Wyoming Solid Waste Diversion Study

Conducted by LBA Associates

Commissioned by the

Wyoming Department of Environmental Quality

January 3, 2013

EXECUTIVE SUMMARY

The Wyoming Department of Environmental Quality (WDEQ) commissioned a Statewide Study of Waste Diversion (Study) to collect data and information on waste diversion, to evaluate existing barriers for waste diversion, and to identify strategies and make recommendations to improve the overall rate of waste diversion in Wyoming. The Study focused on public and non-profit diversion of paper and container recyclables, yard and wood waste, tires and construction/demolition debris. The Study recommends actions for advancing waste diversion by implementing local and regional system improvements, by evaluating potential funding and grant options, and by improving state-level support. The Study outcomes have been developed to provide ready-to-use data and on-the-ground guidance for local, regional and state leaders alike. Specific components of the Study include:

- Evaluation of current Wyoming waste diversion quantities
- Identification of significant waste diversion barriers
- Implementation and cost analysis for key programs, infrastructure & policy
- Recommendations of key improvement strategies

These components have been developed to support future waste diversion on a statewide level, and to provide stand-alone strategies that can be used by local and regional waste managers. The Study in part uses information obtained from the state-wide integrated solid waste management (ISWM) planning process, and was completed with the assistance of local community waste managers who provided information and data on current waste diversion and recycling systems. It is believed that, if implemented, the approaches proposed in the Study would allow for increased waste diversion at local and regional levels, and give state government and other organizations roles and tools to support and grow waste diversion activities in Wyoming.

The Wyoming Study of Statewide Diversion was commissioned by the Wyoming Department of Environmental Quality using funds appropriated by the Wyoming Legislature. LBA Associates, Inc. was contracted by the Department to undertake the study with WDEQ input and oversight. Any recommendations made or conclusions reached in the study are those of LBA Associates, Inc., and not necessarily the State of Wyoming.

Current Status of Waste Diversion in Wyoming

In 2010, the Study baseline year, about 1 million tons of solid waste was managed in Wyoming. Approximately 85% was disposed, while 7% was recycled and 8% composted. Each Wyoming citizen generated about 6 pounds of municipal solid waste each day and about 19% of this was diverted. When non-municipal solid waste streams (e.g., commercial/industrial wastes) were added to the municipal solid waste stream, approximately 9 pounds of waste were generated per person per day and the waste diversion rate was reduced to approximately 15%.

In the baseline year of 2010, there were approximately 45 active, operating landfills for the disposal of municipal solid waste. As the comparative cost of landfilling is an important component in determining the feasibility of diversion programs, the Study estimated average landfill disposal costs. Future disposal costs within the ten (10) planning areas established during the state-wide ISWM planning process are projected to range from $60 to $100 per ton, with an average of $73 per ton. The Study notes that these costs are likely underestimated as some landfill improvement estimates have increased since 2010 and other facilities could not report total costs. The Study recommends that on-going data collection of disposed and diverted waste be implemented to better inform decision-making regarding the viability of

waste diversion programs.

The Study identified numerous, decentralized diversion programs within the ten (10) ISWM planning areas. These programs are diverse with respect to size, materials accepted, material management approaches, ownership and operation. As of 2011, there were approximately 38 recycling collection drop-site programs, 18 organic waste (yard and/or wood waste) drop-site programs, 7 municipally operated recycling collection programs, and 12 commercially operated recycling collection programs. Material processing at these sites ranges from simple collection to full-scale processing (e.g., sorting and baling) to mulching and composting of organics.

Wyoming has a limited number of end-markets for diverted materials, which requires many waste diversion program managers to rely on intermediate brokers to aggregate, process, transport and sell materials to distant markets. As most final markets are located out of state, revenue earnings are largely off-set by increased hauling costs. The Study underscores the importance of understanding broker and market opportunities as they are critical to determining factors (i.e., materials collection, processing, transportation, costs and revenues) that will support the shift from decentralized to regional programs.

Existing Barriers to Waste Diversion

As a rural state, Wyoming has a number of barriers and obstacles to waste diversion, including low quantities and the long hauls to markets noted above. For the Study, Wyoming waste diversion managers assisted in developing a comprehensive list of existing barriers in three broad categories - markets, implementation and policy. Market barriers include the lack of developed markets, problems related to understanding and recognizing market opportunities, and the lack of coordination of market information. Implementation barriers include local planning obstacles (e.g., limited demonstration of benefits, low levels of public awareness, scarce regional development options and high transportation costs) and equipment and infrastructure needs (e.g., lack of information sharing including designs and costs for waste diversion systems/programs). Policy barriers cited the lack of policy and resources to support and incentivize waste diversion, limited guidance and funding, lack of mandates for waste diversion and the lack of true disposal cost and material quantity data.

The Study identified and evaluated a short-list of key collection, processing, policy, resource and funding recommendations as well as implementation strategies that can be further evaluated by program managers, the state and other stakeholders to address waste diversion barriers and obstacles.

Key Findings of the Study

- The solid waste diversion rate in Wyoming is approximately 15% - this could be raised to at least 30% (national diversion rate average) through regional collection & processing programs
- Numerous, decentralized & low-quantity diversion programs earn low to no revenues - costs could be reduced and revenues increased through regionalization (e.g. hub & spoke systems)
- Wyoming lacks in-state markets due to its rural character & low generation rates of divertible materials - the availability of in-state markets may be improved through regional collection & increased state support of waste diversion activities
- As modeled, the cost of most waste diversion programs are variable but are generally lower than the average landfill disposal cost (which is expected to exceed $73/ton)
- Improving waste diversion activities could create as many as 200 new full-time jobs in Wyoming

Recommendations and Implementation Strategies

To improve waste diversion in Wyoming, the Study recommends specific strategies for material collection, regional processing, policies, expanded state leadership, and grant and funding options.

Collection Strategies

The Study evaluated three collection strategies to improve waste diversion at the local level. The first strategy was drop-off center collection for recyclables, yard and wood waste (centers ranging from just under 1,000 to 3,000 tons/year were considered). Drop off centers for recyclables are common in Wyoming and fit well where population and housing density are low. The ability to source separate materials requires less processing and may generate higher revenues than those earned from commingled materials collected from curbside collection. The primary on-going cost, once a center is established, is transportation to downstream processors.

The second collection strategy was diversion of recyclables at schools (small programs of less than 1,000 tons/year were evaluated). The Study concludes that school diversion is relatively easy and can be beneficial in educating children about recycling. Such a program would rely on student, teacher and staff education. On-site organics recovery (yard waste composting) could be a natural expansion of the initial recycling program.

The final collection strategy focused on recycling at multi-family housing units (again, small sub-1,000 ton/year programs were evaluated). This recycling opportunity is relatively untapped and is challenged by motivating residents to participate, finding adequate collection and storage space and obtaining adequate hauler services.

Regional Processing Strategies

The regional processing option evaluated in the Study is expected to divert the most materials, generate the most sustainable revenues and create the most jobs for Wyoming. Regionalizing materials recovery facilities, regional yard and wood waste composting facilities and regional mobile processing equipment was emphasized as an important means for rural communities to share processing and transportation costs, and improve market leverage by aggregating greater amounts of diverted materials. These types of systems have been implemented in other rural states and Wyoming could benefit from their experiences in organization and financing.

A materials recovery facility (MRF) receives, processes, sorts and typically bales diverted recyclables. The Study assumed the MRF would be the heart of a "hub and spoke" operation provided with primarily source-separated materials from satellite collection centers and would be sized to serve an average ISWM planning area, processing from 7,000 to 18,000 tons/year. Given the Study analysis, it is possible recycling rates of up to 40% could be obtained by 2020. The benefits identified for a MRF hub and spoke system were:

- Increased transportation efficiencies through baling of recyclables
- Reduced operating costs by managing increased material tonnages
- Better market leverage from improved material quantity and quality

To achieve maximum diversion rates and afford all communities (small and large) recycling opportunities, a regional hub and spoke system is a key option for waste diversion statewide. This system has been adopted with success in neighboring states and would allow for greater diversion of materials through the use of shared equipment and by aggregating materials to achieve better market pricing. As specification of balers for collection sites and MRF operations is challenging, the benefits of various equipment options is also provided.

The regional yard and wood waste composting facility was evaluated for small- (1,000 ton/year) and medium-sized (4,000 ton/year) facilities that receive an equal mix of yard waste and wood waste. Some considerations for a regional composting facility included:

- Many Wyoming communities aren't currently served by yard waste composting facilities that are actively managed
- These facilities can divert significant quantities of waste from landfill disposal
- Local markets for the final compost materials do not yield high revenues - facility tip fees are typically required, although they are expected to be less than half of estimated landfill disposal costs
- Bio-solids & other organics could also be composted with yard and wood waste, but may present operational challenges

For purposes of the Study, regional processing equipment considered aggregate crushers, wood grinders and tire shredders. Crushed aggregate can be used in road applications and as clean fill. Ground wood can be used in landscaping, composting and reclamation. Tire shreds reduce the overall volume for any management options (reuse of tire shreds in Wyoming is currently limited). Shared use of equipment could reduce operational costs, but ownership and operation challenges need to be considered. Due to the high cost of processing equipment and low quantities generated locally, regional ownership of equipment should be considered. Contracting for equipment may be a simple, low cost alternative to ownership as well.

Policy Recommendations

The Study evaluated four policy strategies, including a state ban on yard waste disposal, development of state beneficial use guidance, local pay-as-you-throw programs and state requirements for data collection and reporting on waste diversion.

A ban on yard waste disposal can significantly increase the operating life of a landfill. However, before a ban on yard waste disposal could be implemented, adequate state-wide infrastructure would be needed to manage and market (use) the diverted material. Consideration also should be given to appropriate exemptions or waivers for communities finding it difficult to manage yard waste once it is banned.

Beneficial use guidance encourages waste diversion by exempting some materials from the permitting process when used beneficially and in a manner protective of human health and the environment. WDEQ is currently developing guidance and the Study recommends the guidance describe appropriate beneficial uses of pre-approved materials, describe the application procedure and develop a compliance strategy. Asphalt shingles were used in the Study as a beneficial use example.

A local pay-as-you-throw (PAYT) program applies variable rate pricing to customers based on the amount of waste disposed and diverted – the more disposed, the greater the customer cost. Local communities would need to take responsibility for developing PAYT programs. As an example, the City of Cheyenne currently implements a PAYT program.

Data collection and reporting is important to local and regional waste diversion programs and could include data on participation levels, material quantities and quality, environmental benefits and impacts, job creation, and diversion program costs and revenues. The Study recommends mandatory disposal and diversion quantity data collection and reporting. Routine collection and analysis of such data could identify successes or where improvement is needed. Data collection is also seen as an important tool for market development purposes.

Expanded State Leadership Roles

The Study considered expanded leadership roles for WDEQ and the Wyoming Solid Waste and Recycling Association (WSWRA) as pivotal to all other diversion activities. The report recommends increased WDEQ staff resource and funding to support waste diversion activities and initiatives including data collection, grant programming and public outreach. The Study recommends an enhanced WSWRA role that will likely require growth in the organization's membership base to support a strong industry leadership role as well as the development of state policy (i.e., legislative advocacy). WSWRA and WDEQ should provide support and leadership to Wyoming's core waste diversion organizations and stakeholders.

Specifically, the Study identified the need for a total of two full-time staff at WDEQ dedicated to waste diversion activities. The Study further estimated the likelihood that WSWRA may require at least a half-time staff person to lead membership service, fundraising and advocacy programs.

Grant and Funding Options

Currently, there are funding sources potentially available to qualifying programs, although to date most are not commonly used to support waste diversion in Wyoming. They include the Office of State Lands and Investment grants and loans; Wyoming Business Council grants and loans; local funds, including property, specific purpose excise and special district taxes; and federal funding (primarily USDA Rural Development grants).

Given the competitive nature and limited funding of existing grant and loan options, the Study recommends the establishment of a state grant program to support waste diversion programs and infrastructure. Considered critical to future local and regional programs and infrastructure, a grant program capable of providing at least $1M/year (2012$) to public, private and non-profit organizations was evaluated. The Study acknowledged the need for legislation to implement this program and suggests possible funding sources including a state-wide solid waste tipping fee surcharge.

The surcharge was subsequently evaluated in terms of funding a state waste diversion grant program and supporting resources - this equates to approximately $2.25/ton based on expected solid waste disposal quantities.

Conclusions

The State of Wyoming is currently undergoing changes with respect to solid waste management practices (primarily related to landfill disposal). Recently completed statewide ISWM planning showed that waste management costs throughout the state are increasing due to a number of factors. As a result, many communities have begun the process of closing small local landfills and shipping wastes to larger regional sites to achieve an economy of scale as a cost control measure. Waste diversion needs to become an important component in this effort to:

- Better manage environmental resources in Wyoming and beyond
- Reduce the quantity and cost of waste shipment and disposal
- Create good paying jobs (up to 200 jobs would be created through implementation of the options evaluated in the Study)

To address this need, this Study recommends that at a minimum:

- Local/regional governments, non-profit & private organizations be encouraged to utilize the appropriate Study findings to regionalize their waste diversion programs & facilities, to implement hub and spoke systems & to support state-level funding & policy issues
- On some level, all stakeholders should offer legislative solutions to implement a state-wide grant program & supporting resources as well as collect quantity data
- Both WDEQ & WSWRA should provide effective leadership and outreach within the Wyoming solid waste industry

This Study is the first step towards increased diversion in Wyoming and provides tools for state, regional and local professionals and elected officials to begin that journey.

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LIST OF ABBREVIATIONS

ADC	Alternative daily cover
ARK	ARK Regional Services (community service organization)
ASTSWMO	Association of State & Territorial Solid Waste Management Officials
BOD	Board of Directors
BU	Beneficial use
BUD	Beneficial use determination
CAFR	Colorado Association for Recycling
CDBG	Community Development Block Grant
CDPHE	Colorado Department of Public Health & Environment
CF	Cubic feet
CFP	Community Facilities Program
CHaRM	Center for Hard-to-Recycle Materials (Boulder, CO facility)
CES	Community Entry Services (community service organization)
C&D	Construction and demolition debris
C:N	Carbon to Nitrogen ratio
CY	Cubic yards
DOC	Drop-off center
DSI	Diversified Services, Inc. (private recycling in Torrington)
E-Waste	Electronic waste
EPA8	U.S. Environmental Protection Agency Region 8
EPR	Extended producer responsibility
FTE	Full-time equivalent
H&S	Hub-and-spoke
HDPE	High-density polyethylene
HHW	Household Hazardous Waste
HP	Horsepower
HTR	Hard-to-recycle (materials)
ILSR	Institute of Local Self-Reliance
IRC	Investment Ready Communities
IRS	Internal Revenue Service
ISRI	Institute of Scrap Recycling Industries, Inc.
ISWMP	Integrated Solid Waste Management Planning Program (WDEQ program)
JPA	Joint powers authority
LBA	LBA Associates, Inc. (WDEQ contractor)
LBS	Pounds
LCSR	Lincoln County Self-Reliance (community service organization)
LDPE	Low-density polyethylene
MCE	Magic City Enterprises (community service organization)
MFU	Multi-family units
MOU	Memorandum of understanding
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste
NA	Not available
NDSWRA	North Dakota Solid Waste & Recycling Association
NERC	Northeast Recycling Coalition
NMRC	New Mexico Recycling Coalition
NRC	National Recycling Coalition
NSRA	Nebraska State Recycling Association

O&M	Operating and Maintenance
OCC	Old corrugated cardboard
ONP	Old newspaper
OMG	Old magazines
OSLI	Office of State Lands & Investment
PAYT	Pay-as-You-Throw
PPAB	Pollution Prevention Advisory Board (Colorado's CDPHE)
PET	Polyethylene terephthalate
PPCD	Pounds per person-day
PS	Product stewardship
PSR	Pacific Steel & Recycling (private recycler in multiple locations)
PVC	Polyvinyl chloride
PVR	Powell Valley Recycling (non-profit organization)
RENEW	Rehabilitation Enterprises of Northeastern Wyoming (community service organization)
RM	Recycle Montana
RONA	Recycling Organizations of North America
RPA	Regional Planning Areas (WDEQ's state-wide planning areas)
RREO	Recycling Resources Economic Opportunity (CO grant program)
SDSWMA	South Dakota Solid Waste Management Association
SEP	Supplemental Environmental Project
SF	Square feet
SFU	Single-family unit
SHWC	Solid & Hazardous Waste Commission (Colorado's CDPHE)
SHWD	Solid & Hazardous Waste Division (Wyoming's WDEQ)
SLC	Salt Lake City
SLIB	State Loan & Investment Board
SPET	Specific Purpose Excise Tax
SRC	State Recycling Coordinator
SRF	State Revolving Fund
SWANA	Solid Waste Association of North America
TPH	Tons per hour
TPY	Tons per year
UAACOG	Upper Arkansas Area Council of Government
UBM	Used building materials
URI	Uinta Recycling, Inc. (non-profit organization)
USEPA	US Environmental Protection Agency
UW	University of Wyoming
WACO	Wyoming Association of Counties
WAM	Wyoming Association of Municipalities
WBC	Wyoming Business Council
WDAI	Wyoming Department of Administration & Information
WDO	Waste diversion organization
WDEQ	Wyoming Department of Environmental Quality
WSWRA	Wyoming Solid Waste & Recycling Association
WYDOT	Wyoming Department of Transportation

PART I
EXISTING WYOMING SOLID WASTE SYSTEM & PROJECTED QUANTITIES

This part of the Study report provides a description of existing conditions in 2010 that serve as the baseline for future waste diversion efforts in Wyoming. It summarizes current recycling and organics recovery programs operated by local government and non-profit organizations, and evaluates secondary materials markets for recyclables. Disposal tons, diversion tons and diversion percentages are tabulated - and estimated landfill disposal costs are provided as a comparison against future diversion costs. Finally, an evaluation of existing barriers to waste diversion are presented together with options for improving waste diversion state-wide. Once prioritized, these options are evaluated in Part II.

