LANCASTER COUNTY
SOLID WASTE MANAGEMENT
AUTHORITY

Waste System Processing and Disposal Capacity Evaluation Report Lancaster County Solid Waste Management Authority

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Dvirka and Bartilucci
CONSULTING ENGINEERS

LANCASTER COUNTY, PENNSYLVANIA

WASTE SYSTEM PROCESSING AND DISPOSAL CAPACITY EVALUATION REPORT

EXECUTIVE SUMMARY

ES.1 Purpose of the Report

Dvirka and Bartilucci Consulting Engineers ("D&B") has prepared a Report which examines the Lancaster County Solid Waste Management Authority's ("LCSWMA's") disposal operations and provides analyses and recommendations regarding the utilization and operating economics of the LCSWMA's disposal facilities. The focus of the Report is on the future operation of the Lancaster County Resource Recovery Facility ("RRF"), including economic forecasts of (1) expanding the capacity of the Lancaster County RRF or (2) continuing the operation of the RRF with no capacity expansion. In order to prepare economic forecasts, D&B developed a Program Economic Model which simulates the economics of the operation of the RRF in the context of the LCSWMA's other disposal facilities. The Model was utilized to evaluate the economics and operational aspects of a Base Case with no RRF expansion and a Scenario with RRF expansion.

ES.2 Waste Generation Forecast

A waste generation forecast was prepared in order to assess the quantities of waste requiring disposal. The forecast utilized projections of residential population and commercial development trends from the Lancaster County Planning Commission and the Pennsylvania State Data Center. An average growth rate of 0.75 percent per year was used to estimate annual population in Lancaster County through the year 2032. Future per capita waste generation rates were projected by reviewing Lancaster County residential and commercial waste generation for the period from 2003 through 2007. This resulted in an estimate of current per capita waste generation of 0.64 tons per capita per year. Information on future waste generation trends from sources such as the United States Environmental Protection

Agency ("USEPA") was utilized to assess the potential for future per capita waste generation rates. As a result, a reduction in per capita waste generation of 0.2 percent per year, for the next five (5) years, was incorporated into the estimate in order to account for increased recycling, reduced use of packaging, and the current state of the economy. It was assumed that per capita waste generation for the remainder of the study period would remain unchanged. The population and per capita waste generation projections were combined in order to estimate future waste generation in Lancaster County. Table S-1 displays the projected generation of processible waste through the year 2032 that was utilized in the feasibility analysis of the RRF expansion. This also includes residual (industrial) wastes from in-County and out-of-County sources that have traditionally been handled by the LCSWMA's system.

ES.3 Current Recycling and Household Hazardous Waste Program

Lancaster County's recycling and household hazardous waste management program has been successful in attaining significant reductions in the amount of wastes disposed at the RRF and the Frey Farm Landfill ("FFLF"), and in reducing the content of hazardous household products in the wastestream. The current status of the municipal recycling programs and the LCSWMA's household hazardous waste program were evaluated to identify the actions necessary to expand these programs while remaining consistent with the County's integrated waste management philosophy. The recycling rates in municipalities that are mandated to recycle by Pennsylvania's "Municipal Waste Planning, Recycling, and Waste Reduction Act of 1988" (Act 101), are generally much higher than in municipalities that are not mandated. Mandated municipalities recycle an average amount of 0.13 tons per capita per year, while non-mandated municipalities recycle an average of 0.05 tons per capita per year. Expansion of recycling efforts in non-mandated municipalities was identified as the primary means to increase recycling rates in Lancaster County. Further, the addition of corrugated cardboard, junk mail, and magazines to programs where these items are not currently collected would add to recycling rates. The Household Hazardous Waste ("HHW") Facility at the LCSWMA's Transfer Station Complex is well situated to serve the majority of the County's population.

Table ES-1

TOTAL PROCESSIBLE WASTE AVAILABLE

Year	Processible Waste
2009	384,040
2010	387,098
2011	387,497
2012	388,421
2013	389,372
2014	390,995
2015	392,651
2016	394,341
2017	396,064
2018	397,820
2019	399,609
2020	401,432
2021	403,287
2022	405,174
2023	407,094
2024	409,047
2025	411,031
2026	413,048
2027	415,097
2028	417,177
2029	419,290
2030	421,434
2031	423,610
2032	425,818

Note: Includes residual (industrial) wastes from in-County and out-of-County sources.

