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FR: Dan Krivit (Foth)

RE: Estimated Calculations of Additional SSR/SSO Tons

This memorandum provides a summary of calculations of existing recycling tonnage data compared to materials still remaining in the mixed municipal solid waste (MSW) stream. The objective of this task was to develop “capture rates” by commodity category where possible. Capture rate for purposes of this analysis is defined as the percent of:

$$\frac{\text{Tonnage of current recyclable tonnage by commodity}}{(\text{Tonnage of current recyclable tonnage by commodity} + \text{Tonnage of comparable materials remaining in the MSW})}$$

The goal is to look at these results to determine how much recyclable material by commodity remains in the MSW relative to amounts recovered in current source separation recycling programs.

This method works best for traditional recyclables (paper, metal, glass, plastic), especially from the residential sector for which communities report reasonably good data overall for municipal curbside recycling programs. But this method is less accurate (or even not feasible due to lack of data), for non-traditional recyclables and the commercial sector (which for these purposes includes multi-family buildings not collected on curbside routes; the quality of multi-unit recycling data reported varies, depending on the community).

An alternative means of estimating capture rates is to examine the quantities of potentially recyclable materials remaining in the MSW, based on the recent R/W *Waste Composition Study* (August 2014), and then to use best professional judgment to estimate what portion of the quantity of each potentially recyclable material can feasibly be recovered through additional source-separated recycling efforts.

This alternative method results in similar total capture rates and “new” recyclables tons compared to the adjusted commercial SCORE reports method.

This data can serve as a basis for discussion and further analysis of feasibility of increasing source separation recovery of these commodities. This task also results in another view on the various means by commodity to achieve the new 75% recycling rate by 2030 goal established by the 2014 Legislature. The final set of data in this memo estimates remaining recyclables in MSW which is used for a separate analysis and Foth report, *Analysis of Mixed Waste Processing (MWP)*.

In “round numbers,” Ramsey and Washington Counties manage approximately 921,000 tons per year (TPY) of solid waste, including all yard waste. About 53% is currently recycled through a combination of recycling methods (approximately 487,000 TPY, including grass and leaves). An additional 204,000 TPY of “new” recyclable tons is needed to achieve the State’s 75% recycling goal.

Methods

The recent R/W *Waste Composition Study* data provides the means to calculate the amount of recyclable materials that remain in the waste stream today. This composition data was applied against the tonnages of total MSW reported by County staff in the 2013 county Certification reports submitted to the MPCA. R/W Project staff estimate that 405,000 tons were available for MSW processing in 2013. This estimate includes MSW delivered for processing at The Newport Facility plus unprocessed MSW delivered to landfills.

The amount of residential MSW was estimated at 182,000 tons for 2013 based on the 45% share estimated from the *Waste Composition Study* applied to the 405,000 tons. The amount of commercial MSW was estimated at 223,000 tons for 2013 based on the 55% share estimated from the *Waste Composition Study*.

2013 recyclable tonnage data for each County were provided by County staff from 2013 county “SCORE” reports submitted to the MPCA. This recyclable tonnage estimate does not include quantities of yard waste because yard waste has not been included as a reportable recycling commodity in SCORE reports.

The estimated amount of commercial recyclables for Ramsey County is not normally fully allocated by commodity due to the significant amount of “Unspecified/Unknown”. To allocate “splits” of these unspecified tons for Ramsey County, Foth applied the relative (i.e., percent by category) Washington County allocations for estimated commercial tons by broad category.

This Foth method of “adjusting” the Ramsey County commercial recyclables tons was compared against an alternative method of simply estimating a target or “new” capture rate of tons remaining in the MSW stream derived from the R/W *Waste Composition Study*. County staff used an assumption of 50% “new” recovery of commercial tons of recyclables remaining today in the MSW.

Foth made minor combinations of line item commodities to allow subtotals of like materials when reported differently by each County. For example, Foth created a more generic “Mixed / Other Paper” for the combined SCORE-reported totals from both Counties.

County SCORE reports have included three categories of organic materials: food-to-people (food rescue), food-to-livestock (food directly for livestock feeding, plus food for livestock feed manufacturing), and source separated organics (SSO). SSO is comprised primarily of food waste and non-recyclable, compostable paper.

For purposes of evaluating mixed waste processing (MWP), “organics” is defined as food waste and yard waste.

“Yard waste” in the *Waste Composition Study* was defined as:

“Yard waste means grass clippings, leaves, branches, sticks, garden waste, brush, stumps compostable yard waste bags, and non-woody plant material such as cut flowers.”

