

Analysis of Consolidated Curbside Residential Collection For 1-4 Unit Households in the Chittenden Solid Waste District

**FINAL REPORT
November 26, 2014**

Introduction

DSM Environmental Services, Inc. (DSM) was the prime contractor to the Chittenden Solid Waste District (CSWD) to complete an analysis of consolidated refuse and recycling collection in the CSWD (see Analysis of Consolidated Collection Systems for the Chittenden Solid Waste District, FINAL REPORT, January 20, 2012.) The analysis estimated the costs of consolidated collection in seven zones, and compared those system costs against the estimated costs of the existing subscription collection in the District. The collection zones were set up to represent different population densities and ranged in size from Burlington (at 15,800 households) to a zone encompassing Richmond, Bolton and Huntington (estimated at 2,900 households). Three options were analyzed for the report – weekly residential refuse and recycling collection only, weekly residential and commercial refuse and recycling collection, and every other week residential refuse and recycling collection.

DSM was recently contracted by the Chittenden Solid Waste District (CSWD) to analyze a fourth option - Weekly Collection of Residential Waste and Recyclables From Households In 1 – 4 Unit Structures. This differed from the original three options analyzed, which considered consolidation of all residential collection activity.

Methodology

CSWD provided DSM with the breakdown of housing in the CSWD using Chittenden County Regional Planning Commission data. CSWD also provided DSM with estimates of drop-off use in each CSWD municipality. Based on these data DSM has assumed a total of 15 percent of households district-wide will continue to drive their refuse and recyclables to a drop-off location under a consolidated collection scheme. As in the original study, a total of 9,030 households were assumed to use the drop-offs; however the distribution of drop-off users by municipality (and consolidated collection zone) changed. Household counts by municipality for drop-off use, 1-4 unit structures (consolidated curbside collection) and 4+ unit structures (containerized) were grouped into each of the seven consolidated collection zones analyzed in the 2012 study. All of the drop-off users were assumed to be from 1-4 unit structures.

Table 1 below displays the original (Table 13 of 2012 Study) number of households by service type in each collection zone analyzed for Options 1, 2 and 3 and the revised figures to be analyzed under Option 4.

TABLE 1 – Households Served By Collection Type In Each Collection Zone In Original Report and Under Option 4 ¹

ZONES	TABLE 13 - ORIGINAL			OPTION 4		
	Curbside (households)	Containerized (households)	Drop-off (households)	1-4 units (households)	5+ units (households)	Drop-off (households)
Burlington	9,700	4,500	1,600	9,067	4,157	1,180
Winooski, Colchester, Milton	8,200	3,600	1,300	9,454	2,103	2,190
So. Burlington, Shelburne, Charlotte	7,500	2,800	1,800	8,149	2,346	1,150
Williston, St. George, Hinesburg	3,900	400	1,100	3,850	318	1,560
Essex, Essex Junction, Westford	6,000	800	1,700	5,798	1,487	1,680
Underhill, Jericho	2,200	0	800	2,982	25	310
Richmond, Bolton, Huntington	2,170	0	730	1,924	108	960
Total:	39,670	12,100	9,030	41,225	10,545	9,030

(1) Numbers may not add due to rounding.

Option 4 assumes that containerized waste is continued to be collected on a subscription basis from all households residing in > 4 unit structures and all commercial waste would continue to be collected from haulers on a subscription basis. Containerized waste from households residing in 1 – 4 unit structures would now be collected under the consolidated collection zones. Table 2 shows the breakdown of tons collected in each collection zone for the residential and commercial sector, based on the same assumptions made in the original report.