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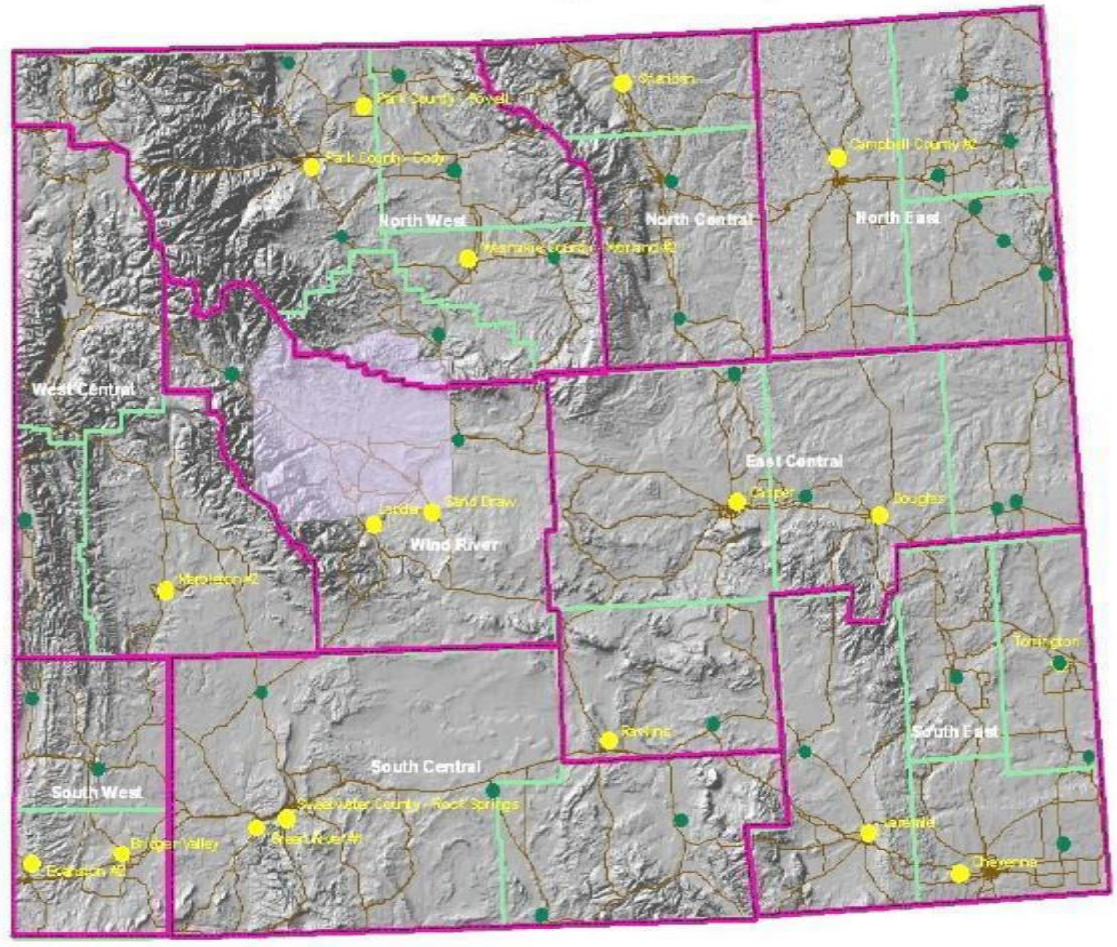
1.0 INTRODUCTION

The Wyoming Department of Environmental Quality (WDEQ) has completed an Integrated Solid Waste Management Planning process (ISWMP) that began in 2006 and focused on assessing the future of the state's landfills. This effort was organized through 10 regional planning areas (RPAs), that covered the state and generally accounted for waste flow between communities and existing landfills (see Figure 1-1). The planning work also addressed waste reduction and recycling, although not all plans produced by the RPA's included future waste diversion planning.

FIGURE 1-1 2010 ISWMP REGIONAL PLANNING AREAS (RPAs)



As a result, WDEQ undertook the Wyoming Statewide Study of Waste Diversion (Study) to advance the diversion of recyclables and organics as a way to achieve the associated benefits of:

- Conserving Wyoming's natural resources & protecting its environment
- Extending existing landfill life
- Improving economics associated with waste management

The Study evaluates current barriers to waste diversion and explores ways to overcome those barriers and increase diversion in an environmentally and economically sustainable manner. WDEQ contracted with LBA Associates, Inc. to complete this study. This report is organized into the following sections:

- **Part I Existing Solid Waste System & Projected Quantities** - describes existing program & quantity conditions, & project generated/diverted quantities over the short- & long-term planning period
- **Part II Priority Collection Options** - evaluates drop-site, school & multi-family collection program options
- **Part III Priority Processing Option**s - evaluates regional processing options including hub-and-spoke materials recovery, baling plastics, yard/wood waste processing & mobile equipment processing
- **Part IV Priority Policy Options** - evaluates regional collaboration, a state-level yard waste disposal ban, beneficial use guidelines, mandatory data collection & local pay-as-you-throw trash pricing
- **Part V Priority State-Level Resources** - including state agency & Wyoming Solid Waste and Recycling Association (WSWRA) roles in increased diversion & a waste diversion grant program
- **Part VI Funding Opportunities** - includes existing & potential future funding opportunities including a state-wide tip fee surcharge option
- **Part VII Observations & Recommendations** - which provides final Study observations, job creation summary and recommended next steps the WDEQ can follow to implement the Study results

1.1 Study Purpose & Outcomes

The purpose of the Study is to assist local, regional and state governments, as well as other organizations, to collectively increase waste diversion throughout Wyoming by 2020. This challenge has been undertaken through interviews with program managers, by identifying current diversion barriers and by breaking down those barriers with the most feasible and practical options.

The end results, detailed in this Study, include a priority list of collection, processing, policy and state resource options that can be made at various organizational levels to increase waste diversion - primarily through recycling and organics recovery. These options are detailed in a manner that will facilitate implementation and described in terms of expected diversion and cost outcomes. In order to make implementation realistic, funding sources (both current and future) are evaluated and final recommendations for Wyoming's necessary next waste diversion steps are provided.

1.2 Targeted Waste Streams

This Study focuses waste diversion efforts on both the municipal solid waste (MSW) and non-MSW components of the solid waste stream. Several materials are specifically targeted because their diversion is considered to yield a "big bang for the buck" in terms of overall statewide diversion. These include:

- Recyclables including paper, containers, scrap metal & tires
- Yard and food waste organics
- Construction and demolition debris (C&D)

The intent of these results is to provide Wyoming governments, recycling businesses, WDEQ, WSWRA, and interested waste diversion entrepreneurs with clear waste diversion strategies that can be put in place as needs and opportunities evolve across the state.

1.3 Planning Horizons

The Study established 2010 as the baseline year. The baseline year waste quantities and programs were subsequently compared against future diversion opportunities. The Study considered both a short-term planning horizon through year 2015, and a long-term horizon through year 2020.

2.0 EXISTING SOLID WASTE PROGRAMS

The information reported in this section was collected through a series of site visits and staff interviews to public and non-profit recycling operations during the spring of 2011.

2.1 2010 Solid Waste Quantities

Disposal and diversion quantities are important for establishing a planning baseline, tracking progress and allocating resources for meeting goals. Data collected for the 2010 calendar year was used to establish the solid waste baseline for this Study, and to estimate diversion benefits for options analyzed in Parts II through V of this report.

Wyoming Population

Population data is needed both to interpret current quantities (such as pounds generated per person-day) and to project future quantities. The data in Table 2-1 includes findings from the 2010 census.

TABLE 2-1 2010 REGIONAL PLANNING AREA (RPA) POPULATION

RPA	COUNTIES	POPULATION[a]
Big Horn Basin	Big Horn, Hot Springs, Washakie	25,013
East Central	Carbon (eastern), Converse, Johnson (south) Natrona, Niobara	104,989
Eastern	Goshen, Platte	21,916
I-80	Carbon (western), Sweetwater	46,983
North Central	Campbell, Johnson (north), Sheridan	83,304
North East	Crook, Weston	14,291
Park	Park	28,205
South East	Albany, Laramie	128,037
Western	Lincoln, Sublette, Teton, Uinta	70,765
Wind River	Fremont	40,123
TOTALS		**563,626**

[a] US Census Bureau, "Profile of General Population and Housing Characteristics: 2010" (includes 2010 census data, can be found at http://eadiv.state.wy.us/demog_data/pop2010/Profile/2010Profiles_WY.html)

Existing Solid Waste Quantities

Table 2-2 (next page) summarizes the diversion of recyclables and organics) and disposed (refuse) quantities of both MSW and non-MSW reported by planning entities in each of Wyoming's ten RPAs (Appendix A includes baseline quantities for each entity). The 2010 data collection effort is a reasonable representation of disposed MSW and non-MSW quantities diverted by local government and non-profit programs (quantities diverted through private recyclers were not fully captured)[1].

[1] Due to its connection with the ISWMP, the Study focused on solid waste programs operated by RPA planning entities - materials that were not routinely tracked by public program managers (such as sporadic industrial wastes) were not consistently captured by this Study. There is no consistent reporting of disposed or diverted wastes required by local or state governments in Wyoming.

TABLE 2-2 2010 WYOMING SOLID WASTE QUANTITIES BY REGIONAL PLANNING AREA[a] (rounded to nearest 100 tons)

RPA	MUNICIPAL SOLID WASTE (tons/year)			NON-MUNICIPAL SOLID WASTE (tons/year)		TOTAL WASTE GENERA-TION RATE (ppcd)[b]	WASTE DIVERSION RATE[c]
	Recy-clables	Organ-ics	Refuse	Recy-clables	Refuse		
Big Horn Basin	700	0	21,400	0	2,300	5.3	2.8%
East Central	7,200	4,400	116,900	0	42,500	8.9	6.8%
Eastern	1,300	0	29,000	0	700	7.8	4.2%
I-80	6,700	2,000	57,500	7,400	29,700	12.1	15.6%
North Central	7,300	13,700	67,300	1,300	23,400	7.4	19.7%
North East	400	0	8,100	0	2,800	4.3	3.6%
Park	4,000	3,800	12,900	0	59,300	15.5	9.7%
South East	8,100	36,400	89,900	5,400	83,500	9.6	22.4%
Western	7,100	6,700	63,000	4,600	16,400	7.6	18.9%
Wind River	1,800	1,000	31,400	0	10,400	6.1	6.3%
Totals	**44,600**	**68,000**	**497,200**	**18,800**	**270,900**		
	Total MSW = 609,800 tpy			**Total Non-MSW = 289,700 tpy**		**Avg Total Generation Rate = 8.7 ppcd**	**Avg Total Diversion Rate = 14.6%**
	Total Solid Waste = 899,500 tpy					**MSW Only Generation Rate = 5.9 ppcd**	**MSW Only Diversion Rate = 18.5%**

[a] Reflects primarily public programs (private programs were not fully reported) - rounding errors may occur; quantities less than 50 tons reported as 0; some tons diverted by private recyclers not included
[b] Generation rates reported as pounds per person-day (rates based on population values in Table 2-1)
[c] Diversion rates reported as percent by weight

It is therefore expected that the Table 2-2 quantities underestimate actual diverted quantities. If missing quantities could be added to Table 2-2, Wyoming's total solid waste stream likely would approach one million tons in 2010, instead of the nearly 900,000 tons shown below.

Several key observations can be made from the 2010 quantity data:

1. The MSW/non-MSW split appears to be 68% MSW & 32% non-MSW - however, the MSW fraction may be falsely high as an average indicator as many planning entities may have failed to fully count C&D and industrial wastes, or counted them as MSW (the 2010 economy was also in a recession with reduced C&D-related activities).

2. Average RPA waste generation rate of 8.7 ppcd reflects both MSW and non-MSW tons - the MSW generation rate was 5.9 ppcd, which compares to a national average of 4.4 ppcd of MSW generated[2].

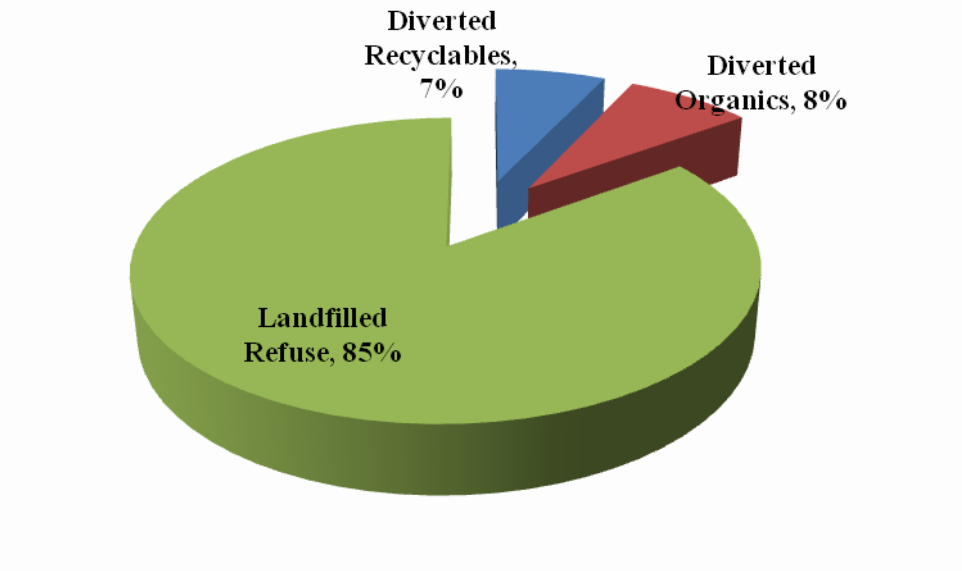
[2] USEPA, "Municipal Solid Waste Generation, Recycling and Disposal in the United States: Facts and Figures for 2010".

3. Average waste diversion rate for all RPAs was 14.6% of the total waste stream - the average MSW diversion rate for all RPAs was 18.5% (which compares to a national average of 34%[2]).

2.2 Existing Diversion Programs

Wyoming governments and non-profit organizations own and operate a myriad of diversion programs around the state. Most of these programs service their immediate communities. Recyclables programs focus primarily on collection and brokering to out-of-state markets. Organics recovery programs include infrequent yard and waste collection and composting activities. Figure 2-1 illustrates the relative quantity of diverted to disposed materials (by weight) reported for Wyoming's 2010 total waste stream.

FIGURE 2-1 2010 WYOMING TOTAL SOLID WASTE STREAM



Recycling & Organics Recovery Programs

Table 2-3 (pages 2-4 through 2-5) includes the types of waste diversion programs reported by the planning entities (the table includes mostly public and non-profit programs[3] and is not meant to be inclusive of every diversion program in Wyoming).

[3] A large number of community service organizations provide recycling services throughout Wyoming (many combine recycling with providing jobs for their physically and mentally challenged clients - examples include ARK Regional Services, Community Entry Services and Magic City Enterprises.

TABLE 2-3 WYOMING DIVERSION PROGRAMS BY REGIONAL PLANNING AREA[a]

	RPAS/PLANNING ENTITIES	RECYCLABLES DROP-OFF	RECYCLABLES CURBSIDE COLLECTION	PROCESSING
Big Horn Basin	Big Horn County	X		
	Thermopolis	X		
	Washakie County #1	X	Commercial	Baling
	Washakie County #2	X		
East Central	Casper	X (plus organics)	Commercial	Mulching, composting
	Douglas	X (plus organics)		Mulching, composting
	Glenrock	X		
	High Country	X		
	Lusk	X (plus organics)	Commercial	Baling, (composting)
	Rawlins	X		Baling
	Salt Creek	X		
Eastern	Wheatland	Organics		
	Guernsey	Organics		
	Torrington	X (plus organics)		Composting
	LaGrange	Organics		
I-80	Baggs	X		
	Eden	X		
	Green River	X (plus organics)	Commercial	(Composting)
	Sweetwater County #1	X (plus organics)	Residential & Commercial	Baling, composting
	Sweetwater County #2	X		
	Upper Platte River	X		
North Central	Buffalo/Johnson County	X (plus organics)	Res (plus organics) + Com	Baling, composting
	Gillette/Campbell County	X (plus organics)	Res (plus organics) + Com	Baling, composting
	Sheridan	X (plus organics)	Commercial	Baling, composting
North-east	Moorcroft	X		
	Newcastle	X (plus organics)	Commercial	Baling, composting
	Sundance	X	Residential	
	Upton	X		
Park	Cody	X (plus organics)	Commercial	Baling, (composting)
	Meteetsee	X		
	Powell		Commercial	
South Eastern	Cheyenne	X	Res (plus organics) + Com	Sort/bale, composting
	Eastern Laramie County	X (plus organics)		
	Laramie	X	Residential	ARK sort/bale, composting
West-ern	Lincoln County	X		
	Sublette County	X		Baling

	RPAS/PLANNING ENTITIES	RECYCLABLES DROP-OFF	RECYCLABLES CURBSIDE COLLECTION	PROCESSING
	Teton County	X (plus organics)		Baling, composting
	Uinta County	X (plus organics)		(Composting)
Wind River	Dubois	X		
	Lander	X		
	Sand Draw/Riverton	X (plus organics)	Residential (plus organics)	Baling, (composting)
	Shoshoni	X		

[a] Res = residential/homes; Com = commercial/businesses & institutions; Composting = active composting; (composting) = passive composting

General observations on existing programs are listed below.

Collections

1. Drop-off center (DOC) collection:
   - Some DOCs are stand-alone facilities while others are co-located with landfills
   - Some programs accept only one material (such as metals) while others collect a wide range of traditional materials
   - Some programs accept "fringe" recyclables such as plastic resins #3 through #7 (Sheridan, Cody, Powell, Cheyenne, Lander & Riverton), Styrofoam (Sheridan & Powell) & film plastic (Green River, Sublette County & Teton County) - others also collect asphalt & concrete (Lusk, Green River, Sweetwater County #1, Cheyenne, Eastern Laramie County & Uinta County)

2. Curbside collection:
   - Some of the residential curbside recyclables collection programs are now single-stream (Cheyenne, Laramie, Gillette/Campbell County and Sheridan is testing single-stream in 2012) - other multi-material programs include Rock Springs, Riverton & Sundance
   - Most notable are the residential curbside yard waste collection programs in Casper, Cheyenne & Gillette

3. Commercial collections were generally limited to cardboard - Some programs (such as Washakie County Solid Waste Disposal District #1 & the ARK collections in Laramie) collect other fiber materials as well.

