

RESOURCE RECYCLING

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HUB AND SPOKE, PART TWO

THE SECOND IN A TWO-PART ARTICLE LOOKS AT THE INITIAL RESULTS OF THE EXTENSIVE AND DETAILED HUB-AND-SPOKE PLAN TO RECOVER RECYCLABLES ACROSS THE LAND OF ENCHANTMENT. BY JUSTIN STOCKDALE

Efficiency, as a concept, has received much attention in relation to the greening of America. We constantly hear about how energy efficiency projects and the fuel efficiency of our cars will save us from the threat of global warming. In contrast, there is very little discussion of how system efficiency can be utilized to design effective solutions for recycling in America's far-flung places.

The New Mexico Recycling Coalition's (NMRC's) efforts to improve recycling opportunities in these rural areas are founded on principles of efficiency. Success here requires an understanding of not just where materials are handled (as discussed in part one of this article, which appeared in the November issue of *Resource Recycling*), but how they are managed as well.

In the end, recycling's challenges in rural areas are no different than recycling in a booming metropolis – what materials do we want to recycle, who has these materials, how do we gather them,

what do we do with them and, finally, who wants to buy them? While urban solutions have been explored for decades, and have brought us single-stream and automated collections, rural solutions have been given far less attention and frequently contradict what we've learned in the city. Automated cart-based collection might work in urban settings with hundreds of homes per square mile, but when the housing spreads out to one home every three miles, efficiency is out the window.

Finding efficiency in rural areas requires us to look for new solutions which utilize different tools and approaches. For NMRC, this effort started with developing a tool to help us understand what material streams we could impact and how much of these materials were out there. To understand this question of composition we designed a simple spreadsheet, affectionately known as the "Diversionator," which helps us explore recycling from the bottom up.

Impressions of collections

The Diversionator uses existing disposal data to calculate the potential tons of recoverable material based on the results of several distinct statewide waste characterization efforts, none of which were conducted in New Mexico. We have heard the argument that without N.M.-specific data this tool has very little value, but we strongly disagree. Yes, we recognize that data from Pennsylvania or Missouri cannot reflect the reality in New Mexico down to 0.01 percent. We do know, however, that a margin of error of as much 1-2 percentage points is completely acceptable when we are starting programs from scratch. Where mature programs are searching for the next point over 30 or 50 percent, we are struggling to get the first one percent recycled and, therefore, have no need for localized waste characterization analysis. Using other states' data allows us to provide a generalized picture of the waste stream, which demonstrates the clear potential for recycling.

As a tool, the Diversionator helps paint an impressionistic view of a community's recycling opportunities. Table 1 shows the Diversionator at work in McKinley and Cibola counties, New Mexico. By first calculating potential recoverable tons we can then explore the fiscal impacts of diversion, both in terms of direct material value, but, more importantly, in avoided costs. This analysis provides the community and local decision makers with a foundation to justify the investment in recycling as well as goals for recovery. We are very clear with communities that the Diversionator is a Monet and not a Rembrandt – that its real value is to demonstrate that the material is there, and with a strategic approach can be recycled with a positive fiscal outcome.

