent of tons diverted are estimated to continue to increase to 75 percent of the recyclable tons diverted by 2048. The linear progression of the percent of tons diverted allows for enforcement of the Universal Recycling Ordinance to ramp up over time. Accounting for growth, these estimates equate to an additional 39,760 tons of recyclables diverted in 2024, and each year thereafter tons diverted continues to increase to an estimated 135,071 tons by 2048.

3.4 Commercial Sector Food Waste Collection and Processing

As part of the development of food scrap diversion from commercial businesses, this strategy proposed providing businesses with carts from the County (see Section 5.8 in the Task 8 report). This represents a significant capital expense and relies on the private sector to create and expand organics recycling activities to support the increased activities from these carts. This strategy is modified to provide carts based on a commitment to direct food scraps to a County owned composting facility. This modification reduces the initial cart investment to an assumed 1,300 carts initially, with the addition of another 600 carts added every five years. Cart will need replacement every ten years to coincide with the end of service life. Should the reception of this program be more favorable, additional carts may need to be purchased. Assuming approximately 2.6 tons per container per year, the initial recovery of food waste in 2026 is 3,380 tons and will increase approximately 1,560 tons with the addition of carts every five years.

Financial Impacts

- Estimated $50 per cart, assuming 1,300 carts to start; adding 600 additional carts every five years and replacing carts every ten years
- Estimated $25 per ton processing costs that includes labor, equipment maintenance and operating (fuel).
- Estimated $7.50 per ton in revenue from the sale of the compost, which would apply to approximately half of the tons collected due to processing losses and screening

Environmental Impacts

While there are vehicle mile environmental costs of fuel consumption and truck emissions associated with separate collection of food waste, composting rather than landfilling provides the environmental benefits of a reduction is consumption of landfill airspace and reducing landfill gas emissions. Additional benefits regarding the use of compost are not quantified as part of the FROI/SROI but can include a reduction in the need for synthetic fertilizers and decreased irrigation when compost is applied as a soil amendment.

Implementation Timing

Implementation of this strategy would coincide with the construction and operation of a compost facility to manage yard waste and food scraps from residential curbside customers in the unincorporated areas beginning in 2026.

3.5 Residential Food Waste Collection and Processing

This strategy, as originally outlined in Section 6.4 of the Task 8 report, focused on the curbside collection and processing of food scraps from residents. As this is reliant on the development of organized curbside collection services in the unincorporated areas and the success of other food related strategies in the commercial sector as well as residential sector, this strategy was described as an intermediate to long term strategy. In the near term, yard waste is a present and growing waste material within the County and the municipalities' waste stream. The County receives roughly 40,000 tons of source separated yard waste from commercial and residential sources. The material is mulched, treated through managed windrows to sterilize weed seeds and other vectors. Only sixteen percent (16 %) of the material processed, is distributed through the County's public drop off locations or picked up by customers for use in landscape

applications. The majority of the material is used on site as slope stabilization or for on-site soil enrichment.

Several municipalities are also managing a large quantity of source separated yard waste. Most notable are the City of St. Petersburg (66,392 tons), The City of Tarpon Springs (10,740 tons) and the City of Clearwater (5,766) based on 2017 recycling reports. There is the potential that these municipalities may be looking for local alternatives for management of this material. Currently this material is managed by the private sector through source-separated organics processing facilities (SOPFs) in and out of the County and is assumed to remain outside of the County's responsibility for processing.

Modification to the organized collection strategy described in Section 3.2 assumes yard waste would be offered as a separate curbside collection service beginning in 2026. Separate curbside yard waste collection has the potential to divert yard waste that is currently commingled with garbage to process and recycle either as mulch or compost and would reduce the waste directed to the WTE. Single family generators are responsible for 30 percent of waste generated in the County. Further, 29 percent of residents reside in the unincorporated portions of the County. This strategy assumes that with the onset of a separate collection service for yard waste that all unincorporated area single family yard waste will be diverted to this new collection practice. Based on the 2014 waste composition study, 8.5 percent of the waste received at the Disposal Complex is yard waste. Given the 1,223,854 tons managed by the Disposal Complex, 9,362 tons (1,223,854 x 30% x 29% x 8.5%) is yard waste from unincorporated single family residents.

Further, another 21,846 tons (1,223,854 x 30% x 71% x 8.5%) could be separately collected from single family residents in incorporated areas of the County that do not currently source separate yard waste. If the municipalities were to universally provide yard waste collection services, this tonnage would also be diverted from disposal. For the purposes of estimating tons diverted and costs incurred, it is assumed the County does not receive these additional tons from municipalities, and instead only receives the yard waste from single family homes in the unincorporated area beginning in 2026.

Food waste would be added to the curbside yard waste collection service beginning in 2034, assuming acceptance by residents for such service. Based on a 20 percent capture rate and the same proportioning for single family homes in the unincorporated area, total food waste that could be captured is estimated at 1,966 tons. The total available food waste, if collected separately would be 1,966 tons from single family sources and ultimately 8,300 tons (2041) from commercial if all materials collected as part of the Commercial Sector Organics Waste Recycling are directed to the County. This amount of food waste (10,266 tons) is below the quantity that would typically be economically feasible to manage through a separate Anaerobic Digestion facility. Instead, this strategy assumes food waste would be added to yard waste composting operations.

As identified in other strategies, there is suitable space on the surface of the Toytown landfill or within a portion of the sod farm for locating a composting facility. Land use needs are on the order of 20 to 30 acres for primary composting pads, curing pads and support facilities and areas to manage roughly 50,000 to 60,000 tons of yard waste annually. Incorporation of food

waste will require additional yard waste to maintain an appropriate ratio of food waste to yard waste of ten to fifteen percent. This revised strategy assumes static windrow composting. As food quantities increase, the County will want to evaluate implementation of other technologies to manage the increasing quantities.

Financial Impacts

- Initial capital costs for the composting facility are estimated to be $5 to 8 million
- Operating costs are estimated at $25 per ton.
- If County operated the facility, 5 to 7 full time employees will be required as well as operating equipment including loaders, windrow turners and support equipment although these operating costs are included in the $25 per ton estimate.
- Equipment capital is estimated at $2 million.
- The market for compost is available but will need additional development. Based on existing practices, an assumed revenue of $7.50 per ton of finished product is reasonable. Due to material losses during compost production as part of the natural composting process as well as final product screening, roughly 50 percent of input tons is available for distribution and sale.

Environmental Impacts

While there are vehicle mile environmental costs of fuel consumption and truck emissions associated with separate collection of yard waste and eventually food waste, composting rather than landfilling provides the environmental benefits of offsetting landfill disposal thus conserving airspace and reducing landfill associated emissions.

Implementation Timing

This strategy assumes the composting facility would need to be completed by 2026, when separate yard waste collection for the residential sector of the unincorporated area is anticipated to be in place. Beginning the process to permit and construct the composting facility would begin in 2025.

4 Potential Strategies Not Recommended for the Final Plan

Based on further investigation and discussions with County staff, seven strategies were determined to either be unviable or generally not supportive of the vision and values for the Plan. The following subsections summarize the strategies included in the Task 8 report that are not recommended for inclusion in the final Plan and the reasons for not recommending them.

4.1 Pay as You Throw (PAYT) Garbage Collection Service

PAYT is a volume based collection system requiring multiple sized containers to vary service levels according to customer preference with a variable rate structure mirroring the container sizes. The implementation of this style of collection program requires 1) organized collection services, 2) automated collection vehicles, 3) containers, typically with nominal rated capacities of 95, 65 and 35 gallons, and 4) extensive administrative and billing protocols such as a cart selection and delivery process and protocols for waste overages. With the implementation of

universal collection considered a mid-term strategy, and billing for collection services being a part of the annual tax assessment, implementation of a PAYT system would not be practical.

4.2 Drop-Off Locations

The County's 52 drop-off locations are functional and are meeting customer demands. Given the moderately low growth anticipated in the County and the strong coverage with the current distribution of these locations, additional locations are not anticipated to be needed over the course of the planning period. County staff are already engaged in reviewing service conditions and levels and are adequately prepared to respond to moderate service changes. If the County should successfully implement universal waste collections, the need for drop-off locations within those organized collection service areas may decrease. As such, this strategy was determined to be unnecessary.

4.3 Development of a Transfer Station in the North of the County

Provision § 106-61 of the County Ordinance does allow for the development of a transfer station. However, absent favorable economic conditions, the need for a transfer station does not provide any operational or financial benefit for the County. Some communities at the north end of the County advocate for the development of a transfer station to provide operational benefit to their collection crews. The capital investment of approximately $30 million, coupled with minimal potential supporting tonnage (and the corresponding increase to user fees), make the development of a transfer station in the north of the County uneconomical.