TABLE 2 – Collection Zones Under Option 4 ¹

ZONES	Residential Refuse (tons)	Number of Households Served by Type of Service			Commercial Refuse (tons)	Commercial Tons Collected by Type of Service		Total Refuse (tons)
		Consolidated Curbside 1-4 unit (households)	Containerized			Curbside (tons)	Containerized (tons)	
			5+ unit (households)	Drop-off (households)				
Burlington	10,700	9,067	4,157	1,180	9,200	1,200	8,000	19,900
Winooski, Colchester, Milton	10,700	9,454	2,103	2,190	6,100	800	5,300	16,800
So. Burlington, Shelburne, Charlotte	9,000	8,149	2,346	1,150	5,500	700	4,800	14,500
Williston, St. George, Hinesburg	4,500	3,850	318	1,560	4,600	600	4,000	9,100
Essex, Essex Junction, Westford	6,800	5,798	1,487	1,680	3,700	500	3,200	10,500
Underhill, Jericho	2,800	2,982	25	310	300	100	200	3,100
Richmond, Bolton, Huntington	2,300	1,924	108	960	1,100	200	900	3,400
Total:	46,800	41,225	10,545	9,030	30,500	4,100	26,400	77,300

(1) Numbers may not add due to rounding.

As in the original report, the cost of residential curbside collection for each collection zone has been estimated based on route sizes (the number of households served per route), the number of routes and trucks necessary to service the zone and the estimated cost to operate each truck. For residential curbside refuse, average annual operating costs (including capital, labor and admin, fuel, maintenance and profit) are estimated to be \$220,000 per truck and for recycling, \$200,000 per truck. In addition, it is assumed that there are 20 percent backup trucks available, and these trucks are included in the total trucks column and added in as contingency costs. While the number of backup trucks varies in the industry, DSM's research found that some small fleets will have as many as 25 percent (or more) where some larger fleets will have as few as one for every 12 trucks operating. Our model assumes an average of 20 percent backup to be conservative.¹

DSM assumed that for containerized residential waste, unit costs charged will remain the same as the current costs. In other words, there will be no per unit cost savings for containerized collection since there will be no consolidation of these routes. There is however a reduction in the number of households served by containers based on the number of 1-4 unit households in the CSWD.

Results

Tables 13 – 17 in the Final Report have been recreated (as Tables 3-7 below) to show the results of Option 4, the consolidation of curbside refuse and recycling collection for 1-4 unit structures only.

TABLE 3 - Weekly Curbside Residential Refuse Collection and Disposal Annual Costs

Residential Refuse Curbside Routes	Households	Tons	Households	Weekly Routes	Refuse Trucks ¹	Collection			Cost Per
	Served (hh's)	Collected (tons)	/ Route (hh's)			Cost (\$)	Tip Fee (\$)	Total Cost (\$)	Household (\$)
Burlington	9,067	7,934	600	15	3.6	\$797,938	\$690,262	\$1,488,200	\$164
Winooski, Colchester, Milton So. Burlington, Shelburne, Charlotte	9,454	8,272	525	18	4.3	\$950,786	\$719,673	\$1,670,500	\$177
Williston, St. George, Hinesburg	8,149	7,131	525	16	3.7	\$819,605	\$620,379	\$1,440,000	\$177
Essex, Essex Junction, Westford	3,850	3,369	525	7	1.8	\$387,204	\$293,084	\$680,300	\$177
Underhill, Jericho	5,798	5,073	500	12	2.8	\$612,255	\$441,363	\$1,053,600	\$182
Richmond, Bolton, Huntington	2,982	2,609	450	7	1.6	\$349,919	\$227,025	\$576,900	\$193
	1,924	1,684	450	4	1.0	\$225,802	\$146,498	\$372,300	\$193
Subtotal:	41,225	36,072		78	18.8	\$4,143,509	\$3,138,285	\$7,281,800	\$177
Cost Per Ton:						\$115	\$87	\$202	

(1) Total trucks dedicated to routes, including 20% spares.

(2) Numbers may not add due to rounding

¹ The 20 percent backup trucks figure is applied to the number of trucks required, which are not whole numbers. This approach is consistent with the 2012 report.