ES.4 Current Status of the Authority's Solid Waste Facility Operations

The LCSWMA System includes the Transfer Station Complex, the RRF, the FFLF, and the HHW Facility. A total of 606,214 tons of waste was processed or disposed of by the LCSWMA in 2008. The Authority disposed of 305,428 tons of refuse, 874 tons of non-processible waste, 1,552 tons of wood, 97,593 tons of construction and demolition wastes, 103,597 tons of residual wastes generated within Lancaster County, and 97,170 tons of residual wastes generated outside of the County; LCSWMA also provided for the transfer of 11,472 tons of recyclable materials to privately owned materials recovery facilities. All LCSWMA Facilities operate in full compliance with their State and Federal Permits.

The RRF has been in operation for seventeen (17) years. It has a nominal processing capacity of 1,200 tons per day. Waste is combusted in three (3), 400 ton per day mass burn units, each including a furnace and waste heat recovery sections and air pollution control equipment. During the past eleven (11) years, the RRF has processed an average of 370,000 tons of waste per year. The waste heat recovery units produce steam for conversion to electricity in the RRF's thirty-six (36) megawatt steam turbine-generator. The residue produced as the byproduct of combustion is transferred to the FFLF, where it is used beneficially as alternative daily cover.

The Authority seeks to utilize the available capacity of the RRF to the maximum extent possible, minimize the consumption of remaining landfill space, and fulfill the goal of recovering energy from post-recycling waste. Aside from the benefits of producing electrical energy in an environmentally sound manner, the RRF reduces the volume of waste by ninety (90) percent, thus delaying the need for additional landfill cell construction. Currently, the RRF is operating at or near capacity, resulting in the landfilling of 10,000 to 30,000 tons per year of processible waste. If the capacity of the RRF remains unchanged, the amount of processible wastes which must be landfilled will increase as waste generation increases.

The FFLF is a double composite lined landfill with leachate collection; leachate treatment is provided offsite by a Publicly Owned Treatment Works ("POTW"). Construction

of the first through fifth cells occurred from 1988 through 2003. As the quantity of post-recycling waste generation increases in the future, the quantities of waste disposed at the FFLF are likely to increase. At the end of 2008, the estimated remaining capacity of the FFLF was 4.29 million cubic yards. The final cell (#6), planned for construction in 2010, will give the FFLF capacity until approximately 2019. Additional landfill capacity is expected to be provided by the Creswell Re-Use Landfill. The preliminary design of the capacity of the Creswell Re-Use Landfill indicates that it will provide capacity for over fifty (50) years.

ES.5 Resource Recovery Facility Expansion Analysis

In order to evaluate the appropriateness of expanding the RRF, the potential benefits associated with conserving landfill space, and the economic feasibility of the expansion, the following two alternatives were evaluated and compared – (1) a Base Case in which the RRF would not be expanded and (2) Scenario 1 in which the RRF would be expanded by adding a 600 ton per day municipal waste combustion unit. The potential expansion would increase the capacity of the RRF from a nominal processing rate of 1,200 tons per day to a rate of 1,800 tons per day. The work required for the expansion and its costs were estimated using information from RRF expansion projects in Lee County and in Hillsborough County, Florida. Each County expanded their existing 1,200 ton per day RRFs by 600 tons per day. The work carried out for those projects and the construction costs were reviewed and adjusted as necessary to match the conditions at the LCSWMA RRF, to account for anticipated Pennsylvania Department of Environmental Protection ("PaDEP") and USEPA permitting requirements, and to account for inflation of construction costs up to the projected construction date. The equipment and work items included in the cost estimate are listed in Table ES-2.

Table ES-2

LANCASTER COUNTY RESOURCE RECOVERY FACILITY EXPANSION COST ESTIMATE CATEGORIES

Building Expansions Boiler Building Expansion and Relocation of Columns and Stairwells (interferences with new feed chute). Turbine Generator Building Expansion. Residue Building Expansion. Water Treatment Building Expansion.
Site and Civil Work Excavation for Underground Utilities and Foundations, Grading, and Landscaping.
Tipping Building-Refuse Pit Additional Crane and Grapple and New Crane Pulpit. Upgrades to Existing Cranes.
Furnace/Boiler and Auxiliaries Martin Equipment: Grate Components, Feed Table, Ash Dischargers, and Hydraulic Drive Components. Primary, Secondary, and Tertiary (NOx Control) Fans. Boiler Components, Waterwall Panels, Boiler, Economizer, Steam Cooled Air Heater Surfaces, and Support Components, Refractory. Steam Drums, Boiler Trim, Control Valve Stations, etc.
Turbine Generator and Auxiliaries New Extraction Condensing Steam Turbine. Turbine Lube Oil, Turbine Control Oil, Steam Seal System, etc. Surface Condenser and Ejector Assemblies.
Feedwater Systems Feedwater Pumps. Feedwater Heaters. Deaerator Modifications. Instrumentation and Controls.
Air Pollution Control Equipment New Scrubber Tower and Expansion to Lime Slaking and Lime Slurry Pumping Systems. New Fabric Filter Train. Induced Draft Fan and Duct Connection to Stack. Expansion of Aqueous Ammonia System with Modifications for Improved NOx Reduction.