Yard waste recycling and recovery is not reported by Counties as part of their annual SCORE reports. This procedure is consistent with MPCA’s SCORE reporting requirements. The R/W Counties’ total residential yard waste recycling and recovery estimates, about at 87,700 TPY, are reported separately to the MPCA. For purposes of this analysis County staff developed separate tonnage estimates for “leaves & grass” recycled (66,200 TPY) vs. “brush” recovered (21,500 TPY).

The residential total yard waste tonnage estimates are derived from yard waste drop-off reports and may be conservative because they do not reflect all yard waste collected. For example, yard waste collected from residents by waste haulers are not reported in the County yard waste drop-off reports. These hauler-collected materials are usually transported to commercial yard waste sites, including composting facilities outside of R/W.

Foth estimated about 10,000 TPY of commercial yard waste is managed in R/W Counties. About 90% (9,000 TPY) is recycled or otherwise recovered and 10% (1,000 TPY) is disposed in with MSW. It is estimated that 6,794 TPY of commercial leaves & grass is recycled via composting and 2,206 TPY is chipped for energy recovery. The calculated total amount of yard waste recycled or recovered is 96,700 TPY (87,700 TPY residential + 9,000 TPY commercial).

Composting of leaves and grass is defined as a form of recycling in Minnesota. Most of the brush reported by R/W Counties is currently chipped and used for waste to energy at District Energy St. Paul along with other urban wood waste residuals. Waste to energy is considered resource recovery and not technically defined as “recycling” and therefore is not included in calculations of recycling rates.

Limitations of Data and Methods

This approach has limitations, including:

- ◆ The “**estimated**” commercial SCORE recyclables tonnage data are very rough estimates of actual commercial tonnages, using estimating approaches developed two decades ago because of the large number of businesses in the two counties. Yet these estimated

commercial SCORE tonnages comprise the largest fraction of the total recyclables at about 283,000 tons total for both Counties in 2013 (59% of the total recyclables tonnage, excluding yard waste).

- ◆ By comparison, the “**documented**” commercial recyclables tonnage is reported at about 76,000 tons for both Counties in 2013 (18% of the total recyclables tonnage, excluding yard waste).
- ◆ Residential recycling tonnages overall are reasonably good, especially because the majority of households in the two counties, when viewed in aggregate, are in communities with contracts for recycling collection that include reporting requirements. Also, minor data inaccuracies in residential recycling reports by community tend to be diluted when aggregated at a county level. Residential recyclables tonnage is reported at about 81,000 tons for both Counties in 2013 (20% of the total recyclables tonnage, excluding yard waste).

Haulers generally report the original source data to communities. Communities then report to the Counties. The residential recyclables, which also includes some drop-off recycling tonnage, is relatively consistent between the two counties.

- ◆ The final fraction of recyclables reported to MPCA via the County’s SCORE reports include 12,265 tons (3% of total recyclables tonnage, excluding yard waste) from “mechanical/hand-separated” recovery at centralized facilities. This fraction of recyclables is reliable data and very consistent from year-to-year. About 98% of the mechanical/hand-separated tons come from the the Newport Facility.
- ◆ The SCORE report categories for recyclables do not match up exactly to the R/W *Waste Composition Study* (August 2014). This is in part because the *Waste Composition Study* categories were designed to be consistent with those used in the 2013 statewide and other recent waste composition studies. Foth consolidated several of the recyclable commodities into “mixed/other” subtotals.

This commodity category consolidation is not feasible for many of the special / problem wastes because of the unique SCORE reporting requirements. The following SCORE commodities were not sorted as separate categories in the *Waste Composition Study*: major appliances, used (automotive) oil, used oil filters, waste tires, and antifreeze.

- ◆ The definitions of commodities differ slightly between SCORE reports and the *Waste Composition Study*, even if they are worded the same. Only the most common commodities (e.g., newsprint, glass containers, film plastic) are defined exactly the same.
- ◆ Yard waste was sorted as one category for the *Waste Composition Study* and not split into subgrades (e.g., “grass/leaves” vs. “brush”). The annual recycling and waste to energy recovery estimates were applied to estimate these grass/leaves vs. brush splits of yard waste remaining in the MSW.

Results

Table 1 displays the calculated tonnage of recyclables remaining in the MSW stream as defined by the *Waste Composition Study*. These are the tons of recyclables estimated to be currently in the MSW stream based on the estimates of total tons of MSW available by sector as discussed above. This is before any projected additional recovery via SSR/SSO improvements.

