Recycling Technical Assistance Project #551

Jefferson County Solid Waste Authority, Jefferson County, PA

Analysis of Alternative Approaches to Recycling Collection and Processing System

June 30, 2014

Sponsored by the Pennsylvania Department of Environmental Protection through the Pennsylvania State Association of Township Supervisors.

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1.0 Purpose of Technical Assistance

This study was conducted for the Jefferson County Solid Waste Authority (JCSWA) under the Pennsylvania Recycling Technical Assistance Program. The RTA program is sponsored by the Pennsylvania Department of Environmental Protection through the Pennsylvania State Association of Township Supervisors. The Scope of Work, countersigned March 25, 2014 by Pennsylvania Resources Council (PRC) and the JCSWA summarizes the grant's purpose as follows:

> Provide assistance to the Authority in exploring alternatives to the existing recycling efforts which rely heavily on third party contractors to execute the technical assistance. Alternatives will be identified and evaluated based on their financial impact and their potential to impact diversion rates. Special consideration will be given to partnership opportunities, both intergovernmental and public/private.

Key tasks were to include *interviews* with current stakeholders, current partners and potential partners, for the purpose of infrastructure inventory; *collection of key data and documents; contract review; assessment of program performance; analysis of alternatives*; writing of a *final report*; and presentation of findings to the Board of the JCSWA.

1.1 Background

Jefferson County Solid Waste Authority (JCSWA) has had a residential drop-off recycling program since 1994. Since 1999, the program has been implemented through a relationship with Veolia Environmental Services (now Advanced Disposal, AD subsequently). JCSWA owns all of the equipment related to the program including (51) 20 or 30 yard roll off recycling containers; (6) 2-yard dump hoppers; (4) 40 cubic yard compactor boxes and an Excel 2R63 baler. AD provides hauling services and operates the baler under a lease agreement with JCSWA. In the most recent service contract between AD and JCSWA, AD acknowledges JCSWA's continued ownership of the baler and other equipment, but there is no compensation specified for this ongoing use. AD is required to provide maintenance of the equipment and painting of containers, as needed. The contract specifies a per container hauling fee paid to AD by JCSWA for the transport of recycling from the collection sites to AD's baling facility.

Faced with increasing costs, JCSWA considered eliminating a significant number of collection sites in 2013. On July 1, 2013, AD agreed to a 15% hauling fee reduction across all drop-off sites. Based on the renegotiated fees, JCSWA elected to limit closure to just two sites (Beaver and Sportsburgh). The net savings from reduced fees and site closures equaled $9,274 with a cost per ton of $95.

1.2 Current System

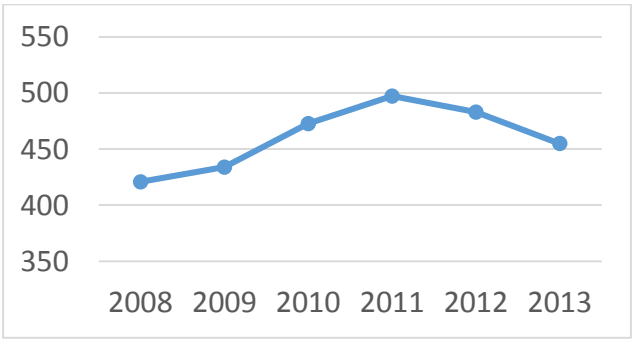
Over 2013, JCSWA had 14 drop-off sites, eight with two drop-off containers (Barnett, Knox, Oliver, Pine Creek, Polk, Punxy, Ringgold and Summerville) and six with three containers (Bell, Gaskill, Reynoldsville, Rose, Walston and Washington). Table 1 shows the tonnages, by site and material, collected at the 14 drop-off sites over 2013.

Table 1: Tons of Recyclables Collected, 2013

	Tin	Alum	Clear Glass	Green Glass	Brown Glass	Plastic	News paper	Mixed Paper	OCC	TOTAL
Barnett	3.15	0.64	5.05	1.26	2.5	2.22	8.94	0	0	**23.76**
Beaver	0.53	0.1	0.84	0.21	0.42	0.73	2.89	0	0	**5.72**
Bell	1.17	0.24	1.88	0.47	0.94	1.42	5.6	3.38	2.27	**17.37**
Gaskill	2.29	0.46	3.69	0.91	1.84	2.13	8.48	5.02	3.33	**28.15**
Knox	1.53	0.3	2.48	0.62	1.24	0.82	3.27	0	0	**10.26**
Oliver	0.78	0.15	1.24	0.31	0.62	0.7	2.81	0	0	**6.61**
Pinecreek	0.77	0.16	1.24	0.31	0.62	1.29	5.12	0	0	**9.51**
Polk	1.6	0.33	2.57	0.64	1.28	1.3	5.15	0	0	**12.87**
Punxy	0	0	0	0	0	3.45	13.8	0	0	**17.25**
Reyn	2.25	0.43	3.58	0.9	1.8	2.39	9.54	6.3	4.38	**31.57**
Ringgold	1.31	0.42	2.24	0.82	1.1	2.03	8.11	0	0	**16.03**
Rose	8.44	1.69	13.54	3.42	6.77	10.22	40.8	20.5	13.91	**119.29**
Sportsb	1.51	0.3	2.42	0.6	1.2	1.64	6.54	0	0	**14.21**
Summ	3.44	0.71	5.49	1.37	2.74	3.79	15.13	0	0	**32.67**
Walston	6.03	1.22	9.67	2.41	4.84	5.51	21.98	16.23	10.86	**78.75**
Wash	2.85	0.57	4.59	1.15	2.3	2.5	9.91	4.21	2.8	**30.88**
TOTAL	**37.65**	**7.72**	**60.52**	**15.4**	**30.21**	**42.14**	**168.07**	**55.64**	**37.55**	**454.9**