4.4 Pilot Glass Bottle Buyback Program

Glass has been identified by collection crews and recycling processors as a problematic material. Often blamed for contamination in fiber commodities coupled with increase equipment wearing properties and a low market value have extenuated this concern. While an end market exists in Sarasota, current commodity pricing does not even cover processing and transport expenses. In the public workshops as well as the regional subcommittee workshop, there was the desire to continue to find ways to divert and recycle glass. As part of a regional recycling workshop held on July 12, 2018, a "glass committee" including members from municipalities, collection haulers and recovered materials processors, was formed to look for alternative solutions to glass recycling. The glass committee is researching means to develop local markets, implement alternative collection strategies and collaborating across jurisdictions to increase economies of scale. It was determined best to allow the glass committee to continue with its efforts rather than include this strategy in the final Plan.

4.5 Special Waste Assured Destruction

This strategy would focus on identifying, marketing and attracting new markets and waste streams for destruction at the WTE facility. To facilitate this service with a facility that is nearing capacity, materials would need to be diverted from processing, exacerbating reductions in waste coming into the Disposal Complex needed to meet the challenges of community growth. To an extent, the County currently provides this service to certain special customers, which can continue. However, bringing additional tons into the Disposal Complex is counter to the objective of preserving capacity at the WTE facility, and is therefore not recommended for inclusion in the final Plan.

4.6 Develop a Regional Metal Processing Facility

With five WTE facilities in the greater Tampa Bay area, there is potential for economies of scale in the management and processing of residual metals post combustion at the WTE's. To coordinate this effort may require renegotiation of individual operating contracts with each facility operator and respective county, agreement on terms with the regional facility and all participating jurisdictions, and logistics for management of metals, revenue disbursement and ash residual disposal. The County has and continues to evaluate enhanced metal recovery at their facility for the County's generated metals. A regional facility involves risk, multi-jurisdictional coordination, and other uncertainties. Because a strategy to enhance metals recovery at the County's Disposal Complex is recommended for inclusion in the final Plan (see Section 2.6), this strategy is also somewhat duplicative and therefore not recommended for inclusion in the final Plan.

4.7 Identify Out of County Disposal Options for Ash

The County's overarching goal for the Plan is "Zero Waste to Landfill". Currently, approximately 200,000 tons of ash are disposed annually into the County's Bridgeway Acres landfill (BWA). The County has an active practice of using ash as daily cover as part of operations to mitigate the need for importing soil. Further, the County is reviewing several strategies for the beneficial use of ash on and off-site. Lastly, although disposal of the ash in the BWA landfill is contrary to the County's goal, it is counterproductive financially to divert this material out of County, incurring transportation and disposal charges when airspace is available at BWA. Because two strategies relating to beneficial use of ash are recommended for inclusion in the final Plan (see Section 2.6), this strategy is not recommended for inclusion in the final Plan.

5 Financial Return on Investment (FROI)

The financial return on investment (FROI) evaluation provides projections of financial impacts directly related to the County's revenues and expenses. To measure financial impacts to the County for the planning period, each of the Recommended Strategies summarized in Section 2, and refined in Section 3 in some instances, was reviewed with County staff to estimate the anticipated financial impacts. For some Recommended Strategies, specific measurable financial impacts cannot be known at this time and are therefore not included in the FROI evaluation. For fourteen of the Recommended Strategies, measurable financial impacts are included in the FROI evaluation. **Table 5-1** provides a summary of which Recommended Strategies are included in the FROI evaluation, what impacts are measured, and the timing of the financial impacts.

The financial impacts summarized above were entered into a financial model that includes inflation factors as appropriate. **Table 5-2** summarizes the inflation factors used in the FROI evaluation.

Table 5-3 summarizes the cumulative tonnage and financial impacts associated with the Recommended Strategies described in Sections 2 and 3, and included in **Table 5-1.**

Table 5-1 Measurable Financial Impacts per Strategy

Strategy Name	Revenue Impacts	Expense Impacts	Financial Impact Timing
Information and Resource Sharing	NA	Transfer and disposal costs associated with transferring waste to Hillsborough during planned outages; avoided costs of landfilling at BWA	2028 through 2048
Promote Commercial Sector C&D Debris Recovery and Recycling	NA	One additional FTE with vehicle	2020 through 2048, vehicle replaced every 10 years
Organize Collection in Unincorporated Area with Universal Recycling	Recyclables tons diverted (loss of tip fee revenue)	Total of 3 additional FTE's and vehicles; cost to process recyclables	One FTE in 2020 through 2048; Two more FTE's and tons diverted 2026 through 2048
Further Standardize and Expand Recycling Education Efforts	Recyclables tons diverted (loss of tip fee revenue)	Annual subscription cost for phone app, licensing fees for label artwork, printing costs; cost to process recyclables	2023 through 2048
Universal Recycling Ordinance	Recyclables tons diverted (loss of tip fee revenue)	NA	2024 through 2048
Commercial Sector Food Waste Collection	Additional revenue for sale of compos)	County-provided food waste bins; processing costs	2026 through 2048
Curbside Collection of Electronic Waste	NA	Reduce by one FTE	2026 through 2048
Increasing the Ability to Process Waste at the WTE Facility (plant expansion)	NA	Capital costs and operating costs (Covanta contract)	Capital spread over 2021 and 2022; Operating 2022 through 2048
Residential Food Waste Collection and Processing	Additional revenue for sale of compost	Capital costs and operating costs for new composting facility	Capital spread over 2025 through 2026; operating costs begins 2026 through 2048
Traffic and Congestion Management Strategy	NA	Traffic study cost	2020
Extension of Landfill Life Through Bulky Waste Processing	Additional revenue from increase in ferrous and non-ferrous metals recycled	Two FTE's; capital costs; permitting and other operating costs	FTE's and capital costs 2021 through 2048; permitting in 2020; other operating costs 2021 through 2048
Expanding Capacity of Existing Disposal Area	NA	Feasibility Study	2020
Onsite Transfer Station	NA	Capital and operating costs	Capital spread over 2025 through 2027; operating costs begin 2028 through 2048
Develop Metals Cleaning or Advanced Metals Recovery Facility at Disposal Complex	Additional metals recovery revenue share	Capital	Capital spread over 2021 and 2022; additional metals revenue in 2023 through 2048

Table 5-2. Inflation Factors

Category	Inflation Factor	Reason
Personnel (FTE)	4.5%	PRMG inflation factor (recent rate study)
General O&M	3%	PRMG inflation factor (recent rate study)
Capital	2.4%	PRMG inflation factor for "general" (recent rate study)
General	2.4%	PRMG inflation factor (recent rate study)
Hauling Fee	2.4%	PRMG inflation factor for "general" (recent rate study)
Tipping Fee (Hillsborough)	2% every 5 years	Assumption
Tipping Fee (Pinellas)	6% through 2022, and 2% every five years beginning in 2027	PRMG rate study through 2022; assumption beginning in 2027 to be consistent with Hillsborough tip fee assumption above
Recycling Revenues	0%	Assumes $30 cost and 0% adjustment over time
Food Waste Bins	2.4%	PRMG inflation factor for "general" (recent rate study)
Covanta O&M Contract	2.09%	Covanta agreement annual adjustment factor (average of last three years)
ADS Cost per ton	1.19%	Based on average annual actual change since initial rate of contract in 2008
Growth in Tonnage	Ranges from 0.8% to 0.4% over 30 year planning period	Follows approach to original waste generation projections in Baseline Report

Table 5-3. Summary of Estimated Impacts

Measure	Impact
Total net tons managed at Disposal Complex [1]	35,069,124
Total additional tons diverted or redirected from landfill disposal [2]	5,274,722
Average additional tons diverted or redirected from landfill per year	181,887
Overall financial impact [3]	$(353,948,148)
Average annual financial impact	$(12,205,109)
Financial impact per ton diverted or redirected [4]	$(67.10))
Financial Impact per total tons managed at Disposal Complex [5]	$(10.09)

Notes:

[1] Total tons over 30-year planning period per Baseline Report minus tons diverted (traditional recyclables, and organics including yard waste and food waste).

[2] Estimated additional tons diverted or redirected from landfill over the 30-year planning horizon (through 2048). Note that this includes bulky waste that is being diverted from the landfill to be processed at the WTE, and MSW during outrages at the Pinellas WTE being redirected to other WTE facilities in the region.

[3] Total estimated financial impact to current costs over the 30-year planning horizon (through 2048).

[4] Overall financial impact through the planning period divided by additional tons diverted or redirected during the planning period.

[5] Overall financial impact through the planning period divided by total net tons managed at Disposal Complex during planning period.

As compared to making no changes to the current system, the Recommended Strategies are estimated to result in diversion of an additional 3.2 million tons of traditional recyclables and organics from disposal at the Disposal Complex, and redirection from the landfill of an additional 2.0 million tons of bulky waste and waste during WTE outages over the next 30 years. That equates to an average of nearly 182,000 additional tons of waste diverted or redirected each year.