Table 1
"Recyclable" Commodities in MSW
from the Waste Composition Study

Before Additional Recovery via SSR/SSO Improvements
(Tons per year)

	Residential	Commercial	Aggregate
Traditional Recyclables:			
Paper	18,296	22,366	40,662
Plastic	11,771	13,996	25,767
Metal	6,098	6,993	13,091
Glass	3,425	2,945	6,370
Compostable Paper ^(a)	11,501	14,027	25,528
Food Waste ^(b)	36,456	49,849	86,305
Yard Waste	13,819	1,007	14,826
Other "Organic" Materials:			
Textiles	13,010	4,162	17,172
Clean Lumber / Pallets / Crates	2,730	11,579	14,309
Electronics	2,568	2,355	4,923
HHW	294	132	426
Other ^(c)	20,832	30,508	51,340
TOTAL	140,800	159,919	300,719

Sources: Waste Composition Study (2014) and

Foth MSW tonnage data calculations as applied to the Composition Study percentages

Notes:

- (a) "Compostable paper" was defined in the *Waste Composition Study* as: "Other paper products including paper napkins, towels, and tissues; paper plates, cups, coffee filters, paper egg cartons, soiled fast food paper bags and wrappers, waxed paper, parchment, and food contaminated or wet pizza boxes, and refrigerated or frozen food packaging."
- (b) "Food waste" was defined in the *Waste Composition Study* as: as "Food preparation wastes, food scraps, composting food waste bags, and spoiled food including meat' bones' and Keurig type coffee cups that have not been emptied."
- (c) "Other": includes: bulky material, small household appliances, carpet and padding, construction & demolition material, and tires/rubber.

Table 2 displays the SCORE - reported recyclable commodities recovered in 2013. The commercial data is after the adjustments Foth made to the Ramsey County estimated commercial tonnages to match the same material category breakdown from Washington County.

The tonnages shown exclude recyclable materials removed from MSW by mechanical/hand-separation as reported in the county annual SCORE reports. These materials (a total of approximately 12,265 TPY in 2013) are not source separated and would be available to any future MWP system. The breakdown of R/W combined totals (both residential and commercial) mechanical/hand-separated tonnages include: 31 TPY of paper and 12,234 TPY of metals.

Table 2
"Traditional Recyclable" Commodities as Reported in Annual SCORE Reports Plus Yard Waste and Other Non-Traditional Materials

As Calculated and/or Reported in Annual SCORE Reports
(With Adjusted Estimates of Commercial Tons for Ramsey County)
(Tons per year)

	<i>Residential</i>	<i>Commercial</i> ^(a)	<i>Aggregate</i>
Traditional Recyclables:			
Paper ^(b)	41,104	238,497	279,602
Plastic ^(b)	3,319	1,178	4,497
Metal ^(b)	3,524	13,530	17,054
Glass	13,508	1,473 ^(c)	14,981
SSO ^(d)	30	2,360	2,390
Food Waste ^(e)	0	61,324	61,324
Grass & Leaves	66,200 ^(f)	6,794 ^(g)	72,994
Other "organic" materials:			
Textiles	1,186	6	1,192
Clean Lumber / Pallets / Crates	0	1,113	1,113
Electronics	986	0	986
HHW ^(h)	5,154	0	5,154
Other ⁽ⁱ⁾	4,802	0	4,802
TOTAL	139,813	326,275	466,089

Notes:

- (a) Adjusted "Estimated Commercial" from Ramsey County (prorated per Washington County splits).
- (b) Recyclable tonnages shown in this Table 2 exclude recyclables removed from MSW by mechanical/hand-separation as reported in the county annual SCORE reports. These materials (a total of approximately 12,265 TPY) are not source separated and would be available to any future MWP system.
- (c) Commercial glass, 1,473 TPY, based on assumed estimate from amounts in the MSW. SCORE reports reported no commercial glass recycling tonnages.
- (d) Source separate organics ("SSO") tons reported by Ramsey County for residential organics include both food waste + compostable paper. Commercial food waste (not including compostable paper) shown in this table are separate from SSO.
- (e) "Food waste" includes recycling for animal feed and food rescue programs (i.e., "food-to-people").
- (f) Residential yard waste calculations from County staff data (66,200 TPY), includes grass & leaves only. Brush is generally chipped and used for energy recovery and therefore not technically "recycled".
- (g) Commercial yard waste estimates based on Foth calculations (6,794 TPY), include grass & leaves only; No brush is included.
- (h) Recyclable HHW reported in SCORE reports includes lead acid batteries and paints/solvents.
- (i) "Other": includes: bulky material, small household appliances, carpet and padding, construction & demolition material, and tires/rubber.