4. Collected organics vary by program - Typically including green waste/branches/limbs, wood & manure:
   - Some programs included biosolids (Gillette, Sheridan & Laramie - Casper operates separate yard waste & biosolids composting operations)
   - Teton County's compost program included dimensional lumber & drywall materials
   - Cheyenne's program accepts pallets and dimensional lumber

Processing

5. Because most recyclables collection programs target source-separated materials, intermediate processing throughout Wyoming is typically limited to baling operations - Cheyenne, Laramie, Gillette and Sheridan are the exceptions with single-stream programs (processing for single-stream materials requires both sorting & baling).

6. Compost operations included both "passive" systems (no turning, hydrating or monitoring activities) and active systems (operated to generate a quality product). Examples of publicly-operated active composting systems included Casper, Douglas, Torrington, Fremont County, Sweetwater County #1, Buffalo, Gillette, Sheridan, Newcastle, Cheyenne, Laramie, Teton County & Warren AFB. Most of these operations are co-located at landfill facilities.

Household Hazardous & Electronic Waste Programs

The majority of household hazardous waste (HHW) and electronic waste (e-waste) programs in Wyoming are periodic collection events:

- Most HHW & e-waste collection events are combined
- Many programs provide regional service
- Most collection programs are publically operated & funded (there are some private collections in the I-80 RPA) - although private vendors are used for final materials management
- Collections are often funded in part by other agencies or organizations - such as the county/disposal district, local conservation district or other environmental groups
- Frequency of collections vary from as-scheduled to twice per year
- Some residential HHW collections also serve conditionally-exempt small quantity generators (i.e., small businesses)- Casper, Cheyenne, Laramie & Teton County
- There are two permanent HHW/e-waste facilities (Casper & Teton County)

2.3 Existing Landfill Programs

Nearly 50 Wyoming MSW landfills served the state in 2010. All of these excepting Torrington are owned and operated by local governments. As a result of the ISWMP effort, some of these facilities have identified the need to close and/or convert one or more of its landfill cells for C&D-only disposal. Still others are working to regionalize their operations and accept waste from other communities. While several of these landfills also provide ancillary recyclables or yard/wood waste collection, most of them could notably enhance diversion activities to significantly reduce future air space consumption and conserve natural resources.

During the ISWMP planning process, each planning entity worked to evaluate the cost of future disposal, based on their plans to maintain or change landfill operations. Knowing the cost of disposal is important to evaluating the alternative cost of diversion - the average disposal cost presented below is used in Parts II through IV to predict potential avoided landfill costs. Table 2-4 (next page) summarizes the estimated disposal costs reported by each RPA entity (Appendix B includes costs reported for each landfill)[4].

[4] Landfill estimates were generated between 2007 and 2010 and generally reflect "current" cost for the time of development - actual construction timing and possible cost inflation is an unknown for most.

While these costs represent the best information currently available, many reflect potential facility improvements that have not been fully developed and do not necessarily include the full cost of future landfill cell improvements, equipment purchased, on-going operations or closure. ***In some cases, the costs only represent net costs (i.e., mill levy, grant and tax dollars have been subtracted out of gross costs). It is expected that the disposal costs shown in Table 2-4 underestimate actual disposal costs over the next few years, and should be used in comparison to diversion costs carefully (in fact, many of these $/ton facility costs represented in this table have increased since 2010).***

TABLE 2-4 WYOMING LANDFILL DISPOSAL COSTS BY REGIONAL PLANNING AREA

RPA	ESTIMATED FUTURE DISPOSAL COST/TON[a]
Big Horn Basin	$88
East Central	$62
Eastern	$59
I-80	$75
North Central	$76
North East	$103
Park	$97
South East	$60
Western	$88
Wind River	$75
Average Based on Disposed Tons	**$73**

[a] RPA disposal cost based on landfill quantities disposed in 2010 (see Table 2-2) - costs not final or total for many landfills in each RPA (see footnote below)

2.4 Existing Solid Waste Policies & Regulations

There are a limited number of policies that currently encourage waste diversion in Wyoming.

Local Disposal Bans

- Casper & Cheyenne - e-waste disposal bans
- Cheyenne - yard waste disposal ban

Local Collection Ordinances

- Casper - mandatory yard waste collection (phased in over 5 years beginning in 2012)
- Cheyenne - mandatory recyclables collection & PAYT refuse pricing
- Sundance - city provides trash & recycling collection with mandatory fees for recycling

Other Policies

- Casper - has an idling policy, which may not directly impact diversion, but does reduce fuel consumption & greenhouse gas emissions
- Cheyenne - municipal code requires that the top 6" of landscape material be high-organic material on any project requiring a site plan or water permit (Gillette is currently working on a similar policy)

State Policies - State-wide policy is limited to:

- A voluntary state-wide diversion goal of 25% (recyclables only) and 35% (recyclables & organics) by 2005 was established by WDEQ 2005 - progress towards this goal has not been pursued

State Regulations - Table 2-5 provides a general summary of key solid waste regulations in Wyoming. WDEQ is in the process of rule-making and expects to make some modifications to its solid waste regulations by 2013. These modifications may reduce and clarify requirements for small transfer, treatment and processing facilities.

TABLE 2-5 WYOMING REGULATIONS APPLICABLE TO WASTE DIVERSION

MATERIAL[a,b]	REQUIREMENT	PERTINENT REGULATION
Source-separated recyclables transferred, treated or processed in small facility (<10,000 square feet)	Exempt from permitting (many of Wyoming's recycling facilities fall under this exemption)	WDEQ Solid Waste Regulations - Chapter 1
Wastes beneficially reused & protective of health/environment	Interpreted to exempt yard waste mulching & composting - other wastes require specific determinations	WDEQ Solid Waste Regulations - Chapter 1
Management of scrap metal, tires, inert C&D materials, used motor oil, lead-acid batteries, anti-freeze & other	Generally exempt from permitting, but volume or quantity specific	WDEQ Solid Waste Regulations - Chapter 1
Source-separated recyclables transferred, treated or processed in mid-sized facility (<30,000 sq feet)	Reduced permitting requirements (i.e., low hazard/low volume requirements) this threshold likely to be increased	WDEQ Solid Waste Regulations - Chapter 6
Mobile processing	Reduced permitting requirements (i.e., low hazard/low volume requirements)	WDEQ Solid Waste Regulations - Chapter 6
Open burning of vegetative waste	Minimal permitting requirements	WDEQ Air Quality Regulations - Chapter 10
Commingled recyclables transferred, treated or processed	Permit required (covers food waste processing)	WDEQ Solid Waste Regulations - Chapter 6
Organics transferred, treated or processed	Permit or authorization required (may receive a de minimis exemption)	WDEQ Solid Waste Regulations - Chapter 6
Commercial facilities (>500 tpd) with mandatory diversion levels	Currently no facilities this size are operational in Wyoming	WDEQ Solid Waste Regulations - Chapter 10

[a] Treatment includes baling, chipping, composting, recycling and other methods
[b] Processing includes shredding, grinding, composting, salvaging, separating and other methods

3.0 BARRIERS & POTENTIAL SOLUTIONS

As in every state, Wyoming has a number of barriers and obstacles to waste diversion that impedes progress beyond existing levels. Being a rural state, these barriers include low recyclable and organic quantities, long haul distances and lack of local markets - which collectively make waste diversion less economically attractive than in more urban areas. This Study focuses on potential solutions to those barriers that can be reasonably implemented by local, regional and state governments, as well as other organizations. Parts II through V present detailed strategies for a prioritized number of these solutions.

3.1 Barriers

Observations on barriers to waste diversion have been provided by planning entities and waste diversion professionals in each of the ten RPAs across the state, as well as by WDEQ. These barriers were occasionally local, but more often state-wide in their impact. They are similar to obstacles seen in other states and collectively can prove difficult when attempting to grow economically and environmentally sustainable programs. The primary barriers to waste diversion observed in Wyoming are tabulated in Table 3-1.

TABLE 3-1 OBSERVED BARRIERS TO & NEEDS FOR IMPROVED WASTE DIVERSION

ASPECT OF DIVERSION	BARRIER OR NEED
MARKETS	
Market Development	Lack of local markets
	Lack of support for existing brokers, processors & markets
Understanding Market Opportunities	Ability to develop sound market strategies
State-Level Marketing Assistance	Coordination of marketing information
	Stakeholder collaboration
POLICY	
State-Level Policy	State commitment to diversion
	Lack of incentives for diversion
	Need for diversion mandates
	State-level diversion guidance
State Resources	Lack of material quantity data
	Lack of funding for diversion programs & infrastructure
	Need for state-level policy coordination
IMPLEMENTATION	
Local Planning	Ability to demonstrate benefits of waste diversion
	Challenges raising public awareness
	Understanding regional development options
	Understanding funding options
	Assistance increasing tons managed
	High transportation costs to markets
Equipment & Infrastructure	Sharing information
	Lack of design & cost information
	True disposal costs

3.2 Solutions

To address diversion barriers, a number of potential solutions were identified for each barrier. Appendix C includes the universe of over 100 solutions initially identified. In order to prioritize those solutions with the greatest feasibility of improving diversion in Wyoming, the long list of waste diversion options was screened by WDEQ in terms of regional applicability, diversion potential, cost, ease of implementation, political acceptance and job creation. The resulting list of solutions (or diversion-related improvements) is listed in Table 3-2.

TABLE 3-2 PRIORITIZED WASTE DIVERSION IMPROVEMENTS

WASTE DIVERSION IMPROVEMENTS & STUDY SECTION	IMPROVEMENTS DISCUSSED IN THAT SECTION
Part I Collection Options	Drop-Off Center Collection for Recyclables, Clean Wood & Yard Waste
	School Recycling
	Multi-Family Recycling
Part II Processing Options	Regional Processing
	Regional Plastics Baling
	Regional Materials Recovery Facility
	Regional Yard & Wood Waste Composting
	Regional Ownership/Operation of Mobile Equipment
Part III Policy Options	State Yard Waste Disposal Ban
	State Beneficial Use
	State Requirements for Data Collection & Reporting
	Local Pay-as-You-Throw Pricing
Part IV State-Level Resources	Agency & WSWRA Roles & Responsibilities
	State Waste Diversion Grant Program
Part V Funding Opportunities	Existing Funding State Landfill Tip Fee Surcharge Option Miscellaneous State Revenue Options

As shown, these prioritized options include program, policy and infrastructure improvements. They have been subsequently analyzed in Parts II through IV of this Study in detail to evaluate key implementation, cost/revenue and diversion potential factors.

4.0 FUTURE SOLID WASTE QUANTITIES

In order to conceptualize future waste diversion infrastructure, programs and policies, it is necessary to project quantities of solid waste and potentially diverted materials over the future short- and long-term planning periods. While these estimates are largely based on assumptions that should be re-evaluated periodically, they provide a reasonable basis for operation and performance.

4.1 Generated Waste Stream Composition

As a starting point for evaluation, the research team developed a waste composition analysis for Wyoming. As there is no current composition data available for Wyoming's solid waste, an estimate was prepared using previous composition analyses conducted on discarded waste in Colorado and Nebraska. Specific percentages measured in other landfill waste studies were combined with observations on Wyoming's diversion practices to develop probable composition ranges for the primary materials in the overall solid waste stream generated in Wyoming. Figure 4-1 depicts the resulting suggestions for the relative composition for the major waste categories and Table 4-1 (next page) presents the relative weights for each individual material.

FIGURE 4-1 SUGGESTED SOLID WASTE COMPOSITION FOR MAJOR MATERIALS CATEGORIES (% by weight)

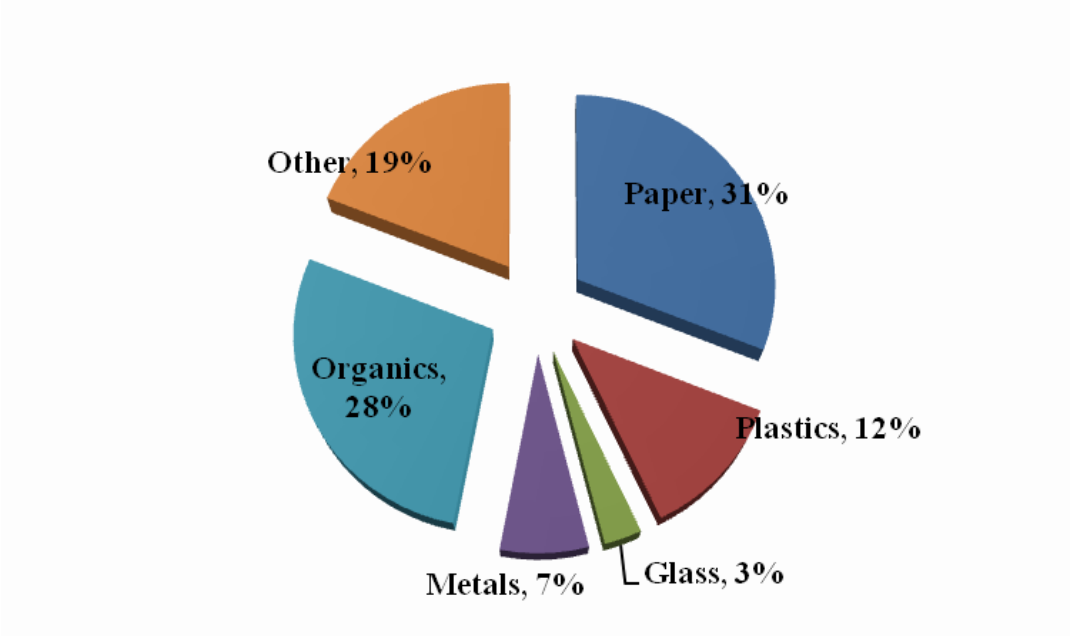


TABLE 4-1 SUGGESTED WASTE COMPOSITION FOR MATERIALS (% by weight)

MATERIALS		SUGGESTED COMPOSITION
Paper	Cardboard/Kraft Paper	10-14%
	Office Paper/High Grade (including shreds)	3-4%
	Newsprint	2-3%
	Magazines	2-3%
	Mixed Paper (paperboard, books, direct mail, etc.)	5-7%
	Other Paper (non-recyclable paper, aseptic packaging, tissues, etc.)	3-5%
	Total Paper	***31%***
Plastics	PET #1 Bottles	1-2%
	HDPE #2 Bottles	1-2%
	Other #1-7 Bottles	1-2%
	Plastic Film/Wrap/Bags	3-4%
	Other Plastics (Styrofoam, rigid plastics, etc.)	3-5%
	Total Plastic	***12%***
Glass	Clear/Brown/Green/Blue Glass Containers	2-3%
	Other Glass	0-1%
	Total Glass	***3%***
Metals	Aluminum Cans	0-1%
	Tin Cans (including aerosol cans)	1-2%
	Other Metals (including white goods)	4-6%
	Total Metals	***7%***
Organics	Food Scraps	8-10%
	Yard Waste/Branches/Limbs (including land clearing debris)	7-9%
	Clean Wood/Pallets	5-7%
	Other Organics (diapers, sanitary products, textiles, rubber, etc.)	4-6%
	Total Organics	***28%***
C&D	Aggregate (including concrete, asphalt, brick, stone, etc.)	4-5%
	Asphalt Shingles	2-3%
	Other Wood (including treated & untreated)	2-4%
	Drywall (including clean & used)	2-4%
	Carpet	0-2%
	Other C&D (insulation, interior finishes, hardwood flooring, tiles, etc.)	0-1%
	Total C&D	***15%***
Other Waste	Electronic Waste	0-1%
	Household Hazardous Waste	0-1%
	Tires	0-1%
	Other Miscellaneous Waste (used oil, anti-freeze, cooking oils, etc.)	2-4%
	Total Other	***4%***
	TOTAL	**100.0%**

4.2 Estimated Quantity Projections by Material

Population estimates are needed to develop projected quantities. Table 4-2 includes population values estimated by the Wyoming Department of Administration & Information (WDAI) for the short- and mid-term planning periods.

TABLE 4-2 WYOMING POPULATION PROJECTIONS

YEAR	POPULATION[a]
2010	563,626
2015	594,710
2020	622,360

[a] WDAI "Population for Wyoming, Counties, Cities, and Towns: 2000 to 2030" *http://eadiv.state.wy.us/pop/wyc&sc30.htm*

Total generated waste stream projections can be developed for Wyoming's solid waste materials by using the baseline 2010 quantities evaluated in Table 2-2, composition estimates from Table 4-1 and the population projections in Table 4-2. As noted previously, it is estimated that the 2010 total solid waste quantity for Wyoming was expected to be approximately 1M tons (higher than the quantity actually measured due to assumptions about non-MSW and recyclables data not fully captured).

The low and high quantities estimated for the projections in the following tables are based on the composition values in Table 4-1, and reflect the 2010 baseline as well as the 2015 and 2020 planning periods. Table 4-3 presents projections for the generated total waste stream (MSW and non-MSW), while Table 4-4 (next page) includes generated MSW waste quantities only.