From a financial standpoint, there will be additional net costs associated with implementing the cumulative Recommended Strategies. The average additional cost per year to implement the fourteen strategies for which measurable financial impacts are included in the FROI is estimated to be approximately $12.2 million. Over the thirty-year planning period, implementation of these Recommended Strategies is estimated to require $353.9 million in additional funds above and beyond that required in the current system. That equates to a cost of $67.10 per ton diverted over the planning period. **Table 5-4** outlines the estimated net financial impact by year associated with implementation of the Recommended Strategies included in the FROI evaluation.

It is important to note that the costs presented for the Recommended Strategies are in addition to existing Solid Waste Enterprise Fund operations and the annual cost associated with the current system.

Following the completion of the FROI evaluation, the HDR team used the estimates and assumptions of impacts of the recommended strategies as the basis for the Sustainable Return on Investment (SROI) evaluation. SROI is an economic-based approach to evaluating key aspects of the recommended strategies triple bottom line outcome (e.g., economic / financial, environmental, and social / community). The environmental and social / community outcomes build from the financial and diversion modeling completed in the FROI to account for and communicate additional factors that can influence decision making. The SROI evaluation is provided as Appendix A (SROI Technical Memorandum).

Table 5-4. Recommended Strategies: Estimated Cumulative Financial Impacts by Year

Fiscal Year	Annual Revenue [1]	Annual Operating Expenses [2]	Annual Capital Costs [3]	Net Financial Impact
2020	$-	$(846,920)	$(81,920)	$(928,840)
2021	-	(461,638)	(18,612,224)	(19,073,862)
2022	-	(799,914)	(16,106,127)	(16,906,041)
2023	369,106	(835,481)	-	(466,375)
2024	(1,364,063)	(717,011)	-	(2,081,074)
2025	(1,506,052)	(742,998)	(12,297,829)	(14,546,879)
2026	(2,663,233)	(1,259,475)	(15,030,899)	(18,953,607)
2027	(2,899,473)	(1,304,071)	(8,059,505)	(12,263,050)
2028	(3,084,915)	(6,110,625)	-	(9,195,540)
2029	(3,283,784)	(6,190,764)	-	(9,474,548)
2030	(3,446,147)	(6,344,918)	(103,846)	(9,894,911)
2031	(3,608,100)	(6,491,497)	(39,877)	(10,139,474)
2032	(3,871,538)	(6,581,201)	-	(10,452,740)
2033	(4,062,982)	(6,673,834)	-	(10,736,816)
2034	(4,256,754)	(6,847,042)	-	(11,103,796)
2035	(4,429,581)	(7,020,949)	-	(11,450,530)
2036	(4,602,299)	(7,191,932)	(3,135,330)	(14,929,562)
2037	(4,895,003)	(7,301,415)	-	(12,196,418)
2038	(5,094,384)	(7,414,486)	-	(12,508,870)
2039	(5,302,570)	(7,531,270)	-	(12,833,840)
2040	(5,486,256)	(7,726,177)	(131,640)	(13,344,074)
2041	(5,668,641)	(7,932,378)	(101,100)	(13,702,118)
2042	(5,992,089)	(8,063,145)	-	(14,055,234)
2043	(6,200,081)	(8,198,224)	-	(14,398,305)
2044	(6,415,806)	(8,337,769)	-	(14,753,575)
2045	(6,651,116)	(8,557,702)	-	(15,208,818)
2046	(6,894,911)	(8,706,319)	-	(15,601,231)
2047	(7,300,483)	(8,859,872)	-	(16,160,356)
2048	(7,569,128)	(9,018,537)	-	(16,587,666)
Total	**$(116,180,284)**	**$(164,067,566)**	**$(73,700,298)**	**$(353,948,148)**

Notes:

[1] Reflects changes in revenue compared to making no changes to the current system.

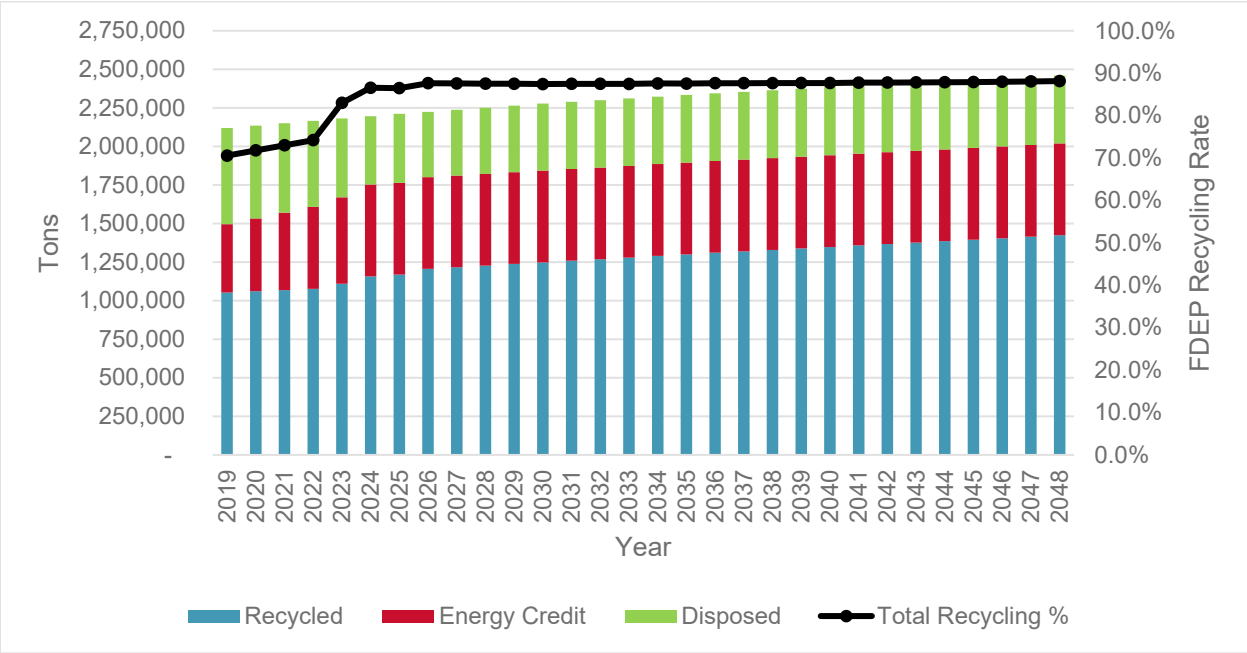
[2] Reflects changes in O&M expenses compared to making no changes to the current system.

[3] Reflects changes in capital expenditures compared to making no changes to the current system.

6 Estimated Impacts of Recommended Strategies on Recycling Rates

With implementation of the recommended strategies, the county-wide recycling rate is projected to increase from 70 percent in 2018 to 86 percent in 2024 and continues to gradually increase to 88 percent through the remainder of the planning period. This assumes the current FDEP rate calculation methodology will remain unchanged. The increase is due in part to increased recycling efforts from strategy implementation and the increased recycling credit of 25 percent granted when the traditional rate exceeds 50 percent as it will in 2023 absent any changes. This increase is driven by a few significant actions that are part of these strategies. In addition to strategies that are estimated to divert more tons of traditional recyclables and organics, the operation of the WTE facility after completion of all activities of the current Technical Recovery Project (TRP) contributes to an increase in renewable energy credits. With completion of the TRP projects as well as growth in the waste stream and the availability of previously unprocessible waste such as bulky materials through processing, the facility will receive sufficient solid waste fuel to achieve peak throughput, which for the purposes of the analysis represented in **Figure 6-1** is assumed at 3,000 tons per day and 92 percent availability for an annual throughput of 1,008,000 tons. **Figure 6-1** shows the tons of material recycled, the tons attributed to the Florida Department of Environmental Protection (FDEP) renewable energy credit from conversion of waste to energy, and the net waste disposed countywide to calculate the estimated annual recycling rates for the County through the planning period.

