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RECYCLING TECHNICAL ASSISTANCE PROJECT #569

CHESTER COUNTY

MRF EVALUATION

1. STATEMENT OF THE PROBLEM

The municipal waste disposal needs of Chester County, Pennsylvania, located in Southeastern Pennsylvania, are primarily serviced by two public landfills. The Lanchester Landfill, located in Honey Brook Township (Chester County), Salisbury Township (Lancaster County) and Caernarvon Township (Lancaster County), services 49 Chester County municipalities, and is owned and operated by the Chester County Solid Waste Authority. The SECCRA Landfill, located in London Grove Township (Chester County), services the remaining 24 Chester County municipalities, and is owned and operated by the Southeastern Chester County Refuse Authority (SECCRA). Each landfill has a dropoff facility for recyclables near its landfill entrance, and the SECCRA landfill also operates a recyclables transfer station to haul materials to processors.

Over half of Chester County's municipalities currently provide (either directly or via contract) curbside recyclables collection to their residents, and over 80% of Chester County municipalities offer either curbside or dropoff recycling services to their residents. Appendix A of this study contains a figure that illustrates the municipalities in the County that provide curbside recyclables collection services, dropoff recyclables collection services, or both. Table 1, also contained in Appendix A, is excerpted from the 2013 Chester County Municipal Solid Waste Plan, and presents similar information in tabular form.

The Chester County Solid Waste Authority (CCSWA) manages a collective marketing contract for the acceptance and processing of curbside-collected recyclables from approximately one dozen Chester County municipalities. Collective bidding for recyclables processing places participating municipalities in a stronger position to obtain competitive pricing for these services. The current consortium recyclables processing contract is with the Allied Waste Recyclery (owner Republic Services) in King of Prussia, Montgomery County.

The primary directive of this technical assistance study is to evaluate whether a centrally located materials recovery facility (MRF) for processing the single-stream recyclables collected from the above entities might offer cost savings and other benefits to Chester County municipalities.

An increase in recyclables diversion in Chester County (through increased or "facilitated" recycling opportunities) may lessen the delivery of materials to the two public landfills in Chester County (Lanchester and SECRRA), preserve remaining landfill space, and potentially generate revenue at a publicly-sponsored MRF. This study tabulates the current recyclables receiving and processing outlets in the county, develops an initial study-level concept of a new centralized Materials Recovery Facility (MRF) in Chester County, estimates ballpark processing costs of a new facility, and tabulates potential benefits to developing a new MRF in the County.

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2. SUMMARY OF WORK COMPLETED

2.1 RECYCLABLES RECEIVING AND PROCESSING SITES IDENTIFICATION, HAULING COST ESTIMATES

MSW Consultants consulted with Ms. Nancy Fromnick, Recycling Coordinator with CCSWA, to determine the current recyclable materials processing outlets for Chester County municipalities. A review of available data confirmed that there are no facilities within Chester County that accept or process single stream recyclables. A listing of facilities that accept recyclables, and the types of materials that they accept (including segregated materials dropoff, such as at the CCSWA and SECCRA landfills), are presented in multiple tables in Appendix B of this report.

Selected out-of-county recyclable materials processing facilities and their physical street addresses have been identified, for the purpose of computing approximate travel distances from Downingtown, identified as a central location in Chester County (i.e. the approximate centroid of the County). The theory of a centroid is that while some County municipalities may be closer or farther away from each selected processing facility, the average hauling distance of all Chester County municipalities to each of the sites will approximate this average distance from the centroid to the site. A direct hauling cost per mile to round-trip hauling distances was applied based on past experience with applying planning-level hauling costs in other studies. For this study, an average hauling cost of \$2 per haul mile was used, including equipment, labor and fuel, and assuming an average travel speed of 35-40 mph, including stops. Assuming an average direct-haul collection truck payload of 5-10 tons (for relatively lightweight recyclables), this cost per mile equates to between 20 and 40 cents per ton-mile. This rate was applied to the round-trip miles from the centroid point to each selected recyclables receiving and processing facility. In this manner, the estimated costs to haul single-stream recyclables to more distant processing sites can be estimated and compared with the relative costs to use other selected sites.

Appendix C presents the results of this recyclables hauling cost analysis. As the table illustrates, the direct-hauling cost for recyclables is estimated to vary from approximately \$9 to \$44 per ton, based on truck payload and processing site used. It is estimated that the average hauling cost from central Chester County to the King of Prussia Recyclery ranges from roughly \$9 to \$17 per ton of single-stream materials hauled. A centrally located single-stream MRF in Chester County could result in some hauling cost savings to Chester County municipalities.

2.2 CONCEPTUAL MRF PROCESSING LINE LAYOUT, COST ESTIMATES

The dozen Chester County consortium municipalities that utilize the King of Prussia Recyclery currently deliver approximately 850-900 tons per month, or about 40 tons daily (residential only) of single-stream recyclables to that facility for processing. In 2013, combined residential and commercial single-stream recyclables from Chester County totaled approximately 50,000 tons per year. In 2014, as more recyclables collections in the County changed over from segregated fiber and commingled containers to combined single stream, the single-stream tons collected from Chester County increased dramatically, to approximately 70,500 tons. This equates to an average processing need of approximately 250-275 tons of single-stream recyclables daily. Clearly, there is a growing need and



demand for convenient, cost-effective single-stream processing capability in Chester County. This processing need will grow over time.

The scope of this study does not include the sizing or pricing of individual MRF equipment components, but rather the development of overall budgetary pricing for a MRF system based on vendor recommendations. Further, the scope does not include site selection, detailed site layout, or CAD-prepared layout drawings nor consideration of a "dirty MRF" for processing mixed waste to extract recyclables.

The "Green Machine" MRF equipment system was recently selected by the Lycoming County Resource Management Services (RMS) Department in an evaluated bid process to upgrade Lycoming County's source-separated MRF, located at the Lycoming County Landfill in Montgomery, Pennsylvania. MSW Consultants toured the upgraded MRF facility in May 2015 and found it to be a robust facility design and installation with which Lycoming County RMS staff appear to be satisfied. Further, its installed price (approximately \$5.5 million, inside the existing Lycoming County MRF building) was significantly less (approximately one-third the capital cost of the other competitive bid) than Machinex's bid to Lycoming County. Bollegraaf and a fourth MRF equipment system vendor also showed initial interest in the Lycoming project, but eventually chose not to submit a bid for the MRF upgrade.

MSW Consultants considered multiple vendors, and selected Green Machine as the selected MRF equipment/system vendor, for the purpose of developing a proposed centrally-located MRF system concept and ballpark capital cost pricing. MSW Consultants met with Nancy Fromnick and Bob Watts of CCSWA, and a consensus was reached to follow MSW Consultants' recommendation to base Chester County's MRF feasibility analysis on the Green Machine technology and budgetary costs, based on favorable factors demonstrated in the Lycoming County project.

Green Machine's conceptual/generic process flow diagram, suggested equipment line configurations, and a brief explanation of the roles of each piece of a typical MRF processing equipment in the processing line are presented in Appendix D.

John Green of Green Machine provided MSW Consultants with conceptual process line layouts and budgetary capital cost estimates for three sizes of typical MRF sorting line equipment (refer to Appendix E). The conceptual layout and cost for a MRF sorting line that can process approximately 10-13 tons of single-stream recyclables per hour (tph) is \$1.7 million, installed. The installed cost for a larger processing line that can handle 18-22 tph of recyclables is approximately \$3 million, based on budgetary costs from the equipment vendor. The installed cost for a 35 tph facility is approximately \$3.9 million. Rolling stock (skid-steer loader, front loader, fork-lift, etc.) is additional cost. A baler, to compact sorted recyclables for shipping, could increase facility costs by approximately \$1 million or more, and is not part of the Green Machine estimates.



Table 1 MRF Sizing and Cost Options

Option	Hourly Throughput	Tons per Day (1 shift)	Tons per Day (2 shifts daily)	Recycling Equipment Capital Cost (w/ installation)
1	10-13 tons/hr	80-104 tpd	160-208 tpd	\$1,700,000
2	18-22 tons/hr	144-176 tpd	288-352 tpd	\$3,000,000
3	35 tons/hr	280 tpd	560 tpd	\$3,900,000

Based on the currently estimated single-stream processing needs of Chester County (250-275 tons per day), and the potential for further growth in processing needs due to further transition from commingled to single-stream collections as well as population growth, Option 3 was selected for further analysis. Option 3, which has an hourly throughput of 35 tons per hour, can be optimized now to meet initial processing needs in a single daily operating shift (one 8-hour shift, 5 days per week operation, and a daily throughput of 280 tons); further, it has the potential of processing up to 560 tons daily with a two-shifts-per-day operation.

Often, these types of recyclables sorting systems are placed inside an existing, repurposed or previously abandoned industrial building. Should building construction and land acquisition be required as part of establishing an MRF in Chester County, the following estimates are provided for illustrative purposes only. New building construction costs of \$100-\$200 per square foot are not unreasonable. A minimum building footprint of 10,000 -15,000 square feet is required. Land acquisition costs could range from \$50,000 -\$100,000 per acre. A 5 – 10 acre site in the vicinity of Downingtown would potentially be required. The site would house the MRF building, building access, bale storage (some of which could be outside the building), roads and related ancillaries. Basic site/infrastructure improvements will vary depending upon existing site utilities, grading, paving, etc., with anticipated costs of at least \$100,000 - \$200,000. Soft costs including engineering, permitting, legal, and related items should be budgeted at 15-25% of the construction cost estimate (excluding land), and a minimum 10-20% design/construction project contingency should also be included in the cost estimate.

Table 2 Capital Cost Summary

Item	Capital Cost	Useful Life	Annualized Cost
Processing Equipment	\$3,900,000	15 yrs.	\$428,200
Baler	\$1,000,000	15 yrs.	\$109,800
Rolling Stock	\$500,000	7 yrs.	\$92,800
Building	\$2,000,000	20 yrs.	\$188,800
Utilities/Site Work	\$150,000	20 yrs.	\$14,200
35% Engineering, Permitting, Legal, Contingencies Allowance	\$2,500,000	20 yrs.	\$236,000
Total	\$10,050,000	varies	\$1,069,800

Table Notes:

- 1. Does not include land, which may add \$1,000,000 or more to the project cost.
- 2. Annualized repayments based on 7% interest.



Operating costs include the cost to: staff and power the sorting equipment; contamination/ residue disposal; maintenance of the equipment; and general administration of the operation. In the last 8-10 years, labor rates have increased, single-stream contamination rates have increased, and the costs to maintain increasingly complex sorting equipment have increased. For the purposes of this analysis, an estimated cost of \$55 per processed ton was used based on recent literature cited in Table 3 below.

Average recyclable commodity revenues have varied widely since the beginning of the recession in 2007-2008, from a blended/ combined rate (all commodities combined) of about \$40 per ton in 2008 to a recent high of about \$140 per ton in 2011. Currently, blended materials rates have been trending downward, into the \$70-\$80 per ton range. This fluctuation in recyclable revenues has been typical of recyclable commodity markets for a long time. MRF systems have to be financed and funded to allow the MRF owner/operator to "weather" these revenue fluctuations.