Following the trash

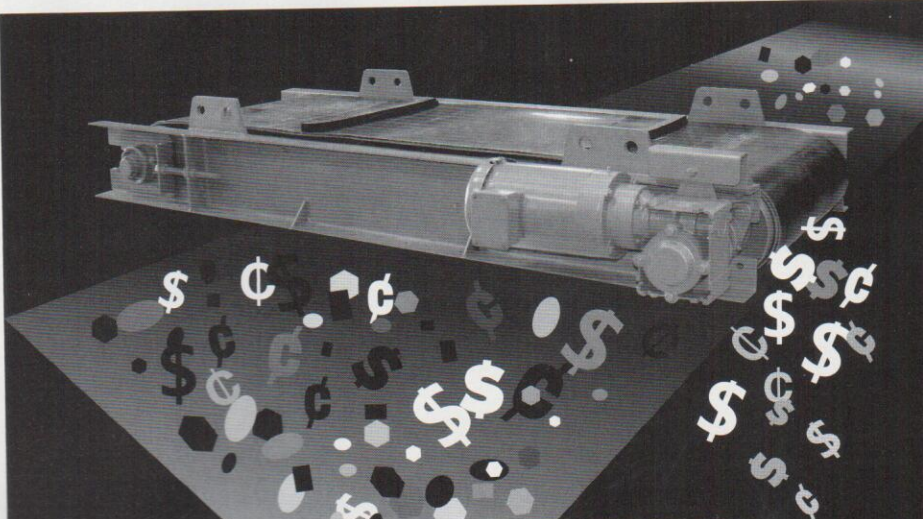
Following this understanding of what we want to recycle, we then examine where it is and how to gather it. As shown in the maps included in the part one of this article, New Mexico's solid waste system relies heavily on dispersed solid waste collection centers. As a rule, these sites are located as close to rural population centers as possible and serve as the only option for solid waste services for both residential and commercial sources. This backbone of infrastructure in the state offers a clear path for recycling collections – follow the trash. These sites are accepted as the community's solid waste disposal sites and are

the obvious and logical location for recycling collection points. By co-locating the services, we not only find efficiency for the customer, but we also build efficiency for the operator.

This approach, of adding recycling to the existing solid waste sites, also addresses NMRC's underlying goal of providing access and in this setting we achieve "equal" access for recycling. The customer is not compelled to make separate trips to different sites, they are directly encouraged to make their own choice to recycle when presented with the option and the station operator is

not faced with additional sites to manage.

With the question of where the materials are answered, we move on to how they should be collected. Again, NMRC focuses on following the trash. At locations where the solid waste system utilizes roll-offs to handle solid waste, we encourage the continued use of roll-offs for recycling. This is not simply a logical consideration, but an efficient solution as well. The material streams we are targeting are already being handled by the system, they are being gathered and hauled as MSW for disposal.



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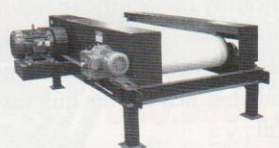
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Table 1 | McKinley and Cibola counties – recycling diversion estimates

Population served	98,009 (U.S. Census, 2008 estimates, entire county)
EPA predicted MSW	80,490 (4.5 pounds/person/day)
Disposed tons	86,105 (actual tonnage at Red Rocks Landfill, NM Environmental Department Solid Waste Report 2009 figures, 2010 report)
Diverted tons	512 (actual, N.M. Environmental Department Solid Waste Report 2009 figures, 2010 report)
Actual MSW generation	86,617 (actual, total of previous two lines)
Landfill tipping fees per ton	\$ 35.00
MSW hauling cost per ton	\$ 15.00

Low capture rate	Percent of MSW ¹	Tons generated	Estimated capture rate	Recovered tons	Estimated \$/ton (low market)	Gross value	Avoided landfill tipping fees	Avoided MSW hauling costs	Combined value & avoided costs
Cardboard (OCC)	11.00%	9,528	15%	1,429	\$50	\$71,459	\$50,012	\$21,438	\$142,918
Mixed paper (ONP#7)	10.00%	8,662	15%	1,299	\$50	\$64,963	\$45,474	\$19,489	\$129,926
Aluminum cans (UBC)	0.42%	364	10%	36	\$750	\$27,284	\$1,273	\$546	\$28,103
Tin	1.00%	866	25%	217	\$50	\$10,827	\$7,579	\$3,248	\$21,654
#1 PET plastics bottles	1.50%	1,299	10%	130	\$150	\$19,489	\$4,547	\$1,949	\$25,985
#2 HDPE plastic bottles	1.50%	1,299	10%	130	\$150	\$19,489	\$4,547	\$1,949	\$25,985
		22,018		3,241		\$213,511	\$133,442	\$48,618	\$375,571