Figure 6-1 - Recommended Strategies: Total Waste Generation, Tons Diverted from Disposal and Estimated FDEP Recycling Rate by Year

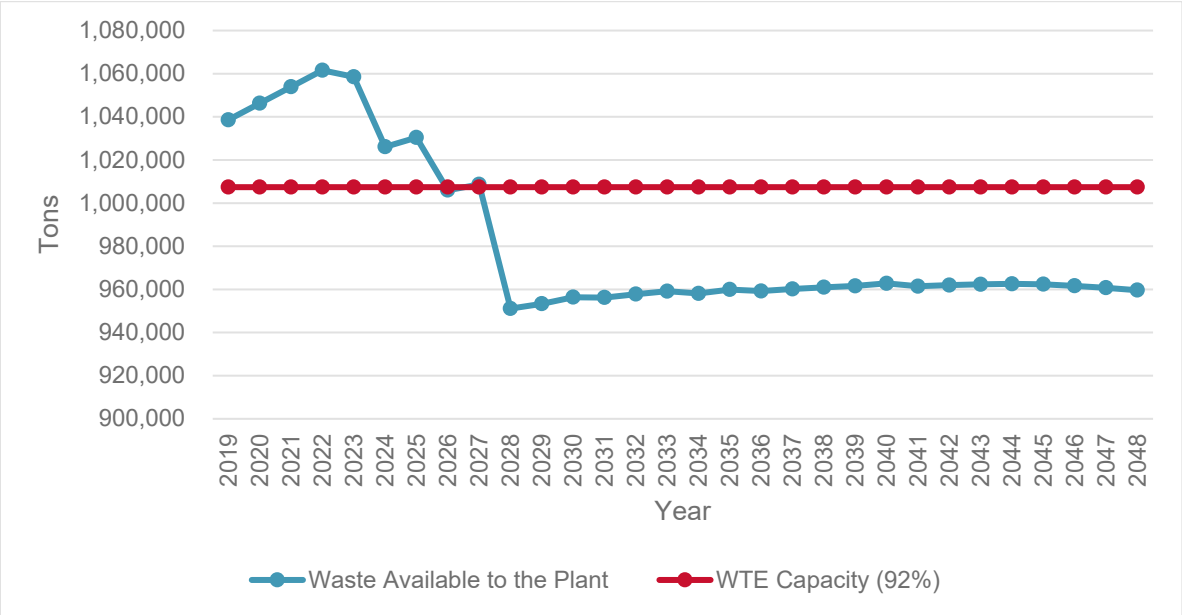


It is important to note that the FDEP recycling rate estimates shown in **Figure 6-1** could be affected positively or negatively by the actions of municipalities within the County and/or local private sector initiatives related to recycling of commercial waste streams (e.g. recyclables, food waste, and C&D debris). The recycling rate estimates developed as part of the planning efforts focus solely on the projected impacts of the Recommended Strategies on the estimated FDEP Countywide recycling rate. The rate may be subject to increases or decreases in later years should the FDEP revise its calculation protocols.

Other key changes that contribute to the increased recycling rate are the diversion of commercial and curbside recyclables and organics for recycling. It is estimated that traditional recyclables represent 64 percent and organics 10 percent of materials diverted throughout the planning period. Also contributing to the increase in recycling is the estimated increased metal recovery from increased WTE facility throughput and the increased recovery from an enhanced metals recovery system.

The off-site diversion of waste during scheduled outages reduces the need to dispose of these tons at the Bridgeway Acres Landfill. As these diverted tons are assumed to be directed to a new or expanded WTE facility in the Tampa Bay region, the tons would generate recycling credits under FDEP's renewable energy recycling credit calculations. For each ton of waste processed by a WTE facility, approximately 0.5 MWh is generated. With an annual diversion of 60,000 tons, approximately 30,000 MWh would be generated creating 30,000 tons of recycling credit. As the County has a traditional recycling rate greater than 50 percent, the renewable energy recycling credits increase by 25 percent for a total renewable energy recycling credit of 45,000 tons attributed to Pinellas County. As no agreement currently exists to provide that diverted tons are processed through a WTE, these additional recycling rate credits are not incorporated in the data presented in **Figure 6-2**.

Figure 6-2: Recommended Strategies - Tons Delivered to the Disposal Complex, WTE Capacity



The diversion of waste during scheduled outages and increased recycling from implementation of the Recommended Strategies results in deliveries to the WTE that are less than the WTE capacity beginning in 2026 and remaining at or below WTE capacity through the planning period. The three major decreases in deliveries to the WTE are attributable to a few key strategies. The first decrease in 2024 is attributed to the Universal Recycling Ordinance and results in an estimated increase in recycling of just under 40,000 tons mostly from the commercial sector.

The second decrease occurs in 2026 and is attributed to two strategies: the start of Commercial Sector Food Waste Collection and the Organizing Collection in Unincorporated Area with Universal Recycling. The first strategy results in over 3,000 tons of food waste being diverted and composted. This second strategy results in increases of over 13,000 tons of recyclables from residents as well as separating almost 10,000 tons of yard waste for composting. The last significant decrease is attributed to the diversion of MSW during WTE outages and delivery of this material to a WTE facility in the region and represents 60,000 tons. As the graph shows, this diversion allows the County to make significant strides towards Zero Waste to the Landfill but it also indicates that there is opportunity to maximize all benefits of the solid waste system. Should the bulk of strategies meet or exceed their goals, the County would have the ability to decrease this diversion and maximize the operating and revenue potential of the WTE facility. Conversely, should strategies not meet desired goals, there is an available window of additional tons that can be diverted, represented by the difference in the red and blue lines above, to meet the Master Plan goals.

The remaining strategies and their contribution to increases in recycling or diversion from landfill disposal help to temper increases from population growth resulting in the relatively flat line for the latter portion of the planning period. **Figure 6-2** shows the deliveries to the Disposal Complex compared to the WTE capacity. The processing of bulky waste provides for these materials to be processed in the WTE avoiding disposal.

With the diversion of ash towards beneficial uses as defined in the Recommended Strategies, the goal of zero waste to landfill could be achieved..

7 Recommended Strategies Impacts to Stated Vision and Values

During the Mission, Vision, Values Workshop held August 2018, the Regional Sub-committee agreed upon a Vision Statement and five values for the Plan. The Vision Statement for the Plan is "***To provide dependable, accessible, and sustainable integrated solid waste management systems for the region in a collaborative manner, with visionary leadership to responsibly manage waste as a resource for the long term***". The Recommended Strategies support the Vision Statement.

The values are summarized in **Table 7-1**. The cumulative effect of the Recommended Strategies on the County's system will work to further the values determined at the beginning of the planning process.

Table 7-1. Recommended Strategies Compared to Plan Values

Master Plan Values	Met by Cumulative Recommended Strategies
Inspire conscious decision making and thoughtful consumption	Yes
Anticipate future needs to stay ahead of the curve	Yes
Balance environmental, economic, and social sustainability	Yes
Seek regional cooperation and collaboration	Yes
Increase operational capacity of the Solid Waste Disposal Complex	Yes

A

Appendix A – Sustainable Return on Investment (SROI) Technical Memorandum

Sustainable Return on Investment (SROI) Technical Memorandum

Solid Waste Master Plan

Task 12

Pinellas County, FL
July 2019

DRAFT

Contents

Tables

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1 Introduction

Following the completion of the Financial Return on Investment (FROI) evaluation of the final 28 recommended strategies described in the Task 11, Preferred Scenario Development and Finalization report, the HDR team used the estimates and assumptions of impacts of the recommended strategies as the basis for the Sustainable Return on Investment (SROI) evaluation. Traditional financial evaluation tools rely exclusively on financial impacts and are not by themselves able to accurately quantify the non-cash benefits and costs accruing to the County and to the community as a whole resulting from a specific decision or investment. The SROI evaluation was used as another tool in the master planning process to account for these important factors in a measurable way and provide the County with additional information on which to make better and more informed decisions regarding the future of its solid waste management system.

SROI is an economic-based approach to evaluating key aspects of the recommended strategies triple bottom line outcome (e.g., economic / financial, environmental, and social / community). The environmental and social / community outcomes build from the financial and diversion modeling completed in Task 11 to account for and communicate additional factors that can influence decision making. Economic valuation data and other factors come from Florida Department of Transportation, US Environmental Protection Agency (EPA), US Department of Transportation (DOT) and other sources.

2 Recommended Strategies

As described in the Task 11Preferred Scenario Development and Finalization report, there are 28 strategies recommended for inclusion in the Pinellas County Solid Waste Master Plan. A summary of the recommended strategies and timing anticipated for each recommended strategy is provided below. Short-term refers to current through 2024; mid-term refers to 2025 through 2033; and long-term refers to 2034 through 2048; the term “ongoing” refers to strategies that would continue with implementation efforts throughout the 30-year planning period.

Similar to the FROI analysis conducted in Task 11, for some recommended strategies, specific measurable impacts cannot be known at this time and are therefore not included in the SROI evaluation. The strategies evaluated in the SROI are strategies that will generate transportation or environmental impacts as a result of diverting tons from the Municipal Solid Waste (MSW) stream such as traditional recyclables and organics, gaining transportation efficiencies, or strategies that will redirect MSW away from landfilling. The remaining subsections summarizing each strategy indicate which strategies have impacts represented in the SROI analysis.

2.1 Collaborate with Partners

The four regional cooperation strategies recommended for the Solid Waste Master Plan include the following. One out of four of these strategies has measurable impacts included in the SROI analysis.