Processing Cost/Ton	Low Material Revenue	Average Revenue	High Revenue
Annualized Capital	\$15	\$15	\$15
Operating	\$55	\$55	\$55
Net Cost/Ton	\$70	\$70	\$70
Material Revenue	\$50	\$100	\$150
Net Revenue (Cost)/Ton	-\$20	+\$30	+\$80

Table 3 Net Cost of New MRF

Table Notes:

- 1. Costs per ton based on 72,800 tons per year of SS recyclables processed (280 tons per day throughput, 260 days per year).
- 2. MRF operating cost estimate from May 14, 2015 National Waste and Recycling Association Presentation (RRS) on "Costs of Recycling and Diversion".
- 3. Blended recyclable materials revenue ranges based on current trends and recent variations in material market prices.
- 4. Does not include annualized land cost.

Table 3 illustrates that with recyclable material revenues (combined) in the \$70-\$80 per ton range, and with system costs estimated at around \$70 per ton, the economics of this hypothetical MRF are breakeven at this time. Further, Table 3 costs do not include the cost of land, which could reach \$1,000,000 or more. However, it is noted that hauling cost savings to municipalities (estimated at between \$9 and \$44 per ton) could improve economics, but would not yield the ability of the MRF to pay for materials delivered by haulers. Therefore, the proposed system remains marginal at best, and if recyclables markets further dip, the MRF would have to charge a tip fee to break even.

It is noted that results from a Season 1 waste characterization sort to be completed independent of this technical assistance project were to be used in this analysis to confirm the appropriateness of the selected MRF processing concept. However, commencement of the waste sort project and municipal waste plan revision was delayed by Chester County. Therefore, the data was not available for this project.



3. RECOMMENDATIONS

Ultimately, the County will need to compare the cost of contracting out the processing with a more remote MRF against the all-in cost of building a MRF locally. The data and cost estimates presented in this report are intended to guide the County in continuing this evaluation. Based on the assumptions included in this analysis, the economics of a new, publicly sponsored MRF, centrally located in Chester County, don not appear compelling enough to support further development of this project at this time.

It was beyond the scope of this study to determine detailed transfer costs to consolidate single stream recyclables for shipment to the MRF. This analysis will need to be conducted, if that is of interest to Chester County.

It is recommended that CCSWA and SECCRA review the information contained in this report. If there is interest in further evaluating a new in-County MRF, and once a potential site/building is tentatively identified, a more complete and accurate construction and project cost estimate can be prepared. Once the waste characterization study has been conducted and results tabulated, the appropriateness of individual components of the Green Machine layout can be further confirmed, if desired.

If these further steps confirm that there is interest and improved economics in the prospect of a centralized in-county MRF, then follow-up steps for further development of this concept can be established. Further, should feasibility be confirmed and should there be interest in developing this project, the need to direct Chester County recyclables to the centralized processing facility via the use of an expanded Designated Site Ordinance should be considered and further developed at that time.

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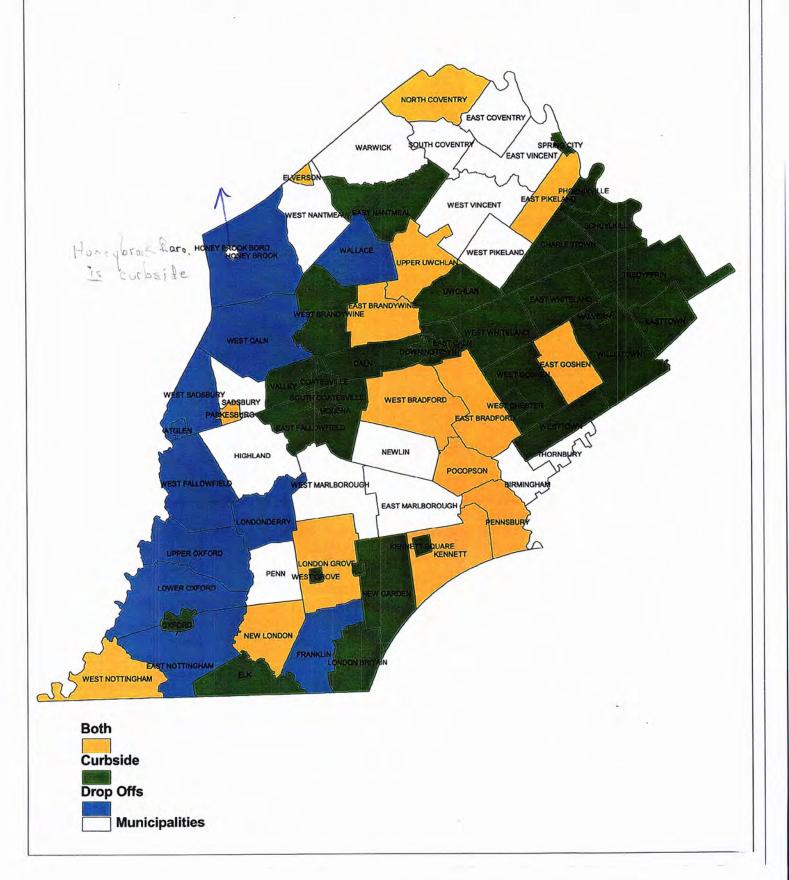


APPENDIX A

CHESTER COUNTY MUNICIPAL RECYCLABLES COLLECTION INFORMATION



Municipalities that provide Curbside, Drop-off or Both



ontial Plan Revil

TABLE 1 CHESTER COUNTY MUNICIPAL RECYCLING PROGRAM SUMMARY

Municipality	Mandated	Curbside	Drop-off	Composting Site
Atglen Boro			X	
Avondale Boro		X		X
Birmingham Twp	X *	Х-НО		
Caln Twp.	X	X		X
Charlestown Twp.	X	Х-НО		
Coatesville City	X	X		
Downingtown Boro	X	X	X	X
East Bradford Twp.	X	X	X	
East Brandywine Twp.	X	X	X	
East Caln Twp.	X *	X	X	
East Coventry Twp.	X			
East Fallowfield Twp.	X	X		1
East Goshen Twp.	X	X		
East Marlborough Twp.	X	Х-НО	X**Unionville H.S.	-
East Nantmeal Twp.			omonvine 11.b.	
East Nottingham Twp.	X		X**	
East Pikeland Twp.	X	Х-НО	X	X
Easttown Twp.	$+\frac{\pi}{x}$	X		Λ
East Vincent Twp.	X	х-но		Donn Organia
East Whiteland Twp.	X	Х-НО		Penn Organic
Elk Twp.	1-2-+	2110		
Elverson Boro	X*	X	X	
Franklin Twp.	+		X**	
Highland Twp.				
Honey Brook Boro		X		
Honey Brook Twp.	X		Lanchester Landfill	Lanchester Landfill
Kennett Twp.	$\frac{\lambda}{X}$	Х-НО	X**	Lanchester Landing
Kennett Square Boro	X	X	X	
London Britain Twp.	+	_A	X**	
ondonderry Twp.	+	+	X**	
London Grove Twp.	X	Х-НО	SECCRA Landfill	SECCRA Landfill
Lower Oxford Twp.	 	A HO	X**	SECCRA Landini
Malvern Boro	X*	v	Λ	
Modena Boro	X*	X		
New Garden Twp.	X	X-HO		
Newlin Twp.	1 1	A-HU		
New London Twp.			X**	
North Coventry Twp.	X	VIIO	-	4.1
Oxford Boro	X	X-HO X-HO	XX	Arborganic Acres

mandated under Act 101 to establish recycling programs

** Operated by SECCRA
HO-Homeowner Contracts

TABLE 1 (continued)
TABLE 1 CHESTER COUNTY MUNICIPAL RECYCLING PROGRAM SUMMARY

Municipality	Mandated	Curbside	Drop-off	Composting Site
Parkesburg Boro	X *	X		
Penn Twp.	X		X** Dansko	
Pennsbury Twp.			X**	
Phoenixville Boro	X	X		X
Pocopson Twp.	X *	Х-НО	X**	
Sadsbury Twp.	X *	x		
Schuylkill Twp.	X	х-но	X	X
South Coatesville Boro	X *	X		X
South Coventry Twp.				
Spring City Boro		X		X
Thornbury Twp.				
Tredyffrin Twp.	X	х-но		X
Upper Oxford Twp.			X**	
Upper Uwchlan Twp.	X	X	and the second s	
Uwchlan Twp.	X	X		
Valley Twp.	X	X		
Wallace Twp.				
Warwick Twp.				
West Bradford Twp.	X	X	X	X
West Brandywine Twp.	X	X	X	X-Vollmecke Orchard
West Caln Twp.	X	X		
West Chester Boro	X	X		X
West Fallowfield Twp.			X	
West Goshen Twp.	X	X	the same of the sa	
West Grove Boro	X *	Х	X	
West Marlborough Twp.				
West Nantmeal Twp.				
West Nottingham Twp.	X *	X	X**	
West Pikeland Twp.				
West Sadsbury Twp.	Х*	X-HO	X	<u> </u>
Westtown Twp.	X	X		
West Vincent Twp.	χ*	х-но		
West Whiteland Twp.	X	X		
Willistown Twp.	X	Х-НО		
Totals	51	49	30	16

Not mandated under Act 101 to establish recycling programs
Operated by SECCRA
HO-Homeowner Contracts



APPENDIX B

RECYCLABLES OUTLETS FOR CHESTER COUNTY



Chester County Recycling Destinations

King of Prussia Recyclery – Republic (Allied)

Accurate Recycling, Delaware County

AJ Blosenski, Chestnut Tree Road, Honey Brook

Eagle, East Earl (Transfer Station)

Waste Management, Wilmington, Delaware

SECCRA Transfer – Re-Community (Blue Mountain)

Mascaro (Great Valley Recycling)

Blue Mountain

Newman

Advanced Enviro Systems, Chester, PA

Rapid Recycling

Modern Recycling Service (Norristown)

Cougles Recycling

New Smithville Transfer (West of Allentown)

Waste Management Norristown Transfer Station

Zwicky Recycling – Biomass fuel only

Commercial

Rock Tenn

Trex

Newark, NJ

United Correstack in Reading

United State Recycling, Inc. Philadelphia

2014 Chester Co Recycling Sites Used Abitibi Recycle Inc. East (Plainfield, NJ) **Interstate Battery** Lorco Hazelton Oil Safety Clean Fat & Bones Darling International in Phila. Organix Recycling Mokena, Illinois MOPAC Waste Oil Recyclers E-Waste SunnKing SAMR, Lakewood NJ Ecovanta Sims **Electronics Recyclers International** Reclamere Keystone Technology Management