Figure 1 gives total tons from all sites, by year, showing a rise and then a fall during the period (inter-annual changes in tons were 3%, 9%, 5%, -3% and -6%). The closing of a few sites may have been a factor in the recent decrease in recycling. There is some variability among materials in these changing rates per year. Tin, Aluminum and Glass (all colors) showed fairly steady declines since 2008, averaging 2% decline per year over the period. Plastics showed a very dramatic increase (73%) between 2009 and 2010, and then lost those gains over the subsequent three years. OCC and mixed paper showed strong increases between 2008 and 2011 (averaging 36% per year), more modest increase over 2012 (6% and 7%), and then a decrease over 2013 (11% and 12%). Newspaper showed a dramatic increase (33%) over 2011 and a range of increases and decreases over other years in the period, with an overall modest increase of 3%.

Figure 1: Total Tons of Recyclables at Jefferson County drop-off sites



The system has been impressive in the tons of material diverted, especially considering that it is source-separated into nine categories (a strength to which we will return) and that it is entirely voluntary, in non-mandated, rural areas with dispersed households. JCSWA will, of course, continue to monitor tons collected at each site. Some targeted publicity, especially for sites that experience reduced participation, should help reverse decreased tonnages. Targeting some larger businesses who do not currently participate should also increase tonage.

While its diversion has been impressive, the system's costs have become unsustainable. Table 2 gives the annual total of fees paid by JCSWA to AD to service these drop-off sites since 2008. The fees for 2013 would have been even higher if AD had not agreed to the across-the-board 15% reduction noted earlier.

Table 2: Annual Fees to Advanced Disposal from JCSWA to service drop-off sites.

2008	$ 10,770
2009	$ 31,870
2010	$ 36,900
2011	$ 37,500
2012	$ 46,129
2013	$ 44,506[1]

While AD is an essential partner in implementing JCSWA's recycling program, there are several opportunities which are not contemplated under the current agreement. These opportunities include:

- Revenue Sharing: JCSWA should be paid a share of the market value of all materials from its collection sites.
- Cost of Service Pricing: fees paid to AD should be based on actual cost of service with a provision for a specified *profit margin* benefiting AD.
- Royalty on Other Baled Materials: JCSWA should be compensated for the use of the baler by AD to process materials generated from non-JCSWA sources.

2.0 Overview of Alternatives Assessed

A central flaw in the current system is that JCSWA receives no income from the 400 to 500 tons of source-separated recycled material that County residents deposit at drop-off sites each year. In order to ensure the long term sustainability of the JCSWA recycling program a mechanism must be adopted which returns at least a portion of the value of the diverted materials. By employing a financial incentive which rewards higher diversion rates, it is assumed that collected tons will increases correspondingly.

The most common model, *revenue-sharing*, is designed so municipalities and other collectors receive a portion of the income that processors receive from markets. This approach is highly effective in settings where there is a third party who is processing and marketing materials on behalf of the collector. The most widely used formulas run as follows:

1) Collector pays a per ton tipping fee to the processor
2) Processor guarantees a percentage of market price to the collector

[1] If the lower rates had held from the beginning of the year, the 2013 fees would be $39,101.

Under these systems the collector assumes some of the risks associated with the commodities market-place while the processor is assured that their operating costs are paid for. The benefit to the collector is that they will be rewarded financially for the collected materials; thereby encouraging increased diversion.

While the current processing agreement could be amended to incorporate a revenue sharing mechanism, this report explores, in detail, the potential of securing the services of an existing nearby processor with a standing revenue sharing program. This analysis assumes that JCSWA would be required to take on the responsibilities of transporting materials to the third-party processor's location.

A second approach explored in this report which will produce a clear financial incentive to increase diversion is for the JCSWA to internalize all recycling related operations. By becoming the collector, hauler and processor JCSWA will recover 100% of the value for all collected materials. This approach has been taken across the Commonwealth, and nationally, by rural recycling programs to ensure their long term viability.

A third approach is briefly discussed which examines the potential of converting the entire collection system to a single stream model.

Finally, this report establishes a clear analysis which can be used to renegotiate existing contracts. The data included in this report provides a clear understanding of the actual cost of implementing the JCSWA waste diversion program.

3.0 Transport Loose Material to ICSWA

The closest County Solid Waste Authority that accepts material from other counties, bales and markets this material is the Indiana County Solid Waste Authority (ICSWA). ICSWA currently offers processing and marketing services to other clients; charging a $70 per ton processing fee and paying an 80% revenue share. Table 3 examines the potential financial implications of ICSWA services in relation to the material collected by the JCSWA.