1. Form a Regional Partners Committee (short term)
2. Information and resource sharing (ongoing) – *included in SROI evaluation*
3. Legislative and regulatory monitoring and advocacy (ongoing)
4. Develop Cooperative Agreement with Tampa Bay Area Plants for Recycling Ash as Construction Products

2.2 Minimize Generation (Waste Prevention, Reduction and Reuse)

The six generation strategies recommended for the Solid Waste Master Plan include the following. One out of six of these strategies has measurable impacts included in the SROI analysis.

5. Promote commercial sector edible food waste prevention, reduction and reuse (ongoing)
6. Continue to promote waste prevention and reuse (ongoing)
7. Promote low waste / zero waste events at public venues (short-term, mid-term)
8. Promote institutional sector food waste in-house composting programs (ongoing)
9. Develop and implement an Environmentally Preferable Purchasing Guide (short-term)
10. Promote commercial sector Construction and Demolition (C&D) debris recovery and recycling (ongoing) – *included in SROI evaluation*

2.3 Maximize Recycling and Diversion

The seven recycling and diversion strategies recommended for the Solid Waste Master Plan include the following. Six out of seven of these strategies have measurable impacts included in the SROI analysis.

11. Organize collection in unincorporated area with universal recycling (short-term, mid-term, add organics long-term) – *included in SROI evaluation*
12. Implement commercial sector food waste collection program (mid-term, long-term) – *included in SROI evaluation*
13. Develop a residential sector organics diversion program (long-term) – *included in SROI evaluation*
14. Implement curbside collection of electronic waste (short-term, mid-term) – *included in SROI evaluation*

15. Implement a universal recycling ordinance (short-term, mid-term) – *included in SROI evaluation*
16. Further standardize and expand recycling education efforts (short-term) – *included in SROI evaluation*
17. Expand Cutting Waste at Work (CWW) program (short-term)

2.4 Maximize Recovery

The four processing strategies recommended for the Solid Waste Master Plan include the following. Two out of three of these strategies have measurable impacts included in the SROI analysis.

18. Evaluate MRF processing capacities and address recycling contamination (short-term, mid-term, long-term)
19. Develop ash recycling methods and specifications (short-term, mid-term)
20. Increase the ability to process waste at the Waste-to-Energy (WTE) facility (short-term, mid-term, long-term) – *included in SROI evaluation*
21. Develop an advanced metals recovery facility at the Disposal Complex (short-term) – *included in SROI evaluation*

2.5 Responsibly Manage What is Left Over

The 7 disposal strategies recommended for the Solid Waste Master Plan include the following. Three out of four of these strategies have measurable impacts included in the SROI analysis.

22. Extend the landfill life through bulky waste processing (short-term) – *included in SROI evaluation*
23. Improve traffic movement at the Disposal Complex (short-term) – *included in SROI evaluation*
24. Extend the landfill life through development of an on-site transfer station for off-site disposal of waste (mid-term, long-term) - *included in SROI evaluation*
25. Revise the flow control ordinance and evaluate the need to expand licensing of haulers (mid-term)
26. Explore the possible utilization of the surface of the closed Toytown landfill (ongoing)
27. Monitor and evaluate the potential availability of contiguous properties for purchase (ongoing)
28. Expand the capacity of the existing disposal area (short-term)

3 Diversion Projections

Some of the recommended strategies divert tons of recyclables and organics from the landfill and Waste-to-Energy (WTE) facility at the Complex. Other strategies redirect

tons of MSW to WTE facilities during outages at the County's WTE facility. Further, by preprocessing bulky waste it can be managed in a WTE facility. Tons of MSW redirected to a WTE facility, as compared to disposal at the landfill, generate energy benefits. Similarly, an increase in recyclables and organics diverted from the MSW stream also result in energy and environmental benefits.

The diversion and redirection projections were estimated as part of the FROI evaluation and used within the SROI analysis. Growth in tonnage followed the approach laid out for the original waste generation projections in the Baseline Report, which used inflation rates ranging from 0.8% to 0.4% over 30-year planning period.

As compared to making no changes to the current system, the recommended strategies are estimated to result in diversion or redirection of approximately 5.7 million additional tons of recyclables, organics, metals and MSW over the next 30 years. That equates to an average of more than 190,000 additional tons of diverted or redirected material each year. This quantity is larger than the value for diverted materials in Task 11, Preferred Scenario Development and Finalization report as metals are a product of recovery post combustion at the WTE. Their capture is not a reflection of reduced waste managed by the County. Recovery of metals generate financial, environmental and social benefit and are included in this SROI analysis.

Table 3-1 summarizes the cumulative tonnage associated with the recommended strategies described in the previous section.

Table 3-1. Diverted or Redirected Tons from Pinellas County Landfill

Measure	Impact
Total tons diverted or redirected from the Pinellas County Landfill	5,701,849
Average additional tons diverted or redirected from the Pinellas County Landfill per year	190,062

Diverting or redirecting tons of material translates to a net increase in total truck vehicle-miles traveled (VMT). The increased VMT is the result of added transfer trucks needed to move the diverted or redirected material to alternate sites. One recommended strategy, *Organized Collection in Unincorporated Area with Universal Recycling,* is assumed to reduce the average number of trucks on every street in the unincorporated areas of the County from an assumed average of five to an assumed average of three trucks weekly, which is expected to result in a decrease in truck VMT. The net change in VMT generates environmental and social impacts including emissions, safety, pavement maintenance and congestion impacts. When considering the VMT impacts of each recommended strategy involving VMT collectively, there is a net increase in VMT. In other words, the reduction in VMT with organized collection does not offset the increase in VMT to transfer materials to alternate sites.

Table 3-2 below presents the assumptions utilized to generate transportation impacts associated with the recommended strategies.

Table 3-2. Assumptions Used in Estimation of Transportation Impacts

Variable	Unit	Value
Avg. Tons per Garbage Truck [1]	Tons/truck	11.5
Avg. Tons per Recyclables Truck [1]	Tons/truck	3.2
Avg. Tons per Transfer Truck [1]	Tons/truck	20
Garbage truck usage, diesel miles per gallon [2]	Mpg	3
Transfer tuck usage, diesel miles per gallon [1]	Mpg	5
Avg. travel speed for Garbage Trucks [1]	Mph	10.5
Lane Miles in Unincorporated County [3]	Lane miles	3,150
Number of Garbage Trucks per week, Existing Condition [6]	Trucks/week	5
Number of Garbage Trucks per week, under Organized Collection [1]	Trucks/week	3
Avg. Distance from Pinellas Disposal Complex to Hillsborough WTE Facility (round trip) [4]	Miles	66
Avg. Distance to Recycling Facility in Tampa (round trip) [4]	Miles	46
Avg. Distance to Recycling Facility in St. Petersburg (round trip) [4]	Miles	18
Avg. Distance to Scrap Metal Facility in Tampa (round trip) [4]	Miles	38
Price per gallon, diesel fuel [5]	$/gallon	$2.68

Source:
[1] Assumption; supported by WMI (2016)
[2] INFORM. Greening Garbage Trucks: Trends in Alternative Fuel Use, 2002-2005 -- refuse trucks burn approx. 1 gallon every 2.8 miles. Assume 3 mpg
[3] Provided by Pinellas County
[4] Google Maps
[5] Florida State Gas Prices (Last accessed on 6/20/19)
[6] Assumed based on staff discussions.

When implemented, the recommended strategies will encourage the redirection of 1.3 million tons of MSW from the County's landfill during outages at its WTE to another WTE facility over the thirty-year planning period. This waste is assumed to be transported by truck from the Pinellas Disposal Complex to an alternate WTE facility located 33 miles away. An additional 835,000 tons of bulky waste is expected to be redirected from the County's landfill to the County's WTE facility with bulky waste processing, where no additional transfer truck VMT is expected.

Other recommended strategies will result in the diversion of recyclables from the MSW currently delivered to the Complex to alternate sites. 2.7 million tons of traditional recyclables are estimated to be diverted and transferred to an alternative Material Recovery Facilities (MRF) located in either Tampa or St. Petersburg, Florida. An additional 434,000 tons of organics (yard waste and food scraps) are estimated to be diverted from the County's WTE or landfill to an on-site composting location. 427,000 tons of ferrous and non-ferrous metals are estimated to be processed and transferred to a scrap metal facility in nearby Tampa, Florida.

The resulting projections of diverted and redirected tons of material and incremental truck VMT between the current condition and implementing the recommended strategies are presented in **Table 3-3** and **Table 3-4** below.