(Continued)

Table ES-2

LANCASTER COUNTY RESOURCE RECOVERY FACILITY EXPANSION COST ESTIMATE COST CATEGORIES

Water Treatment Systems Expand Water Treatment Capacity-Lamella Clarifier, Floc Tanks, Clearwell, Pumps, etc.
Conveyors Expand Reverse Osmosis ("RO") System Capacity. Extension of Main Conveyor to Serve New Boiler. Fly Ash Conveyors and Air Locks for New APC Equipment and Boiler Fly Ash Handling.
Control Systems Expansion and Upgrade to Distributed Control System. Improvements to Control Room Displays.
Cooling Tower Additional Cooling Tower Cell Circulating Water Pump and Piping.
Electrical Motor Control Center Expansions for New Equipment Motors. Switchgear and Transformer Additions and Modifications.
Air Compressor Station Upgrades for Additional Plant Air and Instrument Air Demands.
Capital Improvements and Upgrades to Existing Equipment and Systems Existing Crane Upgrades to Install Regenerative/VFD Drives and New Grapple. Festoon Replacement. Modify Existing Cooling Tower to Remove Capacity Constraints.

A preliminary schedule for the LCSWMA's RRF expansion was developed, as shown below.

- Project Financing: January 2011 – December 2011
- Engineering, Design, and Permitting: January 2011 – June 2013
- Construction: June 2013 – October 2014
- Start-up and Testing: October 2014 – December 2014
- Commercial Operations: January 2015

The estimated construction cost for the expansion, developed based upon the approach described above, and adjusted to the year 2014, is $161.1 million. The estimated construction cost does not include costs associated with financing.

ES.6 Program Economic Model

A Microsoft-Excel based Program Economic Model was developed in order to model LCSWMA expenses and revenues associated with the past, current, and projected future operations of the RRF. The Model was varied to incorporate the Base Case representing continued future operation of the RRF with no capacity expansion, and the Scenario 1 Case in which the RRF is expanded, as described earlier, with expanded operations beginning in the year 2015. The model also includes a calculation of required landfill capacity, which takes into account the impact of RRF operations on the quantities of materials which are required to be landfilled. The model therefore projects annual operating expenses and annual operating revenues associated with the operation of the RRF and the impact of the RRF operation on the Authority's landfill space requirements.

In calculating operating economics of the RRF, the model includes the categories listed and described below:

Capital Expenses:

1. *Existing Resource Recovery Facility Debt Service.*
2. *Estimated Net Debt Service for Capital Improvement.*
3. *Estimated Net Debt Service for New Fourth Unit.*

Operating Expenses:

1. *Resource Recovery Facility Contract Administration Expenses.*

   Energy Share Expense

   Operator Service Fee

   Annual Fee Adjustment

   Special Waste Fees

2. *Pass Through Costs (escalated at three (3) percent annually, except as noted).*

   Lime – (five (5) percent)

   Water Treatment Chemicals

   DeNOx Reagent – (five (5) percent)

   Activated Carbon – (five (5) percent)

   Electric Expense

   Elizabethtown Effluent Fee

   Susquehanna River Basin Commission ("SRBC") Fee

   Consulting (zero (0) percent), Sales Taxes (two (2) percent), and Change in Law Expenses (0.5 percent)

3. *Other Authority Expenses.*

Department of Environmental Protection ("DEP") Permit and Host Fees

Resource Recovery Facility Site Operations

Sub-Contract Hauling

Insurance

Numerical values used in the Program Economic Model for the above expense categories are based on actual or budget expenses, as provided by the LCSWMA.

Operating Revenues:

1. *Sale of Energy*.
2. *Sale of Metals.*
3. *Tipping Fee Charges*.

Table ES-3 provides a summary of the Program Economic Model results, showing waste quantities processed at the RRF, waste quantities landfilled, gross electric revenues generated from RRF operations, estimated tipping fees for County generated refuse, estimated LCSWMA net revenues for each ton processed at the RRF, and remaining landfill volume after each year shown. The data is shown for both the Base Case (no RRF expansion) and Scenario 1 (600 ton per day RRF expansion in 2015) at three (3) year intervals from 2009 through 2039. Also shown in the Table is the estimated construction year for each landfill expansion project and the remaining useful landfill life after final cell construction in the Creswell Re-Use Landfill.