Several patterns are worth noting here. First, there is a clear negative correlation between tons collected and price per ton, with glass and newspaper dominating the tonnages while commanding the lowest market prices and plastics, tin and especially aluminum commanding the highest prices while collected in the fewest tons. Second, when the $70/ton processing fee is included in the final calculation, the three types of glass show a net cost to JCSWA (as 80% of their market price is less than the per ton processing fee). As the heaviest and the least remunerative of recyclable materials, glass has become a significant financial burden to municipalities and processors. In Section 5.1, the $5700 per year cost of glass in revenue sharing will be added to the cost of hauling it, raising the possibility of dropping it from the list of acceptable materials.

Table 3: Estimating Revenue Sharing with ICSWA, loose material, 2013 tons

JCSWA Collected Tons									
Tin	Alum	Clear Glass	Green Glass	Brown Glass	Plastics	Newsp	Mixed Paper	OCC	TOTAL
37.7	7.7	60.5	15.4	30.2	42.1	168.1	55.6	37.6	454.9
Market Price Paid to ICSWA									
Tin	Alum	Clear Glass	Green Glass	Brown Glass	Plastics	Newsp	Mixed Paper	OCC	
$198	$1,388	$20	$20	$20	$247	$77	$156	$123	
Processing fee debit ($70/Ton)									
$2,636	$540	$4,236	$1,078	$2,115	$2,950	$11,765	$3,895	$2,629	$31,843
Gross Income for tonnage to ICSWA									
$7,466	$10,715	$1,234	$314	$616	$10,394	$12,965	$8,701	$4,601	$57,006
80% of above income									
$5,973	$8,572	$988	$251	$493	$8,315	$10,372	$6,961	$3,681	$45,605
Income to JCSWA (80% of gross income minus processing fee)									
$3,338	$8,031	-$3,249	-$827	-$1,622	$5,365	-$1,393	$3,066	$1,052	$13,762

Utilizing ICSWA for processing and marketing services will require the JCSWA to transport materials from the collection sites to ICSWA's recycling facility. Two distinct hauling options are evaluated;

1. JCSWA operated roll-off truck (estimated cost, new: $120 to $230K)
2. JCSWA operated front-load truck (estimated cost, new: $230 to $250K)

Option 1 relies on the existing fleet of JCSWA owned roll-off containers which limits the capital demands. Option 2 will require not only a new truck, but also the acquisition of a significant number of front load collection containers (104 of 6 cubic yards; 40 of 8 cubic yards; estimated cost $144K).

3.1 Hauling Cost Calculations

In order to estimate transportation costs in the following scenarios, a report prepared by the American Transportation Research Institute (ATRI) was used as a baseline. This annual report examines all costs related to the operation of a commercial vehicle and analyzes these costs in both per hour and per mile increments. These incremental costs are based on an exhaustive survey of motor freight operators and provide a conservative estimate of JCSWA's predicted cost to implement these options. A complete copy of the report can be viewed at http://truckexec.typepad.com/files/atri-operational-costs-of-trucking-2013-final.pdf. ATRI assembles the cost per hour and mile based on nine discreet cost categories, summarized in Table 4.

Table 4: Factors behind Hauling Cost estimates, from ATRI, 2012 figures

Cost Category		Per Mile	Per Hour
Vehicle-based	Fuel	$ 0.641	$ 25.63
	Truck lease or purchase payments	$ 0.174	$ 6.94
	Repair & Maintenance	$ 0.138	$ 5.52
	Truck Insurance Premiums	$ 0.063	$ 2.51
	Permits & Licenses	$ 0.022	$ 0.88
	Tires	$ 0.044	$ 1.76
	Tolls	$ 0.019	$ 0.74
Driver-based	Driver Wages	$ 0.417	$ 16.67
	Driver Benefits	$ 0.116	$ 4.64
TOTAL		**$ 1.634**	**$ 65.29**

This methodology provides a complete estimated cost of operation for a private sector vehicle. Several of these costs are in excess of what JCSWA would incur as a government agency, e.g. truck purchase, insurance and permits. However, utilizing this data as a basis provides a conservative model with which to forecast JCSWA costs.

For the purposes of this report, the above costs were estimated for each route both per total miles and per total hours of operation, using the ATRI factors. The two estimates were averaged to obtain estimated annual costs. We then averaged these two estimates for our estimated annual cost for JCSWA for each route. The variation in total cost by hours and miles respectively is the result of the additional hours incurred loading and unloading. The per mile estimates defined in the ATRI report assume limited down-time at a stop and do not fully account for the nature of a solid waste collection system.

3.2 Hauling with a Roll-Off Truck

Retaining the existing roll-off based system is advantageous as it avoids significant capital costs in comparison to a front load conversion. The analysis of costs associated with the roll-off system are based on the actual and documented routing system currently in use. This data was extrapolated to determine estimated costs of transporting materials to the ICSWA for processing and is summarized in Table 5.

Table 5: Estimated Annual Operational Costs of Hauling Loose Material to ICSWA with Roll-Off Truck

Per Mile		**Per Hour**	
Total Miles	40,053	890	Estimated hours en route
		237	Estimated hours in site pulls & dumps
		1127	Estimated total hour/year
$1.61 / Mile	$64,485	$72,748	$64.55 / hour
Average Annual Estimated Cost		**$68,616**	

3.3 Hauling with a Front-Load Packer Truck

Converting the collection system to employ a front-load (FL) compacting truck offers several advantages when compared to the existing roll-off based system. The FL truck compacts materials as they are loaded, thereby increasing overall density and improving the efficiency of the collection system. However, to maximize the potential value of collected materials the FL truck must be deployed on a single material route, i.e. one route pulls tin from several drop-off sites and hauls it to the processing location. At least one other Solid Waste Authority in Pennsylvania operates its recycling program under the FL model, Monroe County.