TABLE 4-3 ESTIMATED GENERATED QUANTITIES FOR TOTAL SOLID WASTE (rounded to nearest 1,000 tons/year)

MATERIALS[a]	EXISTING 2010[b]		PROJECTED QUANTITIES[c] 2015		2020	
	Low	High	Low	High	Low	High
Paper	250,000	360,000	263,000	379,000	275,000	397,000
Plastics	90,000	150,000	95,000	158,000	99,000	165,000
Glass	20,000	40,000	21,000	42,000	22,000	44,000
Metals	50,000	90,000	53,000	95,000	55,000	99,000
Organics	240,000	320,000	253,000	337,000	264,000	353,000
C&D	100,000	190,000	105,000	200,000	110,000	209,000
Other Waste	20,000	70,000	21,000	74,000	22,000	77,000
TOTAL	**770,000**	**1,220,000**	**811,000**	**1,284,000**	**848,000**	**1,344,000**

[a] See Table 4-1 for material descriptions
[b] Year 2010 projections based on estimated total generation of 1M tons/year (see Section 2.1.2) or 8.7 ppcd
[c] Year 2015 & 2020 projections based on WDAI population estimates and 8.7 ppcd

TABLE 4-4 ESTIMATED GENERATED QUANTITIES FOR MUNICIPAL SOLID WASTE
(rounded to nearest 1,000 tons/year)

MATERIALS[a]	EXISTING 2010[b] Low	EXISTING 2010[b] High	PROJECTED QUANTITIES[c] 2015 Low	2015 High	2020 Low	2020 High
Paper	183,000	263,000	192,000	277,000	201,000	290,000
Plastics	66,000	110,000	69,000	115,000	72,000	121,000
Glass	15,000	29,000	15,000	31,000	16,000	32,000
Metals	37,000	66,000	38,000	69,000	40,000	72,000
Organics	175,000	234,000	184,000	246,000	193,000	257,000
C&D Waste	73,000	139,000	77,000	146,000	80,000	153,000
Other Waste	15,000	51,000	15,000	54,000	16,000	56,000
TOTAL	**562,000**	**891,000**	**592,000**	**938,000**	**619,000**	**981,000**

[a] See Table 3-1 for material descriptions

[b] Year 2010 projections based on estimated total generation of 1M tons/year (see Section 2.1.2) or 8.7 ppcd

[c] Year 2015 & 2020 projections based on WDAI population estimates & 8.7 ppcd

Appendix D includes estimates of generated baseline and projected quantities for each waste material. These generated and diverted values are used in Part II to estimate diversion potential, costs and revenues.

5.0 EXISTING RECYCLABLES MARKETS

Wyoming recyclers struggle with a lack of end users for diverted materials. As there are virtually no material end markets in Wyoming, long haul distances to markets drive up the cost of operations. Sound recycling strategies based on the best available marketing information (which can change monthly) and highest possible economy of scale (regionalization is discussed in Section 15.0) are critical to recycling programs in Wyoming. This section focuses on traditional recyclables (paper and container materials), tires and C&D materials.

5.1 General Market Background

Wyoming is currently served by a variety of secondary materials markets. For the purpose of this report, markets are defined as any company or organization that will accept (for fee, revenue or nothing) materials diverted by waste generators[5]. These may include brokers, processors, mills or other end-users. Some markets may serve a combination of these roles, as well as hauling (Waste Management of America is a good example of a "combination" market that hauls, processes and markets recyclables in Wyoming and throughout the U.S.).

1. Brokers - Brokers serve a much-needed function for small recyclers by providing an economy of scale, better market access and higher revenue returns. Brokers serving Wyoming recycling programs include Centennial Recycling (Colorado), Interwest Paper (Utah) and Rocky Mountain Recycling (Colorado, Montana and Utah). Their services can include:
   - Aggregating quantities from multiple generators
   - Processing materials (typically baling, occasionally sorting)
   - Identifying markets & negotiating pricing
   - Arranging transportation (either by the broker directly or with contract haulers)
   - Assisting with purchase/lease of baling equipment and containers

2. Processors - Processors range from those who bale loose material (or even previously baled material that does not meet market specifications) to those who provide full-scale processing of commingled materials with manual and automated sorting and baling operations. Examples of processors servicing Wyoming include Altogether Recycling in Denver, CO; ARK Regional Services in Laramie; the City of Cheyenne; Jackson County; Powell Valley Recycling; RockTenn in MN & CO; BFI in Billings, MT; Rocky Mountain Recycling in MT & UT; Uinta Recycling, Inc.; and several others in and out of state.

3. End users - End-users may reuse, repair and/or repurpose materials for resale, or may manufacturer new products from secondary, recyclable materials. Examples in Wyoming include Nature Composites (plastics #2), McMurray Ready Mix (aggregate) & Wyoming Tire (tires).

Market Specifications

These can be based on minimum or maximum quantity thresholds, quality requirements or processing requirements (such as baling to specific dimensions and weights). Some end-users set their own

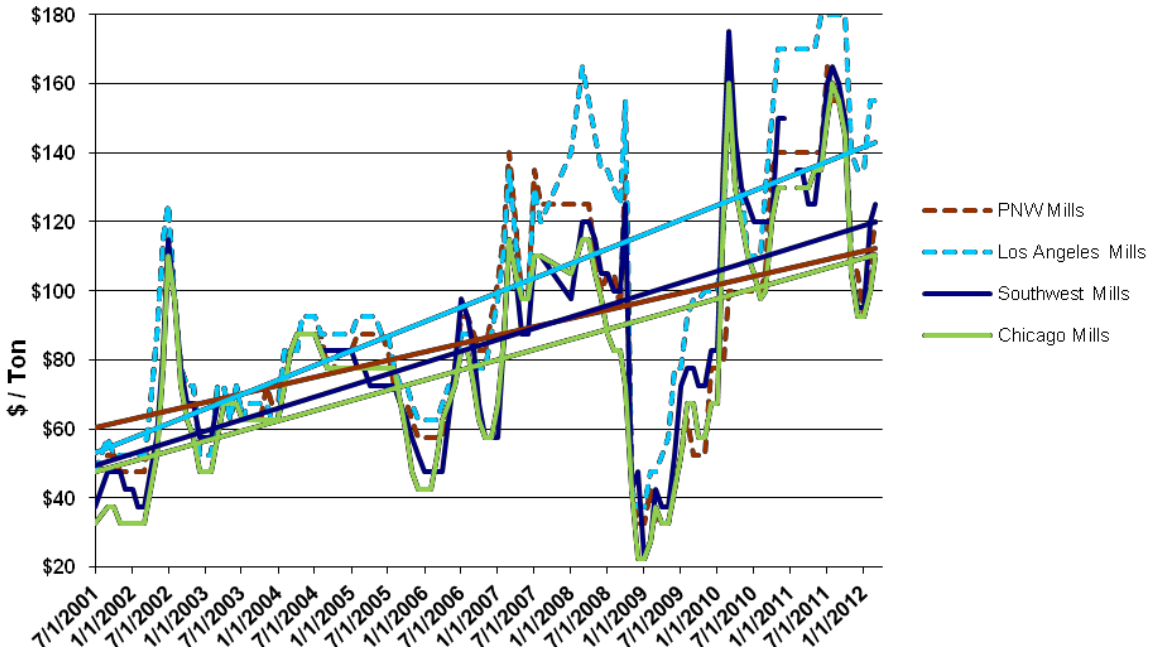
[5] There are also generators who largely manage their own recyclables (e.g., big box stores/retailers, grocery stores, tire dealers, etc.)

specifications, which are followed by brokers and processers who service them. Others follow existing standards (like the ISRI Scrap Specifications Circular 2011 for multiple materials or the Association of Post-Consumer Plastics Recyclers 2011 plastic bale specifications).

Market Pricing

Secondary materials markets are extremely dynamic and subject to a number of market forces such as reduced newspaper production, light-weighting of packaging and less construction during the recent recession (all of which have reduced the generation and subsequent recycled quantities of key materials). Figure 5-1 includes Official Board Markets Yellow Sheet long-term pricing for cardboard in the Pacific Northwest, Los Angeles, southwest and Chicago market areas (these prices are exclusive of any transportation costs). The recession between 2008 and 2010 is clearly visible in all markets - most paper grades have since shown a rebound and returned to pre-2008 pricing similar to cardboard, shown below.

FIGURE 5-1 OFFICIAL BOARD MARKET YELLOW SHEET PRICING FOR CARDBOARD (baled, excludes transportation costs)



Despite the erratic nature of prices, the long-term trend (i.e., the linear trend line) is consistently upward for most materials (the primary exception is glass). Prices ultimately earned at the local recycling level may be structured on one or more factors determined by the buyer and seller, such as local hauling/processing costs, actual revenues paid by end users, a national pricing index (such as that shown in Figure 5-1), or some combination thereof. For example, a broker may pay a recycler actual end-user or index revenue, less a broker's fee, to cover hauling costs and profit.

5.2 Wyoming Markets & Available Pricing

Wyoming is home to very few end-use markets - most notably Nature Composites for some plastics and outlets for recycled aggregate. Most markets for Wyoming recyclables, including those for paper, most plastics, most tires and glass are located out of state and require additional resources for transportation. As a result, many areas of Wyoming have limited direct access to markets for materials diverted and have to rely on brokers in most cases. Tables 5-1 through 5-3 (on page 5-3 through 5-6) include summary information on Wyoming's primary paper and container, tire and C&D material markets, respectively. Appendix E includes an additional listing of brokers, processors and end users for various materials generated in Wyoming.

TABLE 5-1 WYOMING PAPER, CONTAINER & MISCELLANEOUS MARKETS

COMPANY	MATERIALS	SERVICES	AREAS SERVED	REQUIRE-MENTS[a]
ARK Regional Services (broker, processor) ***Bill Vance 307-742-6641***	Brown & green glass mixed, clear glass; plastics #1 & #2, ONP & OMP; OCC; steel & aluminum cans; white paper and OP	Semi-trailers for storage, Gaylords, balers, pallets supplied for fee, trailer haul, processing loose materials, market through Centennial - also assists with vertical balers	Cities, businesses, institutions within 'economic' haul distance - Casper, Torrington, Lusk, Laramie, Rawlins, western NE	Provides marketing agreements (usually 1-year term with 30-day termination clause for both parties)
Centennial Recycling (CO broker) ***Jaime Gormley 970-381-8070***	OCC, ONP, steel, aluminum, plastics (mostly #1 and #2)	Marketing, contract hauling (trailer rental $250-$400/month), assist with baling equipment	State-wide except Jackson, depends on backhauling, haul costs	Baled materials only, 20 tons/load single material for mill ship (some split loads)
Fiber Reclaim / Inland Empire Paper (WA broker, mill) ***Tom Berenowski 509-777-3050***	Mill accepts OCC, ONP, OMG, paper Brokers OCC, ONP, OMG, mixed paper, plastics #1/#2, #3-#7, alum/tin containers	End-use of fiber, processing/marketing fiber and containers	State-wide	
HI-TEC Plastics Recycling (CO processor) ***Jan Hard 303-766-1735***	HDPE, PVC, LDPE	Grinding, washing/drying, pelletizing, capacity is 7,500 tpy & currently have high demand	Any service area (may be sourced through Centennial Recycling)	
International Paper (OR end user) ***Lynette Mathisen 503-520-4148***	OCC, high-grade paper	Manufacturer	Mostly northwest WY	

COMPANY	MATERIALS	SERVICES	AREAS SERVED	REQUIRE-MENTS[a]
Interwest Paper/ Pro Baler/ProPolymer (UT broker, end user) ***Beau Peck, 801-266-3610***	Mixed paper, ONP, OMG, shreds, paperboard, alum/tin, sorted #1/#2 plastic, mixed #3-#7, baled film& Styrofoam, auto batteries, some glass	Marketing, contract hauling, program set-up, assistance with equipment, etc. - end market for plastics	Southwest corridor but can serve state - communities & commercial clients	Prefer bales, primarily mill-direct (some split loads), will take loose (check first)
K.B. Recycling (OR broker, pro- cessor) ***Cory Hansen 503-539-8527***	Everything except glass but markets are mostly rigid plastics #1–#7, film, stretch film, PP supersacks, plastic bags	Will do some processing but mostly brokers baled materials	Western WY	Prefer bales but will process loose, does not break/rebale bales that don't meet specs)
Mountain Fiber (UT end user) ***Dennis Allsop 435-245-6081***	ONP only	Produce insulation, limited by insulation demand	Any service area (must be delivered to Hyram, UT)	Baled, 20 ton/load quantities (often sourced by Centennial)
Nature Composites (WY end user) ***Johnny Wright 877-810-4029***	Clear plastic #2 - will accept colored but pay less	Processing (raw or ground HDPE), capacity is 3,500 tpy, limited by product demand[b]	Any service area (must be delivered to Torrington, WY)	20 ton/load quantity of clean HDPE raw or ground/washed
Pacific Steel (WY broker) ***Chad at Elliott Mills location 307- 234-6006***	All ferrous and non-ferrous	Rent bins, roll offs for collection, haul, inter-mediate processing, market	State-wide	Rock Springs, Gillette, Mills; Rapid City, SD; SLC, UT; Grand Junction, CO locations
RockTenn (WY collector, processor) ***Tameem Khizer 303-549-7584 or Russ Bensley 925 389-8609***	OCC, shredded paper being brokered currently - if new Cheyenne facility developed (2014 or later) will accept single- stream	New facility would demand >1,000 tons/month	Currently only serving Casper for shredded paper, Cheyenne for OCC	20ton/load quantity, clean shreds can be mixed fibers
Rocky Mountain Bottling CO (CO processor, end-user) ***Tony Abel 303-425-7919***	Glass only	Processing, end-use - provides roll-offs, limited hauling but will try work with communities to coordinate/fund rail haul	State-wide and beyond	

COMPANY	MATERIALS	SERVICES	AREAS SERVED	REQUIRE-MENTS[a]
Rocky Mountain Recycling (CO/UT broker) ***Brian Heuer*** ***720-402-9194***	OCC, ONP, office, plastic #1/#2, super sandwich bale (film, office, hangers, alum containers)	Marketing, hauling (trailer rental $150 - $250/month), processing	State- sheltered workshops, com-munities, commercial (big box, grocers, Warren AFB)	Prefer baled, will haul commingled curbside to Denver facility for processing
Wyoming Salvage (collector, processor) **Linda Bradley** ***307-632-6833***	All metals except microwaves	Collect and process metals, mixed metals, UBCs, white goods (will provide roll-off containers)	Cheyenne and surrounding	

[a] About 25 CY/16 Gaylords of PET bottles for 800-pounds bale - about 50 bales = 1 truckload (20k tons/load) - about 40 CY/ 25 Gaylords of HDPE bottles for 800-pound bale (see Section 6.2)

[b] Manufactures composite fencing from recycled HDPE and recovered wheat straw cellulose ("Terrafence" is listed by the Building Green institute for certifying environmentally-friendly products and certified under U.S. Department of Agriculture's BioPreferred program)

TABLE 5-2 WYOMING TIRE MARKETS[a]

COMPANY	SERVICES	AREAS SERVED
Giant Rubber Water Tanks (WY recycler) ***307-467-5786***	Road tires only - provides mobile cutting service to repurpose large, commercial tires into waterers for cattle, etc.	Entire state and beyond
Liberty Tire (UT recycler) ***Chad Baker*** ***801-364-3056***	Tire pile removal & on-site size reduction - processes for numerous end markets	Wyoming & Rocky Mountain states
Resource Management Company (CO processer) ***Twylia Sekavec*** ***785-398-2240***	Shreds/bales tires for landfill cover, sidewalls for silage cover/traffic cones - also clean-up contractor	Wyoming & other states
Waldock, LLC (WY recycler) ***307-334-3103***	Processes mine tires	Wyoming & beyond
Wyoming Tire (WY recycle, end user) ***Richard Ayers*** ***307-235-0133***	Managing road tires for beneficial use	Wyoming

[a] Other Wyoming tire recyclers did not respond to study inquiries

TABLE 5-3 WYOMING AGGREGATE, SHINGLE & WOODEN PALLET MARKETS

COMPANY	MATERIALS	SERVICES
Custom King Pallets (Greybull repair) *307-765-9275*	Wood pallets	Repair service only
Hills Materials (SD processor, end user) *605-394-3320*	Asphalt shingles	Asphalt roofing material grinding & hot mix asphalt production
Intermountain Construction & Materials (Gillette processor, end user) *307-687-1400*	Unreinforced con- crete, brick, block, asphalt pavement & shingles	Crushes aggregate (mobile) for own use or sells - future shingles processing (mobile, currently accepting)
Knife River Corporation (Cheyenne processor, end user) *307-634-5455*	Unreinforced concrete, asphalt	Crushes asphalt for own use/sells - future concrete crushing (currently accepting)
McMurray Ready Mix (Casper processor, end user) *307-472-0548*	Unreinforced concrete, asphalt	Crushes concrete & asphalt for own use/sells (have own crushers)
ProPak Pallets (Cheyenne reuse/repair) *307-637-2851*	Wooden pallets, min 20 ton/load	Reuse, repair for sale or use wood scrap
R&R Pallets (KS reuse/repair) *620-275-2394*	Wooden pallets, min 20 ton/load	Reuse, repair for sale or use wood scrap
Simon Contractors (Cheyenne processor, end user) *307-632-7900*	Unreinforced concrete, asphalt, concrete railroad ties	Crushes/screens concrete & asphalt for own use/sells as concrete base, RAP stock, road base
Waste-Not Recycling (CO reuse/repair) *970-669-9912*	Wooden pallets, min 100 pallets	Reuse, repair for sale or use wood scrap

Table 5-4 (next page) includes 2011/2012 pricing provided by various markets currently accepting Wyoming materials. As most requested anonymity, these prices are tabulated without association to any specific broker, processor or end-user. These prices are used later in this report to evaluate the potential revenue from various waste diversion options.

TABLE 5-4 2012 MATERIAL PRICES PAID TO WY RECYCLERS BY ANONYMOUS END MARKETS (based on delivery to market unless otherwise noted)

MATERIAL	RANGE OF PRICES/TON REPORTED
Cardboard	$140 $100 - $110 $85-90 $45 if mixed load
Newspaper	$140 - $185 mill direct
Office Paper	$120 - $150 $100 - $200
Mixed Paper	$105 - $185 $85
Mixed Paper/Plastic Film Bales	< $40
Clean separated PET	$.22 - $.25/lb.
Clean HDPE	$0.15 - $0.28/lb Up to $0.30/lb
HDPE Flake	Up to $0.43/lb
Plastics (all types)	$0.04 to $0.30/lb
Aluminum Used Beverage Containers	$0.58/lb $0.75/lb
Clear Glass	$20 - $25
Amber Glass	$20 $50
Green Glass	$5 - $10
Mixed Glass	$18 (unless 400-500 tons/month consistent delivery) $20 - $25 $25 including hauling (southeastern Wyoming)
Single-Stream	$20-$30 (net of processing) $25 (net of processing)
Tires	$3/passenger tire cost $9/truck tire cost $120 cost including hauling (western Wyoming) <$40/ton shredded
Wood Pallets	$0.50 - $1/pallet $1 - $1/50/pallet $1 - $3/pallet Repair $3 - $6 cost/pallet
Asphalt Shingles	$35 cost (in state location) $7 cost (South Dakota location)
Clean concrete (minimal rebar), asphalt, rock, brick	$0 $5 cost $5 - $10/ton cost crushed

5.3 Wyoming Market Observations & Gaps

In general, most areas of Wyoming have at least some access to end markets for their recyclables (these are often via brokers). Both quantities and transportation are key obstacles to robust secondary material markets in Wyoming, however. The small quantity of recyclables diverted (and the lack of data describing those materials) prevent end-users from developing manufacturing infrastructure in the state.