TABLE 4 - Weekly Curbside Residential Recycling Collection and Processing Annual Costs

Residential Recycling Curbside Routes	Households Served (hh's)	Households / Route ¹ (hh's)	Tons Collected (tons)	Weekly Routes	Recycling Trucks ²	Cost (\$)	Cost Per Household (\$)
Burlington	9,067	750	2,811	12	2.9	\$580,319	\$64
Winooski, Colchester, Milton	9,454	656	2,931	14	3.5	\$691,481	\$73
Charlotte	8,149	656	2,526	12	3.0	\$596,076	\$73
Williston, St. George, Hinesburg	3,850	656	1,194	6	1.4	\$281,603	\$73
Essex, Essex Junction, Westford	5,798	625	1,797	9	2.2	\$445,277	\$77
Underhill, Jericho	2,982	563	925	5	1.3	\$254,486	\$85
Richmond, Bolton, Huntington	1,924	563	597	3	0.8	\$164,219	\$85
Subtotal:	41,225		12,780	63	15.1	\$3,013,461	\$73
Cost Per Ton:						\$236	

(1) Households per route are assumed to be 25% greater than refuse route sizes.

(2) Total trucks dedicated to routes, including 20% spares.

(3) Numbers may not add due to rounding.

TABLE 5 - Weekly Containerized Residential Refuse Collection and Disposal Annual Costs

Residential Refuse Containerized Routes ³	Households Served (hh's)	Tons Collected (tons)	Yards (yd3)	Cost/Yard ¹ (\$)	Total Cost ² (\$)	Cost Per Household (\$)
Burlington	4,157	2,078	27,713	\$85	\$545,400	\$131
Winooski, Colchester, Milton	2,103	1,052	14,021	\$85	\$275,900	\$131
So. Burlington, Shelburne, Charlo	2,346	1,173	15,638	\$85	\$307,800	\$131
Williston, St. George, Hinesburg	318	159	2,120	\$85	\$41,700	\$131
Essex, Essex Junction and Westfo	1,487	744	9,916	\$85	\$195,200	\$131
All Other	133	67	889	\$85	\$17,500	\$131
Subtotal:	10,545	5,272	69,408		\$1,383,500	\$131
Cost Per Ton:					\$262	

(1) Average monthly cost per yard of container size used for weekly collection and disposal of refuse.

(2) Total costs = cubic yards collected multiplied by cost per yard, and then divided by 4.3 (collections per month).

(3) Numbers may not add due to rounding.

TABLE 6 - Weekly Containerized Residential Recycling Collection and Processing Annual Costs

Residential Recycling Containerized Routes ³	Households Served (hh's)	Tons Collected (tons)	Yards (yd3)	Cost/Yard ¹ (\$)	Total Cost ² (\$)	Cost Per Household (\$)
Burlington	4,157	503	8,381	\$29	\$56,000	\$13
Winooski, Colchester, Milton	2,103	254	4,240	\$29	\$28,300	\$13
So. Burlington, Shelburne, Charlo	2,346	284	4,729	\$29	\$31,600	\$13
Williston, St. George, Hinesburg	318	38	641	\$29	\$4,300	\$14
Essex, Essex Junction and Westfo	1,487	180	2,999	\$29	\$20,100	\$14
All Other	133	16	269	\$29	\$1,800	\$13
Subtotal:	10,545	1,276	20,990		\$142,100	\$13
Cost Per Ton:					\$111	

(1) Average monthly cost per yard of container size used for weekly collection and processing of recycling.

(2) Total costs = cubic yards collected multiplied by cost per yard, and then divided by 4.3 (collections per month).

(3) Numbers may not add due to rounding.

TABLE 7 - Estimated Annual Cost for Drop-off Households

	Households	Refuse Tons Delivered	Recycling Tons Delivered	Cost Per Ton ¹	Cost Per HH ²	Total Cost
	(hh's)	(tons)	(tons)	(\$)	(\$)	(\$)
Drop-off Collection Costs						
Drop-off Centers	9,030	5,520	3,700	\$295	\$181	\$1,630,920
Self Haul Costs	9,030				\$102	\$921,060
Subtotal:					\$283	\$2,551,980

(1) Based on 22 pounds per bag of refuse and cost of \$3.25 per bag (or 14.8 cents per pound of refuse disposed). Price of recycling is included in this cost.