A conceptual routing system was established based on actual tons generated at each site to develop an estimated annual cost. This cost of service model allows JCSWA to not only explore the potential of managing the collection system internally but also provides a basis to inform negotiations with a third party hauler. These routes and the methodology used to develop them are summarized in Appendix 1. Table 6 presents estimated annual operational costs of using a 40 yd3 front-load packer truck.

Table 6: Estimated Annual Operational Costs of Hauling Loose Material to ICSWA with Packer Truck

Per Mile		**Per Hour**	
Total Miles	33,938	756	Estimated hours en route
		155	Estimated hours in site pulls & dumps
		910	Estimated total hours/year
$1.61 / Mile	$54,640	$58,740	$64.55 / hour
Average Annual Estimated Cost		**$56,690**	

In comparing these two approaches it is evident that the capital demands of a conversion to front-load collections greatly exceeds the operating efficiencies it affords. It is also important to note that in both scenarios staffing related costs are modeled on actual program demands. For these estimates to be accurate, it is assumed that the associated work load incurred would be fulfilled by an existing County employee or a part-time new position.

4.0 Direct Market Baled Material

The sale of materials directly to existing recycling markets offers the greatest revenue potential of all approaches to recycling. This strategy is increasingly being employed as the financial incentives to recycle are clearest. However, direct marketing of material is also the most complex as it requires the operator to prepare materials to market specifications and demands large capital and operational investments.

For JCSWA to begin processing and marketing its collected materials it must establish a small processing facility. It is assumed that the processing facility would rely on the existing Excel 2R63 baler being relocated to a JCSWA site by AD and as specified in the lease agreement. Additional capital costs include a fork lift and/or skid loader, a loading ramp and the installation/site improvements required to support the baler. While the majority of these capital costs are verifiable, the costs associated with an actual site/building are not. A direct analysis of local real estate and potential sites was not conducted as part of this project, however a review of similar programs suggests an appropriate facility could be developed at a reasonable expense. Appendix 2 includes a draft facility design and the estimated development costs.

Tables 7 and 8 below utilize the methodology developed to analyze the costs of hauling material to the ICSWA and to forecast the costs to haul loose material to a JCSWA owned and operated site. It was assumed that this site would be located in Brookville, Pennsylvania as it is central to all existing collection sites and is served by Interstate 80.

Table 7: Estimated Annual Operational Costs of Hauling Material to JCSWA in Roll-Off Truck

Per Mile		**Per Hour**	
Total Miles	8,782	195	Estimated hours en route
		237	Estimated hours in site pulls & dumps
		432	Estimated total hours/year
$1.61 / Mile	$14,139	$27,885	$64.55 / hour
Average Annual Estimated Transportation Cost		**$21,012**	

Table 8: Estimated Annual Operational Costs of Hauling Material to JCSWA in FL Packer Truck

Per Mile		**Per Hour**	
Total Miles	5,534	123	Estimated hours en route
		237	Estimated hours in site pulls & dumps
		360	Estimated total hours/year
$1.61 / Mile	$8,910	$23,238	$64.55 / hour
Average Annual Estimated Transportation Cost		**$16,074**	

The estimated annual costs of hauling in these options are less than one-third of those for hauling loose to ICSWA, due to reduced distances. However, there are other operational costs of processing and baling the material. We estimate these to be roughly $40/ton for labor and another $30/ton for electricity, supplies and maintenance of baler/ancillary equipment. Table 9 provides estimated annual operating costs for baling.

Table 9: Estimated Baler Operation Costs

Annual Costs	
Baling Wire ($5/ton)	$2,250
Utilities Per Year	$2,500
Equipment Maintenance Per Year	$7,500
Baler Operator (0.5 FTE)	$18,000
TOTAL ANNUAL COST	**$30,250**

Table 10 multiplies 2013 tons, by material, to the current market prices of each material provided by Tim Long, Director of the ICSWA. Current recycling markets are at levels near the ten year average. Recycling markets do experience significant seasonal fluctuations and if this option is pursued a close analysis of regional and seasonal variation must be conducted to forecast accurate long range revenue potential.

Table 10: Estimated Annual Income from Sales of Baled Material.

	2013 Tons	Current Baled Price (per ton)	Gross Income from Direct Sales
Tin	37.7	$153	$ 5,760
Alum	7.7	$1,460	$ 11,271
Clear Glass	60.5	$30	$ 1,816
Green Glass	15.4	$2	$ 31
Brown Glass	30.2	$20	$ 604
Plastics	42.1	$220	$ 9,271
Newspaper	168.1	$75	$ 12,605
Mixed Paper	55.6	$85	$ 4,729
OCC	37.6	$115	$ 4,318
TOTAL			**$ 50,406**

5.0 Switch to Single-Stream System

Why so many municipalities have shifted to single-stream over the past decade is a complicated question. Suffice it to say that sorting single-stream materials entails significantly higher processing costs relative to handling materials collected separately. JCSWA should recognize that their current drop-off system—in which many thousands of households have learned to separate out materials, place them in appropriate containers at 14 sites throughout the County, to amass over 450 tons of recyclables per year, sorted by material, is a major achievement. This is the greatest advantage JCSW brings to the table in negotiations with any MRF, hauler or market. Switching to a single-stream system reduces the value of this resource. However, JCSWA has been in discussion with Advanced Disposal to explore a switch to Single-Stream. So, although we are unclear how such a switch would benefit AD, we present estimated cost impacts for it in Table 11.