Iron Mountain

MARKETS FOR RECYCLABLES: PAPER

TO BUY, SELL OR TRADE USED MATERIAL: www.materialtrader.org or www.recycle.net

Company Name	Material/Acceptable	Confidential Destruction	Customized Office Recycling	Pick-up Service	Collection Equipment
BERKS COUNTY					
Cougle's Recycling 1000 S. 4 th Street Hamburg, PA 19526 610-562-8336	Corrugated cardboard, newspaper, telephone books, all type of paper	Certificate of destruction can be witnessed	1	1	Trailer, compactor, outside container, drums, office
Goldstan Trading Inc. 822 Buttonwood St. Reading, PA 19601 610-372-9855	Bagged or baled: all grades of office paper (no news-paper, magazine or junk mail) corrugated cardboard		√	No but can arrange pickup	
ShredHeads 100 Main Street Leesport, PA 19553 484-650-9411or 484-678-3126 www.shredheads.net	Rodger Caramanica shedheads@comcast.net	✓		Mobile	Yes
United Corestack LLC 720 Laurel Street Reading, PA 19602 610-374-3000	Baled: mixed paper, corrugated cardboard	✓		1	
BUCKS COUNTY					
Titan Mobile Shredding P.O. Box 2166 Doylestown, PA 215-230-7990	Mixed office paper	~	✓	1	1
CHESTER COUNTY					
Big Shred P.O. Box 125 Cochranville, PA 19330 800-337-1558 www.bigshred.com	9:00-5:00 M-F Charge by box Nancy A. Johnson	Goes into locked containers		Mobile Unit	✓
NextCut Shredding 65 Lancaster Avenue Malvern, PA 877-876-3928	All Paper New York, Boston, Philadelphia Washington, DC	~	~	1	√
ProShred 25 Industrial Blvd. Paoli, PA 19301 484-323-2100 www.proshred.com	There is a fee for this service Jason MacElree-Representative				
Recycling Express 526 Lancaster Ave. Unit 3 Frazer, PA 19355 610-889-3172	Bagged or baled, computer and office paper, corrugated cardboard, cardboard, newspaper, telephone books	√ certified	~	✓	Toter type containers & in- office collection systems
Reuben Stoltzfus 291 White School Rd. Honey Brook, PA 19344 610-273-3602	Newspaper, telephone books, office paper	✓			1

Company Name	Material/Acceptable	Confidential Destruction	Customized Office Recycling	Pick-up Service	Collection Equipment
Wiggins Shredding 1301 West Chester Pike West Chester, PA 19382 610-692-8327 Brad Wiggins	brad@wigginsshredding.com www.wigginshredding.com				
Shredheads Coatesville, PA 484-650-9411 Mobile Document Destruction www.shredheads.net	Florescent bulbs, electronics, batteries, films, x-raysµfiche, ferrous/non-ferrous metals, office furniture, pallets Rodger Caramanica info@shredheads.net	√		Mobile	
DELAWARE COUNTY	Y				
Accurate Recycling Corp. 508 E. Baltimore Pike Landsdowne, PA 19050 610-623-3700	All paper, computer, corrugated cardboard, office paper, residential paper, chipboard	√	~	1	✓
Atlas Traders, LLC 4 Industrial Drive Sharon Hill, PA 19079 610-586-6655	Computer paper, white and color ledger, cardboard (all types except waxed), file stock, bond paper	√		large scale only	
Ogborne McCusker Chester, PA 19013	All paper, newspaper, office paper, residential, cardboard (all types except waxed)		Not in Chester County	1	Roll offs for large volumes
Priority Shred, LLC 5 Chelsea Parkway Boothwyn, PA 19061 610-245-2300 or 2315	www.priorityshred.com				
Recall Secure Destruction 1408 West Baltimore Pike Media, PA 19063 Don Hartman 610-558-2400	Use to be: Eurofibers Inc. Mixed office paper No cardboard or newspaper	~		4	✓
LANCASTER COUNT	Y				
Beartown Recycling 6943 Division Highway (Rte. 322) Narvon, PA 17555 717-354-7734					
Full Circle Recycling 702 South Prince Street Lancaster, PA 17603 717-396-9999	Office, mixed, corrugated cardboard		~	√	✓
Gordon Waste Co, Inc. PO Box 389 Columbia, PA 17512 717-684-2201	Baled corrugated cardboard, mixed paper, newspaper, telephone books	1	1	1	
Shred It 717-393-1147	Call for information				
ALLENTOWN					
Lee Koch Shredding Allentown 877-833-8348	Call for information Mobile Only				
MONTGOMERY COUNTY					
A.J. Catagnus & Sons 1299 West James Street Norristown, PA 19401 610-275-5328	Bagged or baled, corrugated cardboard, mixed office paper, newspaper	certified	See Rapid Recycling	✓	✓

Company Name	Material/Acceptable	Confidential Destruction	Customized Office Recycling	Pick-up Service	Collection Equipment
BFI King of Prussia Recyclery 372 South Henderson Rd King of Prussia, PA 19406 610-265-8941	Mixed office & residential paper, corrugated cardboard, newspaper, printers waste		✓		1
Rapid Recycling, Inc. 5 Brower Avenue Oaks, PA 19456 610-650-0737	Bagged or baled, computer paper, corrugated cardboard, high grade paper, mixed office and residential paper. Hardback books if delivered – no payment	√ shredded	✓	~	✓ Also sell
Russell A. Morello & Sons 18 Maple Street Conshohocken, PA 19428 610-828-1612	Bagged or baled all grades, newspaper, telephone books, corrugated cardboard	certified	1	1	✓
Vento Ink 1310 Conshohocken Road Conshohocken, PA 19428 610-272-3234		~		✓	~
PHILADELPHIA COU	NTY				
Resolute Forest Products Rick Hartner 5000 Flat Rock Rd Philadelphia, PA 19127 215-509-2220	Used to be Abitibi. Is now owned by Suburban Waste.			~	√
Accurate Document Destruction, 1528 Walnut St., Suite 710 Philadelphia, PA 19102 215-732-1145	All paper, video tapes, pick up, microfile; large volume, collection equipment	~	7	1	~
Allied Waste Disposal 3000 E Hendley St Philadelphia, PA 19137 215-744-2900	All grades waste paper Business only	✓	✓	√	✓
Blue Mountain 2900 Ellsworth St. Philadelphia PA 19146 215-462-7372	Call for information Herb Northrop/Robt. Anderson				
Jack's Paper Stock & Scrap Metals 3615 Emerald Street Philadelphia, PA 19134 215-535-7588 Bruce Meltzer	Computer /office paper, cardboard			✓	Provide container
U.S. Recycling 6101 Tacony Street Philadelphia, PA 19135 215-338-5050	Baled, computer paper, corrugated cardboard, high grade office paper, newspaper, telephone books, all paper	certified	1	1	✓
Neuman & Company 6101 Tacony Street Philadelphia, PA 19135 215-333-8700	Baled or loose all grades of paper, corrugated cardboard, telephone books, newspaper	✓ certified	√	~	✓

Company Name	Material/Acceptable	Confidential Destruction	Customized Office Recycling	Pick-up Service	Collection Equipment
NORTHHAMPTON CO.					
Todd Heller, Inc Greenstar 799Smith Lane, Box 28 Northampton, PA 18067 610-262-6988	All paper and corrugated cardboard			√	Negotiable
DELAWARE STATE					
Able Recycling 335 Airport Road New Castle, DE 19720 302-324-1760	All paper and corrugated cardboard	certified	✓	1	~
Document Security Management Wilmington, DE 1-877-474-7337	www.documentsecurity.net	*	4	4	·
NEW JERSEY					
All-American Recycling 2 Hope Street Jersey City, NJ 973-278-7907 ext 102	Bagged or baled, newspaper, computer, office, corrugated cardboard, telephone books			✓	√
Marcal Paper Co. 1 Market Street Elmwood Park, NJ 07407 201-703-6234	Baled office paper, magazines, mixed paper, newspaper, junk mail, school papers	~		with 18+ tons baled or in Gaylords	- P
Nextcut 492-C Cedar Lane #310 Teaneck, NJ 07666				Sayroras	
QP Unlimited LLC 718-948-5309 718-702-7035 Judy Goodstein	Junk mail/magazines \$52 Baled mixed paper \$40 Baled cardboard \$72 Loose cardboard \$65				
Secured Document Destruction 532 Highland Avenue Cherry Hill, NJ 08002 www.sdd-shred.com Ray Dougherty	856-317-1080 856-924-1185 cell	~	Call for more info	1	Call for more info
MARYLAND	000 721 1100 0011				
ReDirect Recycling David Sharkey 1954 Halethorpe Farms Baltimore, Maryland 21227 www.redirectrecycling.com	443-986-1089 Fax 410-741-3898				
MASSACHUSETTS Iron Mountain – Shredding & I 745 Atlantic Ave., Boston, MA 800-327-8345		Waxed Corruga	ated - Chuck Boelh	ins 404-651-55	585 or 800-685-2442
NEW YORK MILL Pratt Industries 4435 Victory Blvd.	Cardboard		Waste Authority. N	lo companies a	
Staten Island, New York 10314 Anthony Mazzone 718-370-1		Updated 2/	11/2015 shared/c	ivicplus/comm	ercial/paper markets

MARKETS FOR RECYCLABLES: METAL, GLASS & PLASTICS

TO BUY, SELL OR TRADE SCRAP OR USED MATERIAL: www.materialtrader.org or www.recycle.net

COMPANY NAME	MATERIAL	WEIGHT SLIPS	PICK-UP CO	LLECTION
BERKS COUNTY				
	Aluminum, copper, brass, Drop Off) stainless steel, all types of n, PA (Mailing) insulated wire, non-ferrous metals	Yes	Yes	No
Cougles Recycling 1000 S. 4 th Street Hamburg, PA 19526 610-562-8336 FAX 610-562-	Aluminum, bi-metal, glass, plastic	Yes		
Goldstan Trading Corp. 822 Buttonwood Street PO Box 419 Reading, PA 19603	Aluminum cans, ferrous & non-ferrous metals, paper products	Yes	Yes, up to & including Chester Co.	Call
Laurel St. Recyclers, Inc. 761 Laurel Street Reading, PA 19602 610-376-2997	Aluminum, ferrous & non-ferrous metals car batteries, misc. car parts, Freon-free appliances (Must be tagged)	Yes	No	No
Pollock-Reading, Inc. PO Box 37 123 East Huller Lane Temple, PA 19560 610-926-4840	Aluminum cans, bi-metal cans, ferrous & non-ferrous metals, Freon-free appliances (Must be tagged)		Yes, large quantities	Roll-off, dumpster toters, & balers
Royal Greene Corp. 30 W.Huller Lane Temple, PA 19560 610-926-4840	Ferrous metals, Freon-free appliances, steel and iron cans	Yes	Yes, industrial accounts only Philadelphia, Lancaster	Trailers, 30-40 yd containe roll-offs
West Lawn Beverage Co. 2330 Penn Avenue West Lawn, PA 19609 610-678-9844 FAX 610-777-	Aluminum cans, aluminum scrap, copper, brass (non-ferrous metals) 5985	Yes	No	No
BUCKS COUNTY				
Delaware Valley Scrap Beaver Dam Road PO Box 1203 Bristol, PA 19007 215-949-1191 FAX 215-949-	Aluminum cans, ferrous and non-ferrous metals, scrap aluminum including foil & pie plates, all metals	Yes	No	No
Franklin Metals 818 Highland Avenue Bensalem, PA 19020 215-633-9700	Aluminum, copper, glass	No	No	No