The long haul distances between rural generation centers and markets drive high transportation costs. Moving materials over mountain passes or on smaller secondary roads costs more money than shipping on major arteries. Even though many markets (including intermediate processors and brokers) claim to service the entire state, realistically this only occurs when economics are positive. The I-80 corridor, the I-25 corridor and the northwest corner of the state all seem to be reasonably well-served. Areas outside these areas in general have more limited options.

For many markets, demand for recycled feedstock far exceeds current supply – reasons for low supply range from lack of community diversion to contamination issues. Other markets are limited by what they expect the demand will be by their own buyers in the coming year - these are typically the smaller, more local companies like Nature Composites (processing HDPE in Torrington) and Mountain Fiber (processing newsprint in Hyrum, UT). Material-specific observations for consideration in Wyoming are listed below.

Paper

- Local recyclers generally find transportation relatively easy as pay-load is generally achievable with loose or baled materials
- Large, out-of-state markets (Colorado, Idaho, Minnesota, Oregon, Utah and Washington) produce traditional paper products as well as insulation creating demand for Wyoming materials

Plastics - These high-value materials are attractive as long as efficient baling is available to reduce haul costs which in turn requires high storage capacity (see Section 11.0 for baling options):

- With the exception of Nature Composites in Torrington (HDPE), markets are out-of-state (California, Colorado, Oregon and Washington)
- Local groceries (Smiths, Safeway & Walmart) also accept plastic bags including film
- Historically, most recycling programs in Wyoming accepted #1 and #2 bottles only – the benefits of collecting all plastic bottles or all rigid plastics marked as #1 through #7 resins include increased convenience for generators & more plastics are recycled[6] (while several Wyoming recycling programs are now accepting the full range of plastic resins[7,8], it is noted that if high-value resins #1 & #2 are not separated out of the larger stream, the overall material value will likely be lower)

[6] Both the American Plastics Council and the Association of Post-Consumer Plastic Recyclers advocate expanded plastic recycling as more PET and HDPE is captured than from #1-and-#2-only programs.

[7] Fiber Reclaim, Interwest, Kahut & RockTenn accept plastics #1-#7 - Cheyenne, Cody, Lander, Powell, Riverton & Sheridan accept these in their collection programs (Rock Springs is accepting #1, #2 and #4).

[8] Expanded plastics recycling programs typically prohibit problem materials such as plastic film (contaminate the rigid plastic stream), foam (not recyclable) and PLA/compostable containers (made from polylactic acid, are compostable in active composting systems but not recyclable).

- Yellowstone Park is a good example of "closed loop" recycling - it uses a broker to sell its plastic recyclables to Universal Textiles (GA) & then purchases carpet from the same company

Metal containers (UBCs) – these can be shipped directly to out-of-state end-users (e.g., Golden Aluminum in Ft. Lupton, CO or the Evraz steel mill in Pueblo, CO).

Glass - many recycling programs (especially curbside, single-stream collections) do not accept glass because it degrades other materials:

- Some programs accept for use at landfills (e.g., Casper, Dubois, Green River, Lander & Riverton)
- Some glass recyclers now crush glass to reduce hauling costs (i.e., ARK, Teton County)
- Source-separated glass markets are very dynamic - Rocky Mountain Bottling Company is currently providing and hauling roll-off containers, & still paying Cheyenne $25/ton for clean, mixed glass (not long ago, the same company was only paying a few dollars for materials delivered to their Colorado location)
- Local Wyoming markets are needed for this (sometimes) problem material - some examples can include backfill, drainage material, aggregate substitute in hot mix asphalt, landscaping material, sandblasting & art (typically multiple markets are needed to utilize the supply)

Tires - projected quantities (less than 10,000 tons in 2010 in Appendix D) do not support strong local end-markets, and are problematic for disposal. See Section 13.0 for a discussion of mobile equipment to shred tires to use locally or improve end-market pricing.

C&D Debris

The north/northeast areas of Wyoming do not have local sources of quality virgin aggregate & have to haul materials more than 100 miles (recycled aggregate has higher value in these areas)

- Clean aggregate is mostly recycled directly by paving companies & contractors who process for their own use or sale (most landfill do not receive clean aggregate suitable for recycling)
- Smaller paving contractors generally do not recycle asphalt into hot mix asphalt as the small quantities don't support the needed equipment
- WYDOT highway specifications[9] allow recycled asphalt pavement & Portland Cement Concrete pavement on a pre-project plan basis (WYDOT designs) - as well as in contractor plan if approved by WYDOT (neither WYDOT or contractors commonly include recycled materials designs, despite research that demonstrates structural acceptability[10])
- WYDOT currently pays contractor on the basis of asphalt binder used - as the binder quantity is decreased in recycled applications, this is a disincentive to recycle

5.4 Other Market Issues

There are a number of challenges to effective marketing of recyclables from rural Wyoming areas. Several are described here - not all have ready answers. The pros and cons of each, however, are important for any Wyoming recycling manager to be aware of.

[9] *www.dot.state.wy.us/files/content/sites/wydot/files/shared/Construction/2010%20Standard%20Specifications/2010%20Standard%20Specifications.pdf*

[10] 2012 University of Wyoming "Performance of Reclaimed Asphalt Pavement on Unpaved Roads".

Spot-Price Marketing versus Long-Term Contracts

Many programs select markets based on the best pricing available that month. This "spot pricing" approach may be preferred in order to maximize short-term profits and meet short-term demands - and in some cases recyclers play the spot market but with the same two or three brokers or processors. Contract pricing typically establishes a pricing structure (which can vary with the economy) over a multi-month or multi-year period[11]. Assuming terms are fair to all parties, longer term contract relationships tend to yield a trust level (in terms of quantities, material quality, services and pricing) that benefits both parties during erratic market conditions. Considerations when evaluating any market agreement include:

- Material specifications/quantity requirements - that are detailed in terms of percentages, weights, contaminants and other requirements
- Transportation terms - that clarify what parties perform what activities at what cost
- Pricing terms - that are clear and flexible in providing recyclers with increased revenues in up-markets (this may be balanced by the opposite in down markets)
- Invoicing and payment terms - that treat both the recycler and market fairly
- Local & state procurement requirements - that may require public recyclers to obtain multiple bids or full proposals before selling materials

Single-Stream versus Source-Separation

End-markets in Wyoming (and elsewhere) continue to indicate quality concerns associated with single-stream recyclables. The cost of cleaning incoming streams, addressing increased wear and tear on equipment from contaminated feedstock, decreased quality, increased residue and decreased revenues are problematic. Most processors and end markets express a preference for source-separated materials and are able to pay higher revenues for these cleaner streams that avoid these pitfalls. Drop-site collections (popular in rural areas) support source-separation of most materials well.

The dilemma is that recycling programs divert more materials in a single-stream collection system due to increased convenience and reduced space requirements (e.g., Cheyenne claims its recyclables tonnages have increased by nearly four times since they switched to single-stream collection and implemented a Pay-as-You-Throw (PAYT) program)[12]. Haulers also see lower costs (labor, worker compensation payments, fuel) with commingled collection. And markets - despite their quality concerns - consistently demand higher quantities. In more urban areas where curbside collection is justified, an increased level of commingling may well balance out the decreased recovery and decreased revenues associated with single-stream. Education of the public regarding acceptable commodities is a key component in a successful single-stream program.

Sections 6.0 and 10.0 discuss the collection and processing of source-separated materials, respectively. These costs would be decreased for single-stream materials - revenues would be decreased as well. Activities that should be undertaken when determining what level of commingling makes sense include:

[11] For example, ARK establishes 1-year marketing contracts with its customers including a clause allowing either party to terminate the contract with 30-days notice. ARK sends out monthly pricing sheets (prices based on ARKs own market revenues) so customers always have current pricing information.

[12] Cheyenne, Laramie & Sheridan (possibly Rawlins in the near future) all have single-stream collections - all bale their materials without sorting & ship directly to processors in Colorado (i.e., to Altogether Recycling & Waste Management MRFs in Commerce City).

- Discuss options with all likely material markets (evaluate their quantity and quality specifications, which will likely have opposing indicators in this discussion)
- Evaluate the pros/cons of baling/shipping commingled materials without sorting, or sorting locally before selling source-separated materials to markets (will include consideration of collection & processing capital & operating costs, as well as the relative transportation requirements)
- Obtain hauler bids to compare transportation costs (markets/market locations may vary depending on whether materials are "pure" or commingled)
- Consider the specifications other regional partners are following (in a cooperative scenario)
- Recognize that once a decision is made to "go single-stream", it is hard to go back to source-separation

Short-Term Materials Storage

One of the main issues in Wyoming is the low generation of recyclables. As markets often require full truckload quantities (typically 20 tons for tractor-trailer hauls), some short-term storage is typically required. This can be provided in existing facilities or warehouses, or can be managed in mobile trailer units (which can subsequently be picked up by a tractor rig for haul to market)[13]. Recycling programs can find used trailers to purchase or may rent trailers from their brokers or haulers. Care must be taken, however, to select a storage option that does not erode potential revenues. It should also be noted that in down-market conditions (such as that experienced in 2008 and 2009), market demand may shrink, requiring programs to store more materials over longer periods of time (this is likely to require more of a short-term fix than during normal market periods).

Regionalizing recycling programs is another way to reduce storage needs for each collection program. When individual collections move materials directly to a regional processing point, the storage requirements for both loose and baled materials can be centralized. Regional processing facilities are also more likely to invest in high-end processing equipment (such as balers) to reduce storage requirements and shipping costs, as well as increase revenues. Sections 10.0 and 11.0 discuss regional materials recovery facilities and plastic baling, respectively.

Backhauling

Backhauling may reduce transportation costs by increasing hauling efficiencies[14]. However, backhauling presents its own challenges and considerations. In addition to general logistics, what the truck typically hauls must be considered (many that haul foodstuffs do not want to contaminate a trailer with waste materials – even recyclables). Rail may be a cost-effective alternative to trucking for haul distances over 100 miles, but requires access to rail, the ability to load and unload to/from rail cars, and sufficient quantities to make this option economically feasible. Transportation options, including back hauling, should be discussed with each potential broker or market. If satisfactory arrangements cannot be made, it is advisable to evaluate alternative hauling scenarios with independent hauling companies to transport

[13] This can be an ideal storage solution for facilities that do not have the room to expand their warehouse space (trailers can be leased or purchased used).

[14] Teton County's partnership with Fiber Reclaim is a great example of successful back-hauling - Fiber Reclaim brings newsprint from WA to the local Jackson newspaper before loading up with Jackson Community Recycling's recyclables for the return trip.

materials to selected markets. Large processors and end markets often have associated larger hauling operations that operate with enough economy of scale to provide lower hauling costs to their suppliers (i.e., collectors and materials recovery facilities).

Recycling Cooperatives

As noted previously, Wyoming recyclers must deal with low recyclable quantities and long market haul distances. A key strategy for decreasing the unit cost of materials management, decrease hauling costs and increase market leverage (and hopefully revenues), is to regionalize with neighboring communities, institutions and businesses to collectively manage more materials. Whether recyclers organize formally or informally, the benefits of collaborating typically outweigh the associated politics and logistics.

Cooperatives can be on a regional level with multiple recyclers in the same or multiple counties, at the state level or at a multi-state level. They can provide a wide range of services ranging from drop-site collection to regional education. One particular type of regional recycling system that may work well in Wyoming is a hub-and-spoke form of collection and processing. Section 15.0 discusses the advantages of recycling cooperatives in greater detail.

PART II
PRIORITY COLLECTION OPTIONS

In order for any diversion program to be successful, materials have to be collected from generators and hauled to processors, brokers or markets. Collection programs, depending on the type selected, can be the most expensive component of the overall diversion system and can, in large part, determine the end result of the overall waste system and warrant careful evaluation. These programs can focus on a variety of improvements from levels of automation to program alternatives. This part of the Study includes a detailed analysis of three program options, targeted to improve Wyoming's waste diversion success in the future:

- Local Drop-Off Center Collection of Recyclables, Yard Waste & Clean Wood
- School Waste Diversion
- Multi-Family Recycling

The Wyoming Statewide Study of Waste Diversion was commissioned by the Wyoming Department of Environmental Quality using funds appropriated by the Wyoming Legislature. LBA Associates, Inc. was contracted by the Department to undertake the study. Any recommendations made or conclusions reached in the study are solely those of LBA Associates, Inc., and not necessarily the State of Wyoming.

6.0 DROP-OFF CENTER COLLECTION OF RECYCLABLES, YARD & WOOD WASTE

This section includes a user-friendly cost model for drop-off centers, created to both support the cost analysis in this section and to provide future users the ability to run alternative drop-off collection scenarios in the future.

TABLE 6-1 SUMMARY OF FINDINGS FOR EACH DROP-OFF CENTER

FINDING	DESCRIPTION
Implementation - At the local, community level during the short-term planning period (2015)	
Potential Diversion	<1,000 to 3,000 tpy
Estimated Site Development Costs	$14,000 to $20,000 Excluding land siting & purchase
Estimated Equipment Costs	$15,000 to $25,000
Estimated Hauling Costs	$13,000 to $70,000/year
Hauling Costs/Ton	*$34-$46/ton recyclables, $17-$24/ton organics*
Estimated Revenue Earnings	$7,000 to $27,000/year
Estimated Net Cost (operations only)	$6,000-$43,000/year
Estimate Avoided Disposal Costs	$46,000 to $183,000/year

All costs estimated in 2011$ - quantities rounded to nearest 1,000 tons, costs to nearest $1,000

6.1 General Considerations

Drop-off center (DOC) collection facilities for recyclables have been successfully located at a variety of location types in different communities. The most common locations have been solid waste facilities (i.e., transfer stations, landfills, recycling facilities), grocery stores, shopping centers, and other public facilities. Some communities have enacted recycling ordinances to site recycling DOCs and provide facility siting standards. Yard waste drop-sites have typically been limited to solid waste facilities, industrial type areas, and periodic collections at public facilities (usually parks). DOCs can include collection of traditional recyclables (papers, plastics, glass, aluminum, and tin) or yard waste/wood waste or both.

DOCs are generally seen as a lower risk and lower cost municipal recycling program. Recycling drop-off programs principally vary in four areas:

1. Staffing - Typically unstaffed facilities with periodic inspections or greater observation when co-located with existing facilities. In some locations, a staffed facility may be a condition necessary for site approvals.

2. Containers - The primary container types utilized at drop-off facilities for recyclables are multi-compartment recycling roll-off containers, trailer or dumpsters. Containers may be purchased by the community/agency or purchased by the collection contractor pursuant to hauling agreement;

- Multi-compartment container – covered roll-off container, various sizes, with up to 6 compartments in a roll-off container (typically up to 30 cy - yard waste & clean wood collection more often utilize open-top roll-off containers up to 40-cy)
- Recycling trailer – compartmentalized trailer with quick mobility, pulled by any vehicle with a hitch and 7000 lb pulling capacity
- Dumpsters (2-, 4-, 6- or 8-cy) – several at drop-site for single materials collection by rear-load or front-load packer trucks for transfer to a processing facility (best suited for paper streams and useful at potential locations limited on space)

3. Site Aesthetics – These can be improved through container color and style, container orientation, surfacing (crushed rock, asphalt or concrete pad), fencing, and/or landscaping.

4. Signage - Variations may include;
   - Large signs listing materials accepted at the site
   - Signs with graphics on each container showing what belongs in that container
   - Possible educational kiosk
   - Directional signs on nearby major thoroughfares

Planning DOC locations can consider the following general standards:

- Average population served typically ranges up to 7,500 to 10,000 per DOC
- Site near population and/or geographic centroid or high traffic location (i.e., facility or commercial area frequented by citizens)
- Voluntary participation yields recovery from drop-site service area:
  - Recyclables – 25 to 75 pounds per capita per year[15]
  - Yard Waste/Wood Waste – 100 to 250 pounds per capita per year (assumes approximately 50% recovery of estimated material generation)[16]

Wyoming Status - Several counties and communities in Wyoming have DOCs for receipt of recyclable materials. Many existing drop-sites for recyclables are located in supermarket parking lots and neighborhoods while others are co-located with solid waste facilities (i.e. transfer stations and landfills). Yard waste drop-sites are less frequent than recyclables, and more likely co-located with solid waste facilities (i.e., transfer stations and landfills).

6.2 Implementation

Recyclable DOCs could be implemented at the local jurisdictional level in Wyoming through existing solid waste management agencies, municipalities, or non-profit recyclers. Drop-sites should be coordinated with existing and future material recovery facilities and compost facilities.

[15] From survey conducted by City of Lincoln, Nebraska for a study on Recycling Drop-Offs Siting Options, HDR Engineering, Inc., 1999.

[16] At total waste generation of 8.9 ppcd and composition from Table 3-1, yard trimmings and clean wood/pallets could yield 1.1 to 1.4 ppcd generated (or about 400 to 500 pounds per capita per year).