High capture rate	Percent of MSW ¹	Tons generated	Estimated capture rate	Recovered tons	Estimated \$/ton (low market)	Gross value	Avoided landfill tipping fees	Avoided MSW hauling costs	Combined value & avoided costs
Cardboard (OCC)	11.00%	9,528	25%	2,382	\$50	\$119,098	\$83,369	\$35,730	\$238,197
Mixed paper (ONP#7)	10.00%	8,662	25%	2,165	\$50	\$108,271	\$75,790	\$32,481	\$216,543
Aluminum cans (UBC)	0.42%	364	25%	91	\$750	\$68,211	\$3,183	\$1,364	\$72,758
Tin	1.00%	866	50%	433	\$50	\$21,654	\$15,158	\$6,496	\$43,309
#1 PET plastics bottles	1.50%	1,299	25%	325	\$150	\$48,722	\$11,368	\$2,923	\$63,014
#2 HDPE plastic bottles	1.50%	1,299	25%	325	\$150	\$48,722	\$11,368	\$4,872	\$64,963
Glass bottles and jars	4.00%	3465	25%	866					
		22,018		6,587		\$414,679	\$200,237	\$83,867	\$698,783

Source: New Mexico Recycling Coalition, 2011.

Adding recycling as an alternative does not “generate” any more material than is currently being managed, and hence should not significantly impact the transportation costs of the system. The only real shift is that the recyclables are now in a different container, and are destined for the hub instead of the landfill.

In some cases NMRC has found that roll-off capacity is limited, or is controlled by costly third parties. In these locations, NMRC has recommended recycling collection trailers which can be hauled by the community with a pick-up truck to the regional hub. In all of these cases, the rural

community finds this strategy appropriate as someone is “headed to town” on a regular basis, and the transport is tagged onto to an already planned trip, again finding efficiency everywhere we can.

The sortation question

A second half of how we gather materials begs the question, to sort or not to sort? In urban areas it is clear that single-stream collections supported by multi-million dollar sorting facilities are the most efficient approach to a successful recycling program. However, with limited tonnages in rural areas, the expense of

sorting facilities is simply out of the question. This is not perceived as a problem by NMRC, however, but as an opportunity to make people aware of the waste they create. We have designed our program as a strictly source-separated effort, where the user is responsible for sorting their recyclables. This strategy not only takes advantage of the user’s free labor, but it brings wasting into focus for the user; they become directly aware of what they are consuming in relation to what is, in fact, recyclable. For all that single-stream collection and processing affords in system efficiency, it misses this critical opportunity to truly engage the consumer about waste.

Processing efficiency

Once we confirmed the collection methodology, NMRC turned its attention to processing the materials and the design of the hub facility. The hub not only has to be effective at producing marketable materials, but it has to perform efficiently to ensure that recycling is not quickly targeted as a fiscal boondoggle. The critical design elements include the need for loose material storage, bale storage, truck load-out operations and baling.

The cornerstone of our solution to hub efficiency was the use of small horizontal balers with in-ground feed conveyors. The in-ground feed allows an operator to simply push material to the baler without having to scoop and dump. The baler placement is also critical to the success of the hub and the operational flexibility to handle varying volumes of different materials. We expected cardboard to be our highest-volume material and knew we had to ensure a direct feed option to support it. Again, we strove to handle the material as minimally as possible.

The hub employs a "bunker" system to contain other loose materials, built of high-way barriers and chain-link fencing. The barriers are readily available from regional Department of Transportation facilities, and the fencing provided an economical solution to material containment. As materials are delivered to the hub, they are unloaded into the appropriate bunkers until a bale-equivalent volume is amassed. The bunkers are scaled to accommodate the varying volume requirements per bale of each material, and are movable to allow flexibility and changes in material streams.

Once a specified volume of a given material is collected, the operator, using a skid loader, pushes the material to the baler with no need to lift, turn or otherwise complicate the process. While it may seem that a scoop-and-dump approach is not so much of a burden, we know that the simpler the process, the more readily the staff will accept it.