COMPANY NAME

MATERIAL

WEIGHT SLIPS PICK-UP COLLECTION

CHESTER COUNTY

Al Cans – Devereux Pickup Doug Bitner 610-696-7462				
Bannon Metals 514 Twin County Road (Rte. 10 Honey Brook, PA 19344 610-286-9797	Aluminum, Assorted Metals)			
Coatesville Scrap 1000 South First Avenue Coatesville, PA 19320 610-384-9230	Appliances, cans, sheet metal, steel, ferrous and non-ferrous metals	Yes		Roll-off containers
Harris Metals 446 Gum Tree Road Coatesville, PA 19320 610-857-4670 www.harrismetals.net 7:30-3:30 Mon-Fri 7:30-11:30	Aluminum cans, ferrous (steel and Freon-free appliances), non-ferrous (copper and brass), car batteries, transmissions	Yes	Yes, large quantity	Roff-offs, large quantity containers
Hartman Plastics 373 Poplar Road Honey Brook, PA 19344 610-273-7113	Clean polystyrene (foam)			
Kodish, JE & Sons Worthington & Union Sts. West Chester, PA 19381 610-696-1054	Aluminum cans in plastic bags, Car batteries, ferrous & non- ferrous metals, appliances- white goods (Freon-free only) scrap aluminum, scrap iron, metal	Yes	Yes, within 20 miles if warranted	Trailers, 12 yd luggers. Roll-off if within 30mile
Phoenixville Scrap Co. 705 St. Mary's Street Phoenixville, PA 19460 610-935-9363	Aluminum cans, ferrous & non- ferrous metals, scrap aluminum	Yes	Yes for large accts.	Yes, container service for large accts
R.J. Evercrest Polymers, Inc. 1234 Wrights Lane West Chester, PA 19380 610-647-1555	Polystyrene, Polypropylene, Polyethy Polycarbonate, PVC, PET, Nylon, Acet Alcohols, Amines, Butandiols, Glycols Glycol Ethers, Polyols, Plasticizers, Un	ates,		
Zebra Hauling PO Box 311 Unionville, PA 19375 610-347-2129	Scrap metal removal	Pick up only		

COMPANY NAME	MATERIAL	WEIGHT SLIPS	PICK-UP	COLLECTION
DELAWARE COUNTY				
Accurate Recycling Corp. 508 E. Baltimore Pike Lansdowne, PA 19050 610-623-7772	All metals and glass bottles	Yes	Yes large accts.	Yes Large accts
Alas Traders, LLC 4 Industrial Drive Sharon Hill, PA 19079 610-586-6655	Aluminum cans, non-ferrous metals, high-grade paper	Yes	Yes, industrial accounts only. cardboard & trash compactors	Yes compactor containers
Cintas Aston, PA 877-638-5300 www.cintas.com				
International Non-Ferrous Met 3415 W. 2 nd Street Trainer, PA 19061 610-494-3171 or 610-494-0200	als Aluminum cans, car batteries, ferrous & non-ferrous metals, scrap aluminum, steel, Freon-free appliances		Yes, over 12 Tons	Roll offs
Waste Management 408 South Oak Avenue Secane, PA 19018 610-626-7500				
LANCASTER COUNTY				
Beartown Recycling 6943 Division Highway Narvon, PA 17555 717-354-7734 717-354-4614	Metals, aluminum, appliances	Yes		
Dart Container Corp. 60 East Main Street Leola, PA 17540 717-656-2236 800-723-1036	Foam polystyrene must be clean, egg cartons, foam packing, meat trays, clam shells, cups www.dartbiz.com	No	Possible for large quantities	No
Full Circle Recycling 702 South Prince Street Lancaster, PA 17603 717-396-9999	Aluminum, brass, copper			
Dan Zook 183 Farmersville Road Leola, PA 17540 717-656-4422 www.zookplastic.com 8:00-11:00AM 12:00-4:00PM	Nursery pots, pp bags, assorted stretch film-will bale; clear agricultural mulch or silage clear bags, film bags-not "vegetable plastic", bales to Trex, VA. Polypropylene batwine, white supersacks and feed bags, greenhouse covers & trays, A		No	No

COMPANY NAME	MATERIAL	WEIGHT SLIPS	PICK-UP	COLLECTIC
LANCASTER COUNTY				
Ephrata Recycling 339 East Fulton Street Ephrata, PA 17522 717-733-2975	Ferrous & non-ferrous metals, car batteries, appliances (fee).	No	Yes	Containers
Graham Recycling 505 Winsor Street York, PA 17403 717-733-2975	World's largest supplier bottles to bottles; HDPE, PE-baled only	Yes	Yes	No
Lancaster Salvage 1058 North Plum Street Lancaster, PA 17601 717-393-6129	Aluminum cans, iron scrap and non-ferrous metals, car batteries	Yes	No	No
Laurel Recycling 339 East Fulton Street Ephrata, PA 17522 717-733-2975	Aluminum cans, non-ferrous metals (copper, brass, aluminum), car batteries, electric motors, radiators, air conditioners, lead, insulated copper & aluminum wire, stainless steel & turnings, catalytic converters		Yes	No
Reliable Services 21 Prestige Lane Lancaster, PA 17603 717-397-7695	Corrugated, plastic, mixed office paper, empty steel & plastic drums			
MONTGOMERY COUNTY				
A.J. Catagnus & Sons 1299 West James Street Norristown, PA 19401 610-275-5328	Aluminum & bi-metal cans, car batteries, ferrous & non-ferrous met	Yes als	If enough to fill dumpster	Yes
Allied Recycling 372 South Henderson Road King of Prussia, PA 19406 610-265-8941	Glass, aluminum & bi-metal cans (bagged-for apartment complexes), PET & HDPE commingled	Yes	Yes	Yes
Bergen Ploymers 221 Hawthorne Ave. Gilbertsville, PA 610-473-9990 www.bergeng	Separated 1 – 10		Yes	Gaylords
John Dieterly, Jr. Metals 401 South Tyson Avenue Glenside, PA 19038 215-886-9607	Non-ferrous metals, aluminum, copper and brass	Yes	Yes	Large load containers
Davis Brothers Scrap Co. 885 North Adams Street Pottstown, PA 19464 610-326-6890	Ferrous & Non-ferrous metal, iron, aluminum cans, foil, pie plates, bi-metal cans	Yes	No	No
KJ Plastics, Inc. 215-361-8222 415 N. Broad Street	Polyethylene, polystyrene, P/P, P/C, nylons, PET, HDPE, 1-10 PVC	Yes	Yes	Gaylords

Lansdale, PA 19446	LDPE/LLDPE		Industrial	
Mayer Pollock Steel Corp. S. Keim & Industrial Hgwy. Pottstown, PA 19464 610-323-5500	Aluminum cans, foil & pie plates, Ferrous & non-ferrous metals – loos no minimum quantity. Scrap alumir bi-metal cans, empty paint cans		Yes Industrial	Yes
COMPANY NAME	MATERIAL W	EIGHT SLIP	S PICK-UP	COLLECTION
PHILADELPHIA COUNTY				
All-Met Recycling 2250 E. Adams Avenue Philadelphia, PA 19124 215-537-5904	X-rays and all non-ferrous metals			
Blue Mountain 2904 Ellsworth Philadelphia, PA 19146 215-462-7372	Single stream	Yes	No	
Jack's Paper Stock & Scrap Metal 3615 Emerald Street Philadelphia, PA 19134	All non-ferrous metals - aluminum, copper, brass, stainless steel, insulated wire, Nickel alloys, zinc, all grades of Scrap iron and steel			Container provided
John Dorazio & Sons 2900 East Bridge Street Philadelphia, PA 19137 215-743-9440	Aluminum & ferrous metals - (clean & enclosed), scrap iron, cardboard	Yes	Yes, within 30 miles f/industri accounts-large loads only	
Dunn Recycling 3611 Welsh Road Philadelphia, PA 19136 215-624-2420	Aluminum cans, copper, aluminum products, brass, stainless steel, non-ferrous metals	Yes	No	No
Richard S. Burns & Company 4300 Rising Sun Avenue Philadelphia, PA 19140 215-455-3222	Paper, glass, aluminum, plastic, waste wood, clean fill, C & D	Yes	No	Roll-offs, luggers, front end loaders
S. D. Richmond & Sons, Inc. 2435 East Wheatsheaf Lane Philadelphia, PA 19137 215-535-5100	Bi-metal cans, ferrous & non- ferrous metals, Freon-free appliances, scrap aluminum, 500 lb. minimum	Yes	Yes, over 20 Tons	Trailers, roll-offs
United States Recycling, Inc. 6101 Tacony Street Philadelphia, PA 19135 610-338-5050	www.unitedstatesrecycling.com www.newmanpaperboard.com	Yes	Yes	Yes
NORTHAMPTON COUNTY				
Todd Heller, Inc. Smith Lane Box 95 Northampton, PA 18067 510-262-6988	Glass separated by color, uncrushed window glass, aluminum, bi-metal cans, foil, pie plates, PET & HDPE, ferrous & non-ferrous metals, empt paint & aerosol cans, Freon-free app		Yes, trailer loads	Roff-offs for window plate glass and assorted bottles

COMPANY NAME	THE PERSON NAMED IN COLUMN TO SERVICE AND ADDRESS OF THE PERSON NAMED IN COLUMN TO SE	WEIGHT SLIPS	PICK-UP	COLLECTIO
Nicos Polymers Group LLC 730 Bangor Road Nazareth, PA 18064 610-614-1400	Plastics #1-6, 8-10			
National Plastics & Manufacturing 11 McFadden Road Easton, PA 18045 610-250-7800	Plastics #1-7 and #10 No agriculture www.natplasticinc.com	Yes	Yes	Yes
Palmer Plastics 2906 William Penn Highway, Ste. 505 Easton, PA 18045 610-330-9900	Plastics #2,4,5,6,7,8 Grind and pelletize	No	No	No
SCHUYLKILL COUNTY				
St. Jude Polymer Corp. 6 Industrial Road Frackville, PA 17931 570-874-1220	PET-baled HDPE-truckload or more	Yes	No	No
DELAWARE STATE				
Diamond State Recycling Corp. PO Box 9798 (mailing address) 1600 Bower Street Wilmington, Delaware 19809 302-655-1501	Aluminum cans, non-ferrous metals, all grades of scrap iron, car batteries	Yes	5,000 lbs. or more	Roll-of
First State Plastic Recycling 955 River Road New Castle, Delaware 19721 302-325-3700	All plastics; cd's, nursery pots, agricultural bags-pre-consumer only, bumpers.			
Industrial Resource Network Inc. 707 S. Church St. Wilmington, Delaware 302-888-2905	Steel drums, cardboard, empty drums, plastic cartons that contain chemicals			
Modular Carpet Recycling Inc. 239 Lisa Drive New Castle, Delaware 19720 484-885-5890	Nylon www.modularcarpetrecycling.com	m		
NEW JERSEY				
Northstar Recycling 31 Heller Road Bellmawr, New Jersey 08031	All grades plastic		Pickup	Call
Recycle Inc. East 908-756-2200 Jeneen Rutar 20A Harmich Road South Plainfield, New Jersey 07080				