DOCs are very easy to implement at other existing solid waste facilities (i.e., transfer stations and landfills) or with approval, at commercial and institutional establishments as described above. It is recommended for solid waste facilities and communities to add DOC locations for collection of recyclables and yard/wood waste in the short-term. DOCs could be phased in over several years (i.e., develop one or two a year) in order to spread the capital costs of roll-off containers and site improvements. These should be coordinated with other planned facilities or facility improvements. Key implementation steps should include:

1. Identify potential site locations – Principal implementation considerations are listed below;
   - Public or donated land – if private property, utilize written agreements to delineate responsibilities (i.e., access, parking lot maintenance, site improvements, drop-site clean-up, etc.)
   - Population/geographic centroids – service area for drop-sites (see population standards above)
   - Convenience of site(s) – easily accessible and traffic flow
   - Location of drop-sites relative to major shopping areas or other municipal services
   - Visibility of sites
   - Space for equipment (containers and collection vehicle access)
   - Check with local jurisdiction for any permit requirements

2. Choose Container Types (roll-offs, trailer or dumpsters) & Combinations – The public agency or the contract hauler may choose container types & number of compartments. Ensure that types are compatible with existing systems.

3. Determine Operations – This should include whether the DOC will be staffed or unstaffed.

4. Design DOC Facility – The INPUT sheet in the Appendix F DOC Cost Models provides general area requirements for roll-off containers (recycling trailer & dumpsters will likely require less space);
   - Physical layout – utilize existing landscaping and fencing to improve aesthetics
   - Make sure adequate space available for container(s) of choice
   - Provide access for collection vehicle to pick up containers or switch out (if room allows)
   - Good orientation of drop-off containers – can improve citizen access, vehicle circulation, visual appearance and noise attenuation

5. Determine Material Collection System & Responsibilities (public collection or private collection);
   - All public collection – public entity purchases the containers and vehicles, collects recyclables and yard wastes and transfers to processing facility
   - All private collection – private company owns the site, purchases the containers and vehicles, collects and processes the recyclables and yard waste; under all-private scenario the company typically owns a processing facility; privates will limit the types of materials accepted to those that provide greatest economic return
   - Public contract with private sector – contractual agreement for hauling and processing
     - Public sites drop-offs, handles site improvements and maintenance, and citizen concerns
     - Private entity provides containers, collection and transfer to processing facility through contract with public entity; contract identifies the fees paid based on cubic yard volume or

number of container pulls and any revenue sharing – alternatively the containers can be purchased by public entity

6. Obtain Funding - Funding options may include solid waste tipping fees, mill levies, general tax funds or grant programs (see Part VI).

7. Facility Promotion – Promote the DOCs through public education and site signs (utilize directional signs if drop-site not visible from major thorough fares);
   - Keep drop-site neat and attractive
   - Unattended sites should have periodic inspection to clean up litter, place recyclables in appropriate containers and maintain site – contract hauler can also be required to pick up litter when collecting containers

8. Improve Implementation of Future DOC Siting – Recommendations are described in Table 6-2 (next page);
   - Develop policy language – several cities have passed recycling ordinances or amendments to allow recycling drop-off facilities as a permitted use in various different zoning areas and to identify siting and operating standards
   - Improve site planning and financing
   - Utilize operational incentives

6.3 Estimated Diversion Potential, Costs & Revenues

Diversion Potential - Diversion of recyclables and yard waste will depend upon the voluntary participation of the citizens. The diversion potential for this analysis is based on an assumed service area ranging from 5,000 to 20,000 people and assumed recovery rates of 25 to 75 pounds/person-year[15] for recyclables and 100 to 250 pounds/person-year for yard/wood waste[16]. Resulting diversion estimates are 625 tpy for small service areas and 2,500 tpy for large service areas. The INPUTS sheet of the DOC Cost Models in Appendix F includes these calculations.

Capital Costs - *Specific costs for this collection option were developed using the DOC Cost Models in Appendix F. These models both support the costs estimated in this section for three different DOC scenarios and provide a user-friendly Excel-based model for running alternative DOC scenarios in the future. The Cost Models use a red font to indicate values or assumptions that can be changed – actual calculations used in the model can be viewed by clicking on specific cells in the worksheet. The READ ME worksheet explains how each model can be used. The INPUTS sheet includes assumed values that can be revised for specific local conditions and planned operations.*

TABLE 6-2 DOC IMPLEMENTATION INITIATIVES

POLICY	SITE LOCATION PLANNING/FINANCING	OPERATIONAL INCENTIVES
Develop recycling ordinance language to allow recycling-related land uses in all zones & identify siting/operating standards for compatibility with surrounding uses	Incorporate a recycling DOC map into city or county comprehensive plans to identify desired future locations in urban developments to help minimize future siting difficulties	Improve the cleanliness & appearance of existing & future DOCs with frequent site visits by personnel, where required - improve aesthetics with landscaping (i.e., trees/fencing)
Amend zoning ordinances for business districts to require new developments to provide space for recycling drop-off facilities (see Appendix G for sample language)	Co-locate recycling DOCs with new or existing public facilities - when acquiring funds for land acquisitions & future developments of government facilities, fire stations, schools & parks, sufficient funds & land should be acquired to include the co-location of recycling DOCs	Consider incentives such as allowing site owner to use DOCs for its recyclables (i.e., grocery store brings corrugated cardboard to the DOC) & making minor improvements to surrounding area which benefit the neighborhood community (i.e., concrete access way to an in-park bike path)
Add a section in the recycling ordinance or amend zoning ordinances to allow parking studies to assess parking requirements and potential space for recycling DOC facilities - this is a reasonable option to perceived parking limitations of a potential site	To finance property purchases for future recycling DOCs, use solid waste operations enterprise funds if available, plan for in CIP budgets, obtain council or commission approvals to use advance land acquisition funds, and/or apply for available grants	Consider sharing revenues obtained from materials collected at the site with the private owner of the site as an incentive - schools may be especially interested in this type of arrangement
	Include allocation for land purchase & site development of new recycling DOCs in CIP budgets	Consider a capital lease payment through a lease agreement with an owner of a site

The DOC Cost Model includes costing components for basic site improvements to a non-paved area, container purchase, periodic site inspection and maintenance, and haul analysis. DOCs located in existing parking lots will have less capital improvements costs. Assumptions used to estimate the costs in Table 6-3 (next page) include:

- Public ownership and operations
- Pre-development costs (planning & siting) not included
- Available land at no cost - cleared and only moderately sloped
- Nearby materials recovery facility (MRF) & compost facility for processing collected materials - ranging from 15 to 25 miles (depending on the cost model site)
- Site improvements - are based on an undeveloped site & sizing of 3,000 square feet per roll-off container, including maneuvering area (use of existing paved lots will require a smaller investment);
  - Minor grading
  - Crushed rock/gravel surfacing – options to include concrete pad or asphalt paving
  - Steel rails for roll-off container placement

TABLE 6-3 DOC CAPITAL COST SUMMARY[a]
(2011$, costs rounded to nearest $1,000)

COST CENTER	TOTAL COST
CAPITAL COSTS	**CAPTIAL COST ESTIMATE**
Grading	$3,000 to $5,000
Crushed Rock/Gravel	$5,000 to $8,000
Steel Rails	$3,000 to $5,000
Signage	$1,000
Contingency (10%)	$1,000 to $2,000
Subtotal Capital Cost	$14,000 to $20,000
EQUIPMENT COSTS	**EQUIPMENT COST ESTIMATE**
Covered Recyclables Roll-Offs	$9,000 to $18,000
Open Yard/Wood Waste Roll-Offs	$5,000 to $10,000
Contingency (10%)	$1,000 to $2,000
Subtotal Equipment Cost	$15,000 to $25,000
ANNUAL HAULING COSTS	**HAULING COST ESTIMATE**
Annual Recyclables Haul (15-25 miles)	$4,000 to $23,000
Annual Organics Haul (15-25 miles)	$9,000 to $47,000
Recyclables Haul/Ton	$34 to $46
Organics Haul/Ton	$17 to $24

[a] See CAPITAL COST SITE #1 through SITE #2 sheets in Appendix F

- Site Improvement assumptions (continued)
  - Signage
  - Optional access stairs/platform, site lighting, fencing, video surveillance, building
- Mobile equipment – purchased by owner or collection contractor;
  - Roll-off containers – covered multi-compartment and open top
    - Basic cost of gable-top, 30-cy six-compartment container - $9,000
    - Basic cost of 40-cy open-top roll-off - $5,000
  - Roll-off truck – included in hauling analysis (assumes roll-off borrowed from other operations with pro-rated operations, maintenance and replacement contribution - cost of new roll-off truck with chassis and hoist – approximately $130,000)
  - Optional container options (not included in the Appendix F cost model which costs larger containers & roll-off truck)
    - Dumpsters – capital cost of dumpsters range from $450 to $1100 depending on size (see Multi-Family Cost Model in Appendix H for dumpster costs); cost of new packer truck – approximately $190,000 to $210,000
    - Recycling trailer – approximately $15,000 to $20,000 for a 20-CY, 8-compartment trailer with OCC in rear of trailer; cost of heavy-duty pick-up truck – approximately $30,000 to $40,000
- Annual labor, operations & maintenance (unstaffed facilities);
  - Periodic inspections and site clean-up – use existing personnel or volunteer labor
  - General site maintenance
  - Processing costs at MRF or compost facility not included

The Table 6-3 summary presented costs for three DOC sizes:

- Site #1 - serves up to 5,000 people with 1 recyclables/1 organics roll-off
- Site #2 - serves up to 10,000 people with 2 recyclables/1 organics roll-off
- Site #3 - serves up to 20,000 people with 1 recyclables/2 organics roll-offs

Hauling Costs - The primary operating costs of DOCs will be the hauling of recyclables to MRF or other consolidation location and yard waste/wood waste to a compost facility. Haul costs will depend upon several variables with the key parameters of container payloads, distance from drop-sites to recycling and compost facilities, average speed, fuel, labor costs and sharing of equipment. The hauling estimates in the DOC Cost Model assumed that DOC containers would be hauled a relatively short distance to a local processing facility, or a range of 15 to 25 miles (see the HAULING COSTS sheet in Appendix F).

Compost Facility Tip Fees - It is assumed for the purpose of this Study that the yard and wood waste will be accepted for free (based on current pricing schedules at Casper and Cheyenne).

Revenue Potential - For the purpose of estimating DOC revenue potential in this Study, the relatively broad assumptions (reflected in Table 6-4, next page) are required:

- Collected recyclables breakdown by weight mimic the Appendix D composition
- Revenues earned for each material are approximately 35% of the prices paid by end users for delivered product identified in Table 5-4
  - DOC recyclables are expected to be clean, source-separated materials
  - Hauling costs have been estimated above
  - Prices are paid by the materials recovery facility that accepts the materials (which has an operating cost of $100/ton - see Section 12.0)
    - Processing cost would be subtracted from Table 5-4 prices
    - Processing facility may provide rebates higher than shown here to incentivize recycling
  - Broker fees are <u>not included</u>
  - Prices will fluctuate depending on quantity, quality, processor & end user
- No revenues are earned for yard or wood waste

TABLE 6-4 ESTIMATE OF POTENTIAL DOC REVENUE[a]
(2011$, costs rounded to nearest $1,000)

MATERIAL	COMPOSI - TION[a] (% by weight)	ESTIMAT ED QUANTI- TY (tpy)	APPROX END USER PRICING ($/ton)[b]	PRICING ADJUSTED BY $100/ton PROCESSING COST	FINAL PRICING (total $)
Cardboard	36%	45 to 180	$100	$0	$0
Mixed Paper	43%	54 to 215	$110	$10	$500 to $2,200
Plastics #1-#7	10%	13 to 50	$300	$200	$2,600 to $10,000
Mixed Glass	7%	9 to 35	$20	($80)	($700 to $2,800)
Metal Containers	3%	4 to 15	$1,300	$1,200	$4,800 to $18,000
TOTAL					**$7,200 to $27,400**

[a] From Appendix D
[b] From Table 5-4
Totals may not appear to match due to rounding errors

Avoided Landfill Costs - The avoided landfill cost estimate included in Table 6-1 is based on a diversion range of 625 tpy to 2,500 tpy from each DOC (depending on service area size) and the average projected disposal cost of $73/ton for Wyoming landfills (see Table 2-4). As noted in Section 2.3, it is likely that this rate underestimates the actual average landfill costs, however, and that avoided costs may be higher once landfill owners make their final facility improvement decisions and confirm costs.

Related Information

- Calub L., Hanlon G., Peterson M., "Siting Land for Drop-off Recycling", Resource Recycling, March 2000
- "Recycling Drop-Offs Siting Options" by HDR Engineering, Inc. for City of Lincoln, Nebraska, 1999. City of Lincoln Recycling Coordinator - Gene Hanlon (402) 441-7043 or *ghanlon@ci.lincoln.ne.us*
- Sample recycling drop-site ordinance language for siting of recyclables drop-site facilities with future commercial business developments (See Appendix G)

7.0 SCHOOL WASTE DIVERSION

TABLE 7-1 SUMMARY OF FINDINGS FOR EACH SCHOOL DISTRICT - RECYCLING ONLY

FINDING	DESCRIPTION
Implementation - At the local, school district level during the short-term planning period (2015)	
Potential Diversion	< 1,000 tpy Could be as high as 2,000 tpy state-wide
Estimated Container Costs	$6,000
Estimated Haul Costs	Not included
Estimated Revenue Earnings	<$1,000/year Could be up to $50,000 state-wide
Estimated Net Revenue	<$1,000/year Minus hauling costs
Estimate Avoided Disposal Costs	$1,000/year

All costs estimated in 2011$ - quantities rounded to nearest 1,000 tons, costs to nearest $1,000

7.1 General Considerations

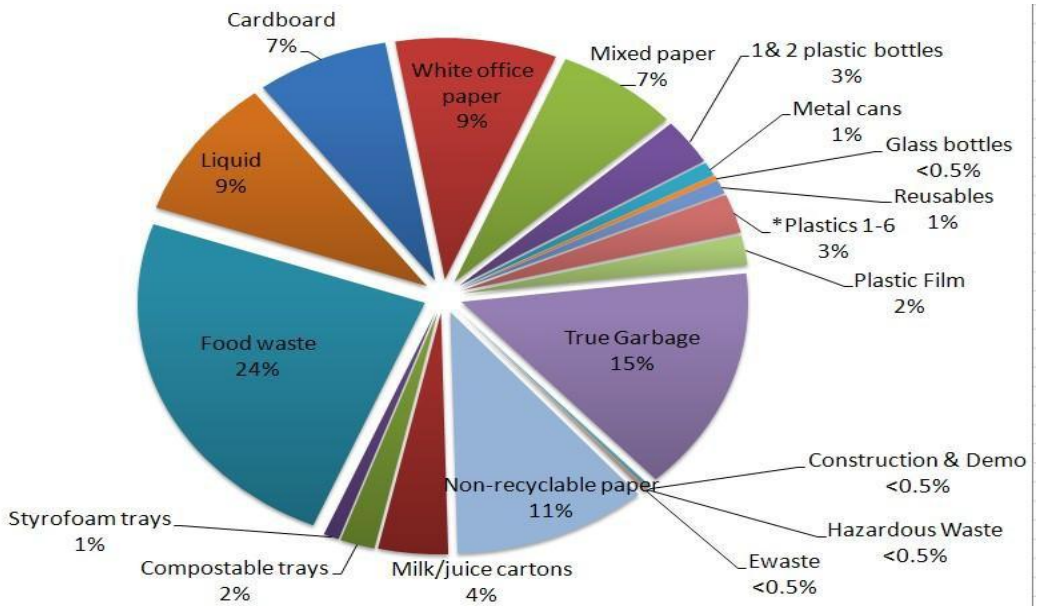
Waste diversion from institutions continues to be a missed opportunity in many states - both paper and food waste quantities are typically high in most institutional waste streams. School programs not only tackle diversion of these materials to avoid landfill disposal and reduce expenses, but provide real-life, hands-on experience for students and involve teachers, staff, administrators, and parents in a positive experience. In fact, school diversion programs can be a jumping-off point for regional or even state outreach programs that target the general population.

School diversion programs can be implemented at all levels – elementary (kindergarten through grade 5, or K-5), middle (grades 6-8), high school (grades 9-12) and college grades. Waste composition from schools varies according to school location and grade level. An example waste composition from a 2010 study of K-12 schools in Minnesota in 2010[17] is illustrated below, in Figure 7-1 (next page).

As shown in the Minnesota example, 1% is re-useable, 30% of the waste stream is recyclable (paper, cardboard and containers) and 50% is compostable (non-recyclable paper, milk/juice cartons (aseptic packaging), trays, food waste and liquids). If only half of these materials could be diverted in a school program, over 40% of the total school waste stream could be kept out of local landfills.

[17] "Digging Deep through School Trash – A Waste Composition Analysis of Trash, Recycling & Organic Material Discarded at Public Schools in Minnesota", Minnesota Pollution Control Agency, September 2010, *www.pca.state.mn.us/schoolwaste*.

Figure 7-1 2010 Minnesota School Waste Composition



Wyoming Status - Many K-12 schools in Wyoming already have some type of diversion program in place. The community colleges and the University of Wyoming also have established programs. Several schools in Gillette and Cheyenne participated in the Keep America Beautiful "Recycle Bowl Competition," which awards schools for recycling volume per person; Sage Valley Junior High School of Gillette was the 2011 Wyoming state winner. Of note is the fact that many areas in Wyoming have school districts with several schools. However, most recycling programs are not operated or promoted at a district-wide level.

At the University of Wyoming (UW) in Laramie, approximately 1,000 recycling collection containers are located in 90 buildings throughout the campus. The recycling staff collects and consolidates recycled materials once per week. The recycling staff consists of three to four full time employees and three to seven work study students. The UW program also collects and markets Laramie's K-12 school recyclables. Another example is the Northern Wyoming Community College in Sheridan which has a desk-side collection program for paper, cardboard and plastics. The college's program is supported by its janitorial staff and also works closely with the city and its program.

At this point, a yard waste composting program is being operated on a minor scale at UW. For the most part, neither yard nor food waste is being diverted at the grade level K-12. However, food scraps are being diverted from three locations at UW (cafeteria, student center, coffee shop). Pre-service food scraps are placed into buckets which are collected three times per week by a student-run project called ACRES. Collection also occurs from several restaurants in Laramie. Scraps are windrow-composted in this project, on UW land, which has been in operation since 2006. Estimated volumes are not available at this time[18]. Food composting programs are required to seek a permit or permit exemption from WDEQ.