(2) Annual self haul cost estimates per household as shown in Table 9.

Table 8 - Weekly Residential Refuse and Recycling Collection Annual Cost Estimates

Zone	Refuse Tons (tons)	Recycling Tons (tons)	Refuse Costs (\$)	Recycling Costs (\$)	Total Cost (\$)	Total Cost / Ton (\$)
Burlington	10,013	3,314	\$2,033,600	\$636,319	\$2,669,919	\$200
Winooski, Colchester, Milton	9,324	3,185	\$1,946,400	\$719,781	\$2,666,181	\$213
So. Burlington, Shelburne, Charlotte	8,304	2,810	\$1,747,800	\$627,676	\$2,375,476	\$214
Williston, St. George, Hinesburg	3,528	1,232	\$722,000	\$285,903	\$1,007,903	\$212
Essex, Essex Junction, Westford	5,817	1,977	\$1,248,800	\$465,377	\$1,714,177	\$220
Underhill, Jericho	2,609	925	\$594,400	\$254,486	\$848,886	\$240
Richmond, Bolton, Huntington	1,684	597	\$372,300	\$166,019	\$538,319	\$236
Subtotal:	41,278	14,039	\$8,665,300	\$3,155,561	\$11,820,861	\$214
Drop-offs:¹	5,520	3,700			\$2,551,980	\$277
Total:	46,798	17,739			\$14,372,841	\$223

(1) Includes self-haul costs.

Results Compared to Options 1-3

As shown in Tables 4-8, savings occur in both curbside refuse and curbside recycling consolidation but remain constant for drop-off users and for households in 4+ unit structures. These savings are compared against Options 1, 2 and 3² analyzed in the original report, and Tables 9 – 12 (Tables 28-31 in 2012 Report) are recreated including Option 4.

² Three options were analyzed for the original report: Option 1 - Weekly residential refuse and recycling collection only, Option 2 - Weekly residential and commercial refuse and recycling collection, and Option 3 - Every other week residential refuse and recycling collection.

Administration costs are reduced by 10% in Option 4 to account for the elimination of contracts for containerized collection routes. An estimate of \$225,000 replaces the \$250,000 administration cost estimate for Option 1, shown in Table 9.

As shown in Table 10, savings are estimated to be roughly \$3.9 million from consolidation of the 1-4 family household routes.

TABLE 9 - Comparison of Annual System Costs (From Table 28)

Estimated Costs	Baseline Total Costs ¹ (\$)	Option 1 Total Costs (\$)	Option 2 Total Costs (\$)	Option 3 Total Costs (\$)	Option 4 Total Costs (\$)
Residential					
Refuse	<i>See below</i> ²	\$8,311,600	\$8,311,600	\$7,404,100	\$8,665,300
Recycling	<i>See below</i> ²	\$3,054,600	\$3,054,600	\$2,394,000	\$3,155,561
Drop-off		\$2,551,980	\$2,551,980	\$2,551,980	\$2,551,980
Subtotal:	\$18,525,000	\$13,918,180	\$13,918,180	\$12,350,080	\$14,372,841
Commercial					
Refuse	\$6,613,200	\$6,613,200	\$5,112,800	\$6,613,200	\$6,613,200
Recycling	\$1,338,900	\$1,338,900	\$1,212,700	\$1,338,900	\$1,338,900
Subtotal:	\$7,952,000	\$7,952,000	\$6,325,500	\$7,952,000	\$7,952,100
Total System					
Refuse		\$14,924,800	\$13,424,400	\$14,017,300	\$15,278,500
Recycling		\$4,393,500	\$4,267,300	\$3,732,900	\$4,494,461
Drop-off		\$2,551,980	\$2,551,980	\$2,551,980	\$2,551,980
Total System Costs:	\$26,477,000	\$21,870,180	\$20,243,680	\$20,302,080	\$22,324,941
Administration: ³		\$250,000	\$350,000	\$250,000	\$225,000
Total Estimated Costs:	\$26,477,000	\$22,120,180	\$20,593,680	\$20,552,080	\$22,549,941

- 1) Baseline costs include the costs associated with billing and collection. Option 1 – 4 costs assume billing by the hauler but not collection of delinquent accounts. See further discussion of this in the 2012 Report under Billing and Collection on page 41.
- 2) Recycling costs embedded in refuse costs for most of residential recycling service.
- 3) Administration costs would include procurement and contract management, enforcement and addressing complaints and collection of delinquent accounts, but do not include direct billing to households and businesses.
- 4) Numbers may not calculate exactly due to rounding.