Table 3-3. Projections of Materials Redirected or Diverted (tons)

	Total	2023	2028	2048
Tons of MSW Diverted to Alternative WTE Facility	1,260,000	0	60,000	60,000
Tons of Bulky Waste Diverted to On-site WTE Facility	835,452	0	32,048	35,322
Tons of Traditional Recyclables Diverted to Alternative Facility	2,745,020	10,320	78,454	162,622
Tons of Organics Diverted to On-site Facility	434,251	0	13,526	23,110
Tons of Metals (ferrous & non-ferrous) Diverted to Alternative Metals Facility	427,127	15,600	16,426	16,510

Table 3-4. Projections of Vehicle Mile Impacts (vehicle miles traveled)

	Total	2023	2028	2048
Garbage Route Truck Miles Reduced	7,534,800	0	327,600	327,600
Transfer Truck Miles Added	(9,361,572)	(46,152)	(354,735)	(489,565)
Total Truck Miles Saved/(Added)	(1,826,772)	(46,152)	(27,135)	(161,965)

4 Environmental and Social Impacts: Methodology and Assumptions

This section describes the measurement approaches used for each impact included in the SROI analysis and listed in **Table 4-1.** It also provides an overview of the associated methodology and assumptions used.

Table 4-1. Impacts Included in SROI Analysis

Benefit Categories
Change in Truck VMT
Environmental Impacts
Safety Impacts
Congestion Impacts
Pavement Impacts C
Recycling (Diverted or Redirected Materials)
Environmental Impacts C
Energy Impacts
Job Creation

4.1 Environmental Impacts (From Change in Truck VMT)

When the recommended strategies are implemented, a net increase in emissions due to added truck vehicle miles is estimated to occur. This increase is monetized using industry-standard values for each of the quantified air pollutants, which are: Carbon Dioxide (CO2), Volatile Organic Compounds (VOC), Nitrogen Oxides (NOx), Fine Particulate Matter (PM), and Sulfur Dioxides (SO2).

4.1.1 Methodology

Emissions rates were estimated using the EPA Motor Vehicle Emissions Simulator (MOVES) modeling system for West Central Florida. These rates were then converted from grams per mile to calculate the reduction in tonnage of emissions due to the change in truck miles associated with the implementation of the recommended strategies. Each pollutant was then converted from grams to metric tons for monetization.

4.1.2 Assumptions

The assumptions used in the estimation of emissions cost impacts are summarized in **Table 4-2** below.

Table 4-2. Assumptions used for Emissions Cost Savings Estimate

Variable	Units	Value
Emissions Rates (2019) [1]		
Carbon Dioxide (CO2)	Gram / mile	2,816.77
Volatile Organic Compounds (VOC)	Gram / mile	0.52
Nitrogen Oxides (NOx)	Gram / mile	6.11
Fine Particulate Matter (PM2.5)	Gram / mile	0.27
Emissions Rates (2030) [1]		
Carbon Dioxide (CO2)	Gram / mile	2,817.73
Volatile Organic Compounds (VOC)	Gram / mile	0.14
Nitrogen Oxides (NOx)	Gram / mile	2.41
Fine Particulate Matter (PM2.5)	Gram / mile	0.06
Emissions Costs [2]		
Carbon Dioxide (CO2)	$ / Metric Ton	From $1 to $2
Volatile Organic Compounds (VOC)	$ / Metric Ton	$2,205
Nitrogen Oxides (NOx)	$ / Metric Ton	$9,149
Fine Particulate Matter (PM2.5)	$ / Metric Ton	$416,453

Source:
[1] EPA Moves data for West Central Florida
[2] USDOT BCA Guidance (December 2018)

4.2 Safety Impacts (From Change in Truck VMT)

Due to an overall increase in truck vehicles miles traveled, the recommended strategies would contribute to an increase in the number of accidents. The number of crashes is directly linked to the vehicle miles traveled, and thus added vehicle miles increases the likelihood of roadway incidents.

4.2.1 Methodology

The increase in roadway accidents is dependent on an increase or addition of vehicle miles. The number of added truck vehicle miles due to implementing all recommended strategies is combined with a multiplier, a weighted average of fatal, injury, and property damage only accidents. These values were monetized using the value of a statistical life. This calculation provides an estimate of the safety impacts associated with the net increase in garbage/transfer trucks required for the future waste operation.

4.2.2 Assumptions

The assumptions used in the estimation of accident impacts from increased truck vehicle miles are summarized in **Table 4-3** below.

Table 4-3. Assumptions used for Safety Benefits Estimate

Variable	Units	Value
Accident Rates (by severity) [1]		
Fatality	per 100m VMT	1.39
Injury	per 100m VMT	134.32
Property Damage	per 100m VMT	129.83
Accident Costs (by severity) [2]		
Fatality	$/incident	$9,600,000
Injury	$/incident	$174,000
Property Damage	$/incident	$4,300

Source:
[1] Traffic Crash Facts Annual Report 2017. A Safer Florida Highway Safety and Motor Vehicles.
[2] USDOT BCA Guidance (December 2018)

4.3 Congestion Impacts (From Change in Truck VMT)

Implementing the recommended strategies would contribute to an increase in congestion related impacts. Congestion cost impacts in the County are generated by the net increase in truck vehicle miles traveled.

4.3.1 Methodology

Congestion disbenefits are generated from an increase in the total number of truck vehicle miles resulting from the implementation of the recommended strategies. The

increase in congestion cost is calculated by applying the external costs of congestion to the added number of truck miles.

4.3.2 Assumptions

The assumptions used in the estimation of congestion costs are summarized in **Table 4-4** below.

Table 4-4. Table 4 4. Assumptions used for Congestion Cost Savings Estimate

Variable	Units	Value
Congestion Cost, Trucks [1]	$/VMT	$0.19

Source:
[1] USDOT BCA Guidance (December 2018)

4.4 Pavement Maintenance Impacts (From Change in Truck VMT)

There are quantifiable disbenefits associated with the net increase in truck vehicle miles traveled resulting from implementing the recommended strategies, including an increase in pavement maintenance costs.

4.4.1 Methodology

The additional truck miles add to the wear-and-tear on the roadway network in Pinellas County, resulting in added pavement maintenance costs. The pavement maintenance costs were monetized by combining the added truck miles and a per mile cost by vehicle type, by the Federal Highway Administration.

4.4.2 Assumptions

The assumptions used in the estimation of pavement maintenance cost impacts are summarized in **Table 4-5** below.

Table 4-5. Assumptions used for Pavement Maintenance Cost Savings Estimate

Variable	Units	Value
Pavement Maintenance Cost, Trucks [1]	$/VMT	$0.10

Source:
[1] USDOT BCA Guidance (December 2018)

4.5 Environmental Cost Savings

Several recommended strategies result in an increase of recyclables, organics and metals diverted from disposal. Increasing the tonnage of recyclables results in a reduction of GHG emissions. Additionally, two recommended strategies result in an increase in tons of waste diverted from landfills to waste-to-energy (WTE) facilities for processing, which also results in a reduction of GHG emissions.

4.5.1 Methodology

Increased Recycling

The net environmental impact from increased recycling was estimated by subtracting the greenhouse gas (GHG) emissions rates (in $MTCO_2E$) per ton of material recycled from the GHG emissions rate (in $MTCO_2E$) per ton of material landfilled. The emissions rates per ton, by type of recycled material, provided by the Environmental Protection Agency's (EPA) Waste Reduction Model (WARM), Version 14 (released March 2016) and are shown in **Table 4-6**.

Table 4-6. GHG Emissions per Ton of Material (WARM Parameter) ($MTCO_2E$/Tons)

Type of Material Collected	GHG Emissions per Ton of Material Recycled ($MTCO_2E$) [1]	GHG Emissions per Ton of Material Landfilled ($MTCO_2E$) [1]	Net GHG Emissions per Ton of Material ($MTCO_2E$)
Mixed Paper (general)	-3.531	0.127	-3.658
Newspaper	-2.748	-0.823	-1.925
Corrugated Containers	-3.121	0.235	-3.356
Aluminum Cans	-9.108	0.020	-9.128
Steel Cans	-1.812	0.020	-1.838
PET	-1.117	0.020	-1.137
HDPE	-0.869	0.020	-0.889
Mixed Plastics	-1.023	0.020	-1.043
Glass	-0.277	0.020	-0.297
Average of (Food Waste (non-meat); and Grains, Bread, Fruit and Veg, Dairy)	0.000	0.543	-0.543
Average of (Aluminum Ingot, Copper Wire)	-5.948	0.020	-5.968

Source:
[1] Waste Reduction Model (WARM) - V. 14 (released March 2016);
https://www.epa.gov/warm/versions-waste-reduction-model-warm#WARM Tool V14

Table 4-7 lists the recycling composition percentages, by type of material collected, provided by Pinellas County. This composition was applied to the total tons of diverted recyclables (2,745,020 tons) to determine the reduction in tons by type of recyclable material.. The reduction in tons, by type of material recycled, were then multiplied by their corresponding net GHG emissions rates and monetized using the social cost of carbon determined by the EPA.