[18] *http://www.uwyo.edu/uwacres/what-we-do/index.html#Composting*

7.2 Implementation

It is expected that school waste diversion programs across Wyoming would be implemented locally, with promotion and costs undertaken by individual schools (or preferably school districts). However, support, guidance and the provision of state-wide messaging will be invaluable to operating good programs. Given the importance and relative ease of developing programs, it is recommended that they be implemented (or expanded as needed) during the short-term planning period of this study. It is recommended that a program for targeted recyclables be implemented over the summer break so that adjustments can be made before the school year starts, and while the volume of materials is at their lowest.

Composting and food scrap/diversion programs started in the fall can be adjusted throughout the year. School diversion would ideally be organized at a district-wide level in Wyoming. This approach would provide consistency between schools, create an economy of scale and create greater awareness about the importance of waste diversion. A district approach would also:

- Encourage the involvement from staff, administrators and janitors
- Encourage and aid individual schools to begin recycling by identifying district-level resources and goals
- Combine the development of educational messages to save money and time
- Assist with obtaining funding for staffing or equipment
- Provide an opportunity for district schools to contract with the same hauler and/or aggregate materials to decrease costs
- Create friendly competition between schools

Key implementation steps should include:

1. Establishing Strong Program Leadership - Leadership can come from staff (administration, teachers, custodial), committees, students or a combination of these parties. Strong leaders will provide ideas, work with involved recyclers, empower staff and students, expand enthusiasm for the idea and provide effective problem solving. It is recommended that leadership should rest with staff or staff and students (versus volunteers) to ensure consistency over time. Custodial personnel especially must be involved and trained on proper participation. Regardless, commitment for waste diversion at the senior administration level is important to the sustainability of these programs.

2. Identify & Design for Material Markets - Any diversion program needs to be designed to divert only marketable materials - or risk having to dispose of collected items. Specific market opportunities and constraints can be researched through local or state recycling or solid waste organizations (including government departments). Constraints that need to be considered may include:
   - Minimum or maximum quantities
   - Types of materials and level of source-separation or commingling
     - Typical school recyclables include cardboard and commingled mixed paper
     - Programs can also include source-separated paper grades (office paper, junk mail, colored paper, telephone directories, paperboard, etc.) as well as commingled containers and organics
   - Contamination

- Processing - sorting or baling (if needed)

The types of markets include local brokers, MRFs, compost facilities or oil recyclers. Less obvious markets might include:

- Food donation outlets - food banks, soup kitchens and shelters
- Food as livestock feed - at local farms & ranches
- Salvageable items (office/school furniture and electronic items) - to thrift stores and reuse centers

3. Create a Convenient Recycling System - for mixed paper, cardboard, containers[19]. Determine the need for:
   - Small, "local" bins suitable for classroom and office use, as well as printer and lounge areas
   - Large containers used to consolidate materials collected in the small bins in an on-site, centralized location (these are often dumpsters, roll-offs or trailers)
   - Responsible parties to collect materials from small bins and transfer to the large containers - also to process the materials (if needed)
   - Relationship with a hauler, broker or end-use market that will accept the school's materials - in most cases, the district will contract with a public or private hauler
     - The hauler will typically market the materials and may also provide the large containers
     - Key contract terms should detail roles and responsibilities as well as the revenue/fee for service (realizing recyclables have a revenue potential in most markets and that markets are dynamic)
     - Haulers typically bill monthly based on the number/size of containers and collection frequency - discounts may be available when multiple schools participate

4. Consider Yard Waste Composting - There are a number of full-scale compost facilities in Wyoming (e.g. Riverton, Buffalo, Casper, Cheyenne, Cody, Gillette, Jackson, Laramie, Rock Springs, Sheridan, Torrington), but the chances for many schools to participate with an existing operation may be limited. In the absence of nearby facilities willing to accept school organics, many schools may find that yard waste-only composting is reasonably simple and inexpensive to develop and operate. Yard waste operations require minimal investment to start, but will require:
   - Basic facility - including an area for windrowing or contained areas similar to back-yard composting programs
     - Windrows require space dictated by quantity of material and equipment access
     - Containment can be provided by specialty bins or built with existing materials (e.g., pallets, cinder blocks) as illustrated in Figure 7-2
   - Permitting requirements - under WDEQ rules, permits typically would not be required for well-operated yard-waste composting programs that utilize all product on site (it is recommended that programs be reviewed for compliance with state and local rules, however)
   - Feedstock - to maintain suitable nutrient balance, a carbon to nitrogen ration of 30:1 is ideal

[19] Kitchen grease is another material often recycled from institutional cafeterias - local recycling companies typically provide grease containers and service them directly for recycling into biodiesel, animal feed and other products.

  - This balance can be achieved by mixing a combination of "green" materials with more "brown"
  - For example - two parts grass clippings (which have a C:N ratio of 20:1) with one part leaves (60:1)
- Access to water - is needed to encourage biodegradation
- Equipment - may be required to chip branches and larger materials & to mix/turn windrows or bins
- Operations plan - should be developed to spell out specific actions (feedstock mixing, curing, screening, etc.), schedules & responsible parties for turning, watering and monitoring the process
- Plan for using composted material on site

FIGURE 7-2 COMPOST CONTAINMENT SYSTEMS[20]

5. Evaluate Food Waste Composting - Due to the significant quantities of food waste generated at most schools, food waste diversion may be a consideration. However, most food waste compost operation will require a WDEQ permit[21] or permit exemption and is a more complex operation requiring additional labor, monitoring & environmental controls. An alternative management for kitchen

[20] Picture credits - *www.homecompostingmadeeasy.com/compostsystems.html*, *www.ct.gov/dep/cwp/view.asp?A=2718&Q=325392* and *www.helpmecompost.com/composting-101/education-a-school-composting/item/63-a-school-food-waste-recycling-project-going-on-now*

[21] See Solid Waste Rules Chapter 6 Transfer, Treatment and Storage Facility Regulations - requirements include a legal property description; map; plot plan; description of the management process, equipment/operations, access roads, run-off/surface water controls, fencing, litter/vector controls, fire protection; & acceptable facility design.

applications is vermi-composting[22]. A discussion of general food waste composting can be found in Section 14.2.

6. Provide On-Going Education - This component should include simple, consistent message that is used district-wide. It will include clear signage at each diversion point, and may also include newsletters, websites and use of social media. Events such as poster contests, Earth Day events and competitions such as Keep America Beautiful's "Recycle Bowl" and design contests are all helpful tools to highlight a school's recycling program. The extent and successes of each school's diversion efforts should be well-documented to track progress and record which activities are most effective.

7.3 Estimated Diversion Potential, Costs & Revenues for Recycling

As Section 12.0 describes yard waste composting in detail, an analysis of school yard waste composting has not been developed here.

Recyclables Diversion Potential - For the purposes of estimating diversion for this Study, the following assumptions were made to determine that each district's potential diversion rate is 14 tpy (although the state-wide school diversion level could be as high as 2,010 tpy):

- Generation rate of 0.52 pounds/student-day from the 2010 Minnesota report[17] (the estimated value excludes staff and teacher waste)
- Four-school district with a total 750 students (the 2010 state-wide student population was 110,411 students[23])
- 175 school days/year
- 40% diversion level through recycling

Other research has estimated that students may generate more than 1 pound/day[24], which would significantly increase the diversion potential from Wyoming schools.

Container Costs - It is possible that school districts could capitalize their school diversion programs with dumpsters in their centralized collection areas, as well as small, individual containers for classrooms, offices, copy or lounge areas:

- Dumpsters for consolidating collected materials - may be $650 for the purchase of a 4-cy metal dumpster - alternatively, these containers may also be provided by the hauler and included in the cost of service or rented by the haulers at an additional cost[25]
- Small, individual containers may be based on 14-quart bin or hanging baskets (see Figure 7-3) and can be purchased for approximately $4.50 to $9.50 each

[22] See *www.ctahr.hawaii.edu/oc/freepubs/pdf/HG-45.pdf*

[23] Wyoming Department of Education enrollment report from Wyoming schools (88,165), UW (12,992) & community colleges (9,254) - *http://edu.wyoming.gov/DataInformationAndReporting/StatisticalReportSeries2.aspx*, *www.uwyo.edu/studentaff/_files/docs/em/fall10enrollanalysis.pdf*, *http://communitycolleges.wy.edu/business/Reports/ER/ER2010Spring.pdf*

[24] Wyoming State Department of Ecology, *https://fortress.wa.gov/ecy/publications/publications/88033a.pdf*.

[25] Rocky Mountain Recycling rents tractor trailers for $200/month to its recycling customers

FIGURE 7-3 INDIVIDUAL RECYCLING CONTAINERS[26]

For a four-school district with 75 areas each requiring a small bin to collect paper and eight 4-cy dumpsters, container purchase costs could be as high as $6,000 (excluding program set-up, training and signage costs).

Hauling Costs - As the cost private vendors will charge for hauling recyclables to a processing facility will vary significantly, they have not been estimated for this Study. These costs depend on the school locations, MRF location, quantities of materials collected and whether the hauler provides other services for the district (such as trash collection).

Revenue Potential - For the purpose of estimating the revenue potential in this Study, it is assumed that recyclables will be collected fully commingled (single-stream). Based on the diversion quantity estimated above (14 tpy) and the Table 5-4 pricing for single-stream materials delivered to MRFs prior to processing, it is possible that each district may earn as much as $350/year (less hauling costs). This value could certainly be increased if on-site sorting was accomplished (requiring more containers and supervision to control contamination). It is further assumed that no revenues would be earned from compost products.

Avoided Landfill Disposal Costs - An estimate of $1,000 is based on the diversion potential estimated above (14 tpy) and the average projected disposal cost of $73/ton for Wyoming landfills (see Table 2-4). As noted in Section 2.3, it is likely that this rate underestimates the actual average landfill costs, however, and that avoided costs may be higher once landfill owners make their final facility improvement decisions and confirm costs.

Related Information

- District-wide approach to school diversion in California with sample resolution language for recycling paper and food disposables used in a district-wide program - *www.calrecycle.ca.gov/Publications/Recycling/50094009.pdf*
- "How to" websites
  - *www.epa.gov/wastes/conserve/tools/localgov/sectors/school.htm*
  - *www.scdhec.gov/environment/lwm/recycle/pubs/start_school_recycling.pdf*
  - *www.resourcefulschools.org/activities/youtube/how-to-start*
  - *www.dosomething.org/actnow/actionguide/start-a-school-recycling-program*

[26] *www.recycleaway.com/Deskside-Recycling-Bins_c_27.html*

  - *www.ct.gov/dep/lib/dep/compost/compost_pdf/schmanual.pdf*
  - *www.recycleguys.org/schools.asp* (includes financing and collection information)
  - *http://ladpw.org/epd/envdef/Teacher-PrincipalPacket.pdf* (includes reuse)
- Yard waste bin construction
  - *www.calrecycle.ca.gov/publications/organics/44295054.pdf*
  - *www.ct.gov/dep/lib/dep/compost/compost_pdf/schmanual.pdf*
  - *http://greenactioncentre.ca/content/multi-bin-composting-system/*
- Small-scale composting how to:
  - *http://cwmi.css.cornell.edu/smallscale.htm*

8.0 MULTI-FAMILY RECYCLING

This section includes a user-friendly cost model for a multi-family dwelling recycling program, created to both support the cost analysis in this section and provide future users the ability to run alternative program scenarios in the future.

TABLE 8-1 SUMMARY OF FINDINGS FOR MULTI-FAMILY RECYCLING (per MFU complex)

FINDING	DESCRIPTION
Implementation - At individual multi-family complex level by property manager or owner, during the short-term planning period (2015)	
Potential Diversion	<1,000 tpy Could be as high as 9,000 tpy state-wide
Estimated Site Development Costs	$4,000 to $5,000
Estimated Container Costs	$2,000
Estimate Hauling Costs	Not included
Estimated Revenue Earnings	$1,000/year
Estimated Net Revenue	$1,000/year Minus hauling costs
Estimate Avoided Disposal Costs	$3,000/year

All costs estimated in 2011$ - quantities rounded to nearest 1,000 tons, costs to nearest $1,000

8.1 General Considerations

The definition of multi-family dwellings or MFUs vary in many communities. Technically, any dwelling larger than one single-family unit (or SFU) is a MFU. From a service perspective, however, some solid waste programs treat duplexes and triplexes as SFUs (due to their accessibility)[27]. Some cities and states also sub-divide MFUs in terms of residential and commercial solid waste accounts for regulatory and commerce reasons (e.g., Colorado defines any dwelling with 8 or more units to be a commercial account).

MFU diversion rates are typically substantially lower than from SFUs. A 2001 study by USEPA and the US Conference of Mayors[28] reported that cities with moderately mature diversion programs observed 14% recycling rates from MFUs and 18% recycling rates from SFUs. The diversion potential from MFUs is significant enough to warrant focused planning efforts. According to a study done in Thurston County, Washington (approximately 250,000 people) in 2009[29], it was found that the MFU waste stream included 19% food waste, 15% recyclable paper, 9% metals, 5% glass and 3% plastic bottles. MFU diversion is more complicated that SFU diversion for several reasons:

- Many communities rely on drop-site collection for MFU diversion (as convenience goes down, so do diversion levels)
- Many MFUs are serviced throughout the U.S. by private haulers (not all trash haulers offer recycling services)

[27] Similarly, mobile home parks are typically considered MFUs because of their lack of accessibility.
[28] USEPA Multifamily Recycling - A National Study, EPA530-R-01-018, November 2001 (note that the total SFU diversion rate was 34% when yard waste collections were considered).
[29] Thurston County Waste Composition Study, Green Solutions, December 2009, Table E-2 *www.co.thurston.wa.us/solidwaste/regulations/docs/ThurstonCountyWasteComp-08-09.pdf*.

- Many MFUs collect trash in dumpsters which haulers service with front-loading collection vehicles (if recycling service is added using any other type of container, haulers need to utilize a different collection vehicle)
- Most MFUs were not constructed to accommodate space for both trash and recycling in their designated storage area (often located in a parking area or garage) - adding recycling may incur costs associated with expansion (especially if the area is enclosed) and the loss of parking space
- Individual housing units within MFUs also have limited space which may deter a resident from sorting and storing their recyclables prior to taking it to the storage area
- MFUs can have large turn-over rates (especially where rental versus ownership is high) and move-in/move-out activities create higher levels of bulky trash - turn-over also makes it difficult to keep residents educated and implement a consistent recycling program
- MFU recycling may not be a direct benefit to individual unit renters/owners as the cost savings may be earned by the complex owner or property manager level

Wyoming Status - According to the 2010 census information, approximately 16% of Wyoming's total dwellings are MFUs[30]. MFU recycling in Wyoming faces most of the challenges noted above. For example, the City of Riverton provides curbside recycling to its SFUs, but cannot extend this service to MFUs because the city uses pick-up trucks and trailers that cannot service carts or dumpsters. Some successful programs of note include:

- Casper offers MFU cart and dumpster recycling (depending on size) to complexes/trailer parks with three or more units
- Gillette's 2216-unit Remington Village replaced four trash dumpsters with four recycling containers
- All Jackson residents (SFUs and MFUs) are encouraged to recycle at one of the seven drop sites
- Larger MFUs in Sheridan may opt for commercial billing (versus individual residential billing) - with commercial status, they can also have recycling service which provides a 30% reduction in trash fees (paid through utility bills)

8.2 Implementation

Successful MFU diversion programs will be implemented and operated at the local level. Typically promotion and education is provided by the local government, while actual site development, hauler contracting and container purchasing is undertaken by MFU management, with costs passed on to each unit as part of their regular fee.

A curbside MFU recycling program can be started at any time, and should be a short-term target for Wyoming communities. It is expected that a new, voluntary program (described below) would take approximately one year to implement, once hauler service is identified. Mandatory programs may take longer as local policy and stakeholder approval will likely be required.

Only curbside MFU programs for the collection of recyclables is discussed in this section as it is unlikely that MFU organics recovery programs will be implemented in the short-term planning period of this study

[30] *http://quickfacts.census.gov/qfd/states/56000.html*

(Section 6.1 discussed drop-site collection). To implement a successful MFU recycling program, Wyoming communities should consider programs which have the following elements in common:

1. Identify/Enlist Stakeholder Participation of Key Players;
   - Property owners and managers (without their support, diversion efforts may be doomed) - lease/rental agreements can contain language about recycling requirements and opportunities (see the Related Information section for examples)
   - MFU residents including volunteer recycling "champions"
   - Maintenance and janitorial staff
   - Community recycling coordinator (an invaluable asset and way to not "reinvent the wheel" in designing the program and educating residents)

2. Decide Between a Voluntary or Mandatory Program - While it is expected that most Wyoming programs will be voluntary, it is worth noting that USEPA's 2001 study found that 90% of 40 communities surveyed required MFU recycling (see the Related Information section for an ordinance example). Even in a voluntary program, incentives to encourage participation should be considered.

3. Determine the Hauler/Collection Strategy - As the hauler typically does the marketing and hauling to end-use markets, selection of the recyclables hauler usually means selection of markets. Once the hauler is in place the type of containers, collection vehicle, collection frequency and routing relative to trash collection are usually determined. Selection of a hauler may depend on a number of factors;
   - Existing recyclables hauler operations (public or private) - trash and recyclables may not be collected by the same hauler
   - Level of local government control (whether the trash & recyclables collection system is open subscription, contract hauling or public collection)
   - Competitive bidding (for contract hauling by property owner or local government)
   - Contract negotiation with the hauler - which at a minimum should cover contract length, service details (including who provides containers, size, type, collection location and pickup frequency) and pricing

   Hauler selection will also impact any fee assessment on the MFU property and/or individual units. In the 2001 USEPA survey, a majority of surveyed communities utilized a flat fee for recycling service combined with a volume-based variable pricing schedule for trash (which provides a recycling incentive). As recycling levels increase, recycling fees should also decrease.

4. Identify Level of Commingling & Targeted Recyclables - While programs will vary depending on available markets and hauler constraints, single-stream collection will provide the greatest convenience for residents and may allow either semi-automated or automated collection. Targeted materials should include as long a list as the hauler and market can accommodate and is expected to include OCC and a range of mixed paper and containers.