Table 11: Estimated Operational Costs of Hauling Loose Material to Advanced Disposal, Front-Load Packer Truck, Single-Stream

Per Mile		**Per Hour**	
Total Miles	6,673	148	est hrs en route
		159	est hrs in site pulls & dumps
		307	est total hrs/year
$1.61 / Mile	$10,744	$19,817	$64.55 / hr
Average Annual Estimated Transportation Cost		**$15,280**	

While the Front-Load Single-Stream option has the lowest operational cost of any of the assessed collection alternatives, it must be noted that it also produces the least valuable material. As mentioned earlier in this report, single stream sorting is highly intensive, in both operational and capital costs. As a result, any gains made in collection efficiencies are lost to significant sorting costs. A secondary, yet significant, concern with a switch to single stream is the lack sorting facilities in close proximity to JCSWA. Without nearby sorting capacity, the mixed material will require even greater investment as it will be transported to a distant processor.

6.0 Comparison of Assessed Alternatives

Table 12 presents a summary of the annual operational costs and benefits of the alternatives assessed in this report. These cost differences would be even greater if current hauling costs for AD were priced using the same metrics as we have priced all other routes in this report (see below, Table 10). While Front-Load hauling is over $9000 cheaper per year than Roll-Off hauling, capital costs of Front-Load options are considerable (see below). Operational costs of the Baled options include both a hauling component (from sites to a JCSWA mini MRF, lower total miles than to AD) and a processing/baling component. Total estimated operational costs of both baling options are less than current annual fees to AD. The Roll-Off/Baling option has slightly higher operational costs than hauling costs to AD using consistent metrics. The Front-Load/ Baling option has lower total estimated operational costs than AD routes with consistent metrics. However, again, the capital costs of a switch to front-loading are considerable. Front-Load Single-Stream hauling to AD has by far the lowest operational costs.

Table 12: Comparing Annual Operational Costs and Income across Assessed Alternatives

	Current	**Haul Loose to ICSWA**		**Direct Sale Baled**		**Haul Loose to AD**
		Roll-Off	Front-Load	Roll-Off	Front-Load	FL, single-stream
Fee to hauler/processor	$44,500	$0	$0	$0	$0	$0
Hauling Costs		$68,616	$56,690	$18,397	$16,074	$15,280
Baler Operations	$0	$0	$0	$30,250	$30,250	$0
Total	$44,500	$68,616	$56,690	$48,647	$46,324	$15,280
Net Revenue Sharing	$0	$13,762	$13,762	$0	$0	$0
Sales of Baled material	$0	$0	$0	$50,406	$50,406	$0
Total	$0	$13,762	$13,762	$50,406	$50,406	$0
Net Annual Oper Costs	-$44,500	-$54,854	-$42,928	$1,759	$4,082	-$15,280
Net annual improved income over current system	NA	-$10,354	$1,572	$46,259	$48,582	$29,220
Per Ton Net Cost	-$98	-$121	-$94	$4	$9	-$34
Rate of Increase						
10%	-$48,950	-$44,909	-$34,729	$13,401	$17,848	-$12,630
20%	-$53,400	-$48,991	-$37,886	$14,619	$19,470	-$13,778
30%	-$57,850	-$53,074	-$41,043	$15,837	$21,093	-$14,926
40%	-$62,300	-$57,156	-$44,200	$17,056	$22,715	-$16,074
50%	-$66,750	-$61,239	-$47,357	$18,274	$24,338	-$17,222

7.0 Other Options

7.1 Dropping Glass from the System

Glass container recycling has always challenged recycling program managers as it retains very low value. In fact, glass recycling program costs frequently exceed the market value of the material, as is the case in Jefferson County, Pennsylvania. However, glass represents the greatest volume of material in most residential recycling programs. Evaluating the merits of discontinuing glass collection must consider the implications of reduced overall diverted tonnage, especially in PA where state sponsored performance grants are directly tied to program diversion totals. While the scope of this project did not allow for a complete analysis of this subject, it is clear that the termination of glass collection will significantly reduce program operation costs.

7.2 Dropping/Merging More Sites

Whichever of the system options JCSWA pursues, they continue to have the option of dropping or merging any one or several of the current drop-off sites. While this move is likely to reduce overall recycling rates, it may not do so to a significant extent. Evaluating site usage (i.e., visits per month) should precede any decision making process related to site closures.

7.3 Develop Partnerships with Adjacent Counties

Clearly the challenges that JCSWA faces—servicing dispersed rural populations, with minimal infrastructure and staff, dependent on a small number of commercial haulers and processors, with no direct relationship to markets— are faced in several adjacent counties. As a result there is a clear rationale to expand the JCSWA beyond the political boundaries of Jefferson County. A regional approach will achieve greater economies of scale and will create greater efficiencies in terms of capital investments. There are several appropriate examples where this strategy has been highly effective in Pennsylvania and beyond.

Two specific opportunities should be considered as JCSWA examines its current collection system.