Table 4-7. Recycling Composition by Type of Material Collected

WARM Parameter	Percentage [1]
Mixed Paper (general)	23.7%
Newspaper	26.2%
Corrugated Containers	17.5%
Aluminum Cans	1.2%
Steel Cans	1.7%
PET	5.3%
HDPE	3.5%
Mixed Plastics	1.8%
Glass	14.4%
Other	4.7%

Source:
[1] 156-0091-B(LN) Addendum No. 2 – Recycling Collection and Processing Services (April 18, 2016); Pinellas County Purchasing
Note:
[1] Material percentages are based on a drop off site recyclable material composition study conducted in August 2015 during which recyclables were hand-sorted.

Redirection of MSW to WTE

The net environmental impact from tons of material (including bulky waste) redirected from landfill to WTE was estimated by subtracting the greenhouse gas (GHG) emissions rates (in $MTCO_2E$) per ton of material combusted from the GHG emissions rate (in $MTCO_2E$) per ton of material landfilled. An emission rate for mixed MSW provided by the Environmental Protection Agency's (EPA) Waste Reduction Model (WARM), Version 14 (released March 2016), was used and is shown in **Table 4-8.** Total tons of material redirected to WTE were then multiplied by their corresponding net GHG emissions rates and monetized using the social cost of carbon determined by the EPA.

Table 4-8. GHG Emissions per Ton of Material (WARM Parameter) ($MTCO_2E$/Tons)

Type of Material Collected	GHG Emissions per Ton of Material Combusted ($MTCO_2E$) [1]	GHG Emissions per Ton of Material Landfilled ($MTCO_2E$) [1]
Mixed MSW	-0.066	0.347

Source:
[1] Waste Reduction Model (WARM) - V. 14 (released March 2016);
https://www.epa.gov/warm/versions-waste-reduction-model-warm#WARM Tool V14

4.5.2 Assumptions

The assumptions used in the estimation of environmental cost savings are summarized in **Table 4-9** below for materials recycled and materials diverted from landfilling to WTE processing.

Table 4-9. Assumptions used for Environmental Cost Savings Estimate

Variable	Units	Value
GHG Emissions Cost, Carbon Dioxide (CO2)	$ / Metric Ton	From $1 to $2

Source:
[1] USDOT BCA Guidance (December 2018)

4.6 Energy Cost Savings

Diverting recyclables from the MSW stream also results in a reduction of energy consumption. Additionally, two strategies result in a diversion of waste tonnage from the landfill to a WTE facility, which results in a net energy production, which can be monetized.

4.6.1 Methodology

Increased Recycling

The net energy impact from increased recycling was estimated by subtracting the estimated energy use (in million Btu) per ton of material recycled from the estimated energy use (in million Btu) per ton of material landfilled. The energy use rates, by type of recycled material, are provided by the EPAWARM model, Version 14 (released March 2016) and are shown in **Table 4-10**. Where values are negative, there is an energy savings from recycling compared to manufacturing from raw materials.

Table 4-10. Energy Savings per Ton of Material Collected (WARM Parameter) (MMBTU/Tons)

Type of Material Collected	Energy Savings per Ton of Material Recycled (million BTU) [1]	Energy Savings per Ton of Material Landfilled (million BTU) [1]
Mixed Paper (general)	-20.451	-0.207
Newspaper	-16.486	0.052
Corrugated Containers	-15.074	-0.245
Aluminum Cans	-152.764	0.268
Steel Cans	-19.966	0.268
PET	-31.871	0.268
HDPE	-50.203	0.268
Mixed Plastics	-38.837	0.268
Glass	-2.125	0.268
Average of (Food Waste (non-meat); and Grains, Bread, Fruit and Veg, Dairy)	0.000	-0.023
Average of (Aluminum Ingot, Copper Wire)	-98.218	0.268

Source:
[1] Waste Reduction Model (WARM) - V. 14 (released March 2016);
https://www.epa.gov/warm/versions-waste-reduction-model-warm#WARM Tool V14

The same recycling composition percentages (by type of material collected) identified in the Environmental Cost Savings (Section 4.5) were applied to the total tons of diverted recyclables to determine the type of materials represented in the reduction in tons of recyclables. The reduction in tons, by type of material, were then multiplied by their corresponding net energy savings. Energy savings were presented in terms of million Btu and also converted to kWh. The energy savings were not monetized because the energy (saved MMBtu) comes from different fuel sources, and from different geographic regions making it difficult to attribute an overall average cost.

MSW diverted to WTE

Recommended strategies that result in tons of waste (including bulky waste) diverted or redirected from the landfill to a WTE Facility also result in a net energy savings. The net energy savings was estimated using a net energy production factor (MWh / Tons of waste processed using WTE) and was monetized using an average avoided cost electrical utility rate for the Tampa area.

4.6.2 Assumptions

The assumptions used in the estimation of energy cost savings are summarized in **Table 4-11** below.

Table 4-11. Assumptions used for Environmental Cost Savings Estimate

Variable	Units	Value
Btu to kWh Conversion	Btu / kWh	3412
kWh per MWh Conversion	kWh / MWh	1000
MWh per ton of waste using WTE (net impact)	MWh / Ton	0.5
Electrical Utility Rate [1]	$ / kWh	$0.024

Source:
[1] County data - net energy payment (based on capacity payment contract that expires in 2024)

4.7 Job Creation (from Increased Recycling)

Several recommended strategies result in an increase of recyclables diverted from being disposed. Increasing the tonnage of recyclables is expected to add indirect recycling-related collection, processing and manufacturing jobs. These include jobs in the recycling industry related to collection, transporting, processing, and remanufacturing recyclables and can include equipment operators, material sorters, drivers, and administrative personnel.

4.7.1 Methodology

The total number of recycling-related jobs were estimated based on the expected recycling-related jobs per 1,000 tons of diverted waste by type of material, provided in **Table 4-12**. The reuse/remanufacturing jobs factor was then multiplied by the tons of recyclables diverted from the landfill to estimate the total added jobs.

Table 4-12. Jobs Created per 1000 Tons Recycled, by Type of Material
(jobs/1,000 tons)

Type of Material Collected	Collection & Processing Jobs / 1000 Tons	Manufacturing & Reuse Jobs / 1000 Tons
Paper & Paperboard	2.69	4.16
Glass	2.69	15.2
Ferrous	2.69	24.12
Aluminum	2.69	37.63
Other Nonferrous	2.69	37.63
Plastics	2.69	30.3
Rubber & Leather	2.69	16.59
Textiles	2.69	9.85
Wood	2.69	5.6
Other Wastes	2.69	2.5
Food Scraps	1.19	0
Yard Trimmings	1.19	0
Misc. Inorganic Wastes (sand, grit, etc.)	1.19	0

Source:
[1] More Jobs, Less Pollution: Growing the Recycling Economy in the U.S., Tellus Institute and Sound Resource Management, 2011.

Using the 2018 average median income from May 2018, State Occupational Employment and Wage Estimates for the state of Florida, the total expected income from added recycling-related manufacturing jobs was estimated. Added income is considered an economic impact to the local economy, a consequence of increased recycling collection, rather than a broader benefit to society. To avoid double counting, added income should not be included overall project benefit total. The added jobs metrics are presented in **Table 5-1** and **Table 5-2.**

4.7.2 Assumptions

The assumptions used in the estimation of job creation from increased recycling are summarized in **Table 4-13**.

Table 4-13. Assumptions used for Job Creation from Recycling

Variable	Units	Value
Weighted Income per Manufacturing Job created from Recycling [1]	$ / year	$47,632
Weighted Income per Collection & Processing Job Created from Recycling	$ / year	$34,011

Source:
[1] May 2018 State Occupational Employment and Wage Estimates – Florida; http://www.bls.gov/oes/current/oes_fl.htm

5 Sustainable Return on Investment Results

As previously mentioned, SROI is an economic-based approached to evaluating key aspects of the recommended strategies triple bottom line outcome (e.g., economic / financial, environmental, and social / community). The environmental and social / community outcomes build from the financial and diversion models to account for and communicate additional factors that can influence decision making. The SROI results are estimated and reported in specific categories of impacts that are displayed in two matrices that include:

- **Sustainability Impact Indicators:** Presents results measured in physical units to provide a tangible context to monetize SROI values. (Table 5-1)
- **SROI Values**: Presents monetized values of results that apply standard economic valuation parameters from Florida and the U.S. (Table 5-2)

The results in each matrix is organized in a similar manner:

- **Triple Bottom Line:** Columns of information in the matrix represent indicators of value and impact for each of the triple bottom line categories Financial, Environmental, and Social Financial represent direct or indirect financial impacts to the Solid Waste Division operations (direct) or the community (indirect). Environmental measures impacts to the environment including GHG emissions, energy savings, and diversion of materials. Social impact are community based factors such as jobs, traffic congestion, and quality of life.
- **Resource-level impacts:** Rows of the matrix represent impacts to different types of resources and processes including:
    - *Land/waste management:* Relates to costs, benefits and impacts associated with the process of waste collection and disposal, including impacts from trucks on roads;
    - *Energy:* Relates to the use of energy in all forms for waste collection, recycling and disposal;
    - *People:* Relates to changes in direct jobs created as well as impacts to people on roads from changes in hauling waste and recyclables; and
    - *Materials:* Relates to the value of re-manufacturing and reuse of recyclables instead of using virgin materials from a lifecycle perspective including estimated indirect jobs created.