MARYLAND				
Eastern Recycling Services 5107 N. Point Blvd. Sparrows Point, Maryland 21219 410-477-7500	Plastics #1 – 10	Yes	Yes	Yes
VIRGINIA				
Regency Polymer Services 5112 Park Drive Fredericksburg, VA 22408 540-604-5722	Vinyl siding, PVC pipe, aluminum	Yes	Yes	Yes
REGIONAL				
GENERATED MATERIALS RECOVERY 594 Broadway, Suite 1217 (Corporate) New York, New York 10012 602-353-9411 www.generated.com	All plastics, call for information Phoenix, Arizona 85006 602-353-94	Yes	Yes	Yes
SDE Services USA, LLC 4002 167 th Street Flushing, New York 11358 718-384-8078	Plastics #1 - 7 Export plastics			
Mondo Polymer Technologies 27620 State Route 7 PO Box 250 Reno, Ohio 888-607-4790	High & low density polyethylene #2 and #4. Drums, buckets, bottles, shrink wrap, construction fencing		Will pick up	No collection equip. Need 20,000 lbs. Can commingle
EAST COAST				
Suntex Plastics Corporation 125 East Merritt Island Coastway Suite 209, PMB #314 Merritt Island, Florida 32952 321-537-3437	All plastic scrap	Yes	Yes	Yes
Recycling Revolution, LLC 20283 State Rd. 7 #219 Boca Raton, Florida 33498 561-488-1305 or 561-866-8866 Brian S Fax 561-488-1336 www.recyclingrevo	A A CARROLLINA CONTRACTOR OF THE CARROLLINA C			

Tyvek (high density polyethylene) – DuPont and Waste Management – signs, banners, posters, envelopes, and wristbands

Made into decking www.recycletyvek.wm.com to order

Disclaimer: This listing is provided as a public service by Chester County Solid Waste Authority.

No companies are endorsed or recommended. To add listings or make changes,

Contact Nancy Fromnick, Chester County Recycling Coordinator, 610-273-3771, *226.



APPENDIX C

RECYCLABLES HAULING COST ANALYSIS
TABLE



Estimated Transportation Costs from Geographic Population Center of Chester County to Selected Recyclables Receiving and/or Processing Facilities

Salastad Daguslahlas	From Downingtown, Chester County PA				
Selected Recyclables Receiving Facility	Est. Round Trip In Miles	Est. Round Trip Hauling Cost	Cost/Ton		
King of Prussia Recyclery					
(Republic - Alied), 372 S.					
Henderson Rd., King of	43	\$86	\$8.60 - \$17.20		
Prussia PA (Montgomery	.5	400	φοισο φ17.20		
Co.)					
Cougle's Recycling, 1000					
S. 4th St., Hamburg PA	98	\$196	\$19.60 - \$39.20		
(Berks Co.)	30	V 130	ψ13.00 ψ33. 2 0		
Accurate Recycling Corp.,					
508 E. Baltimore Pike,					
Landsdowne, PA	71	\$142	\$14.20 - \$28.40		
(Delaware Co.)					
A.J. Catagnus & Sons,					
1299 W. James St.,					
Norristown PA	48	\$96	\$9.60 - \$19.20		
(Montgomery Co.)					
Mascaro (Great Valley					
Recycling), 315 W 6th St,					
I	44	\$88	\$8.80 - \$17.60		
Bridgeport PA					
(Montgomery Co.)					
ReCommunity (Blue					
Mountain), 2900	78	\$156	\$15.60 - \$35.20		
Ellsworth St., Philadelphia					
PA (Philadelphia Co.)					
Newman & Co., 6101					
Tacony Street,	00	4470	447.00 4.05.60		
Philadelphia PA	89	\$178	\$17.80 -\$ 35.60		
(Philadelphia Co.)					
Greenstar (Todd Heller/					
WM), 799 Smith Ln.,	.=-	4004	400 40 400 00		
Northampton PA	152	\$304	\$30.40 - \$60.80		
(Northampton Co.)					
. ,					
Diamond State Recycling		Asse	440.40 450.5		
Corp., 1600 Bower Street,	52	\$104	\$10.40 - \$20.80		
Wilmington DE					
Recycle America (WM) -	100	¢240	¢31.00 ¢43.00		
4555 Mount Pisgah Road,	109	\$218	\$21.80 - \$43.60		
York, PA (York Co.)					

Note 1: All mileage shown is a round trip estimation from Downingtown to each site, using Mapquest.

Note 3: Cost per ton is based on a truck payload range of 5-10 tons for relatively light single-stream recyclables collected and direct-hauled to the processing site.

Note 2: All transportation cost estimates are based on an average truck hauling cost of \$2 per mile,

for comparison purposes. "Est. Costs" reflects hauling cost per truck per round trip, including labor, fuel and equipment. Costs do not include gate fees or revenues paid for materials.



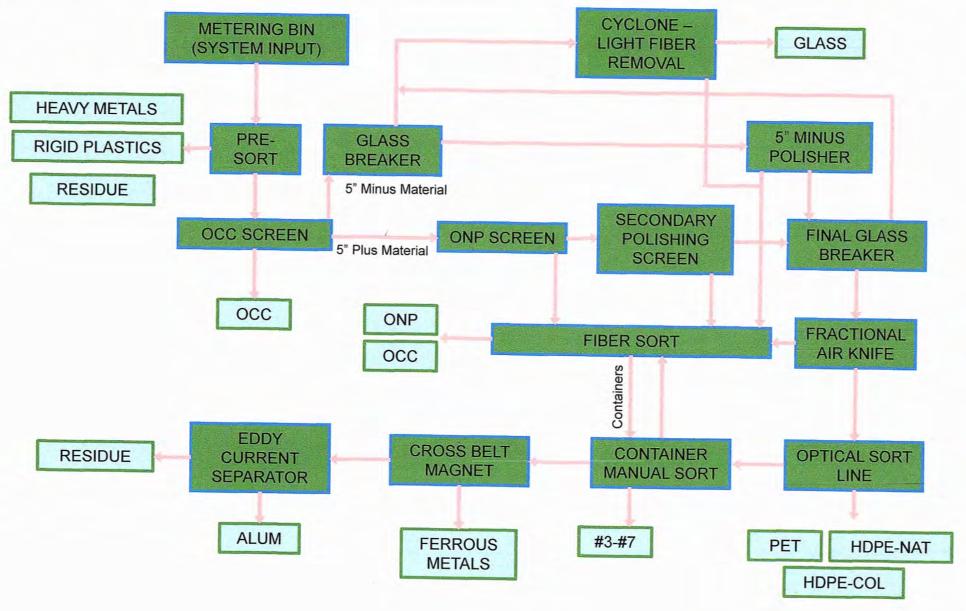
APPENDIX D

TYPICAL MRF FLOW DIAGRAM AND PROCESSING LINE

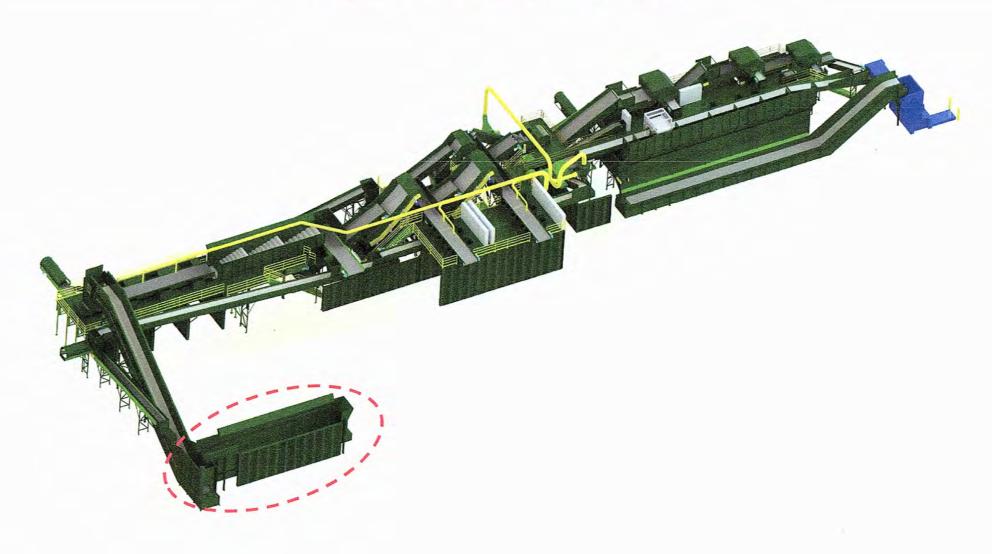
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Typical Single Stream Process Flow Diagram