7.3.1 Share purchase and use of a truck

Even with positive operational income each year, investing several hundred thousand dollars in a new truck is a major expense. Based on the forecasted demands of JCSWA's collection system, and summarized below, there is ample opportunity to share a resource with a neighboring jurisdiction.

1. Hauling to ICSWA via packer truck: 18 hours/wk
2. Hauling to ICSWA via roll-off truck: 22 hours/wk
3. Hauling to JCSWA via packer truck: 6 hours/wk
4. Hauling to JCSWA via roll-off truck: 8 hours/wk

7.3.2 Share in building and/or managing mini-MRF

The greatest annual positive operational income comes from the options with the greatest capital expenses: the baling options. Cooperation with an adjacent SWA makes good sense here for two reasons. First, two or more SWAs can share the capital and operational expenses of a small processing facility. Second, by managing a combined volume of material the joint facility will command a stronger market position and secure improved pricing and service from buyers.

It is worth bearing in mind that these partnerships, and the baling options they allow, can and should derive maximum benefit from JCSWA's two greatest and most unique resources: a strong, popular tradition of household source-separation, and ownership of a relatively new, quality baler and conveyor. The Director of Clearfield County SWA expressed interest in exploring partnerships with JCSWA.

7.4 Renegotiate Terms with Advanced Disposal

Once management of JCSWA has a clear sense of the above options and their estimated costs and benefits, they may want to approach Advanced Disposal and begin to renegotiate terms for the next contract. While the outcomes of renegotiation are uncertain, a solid grasp of the costs and benefits of the other options should give JCSWA some minimum income thresholds going into negotiation.

Table 11 provides estimated annual diesel and driver costs for hauling loose material from each site to Advanced Disposal, using a roll-off truck. Each route is a round-trip from AD to the drop-off site and back to AD. Routes and calculations based on them are summarized in Appendix 1.

Table 12: Estimated Operational Costs of Hauling Loose Material to Advanced Disposal with a Roll-Off Truck, based on pull frequency data from AD over 2013

Per Mile		**Per Hour**	
Total Miles	15,670	585	est total hrs/year
$1.61 / Mile	$25,229	$37,762	$64.55 / hr
Average Annual Estimated Transportation Cost		**$31,495**	

Table 12 provides a frame of reference for renegotiations with Advanced Disposal. It uses ICSWA's current per ton processing fee ($70/ton), current revenue sharing rate (80%), current market prices obtained for JCSWA's 2013 tons and Net Revenue Sharing Income ($13,762) from Table 3. It then deducts this last figure from the estimated hauling costs just shown ($31,495).

Table 13: Summary Data Supporting Renegotiation with Advanced Disposal

Estimated total hauling cost	$	31,495
Total Tons		455
Processing Fee	$	70.00
Gross Income	$	57,006
80% of Gross Income	$	45,605
Processing Cost	$	31,850
Net Revenue Sharing Income	$	13,762
Net Program Costs	**$**	**17,733**

According to these calculations, JCSWA would be paying $17,733 per year to AD if contract terms were equal to those offered by ICSWA, rather than the $39,101 per year they are currently paying (for a full year at current rates). It is important to note that the lack of a lease or royalty payment by AD to the JCSWA is another area of significant concern. While there is no industry standard which informs the

value of this payment, it is reasonable to expect that AD should at a minimum be making payments which in sum over time cover the replacement value of the baler and conveyor.

In summary, there are two elements that should be considered minima in the renegotiations;
1) Some annual or monthly fee from AD to JCSWA for the use of the latter's baler and conveyor.
2) Some revenue-sharing for the tons of material collected.

While any reduction in hauling and/or processing fees would be a net fiscal improvement over the current contract, these reductions are not sufficient. There should be positive income, even if only set against hauling and processing fees, from both leasing of equipment and provision of tons of source-separated material.

8.0 Conclusion.

Looking over the above analysis, there is a clear trade-off between shorter-term and longer-term strategies. The most attractive longer-term strategies are the two baling options. They are attractive because, among the other alternatives assessed, they provide clear positive net annual operational income. This means they can both lead to fiscal sustainability in the short-term and provide ongoing clear positive incentives to increase recycling over the medium and long-term.

References

Nestor Resources, Inc. *Comparative Analysis of Options for Solid Waste and Recycling Program Sustainability for Jefferson County Solid Waste Authority and Clearfield County Solid Waste Authority* July 2009.

Fender, Katherine J. and David A. Pierce. *An Analysis of the Operational Costs of Trucking: A 2013 Update.* September, 2013. American Transportation Research Institute (ATRI).

Appendix 1: Routes used to estimate operational costs of hauling material.