Because some of the strategies involve additional trucks and truck vehicle miles, not all impacts of the strategies are positive from a triple bottom line perspective. Some of the key findings include the following observations:

- Strategy 26 – *Information and Resource Sharing* result in an increase of approximately 4.2 million truck vehicle miles traveled (VMT) from transferring delivered MSW from the County Complex to Waste-to-Energy (WTE) in Hillsborough County over the 30 year period of analysis and avoiding landfill disposal.
- Strategies 7 – *Organize Collection in Unincorporated Area with Universal Recycling*, 12 – *Further Standardize and Expand Recycling Education Efforts*, and 11 –

Universal Recycling Ordinance all implement different levels of recycling education and programming to help increase tons of recyclables and organics diverted from the Complex and accomplish the long-term goal of zero waste to landfill. All three strategies result in a total increase of 4.4 million truck VMT from diverting collected recyclables from the Complex to two nearby material recovery facilities (MRF): Tampa, FL Waste Management Inc. and the St. Petersburg, FL Waste Connections over the 30 year period of analysis.

- Strategy 7 – *Organize Collection in Unincorporated Area with Universal Recycling*, results in an overall reduction in the number of collection trucks that travel on every road in unincorporated county, from 5 truck to 3 trucks per week, resulting in a decrease of 7.5 million collection truck VMT from organized collection.
- Similarly, strategies 18 – *Extension of Landfill Life Through Bulky Waste Processing* & 17 – *Develop Metals Cleaning or Advanced Metals Recovery Facility at Disposal Complex* supports the County's long-term zero waste to landfill goal by removing additional ferrous and non-ferrous metals from waste prior to landfilling the ash and transferring the metal to a nearby scrap metal facility in Tampa. Over the 30 year analysis period, this strategy results in an increase of 812,000 truck VMT from transferring collected ferrous and non-ferrous metals from the Pinellas County Landfill to the Tampa, FL scrap metal facility as well as the environmental benefits from increased tons recycled.
- Implementing all strategies would result in 165 job-years (5.5 jobs) added at the Complex.[1]
- Strategies where tons of waste are diverted from the landfill to alternative WTE facilities over the 30 year analysis period, result in an energy savings of more than 22 million MMBTU.
- Recycling strategies result in over 3.6 million tons of recyclables and organics diverted from disposal over the 30 year analysis period. The increase in tons of recyclables yields 9 million $MTCO_2E$ savings from Greenhouse Gas Emissions (GHG) from landfill to recycling. This is equivalent to removing the GHG emissions of approximately 63,000 passenger vehicles per year.
- Additionally, recycling strategies results in nearly 93 million MMBTU savings in energy from landfill to recycling, which equates to nearly 27 billion kilowatt-hours saved.

The results of the SROI analysis are presented below by Triple Bottom Line categories organized by each Resource. Unless stated otherwise, values presented are for the entire 30 year planning period.

[1] A job-year is one 12 month period of employment.

5.1 Land and Waste Management

5.1.1 Financial

From the FROI analysis performed in the Task 11, Scenario Development and Finalization report, total direct financial impact to the Solid Waste Department's operations is $353.9 million. This is generated through the individual impacts for all Recommended Strategies implemented.

5.1.2 Social

Truck impacts are positive and negative. The organizing of collections decreases truck traffic but movement of increased recyclables and the redirection of MSW to WTE add truck miles. This resulted in a net of 1.8 million additional truck miles added to the system operations. When monetized to reflect the impact of these miles to pavement resulted in a net impact of $93,000 in increased pavement damage. Strategies contributing to this impact include: 7, 8, 9, 11, 12, 17, 18, 19, 20 and 26.

5.1.3 Environmental

With the redirection of waste to WTE, increased energy output is gained. The net energy created is just over one million megawatt-hours. Using local avoided costs values for energy value, this results in a total of $14.9 million in energy production. Strategies contributing to this impact include: 16, 18, 19, 20 and 26

5.2 Energy

5.2.1 Financial

The organization of collection strategies results in a decreased route truck use for curbside collections. Movement of MSW and recyclables to facilities for further processing uses transfer trucks and equates to a net increase in miles traveled. Transfer trailers, even with increased miles have greater fuel efficiency than route truck and can carry heavier loads per truck. The total result of the increased fuel efficiency of the system is a decrease of 639,000 gallons of diesel. This has an equivalent value of $1.1 million. Strategies contributing to this impact include: 7, 8, 9, 11, 12, 18, and 26.

5.2.2 Social

Increased truck miles results in a net total increase in emissions from truck operation. A net total of 12.3 tons of air pollutants will be generated. These emissions include criteria air contaminants such as Nitrogen Oxides, Sulfur Oxides, and volatile organic compounds. When monetized, this represents $157,000. Strategies contributing to this impact include: 7, 8, 9, 11, 12, 16, 18, 19, 20 and 26.

5.2.3 Environmental

The increase truck miles results in a net increase in greenhouse gas (GHG) emissions with the chief gas being carbon dioxide often referenced as metric tons of carbon dioxide equivalent (MTCO2e). The increase GHG emissions is equivalent to adding 36 passenger vehicles to the road each year. When monetized this represents a cost impact of $5,200. Strategies contributing to this impact include: 7, 8, 9, 11, 12, 18, 19, 20 and 26.

5.3 People

5.3.1 Financial

With the implementation of the Recommended Strategies, the Department of Solid Waste will need to develop staff to manage and monitor programs. The net result is an increase in 165 jobs-years or 5.5 jobs across the 30 year period. When accounting for the expected annual compensation for these County employees, this results in an increase in $13.5 million in income. Strategies contributing to this impact include: 6, 7, 10, and 18.

5.3.2 Social

With the net increase in truck miles from collection changes and increased recyclables and MSW movement, more trucks will be on the County's roadways. The impact of this increased truck traffic is estimated to result in 726 hours of average congestion time added. When monetized for time and safety impacts, this results in a $547,000 community impact. Strategies contributing to this impact include: 7, 8, 9, 11, 12, 18, 19, 20 and 26.

5.3.3 Environmental

Many of the Recommended Strategies include or provide for increased educational programs for the community to improve the solid waste management system. From these programs an estimated 2.75 million tons of recyclables and 400,000 tons of organics will be diverted from landfill disposal. Strategies contributing to this impact include: 7, 8, 9, 11, 12, 17, and 18.

5.4 Materials

5.4.1 Financial

In general, the impacts from recycling are less than the impacts from development of products from raw materials. Extreme examples include Aluminum which is approximately 152 times more efficient to recycle than to create aluminum from raw ore. The recycling increases from the Recommended Strategies results in an estimated savings of 92 million MMBtu of energy. This estimated savings is the equivalent energy needed to annually power 28,000 single family homes. Strategies contributing to this impact include: 7, 8, 9, 11, 12, 17 and 18.

5.4.2 Social

Recycling of materials generates downstream jobs in the recycling industry including collection, processing, manufacturing and reuse industries. Implementation of the Recommended Strategies results in the development of an estimated 1,485 jobs annually to support the material management (processing, manufacturing and transportation) efforts from recycling. When accounting for the expected annual compensation for these recycling employees, this results in an increase in $39.6 million in income. Strategies contributing to this impact include: 7, 8, 9, 11, 12, 17 and 18.

5.4.3 Environmental

While saving on manufacturing energy, recycling of materials also reduces net emissions compared to manufacturing from raw materials. Strategies contributing to this impact include: Recycling impacts from the Recommended Strategies results in a net decrease of over 9.8 million tons of GHG. This is the equivalent to removing almost an estimated 69,000 passenger vehicles from the road each year. When monetized, this represents a benefit of $9.5 million to the community. Strategies contributing to this impact include: 7, 8, 9, 11, 12, 17 and 18.

5.5 SROI Financial Impacts

Where applicable, the Environmental and Social benefits or disbenefits have been monetized based on numerous sources including the EPA and US DOT and other sources. When aggregated for strategies that have a measurable impact, the total Environmental and Social Benefit equates to $23.6 million over the 30 year planning period. Factored against all impacted tons (5.7 million tons), the net benefit per ton is $4.15.