Table 3 (see page 7) displays the current capture rates before any additional recovery via improved SSR/SSO systems. These data indicate very high capture rates for the most traditional, highest value recyclable commodities: paper and metal. The capture rates for plastic are low. The capture rate for SSO in the commercial sector is quite high; this is primarily a reflection of sizable quantities of recovery of food waste for livestock feeding that has been occurring for many years and has increased in recent years, accompanied by increases of smaller quantities of food rescue and SSO collections. As displayed, residential SSO is not yet started.

Table 3
Current "Recyclable" Commodities Capture Rates
 With Adjusted Estimates of Commercial Tons for Ramsey County
 (Percent of Total: In MSW + Current Recovery)

	<i>Residential</i>	<i>Commercial ^(a)</i>	<i>Aggregate</i>
Traditional Recyclables:			
Paper	69%	91%	87%
Plastic	22%	8%	15%
Metal	37%	67%	57%
Glass	80%	33%	70%
SSO ^(b)	0.3%	15%	9%
Food Waste	0%	55%	42%
Grass & Leaves	86%	90%	87%
Other "organic" materials ^(selected):			
Textiles	8%	0.2%	6%
Clean Lumber / Pallets / Crates	0	9%	7%
Electronics	28%	0%	17%
HHW ^(c)	95%	0%	92%
Other ^(d)	50%	0%	7%

Notes:

- (a) Adjusted "Estimated Commercial" from Ramsey County (prorated per Washington County splits).
- (b) SSO capture rates for residential organics include commingled food waste + compostable paper. Commercial food waste (not including compostable paper) capture rates shown in this table are separate from SSO.
- (c) Recyclable HHW includes batteries and paints/solvents.
- (d) "Other": includes: bulky material, small household appliances, carpet and padding, construction & demolition material, and tires/rubber.

Table 4 provides the residential waste line item calculations of the current capture rates, projected target capture rates, and the resulting projected tons of additional recyclables by type and total, based on 2013 total tonnages generated in the two counties. The projected target capture rates, which are drawn from experience in other mature recycling programs with documented capture rates, are significantly higher than the current capture rates for most materials.

Table 4
Current and Projected New Residential Capture Rates by Material
(Tons per Year and Capture Rate as a Percent of Total Available Material Available)

Material	TOTAL Recycled + in MSW	Current Capture Rate	Target Capture Rate	New SSR Tons Recycled	Total of "Old" + "New" Tons Recycled	Tons Remaining in Mixed MSW
Traditional Recyclables:						
Recyclable Paper Subtotal	59,401	69%	84%	8,721	49,826	9,575
Newspaper	29,514	93%	93%	0	27,348	2,166
Office Paper	1,281	4%	60%	712	768	512
Magazines / Catalogs	3,897	45%	60%	581	2,338	1,559
Cardboard / Kraft Paper	7,920	44%	75%	2,451	5,940	1,980
Mixed / Other recyclable paper	16,790	50%	80%	4,977	13,432	3,358
Recyclable Plastic Subtotal	15,091	22%	45%	3,487	6,806	8,285
All PET	2,255	31%	50%	432	1,127	1,127
All HDPE	1,573	29%	50%	335	786	786
All other rigid plastic ["mixed rigid plastic"]	8,799	24%	50%	2,258	4,399	4,399
Recoverable Film & Film Bags	2,465	1%	20%	462	493	1,972
Recyclable Metal Subtotal	9,623	37%	69%	3,132	6,657	2,966
Aluminum Cans	2,084	65%	80%	320	1,667	417
Steel Cans	3,110	56%	75%	579	2,332	777
Mixed / Other Metal	4,430	10%	60%	2,234	2,658	1,772
Food & Beverage Glass	16,933	80%	85%	885	14,393	2,540
Food Waste	36,486	0.3%	30%	10,916	10,946	25,540
Compostable Paper	11,501	0%	30%	3,450	3,450	8,051
Yard Waste: Grass & leaves	76,631	86%	95%	6,600	72,800	3,831
Textiles & Leather	14,196	8%	25%	2,363	3,549	10,647
Electronics	3,554	28%	90%	2,212	3,198	355
Batteries	4,749	98%	98%	0	4,669	80
Paints (latex) & solvents	489	99%	99%	0	485	4
Bulky Materials	9,563	50%	75%	2,371	7,172	2,391

Considerations by individual commodity grade included: current capture rate, ease of recycling, and “law of diminishing returns.” The general rule of thumb, or “law of diminishing returns,” is that the higher the capture rate, the more expensive (\$/ton) it is to recover new tons. For example, we are forecasting residential newspaper to have zero additional new tons because of the currently high capture rate. In addition, this forecast of zero new tons is due to the very clear, declining trend in the amount of newsprint generated due to decreasing subscriptions (e.g., due to the impacts of the

Internet), light-weighting of newsprint stock, downsizing the format of newspapers, and fewer newspaper ads, including inserts.