Metering Bin System

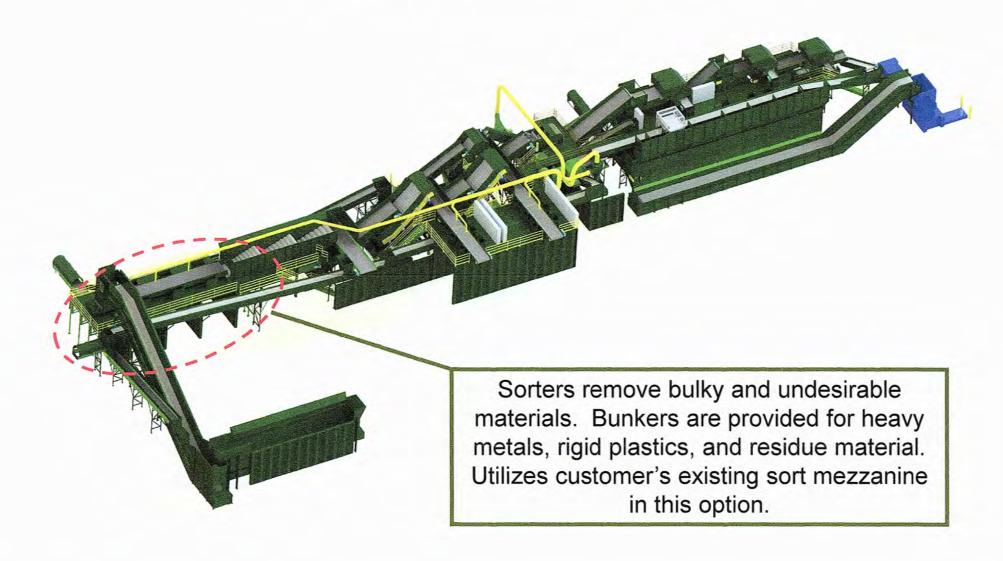


Metering Bin System

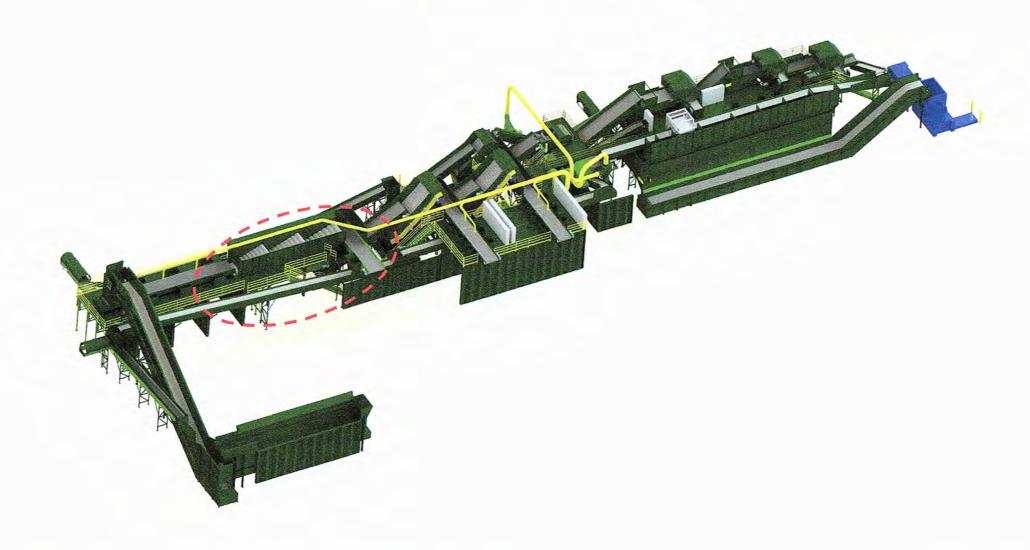


The Metering Bin system is designed to provide metered homogeneous flow of single stream material to the system pre-sort. Bulky materials are lifted over the metering drum placing them on top of the stream to allow for quick pre-sort inspection.

Pre-Sort Mezzanine



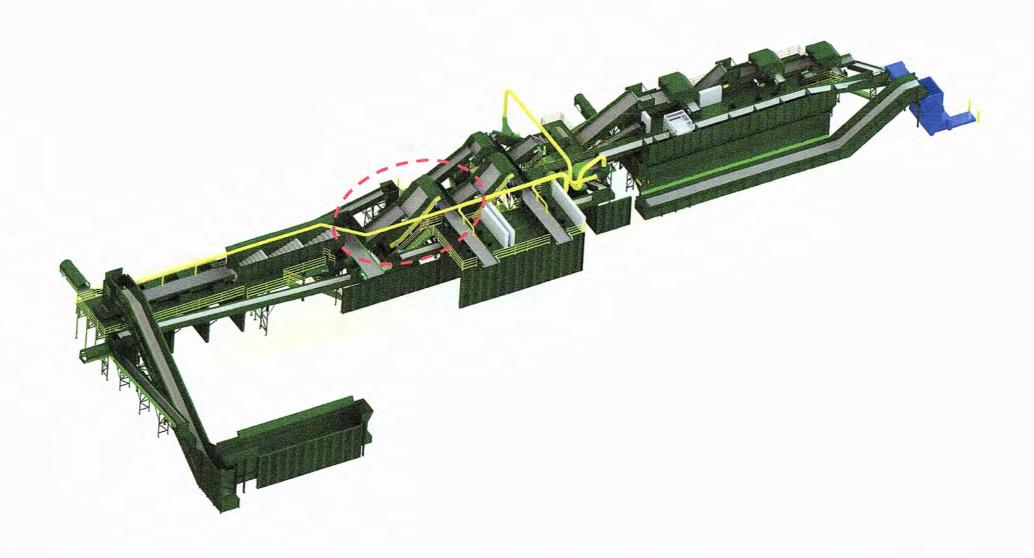
OCC Screen



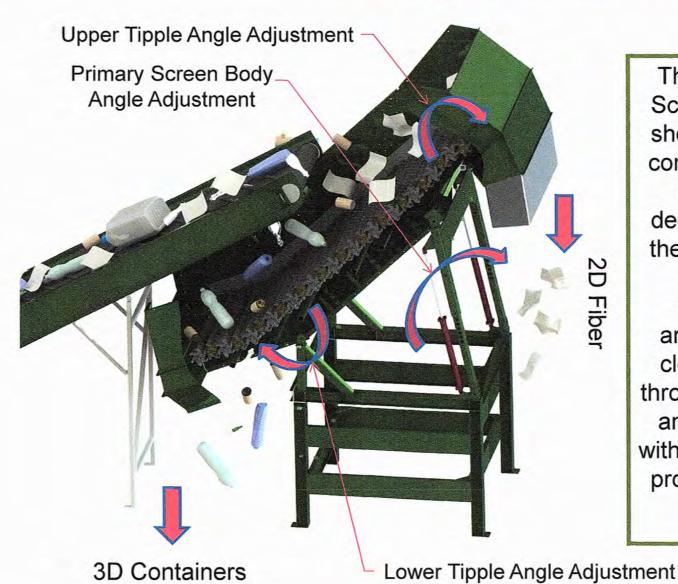


The Green Screens® OCC Screen is designed to separate flat bulky cardboard from competing fiber and 3D containers. Two or three screening decks are offered including two speed zones per deck with variable disc spacing designed to segregate material by size. The OCC discharge conveyor typically includes QC sort locations where sorters can remove contaminates.

ONP Screen

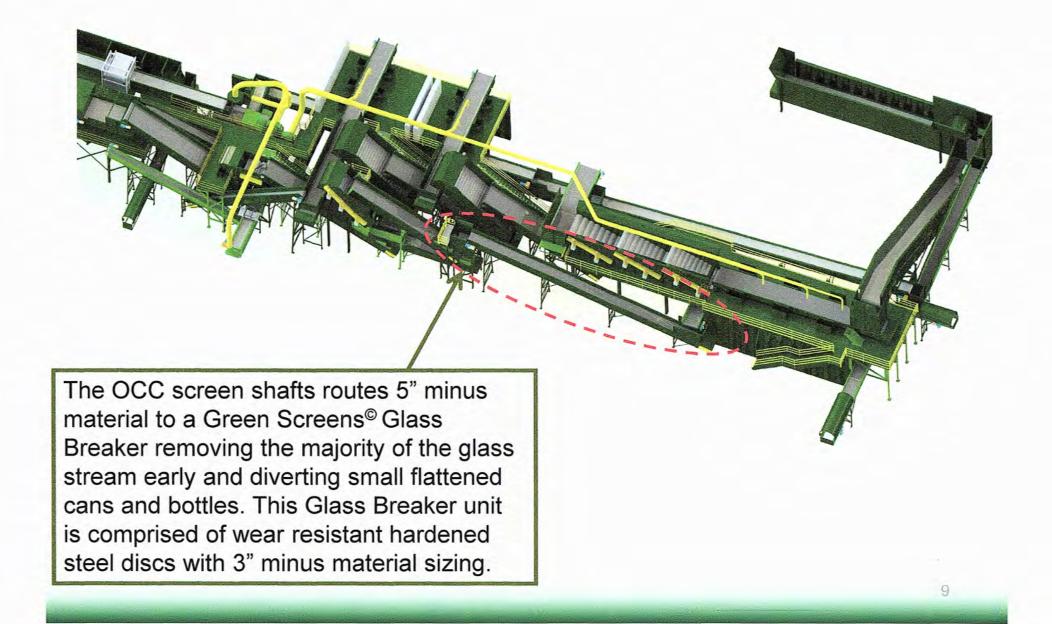


Primary ONP Screen

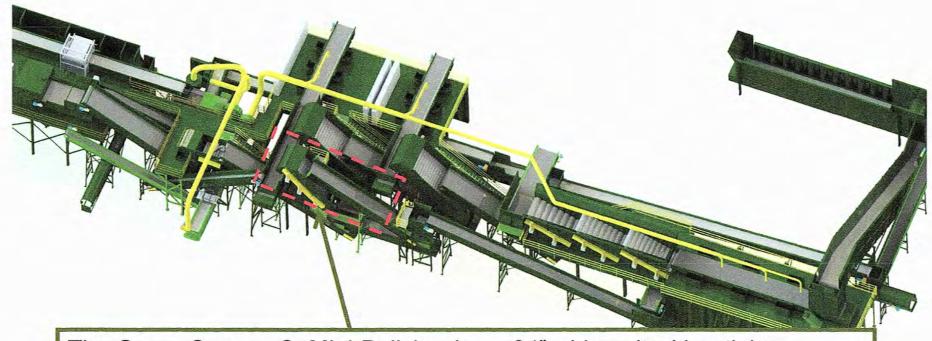


The Green Screens® News Screen removes clean large sheets of newsprint from 3D containers and smaller sized fiber. Two screens are dedicated to the output from the second and third deck of the OCC screen. An adjustable disc/spacer arrangement allows a very clean ONP product at high throughputs. Multiple variable angle adjustments coupled with four variable speed zones provides industries' cleanest news sort.

Coarse Glass Remover

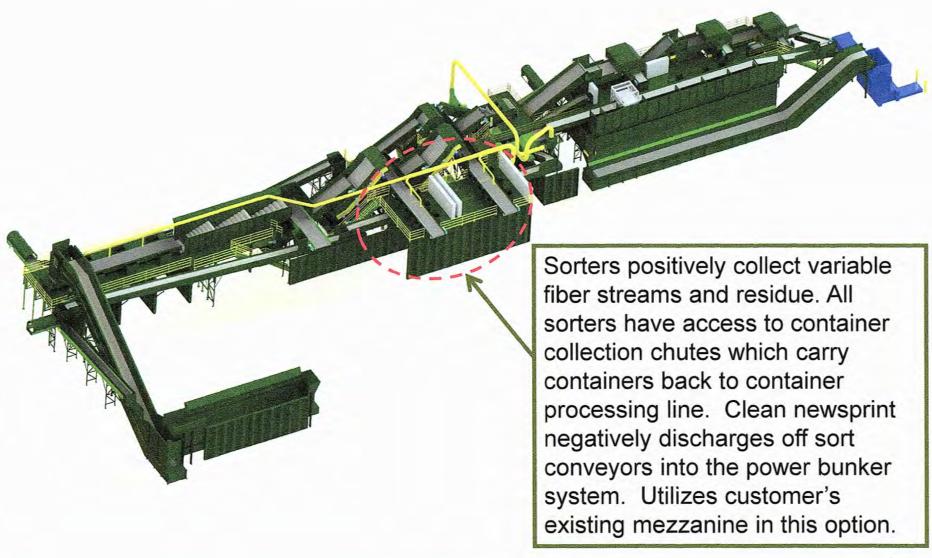


Mini-Polishing Screen

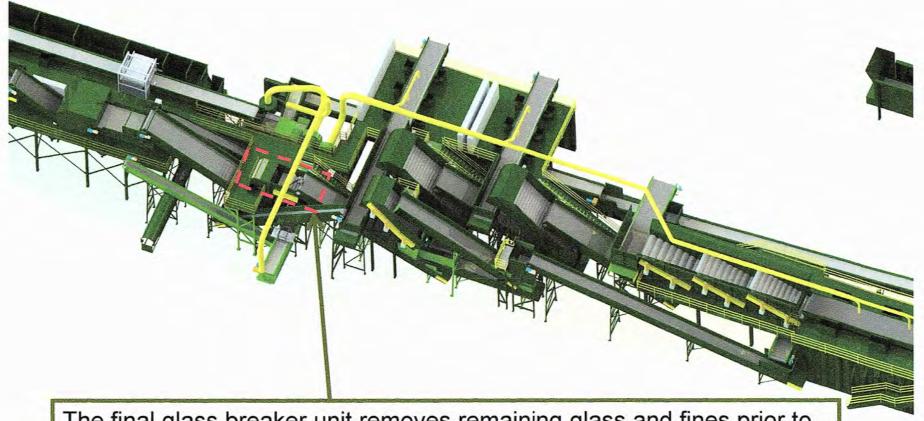


The Green Screens© Mini-Polisher is an 84" wide unit with a tight disc/spacer arrangement designed to separate problematic 2D flattened cans and bottles from a reduced fiber stream. Hydraulic actuation provides variable angle adjustment on the main deck and on the lower tipple.