1.1. Current System

Site	pulls/ year	RT miles/ pull	RT miles/ year	Est hrs enroute	Est hrs at stops
Barnett	15	64	960	21	10
Bell	14	48	665	15	9
Gaskill	24	49	1176	26	16
Knox	6	40	239	5	4
Oliver	6	61	367	8	4
Pinecreek	6	32	193	4	4
Polk	9	33	297	7	6
Punxy	13	54	699	16	9
Reyn	30	26	774	17	20
Ringgold	12	67	809	18	8
Rose	95	39	3743	83	64
Summ	22	59	1302	29	15
Walston	73	56	4073	91	49
Wash	29	13	371	8	19

Total Miles/year	15670	348	Total hrs enroute
estd MPG	5	237	Total hrs at stops
est gallons/year	3134	585	est total hrs/year
est price/gallon	$ 4.00	$ 20.00	est hourly salary+benefits
est diesel cost/year	$ 12,536	$ 11,708	est driver salary/year
est total cost per year		$24,244	

1.2: Hauling Loose Material to ICSWA in Roll-Off Truck

Site	pulls/ year	RT miles/ pull	RT miles/ year	Est hrs enroute	Est hrs at stops
Barnett	15	130	1949	43	10
Bell	14	116	1623	36	9
Gaskill	24	119	2849	63	16
Knox	6	109	656	15	4
Oliver	6	108	647	14	4
Pinecreek	6	111	667	15	4
Polk	9	126	1134	25	6
Punxy	13	110	1429	32	9
Reyn	30	112	3368	75	20
Ringgold	12	115	1385	31	8
Rose	95	109	10315	229	64
Summ	22	114	2518	56	15
Walston	73	109	7930	176	49
Wash	29	124	3585	80	19

Miles and Fuel		Time and Labor	
total miles	40,053	890	est hrs en route
avg mpg	5	237	est hrs in site pulls & dumps
est gallons	8011	1127	est total hrs/year
$/gal	$ 4.00	$ 20.00	salary+benefits/hour
Fuel cost/year	$ 32,043	$ 22,545	total salary+benefits/year
Total est cost/year		$54,588	

1.3: Hauling Loose Material to ICSWA in Front-Load Packer Truck

Route	pulls/ year	RT miles/ pull	RT miles/ year	Est hrs enroute	Stops/ pull	Est hrs at stops
Jeff SWA, Rose, Walston, Washington, ICSWA, Jeff SWA	29	288	8361	186	4	39
Jeff SWA, Rose, Summerville, Reynoldsville, ICSWA, Jeff SWA	22	306	6721	149	4	29
Jeff SWA, Rose, Walston, Barnett, ICSWA, Jeff SWA	15	306	4595	102	4	20
Jeff SWA, Punxy, Bell, Gaskill, Walston, ICSWA, Jeff SWA	13	331	4307	96	5	22
Jeff SWA, Rose, Ringgold, Walston, Gaskill, ICSWA, Jeff SWA	12	348	4181	93	5	20
Jeff SWA, Rose, Polk, Reynoldsville, ICSWA, Jeff SWA	8	328	2627	58	4	11
Jeff SWA, Rose, Oliver, Pine Creek, ICSWA, Jeff SWA	5	297	1484	33	4	7
Jeff SWA, Rose, Walston, Knox, ICSWA, Jeff SWA	4	269	1077	24	4	5
Jeff SWA, Oliver, Knox, Pine Creek, ICSWA, Jeff SWA	1	297	297	7	4	1
Jeff SWA, Polk, Knox, Bell, ICSWA, Jeff SWA	1	289	289	6	4	1

Miles and Fuel		Time and Labor	
Total Miles/year	33938	754	Total hrs enroute
estd MPG	5	155	Total hrs at stops
est gallons/year	6788	909	est total hrs/year
est price/gallon	$ 4.00	$ 20.00	est hourly salary+benefits
est diesel cost/year	$ 27,150	$ 18,184	est driver salary/year
est total cost per year		$45,334	

Methodology for Source Separated Front Load to ICSWA

To derive realistic estimates for the annual operational costs of these routes, we did the following. First, we assigned the tons collected in 2013 at two sites that have since closed (Beaver and Sportsburg) to the two operational sites closest to them (Summerville and Walson, respectively). We then divided the pounds of each material collected at each site by the average pounds per cubic yard for that material (when collected uncompacted or 'loose'). Next, we assigned one or more of 6 or 8 cubic yard front-load containers to each material, depending on collection rates and material densities. We then divided the cubic yards collected per year, by material and site, by these assigned container capacities, to estimate pulls required per year, by material and site. Next, we applied average compacted densities to each site-

by-material volume per year, to assure that no planned route surpassed the capacity of the 40-yard packer truck. We then entered addresses of each drop-off site, JCSWA and ICSWA into Mapquest and created the most efficient routes for each material over the course of a year, i.e. fewest total trips, miles and hours while pulling materials before they surpassed drop-off bin capacities.

We multiplied the miles of each route by the number of times the route would be run per year (based on 2013 recycling rates); added these to get total miles; divided this figure by an estimated average MPG of 5 to get estimated gallons of diesel used per year; multiplied this figure by an estimated $4/gallon to get an estimated fuel cost per year. To estimate annual labor cost, we summed Map-Quest estimated minutes, adjusted these to an estimated average of 45 miles per hour; added 20 minutes per stop for loading and unloading material; and multiplied total estimated hours per year by $20 (estimated hourly rate for salary and benefits).