As illustrated in Table ES-3, the increase in RRF processing capacity in 2015, after RRF expansion (Scenario 1), is associated with yearly decreases in processible waste and total

Table ES-3
SUMMARY OF ECONOMIC MODEL RESULTS

BASE CASE: No RRF Expansion

Year	RRF Proc. Tons	Tons of Waste Landfilled			Gross Electric Revenues	Refuse Tipping Fee	LCSWMA Net Revenues per Ton Processed at RRF	Remaining Landfill Volume (Cubic Yards)
		Proc. Waste	Non-Proc. Waste	Total Waste				
2009	362,500	33,000	332,101	365,101	$ 11,852,600	$ 68.00	$ 9.54	1,273,389
2012	351,360	39,061	252,824	291,885	$ 11,571,063	$ 72.00	$ 6.43	2,982,079
2015	354,382	40,269	250,569	290,838	$ 11,935,140	$ 75.00	$ 28.40	1,930,269
2018	354,382	45,438	246,327	291,766	$ 17,032,866	$ 75.00	$ 35.79	861,044
2021	354,382	50,905	242,335	293,240	$ 18,375,914	$ 78.00	$ 35.72	2,848,843
2024	355,353	55,694	238,809	294,503	$ 19,476,311	$ 81.00	$ 34.76	1,704,221
2027	354,382	62,715	235,041	297,756	$ 22,385,697	$ 81.00	$ 43.31	3,463,940
2030	354,382	69,052	231,713	300,765	$ 24,593,584	$ 84.00	$ 33.06	2,224,084
2033	354,382	75,675	228,580	304,255	$ 27,017,078	$ 84.00	$ 30.32	928,723
2036	355,353	81,610	225,863	307,472	$ 29,760,293	$ 87.00	$ 30.49	3,356,794
2039	354,382	89,768	222,857	312,625	$ 32,606,246	$ 90.00	$ 29.78	1,931,454

LF Cell Construction	Estimated Year of Const.
Frey Farm LF Cell #6	2010
ReUse LF Cell #1	2018
ReUse LF Cell #2	2025
ReUse LF Cell #3	2033
ReUse LF Cell #4	2041
ReUse LF Cell #5	2048
Final ReUse LF Cell #6 (11.65 MM CY) Constructed in 2056 ReUse full 2072	

SCENARIO 1: RRF Expansion in 2015

Year	RRF Proc. Tons	Tons of Waste Landfilled			Gross Electric Revenues	Refuse Tipping Fee	LCSWMA Net Revenues per Ton Processed at RRF	Remaining Landfill Volume (Cubic Yards)
		Proc. Waste	Non-Proc. Waste	Total Waste				
2009	362,500	33,000	332,101	365,101	$ 11,852,600	$ 68.00	$ 9.54	1,273,389
2012	351,360	39,061	252,824	291,885	$ 11,571,063	$ 72.00	$ 6.43	2,982,079
2015	531,573	16,278	292,740	309,018	$ 17,902,710	$ 75.00	$ 12.19	1,995,756
2018	531,573	16,647	288,499	305,146	$ 25,549,299	$ 75.00	$ 19.83	969,013
2021	531,573	17,024	284,507	301,531	$ 27,651,114	$ 78.00	$ 20.41	3,030,390
2024	533,029	17,410	281,096	298,506	$ 29,693,679	$ 81.00	$ 20.46	1,993,802
2027	531,573	17,805	277,213	295,018	$ 33,578,546	$ 81.00	$ 19.94	950,486
2030	531,573	18,208	273,884	292,093	$ 36,890,376	$ 84.00	$ 20.73	2,849,605
2033	531,573	18,621	270,752	289,373	$ 40,525,616	$ 84.00	$ 18.47	1,787,967
2036	533,029	19,043	268,150	287,193	$ 44,640,440	$ 87.00	$ 47.35	715,289
2039	531,573	19,475	265,028	284,503	$ 48,909,369	$ 90.00	$ 47.25	3,415,030

LF Cell Construction	Estimated Year of Const.
Frey Farm LF Cell #6	2010
ReUse LF Cell #1	2019
ReUse LF Cell #2	2028
ReUse LF Cell #3	2037
ReUse LF Cell #4	2046
ReUse LF Cell #5	2055
Final ReUse LF Cell (11.65 MM CY) Constructed in 2067 ReUse full 2090	

waste requiring landfilling. Under Scenario 1, gross electric generation revenues are significantly increased through the generation and sale of increased quantities of renewable energy from waste.