Fiber Sort Mezzanine

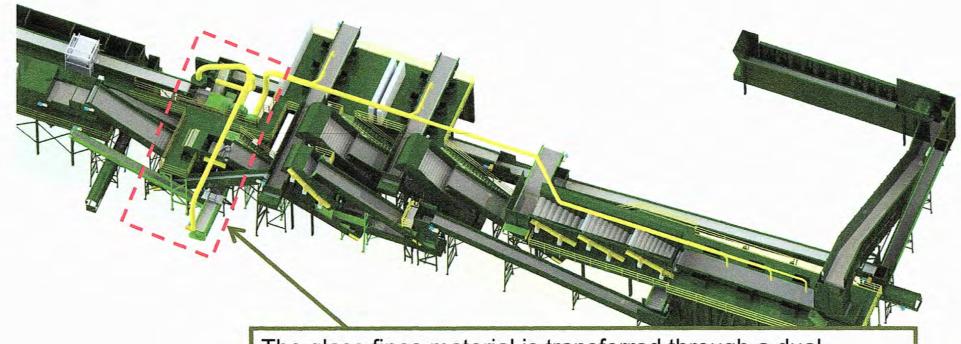


Glass Breaker / Fractional Air Knife



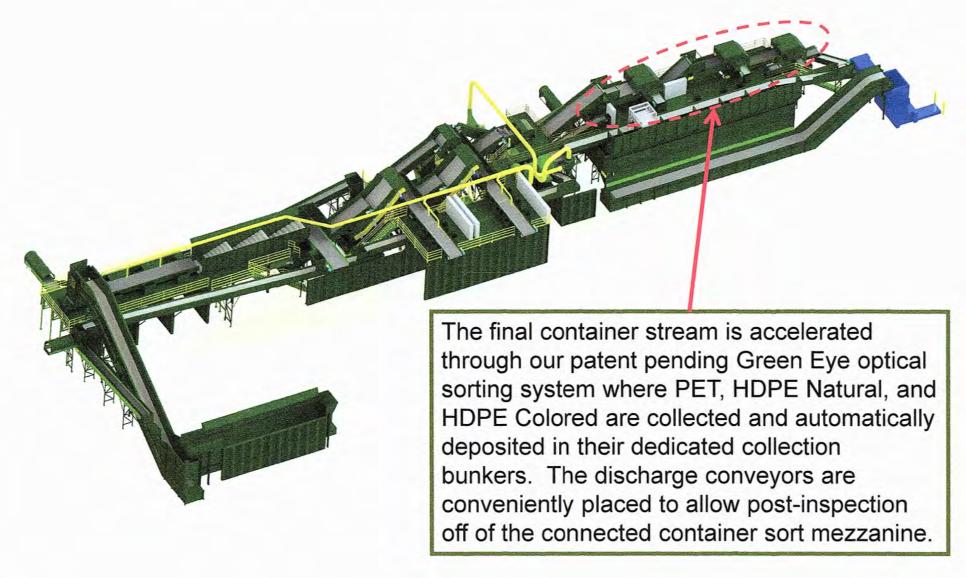
The final glass breaker unit removes remaining glass and fines prior to container processing. Containers discharging off the end of the screen pass through a compressed air knife to remove fractional light fiber. Fines are directed to glass stream for further processing.

Cyclone Light Fiber Removal System



The glass fines material is transferred through a dual compressed air knife system which agitates and lifts light fiber. The fiber is collected with a cyclone vacuum system and automatically deposited in with the fiber sorting area.

Green Eye[©] Optical Sorter

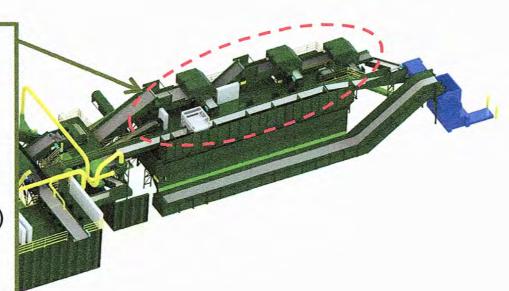


Container Sort Mezzanine

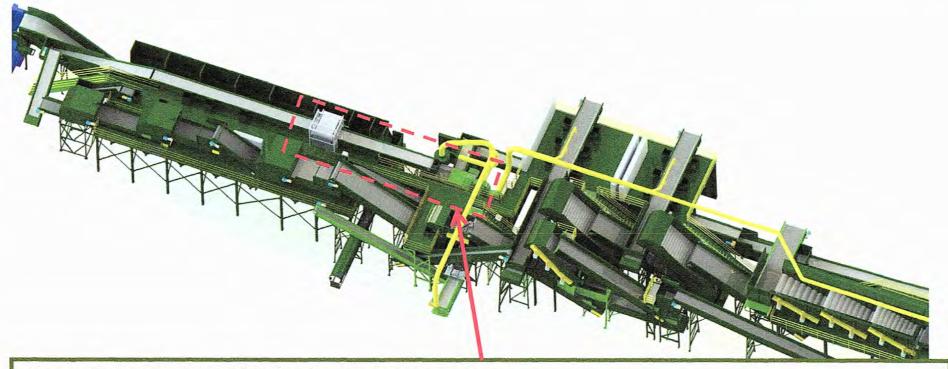
Here, sorters collect remaining plastic containers in containment bunkers. The following bunkers are provided:

- PET (picked optically)
- HDPE Natural (picked optically)
- HDPE Colored (picked optically)
- #3-#7 Plastics (picked manually)

Additionally sorters have three drop chutes dedicated to 3D fiber that is automatically conveyed to the fiber sort area.



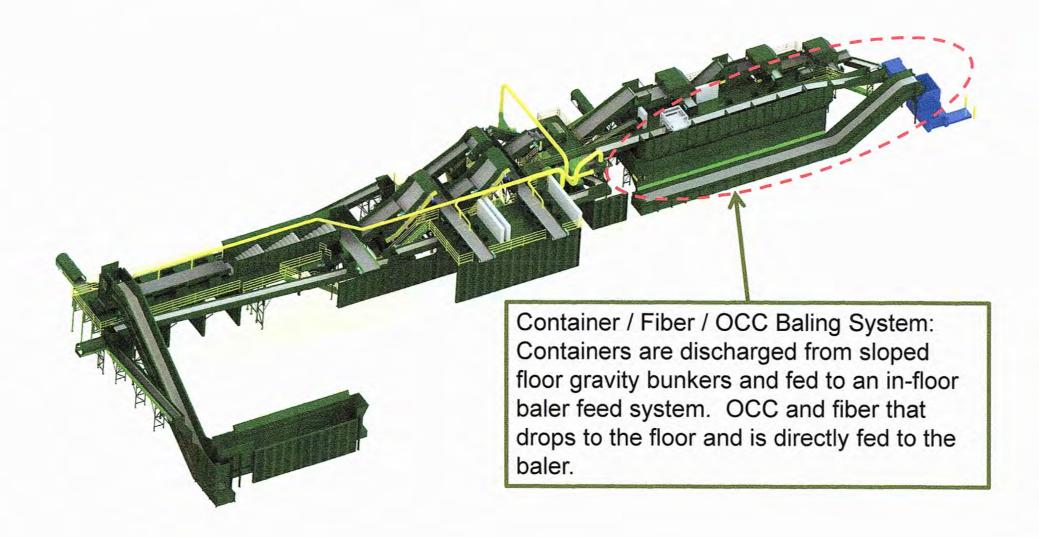
Cross Belt Magnet / Eddy Current Separator



Cross Belt Magnet / Eddy Current Separator:

The final commodities picked are ferrous metals and aluminum. Ferrous metal is lifted off the sort conveyor with an armor plated cross belt magnet depositing into its dedicated bunker. Remaining material falls onto an Eddy Current separator which automatically collects aluminum and transfers it to its dedicated bunker. Any remaining material is conveyed out the building as residue.

Gravity Feed Bunkers / Baling System



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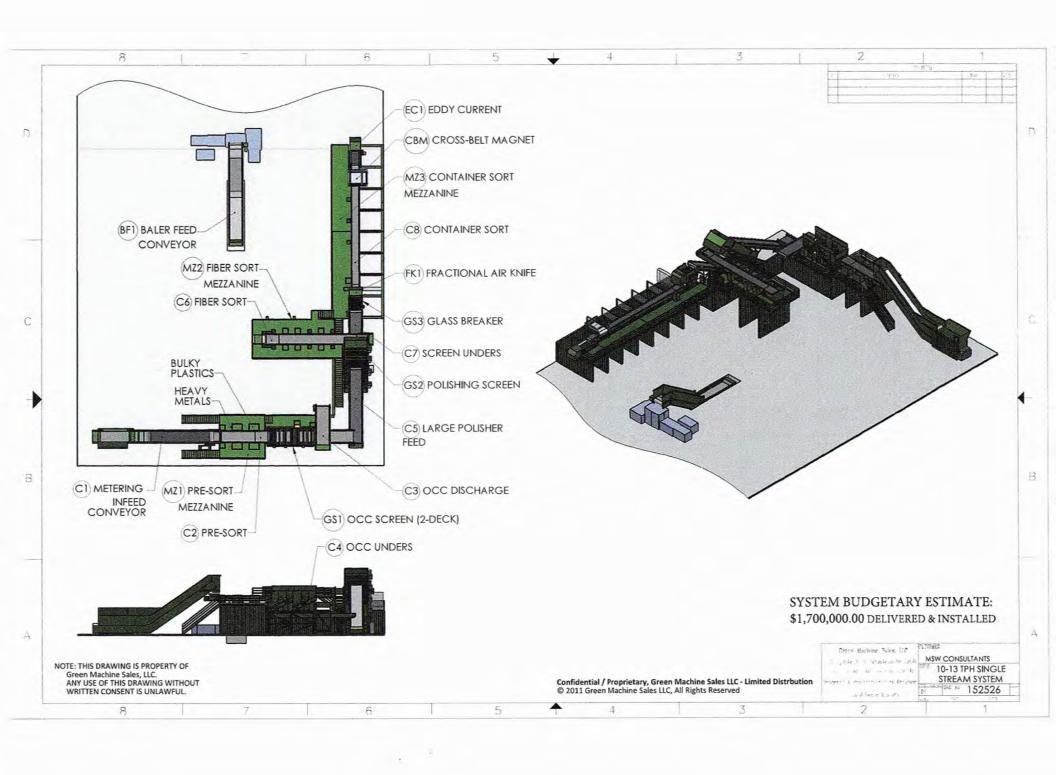