With the process established, NMRC developed a conceptual design to accom-

Figure 1 | The near-complete hub facility at the Estancia Valley Regional Landfill



Source: New Mexico Recycling Coalition, 2011.

modate it. A footprint of 75 feet by 65 feet was established as sufficient to house this basic operation. The baler infrastructure is designed as a 45 feet by 75 feet, three-side pole barn, with the bunkers filling two-thirds of the open side. A roll-up door is placed on each of the short sides, with one

serving as the tipping area for cardboard to be directly fed to the baler, and the other to provide access to a loading ramp for shipping. All baled materials are stored inside the structure, adjacent to the load out door to limit travel and to maintain quality. Figure 1 shows a near-complete hub facility

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For outreach, each their own

NMRC is also employing what one might call “knowledge efficiency.” When programs share needs, yet resolve these needs independently, one must assume there is an inherent wasting of resources, time and energy. To create knowledge efficiency, NMRC has pursued these infrastructure developments beyond equipment and has tackled outreach and education programming as well.

We have developed new outreach campaigns which are tailored to specific communities, yet are all based on common templates. These efforts include collection-area signage (see Figure 2) and print materials (see Figure 3). This strategy not only limits the demands on local communities, but it also offers an opportunity to brand recycling across the state. Residents will find consistent messaging across the state which NMRC expects will make recycling that much easier.

In our terms, efficiency is not the automation of services once performed by human hands, efficiency is a cornerstone element of our strategy to bring recycling to communities with limited resources, industry knowledge and a fear that recycling cannot succeed in rural places. Efficiency is considered in every aspect of our work and allows us all to do more with less. RR

Justin Stockdale is the technical projects director for the New Mexico Recycling Coalition. He can be reached at justin@recyclenewmexico.com.

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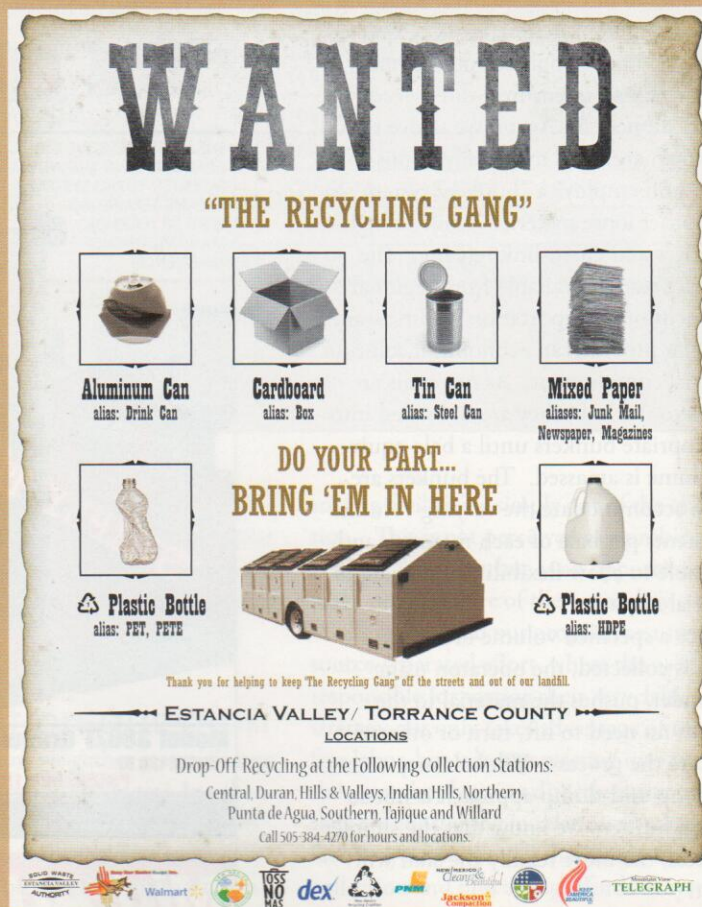
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Figure 2 | Signage



Source: New Mexico Recycling Coalition, 2011.

Figure 3 | Print materials



Source: New Mexico Recycling Coalition, 2011.