Methodology for Single Stream Front Load AD

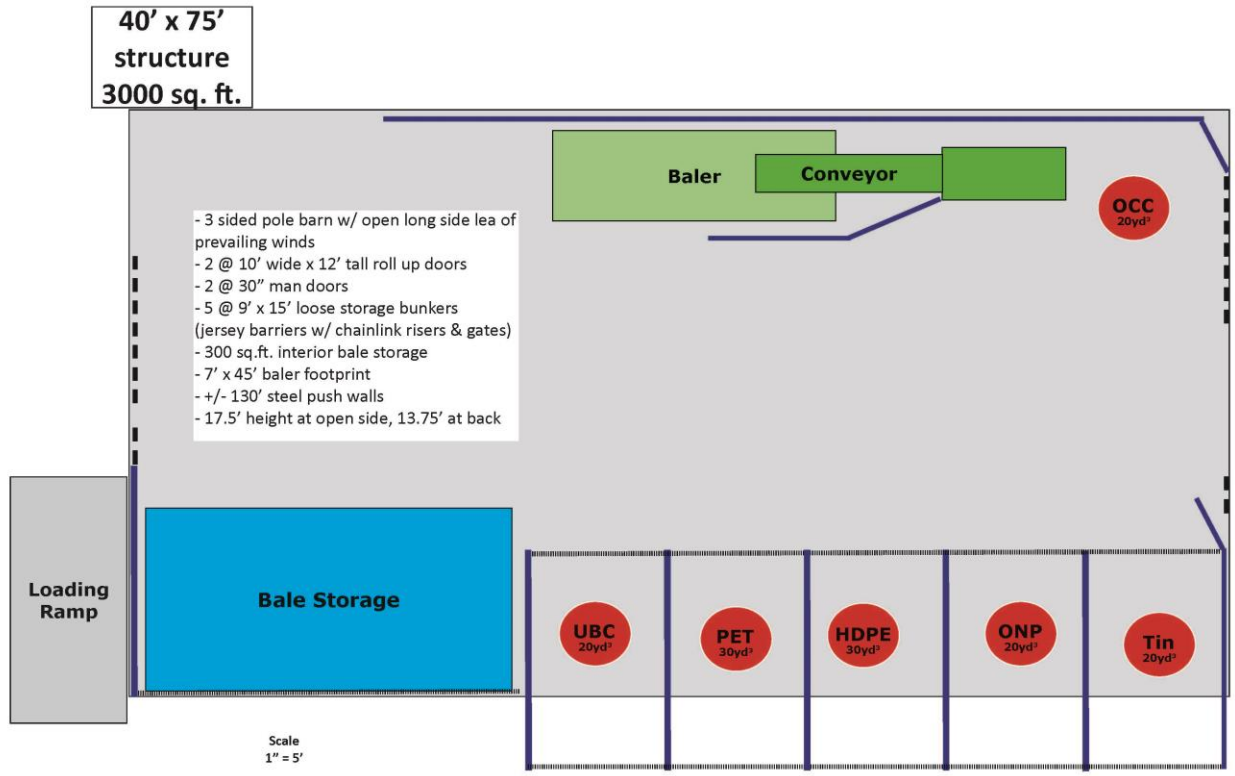
We began by finding the total cubic yards of all materials deposited at each drop-off site over the last year (2013). We then divided these totals by 52, 26, 17.34 and 13 (i.e. pulls once each week and every two, three and four weeks, respectively) to see the cubic yards accumulated at each site in these intervals. Our goal here was to see how close each site and pull-frequency combination could be to a 6-yard front-loading bin, an 8-yard bin or some multiple of either or both, without exceeding these. We then placed each site into a pull-frequency route (once a week, once every 2 weeks, etc) based on these fits. To verify that each resulting route's material could fit into a 30-yard front-load packer truck we did the following. We used standard compaction rates for each material, multiplied these by the uncompacted volume totals for each material to find the total compacted volumes for each material. We added these compacted volumes for all sites for 2013 and found an overall compaction rate of 2.72. We then divided each site's annual uncompacted volume by 2 to estimate its compacted volume. We then added each of these compacted volume estimates to assure that each route's materials would fit into the 30-yard packer truck. As in the previous route-building, we utilized Map-Quest and plotted out the most efficient routes; determined total miles; divided miles by 45 to estimate hours en route; and added 20 minutes per stop to this for estimated total hours. Table 9 shows the resulting estimates.

1.4 Hauling Loose Material to JCSWA in Roll-Off Truck

Site	pulls/ year	RT miles/ pull	RT miles/ year	Est hrs enroute	Est hrs at stops
Barnett	15	26	396	9	10
Bell	14	40	560	12	9
Gaskill	24	53	1272	28	16
Knox	6	17	101	2	4
Oliver	6	22	132	3	4
Pinecreek	6	22	134	3	4
Polk	9	20	176	4	6
Punxy	13	44	572	13	9
Reyn	30	24	714	16	20
Ringgold	12	32	384	9	8
Rose	95	1	95	2	64
Summ	22	19	427	9	15
Walston	73	40	2891	64	49
Wash	29	32	928	21	19

Miles and Fuel		Time and Labor	
total miles	8,782	195	est hrs en route
avg mpg	5	237	est hrs in site pulls & dumps
est gallons	1756	432	est total hrs/year
$/gal	$ 4.00	$ 20.00	salary+benefits/hour
Fuel cost/year	$ 7,026	$ 8,648	total salary+benefits/year
Total est cost/year		$15,673	

Appendix 2: Sample Small Recycling Facility Concept Design



Actual Facility Budget 2012

Equipment	
Fork Lift	$ 25,000.00
Loading Dock	$ 10,000.00
Skid Loader	$ 25,000.00
Building	
Engineering Design	$ 5,000.00
Engineered Building	$ 25,000.00
Foundation/Asphalt	$ 30,000.00
Construction	$ 60,000.00
TOTAL FACILITY COST	**$ 180,000.00**