TABLE 10 - Comparison of Annual Savings From Consolidated Collection Options (From Table 29)

	Baseline	Option 1	Option 2	Option 3	Option 4
	Total Costs	Total Costs	Total Costs	Total Costs	Total Costs
	(\$)	(\$)	(\$)	(\$)	(\$)
Savings From Consolidated Collection					
Residential System Only (\$)	\$0	-\$4,606,820	-\$4,606,820	-\$6,174,920	-\$4,152,159
<i>Percentage (%) saved:</i>		-25%	-25%	-33%	-22%
Commercial System Only (\$)	\$0	\$0	-\$1,626,500	\$0	\$0
<i>Percentage (%) saved:</i>			-20%		
Total Savings (\$):	\$0	-\$4,606,820	-\$6,233,320	-\$6,174,920	-\$4,152,059
<i>Percentage (%) of System Costs saved:</i>		-17%	-24%	-23%	-16%
Total Savings including Administration Costs:	\$0	-\$4,356,820	-\$5,883,320	-\$5,924,920	-\$3,927,059
<i>Percentage (%) of System Costs saved:</i>		-16%	-22%	-22%	-15%

Table 11 - Comparison of Per Ton System Costs for Residential and Commercial Refuse and Recycling^{1, 2}
(Total Cost Per Ton of Refuse and Recycling, From Table 30)

	Baseline	Option 1	Option 2	Option 3	Option 4
	Total Costs Per	Total Costs	Total Costs	Total Costs	Total Costs Per
	Ton	Per Ton	Per Ton	Per Ton	Ton
	(\$)	(\$)	(\$)	(\$)	(\$)
Residential	\$285	\$214	\$214	\$190	\$221
Commercial	\$183	\$183	\$146	\$183	\$183
Total System:	\$244	\$202	\$187	\$187	\$206
Potential Savings (Per Ton):					
Residential		-\$71	-\$71	-\$95	-\$64
Commercial		\$0	-\$37	\$0	\$0
Total System:¹		-\$43	-\$58	-\$57	-\$38
<i>Percentage (%) saved:</i>		-17%	-24%	-23%	-16%
Admin costs/ton:	NA	\$2.32	\$3.25	\$2.32	\$2.09

- 1) Does not include administration costs which are estimated to reduce savings by roughly \$3.00 per ton managed.
- 2) Numbers may not calculate exactly due to rounding.

TABLE 12 - Comparison of Estimated Per Household Costs (and Savings) For Residential Refuse and Recycling ^{1,2,3} (From Table 31)

	Baseline Total Costs	Option 1 Total Costs	Option 2 Total Costs	Option 3 Total Costs	Option 4 Total Costs
Residential Costs Per Household	<i>(\$)</i>	<i>(\$)</i>	<i>(\$)</i>	<i>(\$)</i>	<i>(\$)</i>
Annual	\$305	\$229	\$229	\$203	\$236
Per Month	\$25	\$19	\$19	\$17	\$20
Potential Annual Savings:		-\$76	-\$76	-\$102	-\$68
Percent Savings (%):		-25%	-25%	-33%	-22%
Admin costs/household:		\$4.11	\$4.11	\$4.11	\$3.70

- 1) Does not include administration costs which are estimated to reduce annual savings by roughly \$4.00 per household.
- 2) Numbers may not calculate exactly due to rounding.
- 3) Potential annual savings under Option 4 are shown for all households, not just those subject to consolidated collection.