Assuming equivalent LCSWMA tipping fees for the Base Case and Scenario 1, the net revenues (LCSWMA RRF revenues minus LCSWMA RRF expenses) are lower in Scenario 1 between 2015 and until 2035 mainly as a result of required debt service payments associated with funding the RRF expansion. Remaining landfill volumes in each year shown are estimates based on projected landfill consumption rates and the projected year for each landfill cell expansion project.

The Table also shows the estimated years in which landfill cell construction would be required and the estimated remaining life of the Creswell Re-Use Landfill after construction of the final cell. As a result of the reduced reliance on landfill space in Scenario 1, the construction of Creswell Re-Use Landfill cell number 1 is delayed approximately one (1) year as compared to the Base Case. Cell number 2 construction is delayed for approximately three (3) years as compared to the Base Case. Cell number 3 construction is delayed for approximately four (4) years as compared to the Base Case, and cell Number 5 construction is delayed approximately seven (7) years as compared to the Base Case. The final Creswell Re-Use Landfill cell construction (cell number 6) is delayed approximately eleven (11) years as compared to the Base Case. In the Base Case, after construction of the final cell, estimated to occur in 2056, there would be approximately sixteen (16) years of remaining Creswell Re-Use Landfill life. In Scenario 1, after construction of the final cell, estimated to be in 2067, there would be approximately twenty-three (23) years of remaining Creswell Re-Use Landfill life. Therefore, the total increased life of the Creswell Re-Use Landfill resulting from the RRF expansion in 2015 would be approximately eighteen (18) years (2019 through 2090 with RRF expansion and 2018 through 2072 without RRF expansion).

ES.7 Conclusions and Recommendations

Conclusion 1

The currently available waste for processing at the RRF is greater than the current capacity of the RRF to process that waste. The gap between the available waste and the RRF capacity is projected to increase in the future, accelerating consumption of landfill capacity.

Conclusion 2

If the RRF is expanded with the addition of a 600 ton per day unit in 2015, the life of the FFLF may be extended by one (1) year and the life of the Creswell Re-Use Landfill's constructed cells will be extended by eighteen (18) years. However, the residential and commercial refuse and residual waste generated in the County, as presently processed at the RRF and as projected in the future, is insufficient to fill the capacity of an expanded RRF.

Conclusion 3

Based on the assumptions used for future tipping fees, particularly the assumptions used for additional waste needed to fill the RRF's expanded capacity, it is possible for the expanded RRF to have sufficient operating revenues to meet the added capital and operating expenses of the expanded RRF.

The expansion of the RRF from a 1,200 ton per day nominal processing rate to an 1,800 ton per day nominal processing rate initially appears to be economically feasible. However, the feasibility is largely dependent on the ability of the Authority to obtain sufficient quantities of waste from out-of-County sources to supplement current in-County sources so that the expanded RRF capacity would be fully utilized. The economic feasibility is also dependent on the ability to attract such waste at prices that will offset the additional capital and operating costs associated with the expansion. Finally, the economic feasibility is dependent on all other assumptions used in the Economic Model.

The expansion of the RRF will have a direct impact on landfill consumption, in that all County-generated processible wastes, which includes all of the residential and commercial waste generated in the County, would be processed at the RRF and there would be little processible waste requiring landfilling. The benefits of reducing the quantity of wastes landfilled include an extension of landfill cell operating life, the additional generation of renewable energy from waste that would otherwise be landfilled, the economic benefits associated with longer periods between required cell construction, and environmental benefits of reduced quantities of waste landfilled.

Conclusion 4

The increase in recyclables collections that would result from the provision of curbside collections or drop-offs in municipalities with no current recycling programs is projected to be approximately 2,100 tons per year. LCSWMA should continue to provide technical assistance to municipalities voluntarily setting up recycling programs.

Municipalities should be encouraged to set up collection programs as their populations increase. The population density of the municipalities currently approaching the first trigger point of 5,000 residents and 300 people per square mile for the PaDEP's Act 101 mandatory recycling program was reviewed. The year 2000 United States Census block map data was examined for municipalities with 5,000 residents that do not have programs. The populations as of the year 2000 were sparsely dispersed and below the density requirement, with pockets accounting for most of the population. Because of growth trends in the County, the population distributions should be tracked and reexamined when the results of the year 2010 census are made available to reassess the population distribution and State recycling requirements.

Conclusion 5

Consideration should be given to expanding recycling programs to include magazines and junk mail to increase recycled tonnage, if local materials recovery facilities wish to accept these materials.

Conclusion 6

Corrugated cardboard material is accepted at municipal drop-offs in the County. It is estimated that an additional 1,000 tons per year of corrugated material could be collected within the County if additional drop-off locations were available.