Table 5 displays the “additional” recyclable commodities projected to be recovered with improved SSR/SSO programs, based on current total tonnages generated in the two counties. These are TPY in addition to current recycling tons. The primary driving assumptions for these projections is the estimated “new” capture rates with improved SSR/SSO recovery programs. The estimated new capture rates were forecasted on best professional judgments of the full R/W Project staff team, including the extended Foth staff team.

The data for the commercial waste stream capture rates in Table 5 are not as detailed because there is less available documented data for these materials. According to the estimated total paper recyclables currently recovered, the current capture rate is already over 90%. Plastics, metal, and SSO present potential for additional recyclables recovery from commercial wastes.

Table 5 also displays the calculated “percent recycling of total solid waste (MSW) managed.” This line indicates that, given the assumed new capture rates, the total amount of additional “new” tons of recycling (including SSO) is only 11.2%. This includes very ambitious target capture rates for residential SSO (30%) and commercial SSO (80%).

Table 5
Additional "Recyclable" Commodities

Projected for SSR/SSO Recovery by 2030
("New" tons per year, based on 2013 total tons generated)

	<i>Residential</i>	<i>Commercial ^(a)</i>	<i>Aggregate Sum</i>
Traditional Recyclables:			
Paper	8,700	9,300	18,000
Plastic	3,500	6,400	9,900
Metal	3,100	2,500	5,600
Glass	900	2,300	3,200
Food Waste	10,916	27,614	38,530
Compostable Paper	3,450	7,460	10,910
Grass & leaves	7,700	0	7,700
Other “organic” materials:			
Textiles	2,400	400	2,800
Clean Lumber / Pallets / Crates	0	2,000	2,000
Electronics	800	1,200	2,000
HHW ^(b)	0	0	0
Other ^(c)	2,400	0	2,400
TOTAL	43,866	59,174	103,040
Percent Recycling of Total Solid Waste Managed	4.8%	6.4%	11.2%

Notes:

- (a) Based on adjusted "Estimated Commercial" from Ramsey County (prorated per Washington County splits)
- (b) Recyclable HHW includes batteries and paints/solvents.
- (c) “Other”: includes: bulky material, small household appliances, carpet and padding, construction & demolition material, and tires/rubber.

Table 5 indicates that even with ambitious SSR/SSO program improvements, it will be very difficult to achieve the 75% recycling by 2030 targets established by the 2014 Minnesota Legislature with source separation programs alone.

Table 6 displays the recyclable commodities remaining in the MSW stream after the additional SSR/SSO recovery (from Table 5). This table indicates the recoverable commodities that could be targeted for recovery through MWP. However, MWP will not be expected to recover all the targeted recyclables. It may not be possible to recover the approximately 200,000 total tons of materials to go from 53% recycling to 75% recycling.

Table 6
"Recyclable" Commodities Remaining in
MSW after Additional SSR/SSO Recovery by 2030

(Tons per year remaining in MSW)

	Residential	Commercial ^(a)	Aggregate Sum
Traditional Recyclables:			
Paper subtotal:	9,600	14,891	24,491
Cardboard	1,980	4,244	6,224
Plastic subtotal:	8,300	7,600	15,900
HDPE	786	612	1,398
PET	1,127	1,459	2,586
Metal subtotal:	3,000	4,444	7,444
Ferrous (steel cans)	777	332	1,109
Other / mixed metal	1,722	3,082	4,804
Non-Ferrous (e.g., aluminum cans)	417	1,030	1,447
Glass	2,500	1,104	3,604
Food Waste	25,500	22,235	47,735
Compostable Paper	8,100	6,567	14,667
Grass & Leaves	3,832	751	4,582
Brush / Wood Waste	1,244	250	1,495
Other "organic" materials:			
Textiles	10,600	3,800	14,400
Clean Lumber / Pallets / Crates	0	2,100	2,100
Electronics	355	1,200	1,555
HHW	100	0	100
Other ^(b)	2,400	0	2,400
TOTAL	75,531	64,942	140,473

Notes:

(a) Adjusted "Estimated Commercial" from Ramsey County (prorated per Washington County splits)

(b) "Other": includes: bulky material, small household appliances, carpet and padding, construction & demolition material, and tires/rubber.