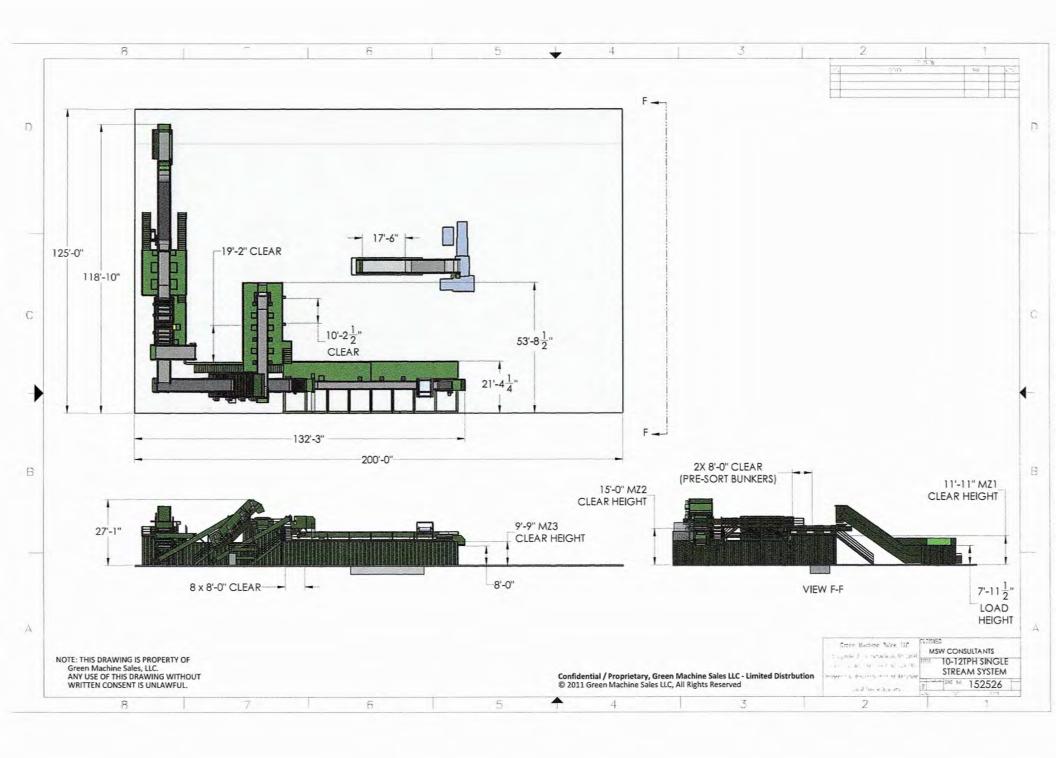
APPENDIX E

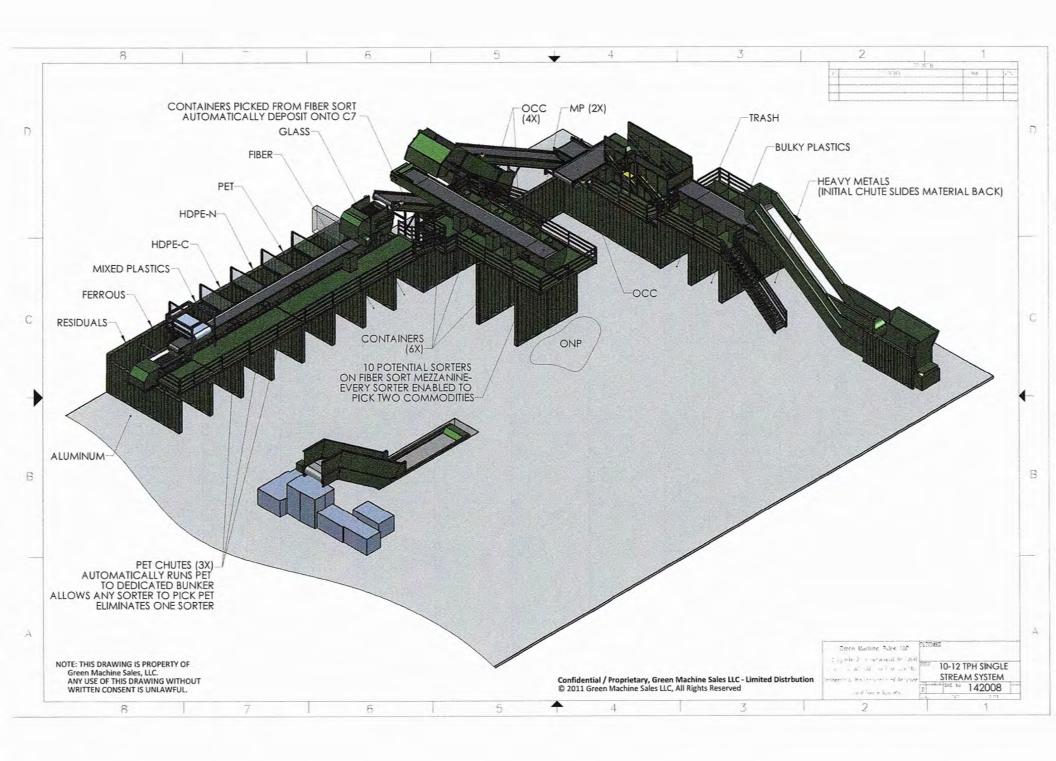
MRF CONCEPTUAL EQUIPMENT LAYOUTS AND BUDGETARY PRICING

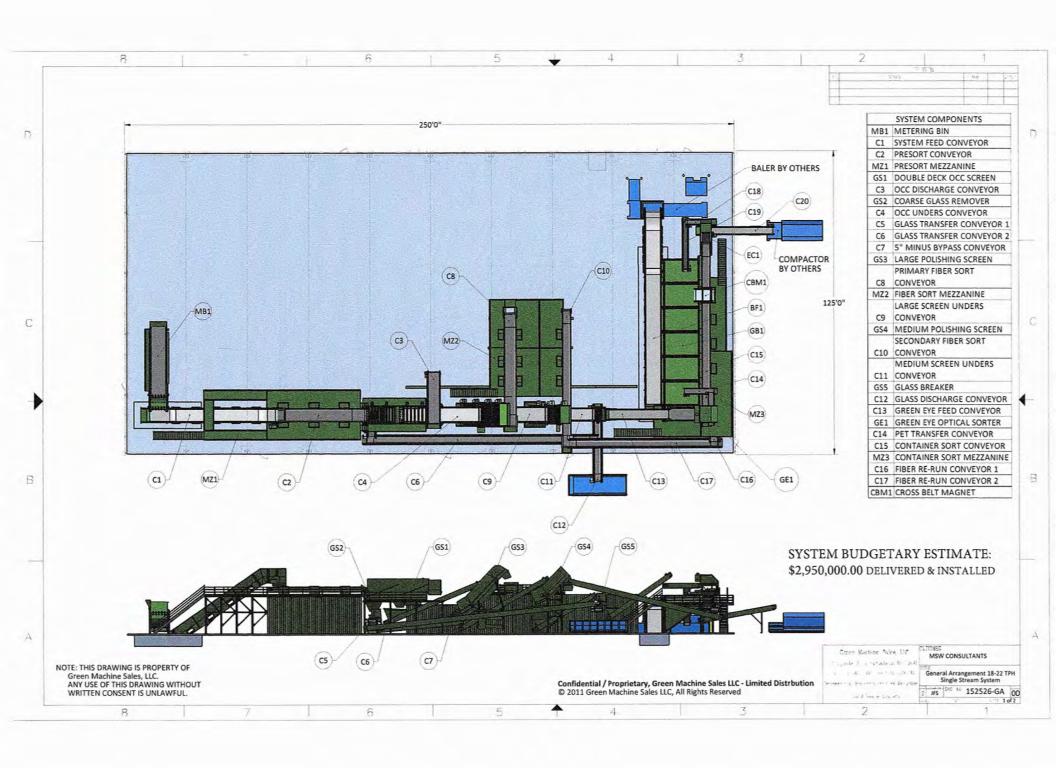
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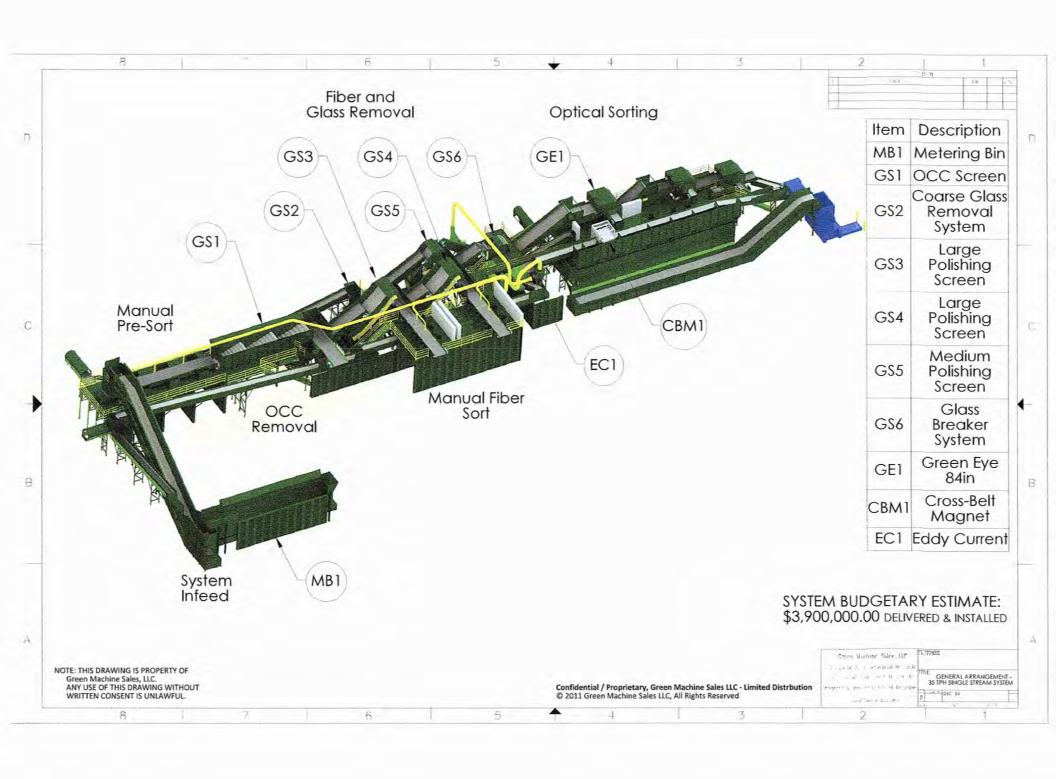












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