5. Design the Collection System (including both containers and a centralized storage location) - Container considerations include;

- There are a variety of container options available for MFU resident recycling but most programs have found success by providing a cluster of two to three 95-gallon, wheeled carts for every 20 to 30 residential units - these can provide redundancy for a single-stream program or can be used for source-separating materials as needed
- Containers can be placed wherever they are most convenient to residents (such as at the ends of halls) - however, experience demonstrates that when recycling containers are not placed adjacent to a trash container, recyclables contamination can be an issue (see Figure 8-1)
- Alternative container options can include individual unit recycling bins or bags
- Additional containers should be kept in inventory for residential move-in/move out
- Container purchase/ownership can be the responsibility of residents, property owner/manager or hauler (the Related Information section references sample language for a container deposit system)

FIGURE 8-1 EXAMPLE MFU RECYCLING CENTER[31]

The design of a centralized storage and collection point for MFU recyclables should consider;

- Trash and recyclables collection sites are typically located outside (some communities may provide small, covered and/or enclosed structures to discourage littering and contamination)
- The ability to co-locate with existing trash storage and collection (may be ideal if the same trash and recyclables hauler is used) - including expansion of the storage area, enclosures (if any) and hauler access
- If a new area is required for recyclables, a site assessment providing convenience to residents, safe access for haulers and materials control may be needed

6. Implement Policies to Support Collection Infrastructure - Policies that might be implemented at the local government level to encourage MFU recycling include;
   - Implement policy that requires all new MFU/commercial building or major renovation to include designated recycling storage/collection space - this “equal space" concept addresses the common obstacle of inadequate space for recycling (see the Related Information section for example language)
   - Create incentive/rebate program – such as:

[31] Picture from: San Antonio Multi-Family Recycling Guidelines, *www.sanantonio.gov/swmd/documents/MF%202011%20Guidebook_Final.pdf*

  - Sheridan provision of a 30% discount on garbage collection fees for large MFUs
  - Fort Collins, Colorado's 50% rebate on the cost of MFU recycling (up to $500) for the first six months of service[32]
- Extended technical assistance for system design and public outreach targeted toward MFU residents

7. Implement an Outreach & Education Plan – Experience indicates that individuals who connect recycling with the larger issues of resource conservation and environmental protection are more motivated to participate in recycling and reuse programs. Plan components should include;
   - Use of graphics to the extent possible and multiple languages as appropriate to the region
   - Use of clear signage on containers and in the centralized storage area including what materials are accepted and which are not in the program, and who to contact for more information
   - Providing clear instructions on options for bulky and non-recyclables items to minimize contamination
   - Providing recycling information with move-in welcome packets (and move-out recycling instructions as needed)
   - Providing consistent, on-going messaging and reinforcement to permanent residents

8. Monitor Progress & Provide Feedback to Residents – Track quantities, costs, cost savings and contamination and share data, program feedback and other information with residents to encourage participation and ownership in the program.

8.3 Estimated Diversion Potential, Costs and Revenues

Diversion Potential - Less than 100 tpy would potentially be diverted from a 200-unit MFU complex if the USEPA 2001 finding that each MFU generated 0.211 tons/year of recyclables is applied. As state-wide there are 41,000 MFUs,[33] the state-wide diversion potential could be as high as 9,000 tpy.

Costs - *Specific costs for this collection option were developed using the MFU Cost Models in Appendix H. These models both support the costs estimated in this section and provide a user-friendly Excel-based model for running alternative MFU scenarios in the future. The Cost Model uses a red font to indicate values or assumptions that can be changed – actual calculations used in the model can be viewed by clicking on specific cells in the worksheet. The READ ME worksheet explains how each model can be used. The INPUTS sheet includes assumed values that can be revised for specific local conditions and planned operations.*

The cost of implementing a curbside MFU recycling program will vary widely with the size of the complex, need for centralized storage/collection area expansion and the hauling option. As noted above, these costs are most likely to be incurred by MFU management and passed on to individual residents. Key cost components include:

[32] www.fcgov.com/recycling/pdf/multi-family-recycling-service-rebate-pre-application.pdf?1323293012
[33] Units In Structure from the U.S. Census Bureau's, 2010 American Community Survey, 1-Year Estimates; provided by State of Wyoming, Economic Analysis Division

1. Dedicated, Enclosed Recycling Area - The Appendix H MFU Cost Model identifies a site development cost of approximately $5,000 based on the following assumptions;
   - 300-sf for four 4-cy dumpsters (this roughly mimics the Remington Village complex in Gillette)
   - Suitable paved area will exist at the MFU for recycling use (preferably near or adjacent to the trash collection area) - and with adequate lighting
   - The area will be fenced, gated & provided with adequate signage
   - Collection will be contracted out - haulers will provide containers as part of the service fee

   While the Appendix H model estimates the cost for a recycling area of a specific size, it provides additional information that can be used to estimate the cost of an alternatively sized area, depending on each MFU's recycling needs. Table 8-2 summarizes the modeling results for four MFU sites;
   - Four 2-cy dumpsters (250 square feet) - two each for commingled containers and mixed paper
   - Four 4-cy dumpsters (300 square feet, highest capital costs) - two each for commingled containers and mixed paper
   - Two 6-cy dumpsters (170 square feet, lowest capital costs) - one each for commingled containers and mixed paper
   - Two 8-cy dumpsters (200 square feet) - one each for commingled containers and mixed paper

TABLE 8-2 MFU SITE COST SUMMARY[a]
(2011$, costs rounded to nearest $1,000)

COST CENTER	TOTAL COST
CAPTIAL COSTS	**CAPITAL COST ESTIMATE**
Fencing	$1,000 to $2,000
Gate	$1,000 to $2,000
Signage	$1,000
Contingency (10%)	<$1,000
Subtotal Capital Cost	$4,000 to $5,000
EQUIPMENT COSTS	**EQUIPMENT COST ESTIMATE**
Individual Recycling Containers	$2,000
Subtotal Equipment Cost	$2,000

[a] See INPUTS sheet in Appendix H

2. Individual Recycling Containers for Each Unit - A suitable example includes a rigid, 6-gallon containers (see picture in Figure 8-2) that can be imprinted with the MFU's name & recycling instructions. These containers can be purchased for approximately $10 each & would therefore cost about $2,000 to purchase for a 200-unit complex.

FIGURE 8-2 EXAMPLE INDIVIDUAL MFU CONTAINERS[34,35]

Hauling Costs - As the cost private vendors will charge for hauling recyclables to a processing facility will vary significantly, they have not been estimated for this Study. These costs depend on the MFU location, MRF location, quantities of materials collected and whether the hauler provides other services for the MFU (such as trash collection).

Revenue Potential - For the purpose of estimating the MFU revenue potential from dual-stream recyclables, single-stream pricing from Table 5-4 has been applied (the materials recovery facility analyzed in Section 10.0 accepts source-separated materials and does not include a sort line). This equates to an estimated $1,000/year revenue stream for a 200-unit MFU. It is possible that MFUs would receive slightly better pricing than $25/ton if the paper and containers are collected separately - although, as noted above, individual unit renters/owners may not directly receive the earnings. Broker fees have not been included.

Avoided Landfill Disposal Costs - An estimate of $3,000/year is based on the diversion potential estimated above (<100 tpy) and the average projected disposal cost of $73/ton for Wyoming landfills (see Table 2-4). As noted in Section 2.3, it is likely that this rate underestimates the actual average landfill costs, however, and that avoided costs may be higher.

Related Information

- Mandatory MFU recycling law in Maryland - *http:/waste360.com.multi-family/maryland-passes-multifamily-recycling-law*
- Comprehensive guide including program set-up/maintenance, move-in/move-outs, sample lease agreement - *www.ecoact.org/PDF/MultiFamilyRecycling/MFD_ManagerKit_2010.pdf*
- Program Guides
  - *www.sanantonio.gov/swmd/documents/MF%202011%20Guidebook_Final.pdf*
  - *www.epa.gov/osw/conserve/rrr/pubs/multi.pdf*
  - *www.calrecycle.ca.gov/LGCentral/Library/Innovations/MultiFamily/Program.htm#Programb*
  - *www.eurekarecycling.org/tools/Wheel_Basic_Recycling_Structure/1a.Developing_A_Multifamily_Recycling_Program.pdf*

[34] *http://store.recyclingcontainer.com/multi-recycler-multi-rec-p58.aspx*
[35] *www.bagitsystem.com/recycling-bag-products/multi-family-tote*

- Sample language for lease agreement
  - *www.sdcounty.ca.gov/dpw/recycling/Files/Sample_Lease_Agreement.pdf*
  - *www.ecoact.org/PDF/MultiFamilyRecycling/MFD_ManagerKit_2010.pdf*
- Sample Language on Equal Space
  - *www.ecocycle.org*
  - *http://greenyes.grrn.org/2006/04/msg00019.html*
- Additional Resources:
  - "The Effectiveness of Multifamily Dwelling Composting Programs in Alameda County," - *http://nature.berkeley.edu/classes/es196/projects/2010final/CrummettN_2010.pdf*

9.0 OTHER COLLECTION CONSIDERATIONS

There are many other collection options that may be viable for Wyoming communities, but are too numerous for review in this Study. The following summary includes two such examples.

9.1 Curbside Collection of Diverted Materials

As in all parts of the U.S. there are several recyclables collection strategies in Wyoming. There is a prevalence of public collection programs in Wyoming. Local governments both provide curbside collection and operate DOCs, depending on the location - while private haulers are generally limited to curbside collection. Residents are fairly well-serviced in terms of recycling, while commercial recycling may be limited to cardboard (see Section 9.2). Table 2-3 detailed the types of diversion collection programs in each community.

By making recycling more convenient for the generator, curbside collection typically diverts much larger quantities – its greatest benefit. Additional "pros" include the ability to:

- Reach a greater number of customers on collection routes with educational materials & program updates – instead of reaching only those generators who use a DOC
- Collect organics (especially food waste) - that can create nuisance issues if stored at drop sites
- Implement PAYT or other incentives - to encourage generators to "trash less, recycle more" (more difficult to implement these incentives at DOCs)[36]
- Track generator-specific data - either on a household/business basis or on a per-route basis

The primary limiting factors ("cons") to curbside recycling include:

- A minimum number of households or businesses (& location density) are required to justify a separate recyclables or organics collection equipment & routing - in rural areas, quantities and housing densities can be so low that curbside collection is simply not economical
- The costs needed to capitalize and operate a collection fleet (although in some cases the same vehicle can be used to collect both trash and recyclables at separate times on the same routes)

Regardless of the collection method used for recyclables, in areas where waste diversion levels have increased significantly, there may also be an option for decreasing the frequency of trash collection. While relatively new across the U.S., some cities are observing the ability to off-set the cost of collecting recyclables and/or organics but reducing trash collection to every-other-week (Portland, OR; Renton, WA; Toronto, ON) or monthly/on-call (Boulder, CO; Arcata, CA). While this may not be common practice in Wyoming in the near future, it is a potential benefit of increased diversion in the long-term.

[36] PAYT can be implemented at DOCs (as in Fremont County) - however, this pricing structure is more difficult to implement effectively without staff available to assess/collect fees.

Case Study - WE RECYCLE (Pueblo, Colorado)

WE RECYCLE is a non-profit organization that provides curbside recycling collection using a successful mix of concepts that is unique - but very transferable - including an initial investment of less than $10,000. WE RECYCLE purchased reusable bags, a pickup truck and work space; sold memberships in its 'recycling cooperative' to pay for weekly collection of single-stream materials in reusable bags (bags are washable & are cleaned between uses); provided members with discount coupons solicited from local merchants; negotiated lower trash rates from local haulers; sold their bags to local non-profits and service organizations; and leveraged additional savings for the cooperative through material sales revenues. WE RECYCLE does minimal processing and sells the materials to another processor (limited equipment is needed). The organization now has thousands of customers, including commercial and institutional clients, and are currently expanding to outlying communities. They plan to purchase additional processing equipment in the near future. WE RECYCLE is a highly effective model that could potentially be used in Wyoming.

9.2 Commercial Recycling

Focusing on the commercial waste stream for the collection of recyclables can dramatically increase recycling rates in Wyoming. High quality, source separated papers (and in some instances select plastics or metals) can often be obtained from commercial businesses. Food waste is another material that can be collected from businesses (i.e. restaurants) and institutions for composting. Commercial recycling generally brings the largest amount of recyclable materials for least cost per ton; a lower cost per ton of recovered material than a residential recycling program. Because this can often be an easily captured material stream with potentially high resale value, private recyclers often target commercial material as a source of income. Effective commercial recycling programs often target corrugated cardboard (OCC) and office paper as the two predominant waste streams. Wyoming communities of Casper, Cheyenne, Green River, Jackson County, Sheridan, Buffalo, Powell, and Riverton (contracted to CES) operate public collection of commercial OCC. Private companies such as Jackson Recycling (Jackson), Star Solution (Evanston) and others also provide commercial OCC recycling collection in Wyoming.

By utilizing a targeted approach to commercial recycling, communities can provide a sustainable level of service that result in significant waste diversion rates. Commercial collection is often presented to businesses as a two-dumpster concept – one for waste and one for select recyclables; food waste collection could be the second cart/dumpster or third. The collection and delivery of the "second dumpster" to MRF or compost facility could be provided as public collection or through existing private-contract haulers. There are a number of business structures that communities and a commercial recyclables generator could use to increase diversion, if local processing capabilities exist.

Food waste can be generated in great quantities by restaurants, grocery stores, businesses with on-site cafeteria services, and institutions (i.e. schools – see Section 7.0). Based on national data, each business may generate between 20 and 60 tons of food waste annually. Collection of food waste (organics) may present additional challenges. Key issues for generators and haulers are expected to include:

- Containers - high moisture content in food waste is corrosive and would decrease the life of metal containers & vehicles (plastic carts can be an ideal solution, depending upon space constraints - plastic dumpsters are also available in sizes ranging from two to eight cy).

- Container Maintenance - containers will typically be provided by the hauler & there should be a clear understanding of which party is responsible for keeping the containers clean and minimizing odors and vermin (regular container cleaning should be part of the collection contract)
- Collection Frequency – food waste will need to be collected frequently, up to 3 or more times a week & more frequently in the summer
- Compost Facility - One of the biggest challenges for haulers may be the identification of a compost facility permitted to accept food waste

Even though private haulers would have expenses to implement recyclables and food waste collection services (e.g. vehicles, drivers, carts, etc. and the MRF or compost facility tip fee), it is anticipated that fees charged for refuse, recyclables and/or food waste collection would generate the revenues needed to cover the incremental cost increases. Direct marketing of collected recyclables or partnership/contract with a local MRF can also generate revenues. Commercial recycling collection can provide the following benefits:

- Collect large quantities of recyclable materials for least cost per ton
- Potential to generate positive cash flow (papers, plastics, metals)
- Reduce the quantity of waste & generate profit by lowering waste disposal costs and reducing frequency of waste collection

In addition to the limiting factors presented for residential curbside collection, commercial recycling can face the following cons:

- Limited space near business for additional dumpsters or carts
- Businesses and private haulers may be resistant to change unless the potential economic benefit (or no increase to current costs) can be shown

Related concepts to commercial recycling collection program would be select processing of concentrated loads delivered to a transfer station or landfill baling facility and to work with businesses that might already have a small vertical baler (for OCC or plastic bags) to jointly market material with the goal of increasing revenue based on increased volume of materials sent to the market.

PART III
PRIORITY PROCESSING OPTIONS

Once diverted wastes are collected from generators, many materials require some level of processing or aggregating before they become cost-effective to transport and are acceptable to end-markets. These interim steps may include aggregating tons; removing contaminants and sorting commingled materials; volume reduction; composting or other organics processing; and processing special waste. As with all other steps in a waste diversion system, each component must contribute to a level of cost-efficiency that makes the total system economically sustainable. One of the best ways to increase sustainability - especially in rural areas - is through regionalizing infrastructure and programs. This part of the Study includes a detailed analysis of four regional processing options, targeted to improve Wyoming's waste diversion success in the future (Section 15.0 in Part IV discusses implementation of regional collaborations on a policy level):

- Regional Materials Recovery Facility
- Regional Yard & Wood Waste Composting Facility
- Materials Baling Options (Plastics)
- Regional Mobile Equipment

The Wyoming Statewide Study of Waste Diversion was commissioned by the Wyoming Department of Environmental Quality using funds appropriated by the Wyoming Legislature. LBA Associates, Inc. was contracted by the Department to undertake the study. Any recommendations made or conclusions reached in the study are solely those of LBA Associates, Inc., and not necessarily the State of Wyoming.

10.0 REGIONAL MATERIALS RECOVERY FACILITY (HUB & SPOKE SYSTEM)

This section includes a user-friendly cost model for a material recovery facility, created to both support the cost analysis in this section and to provide future users the ability to run alternative drop-off collection scenarios in the future.

TABLE 10-1 SUMMARY OF FINDINGS FOR MATERIALS RECOVERY FACILITY OPTIONS (per RPA)

FINDING	DESCRIPTION
Implementation - At the regional level by public, private, and/or non-profit partnerships with planning completed during the short-term planning period (2015) & construction complete by 2020	
Potential Diversion	7,000 to 18,000 tpy Could be as high as 66,000 to 177,000 tpy state-wide
Estimated Capital Costs	($3,824,000) Excluding land siting & purchase Annual debt service is included in estimated O&M costs
Estimated Equipment Costs	($844,000) Annual debt service is included in estimated O&M costs
Estimated O&M Costs	$1,101,000 Including capital, development, equipment costs annual debt service; annual O&M & hauling costs
Operating costs/ton	*$100/ton based on average throughput of 11,000 tpy*
Estimated Revenue Earnings	$1,028,000 to $2,684,000/year
Estimated Net Cost/Revenue	$73,000 cost to $1,583,000 revenue Excluding any MRF payments/rebates for delivered recyclables
Estimate Avoided Disposal Costs	$482,000 to $1,292,000/year

All costs estimated in 2011$ - quantities rounded to nearest 1,000 tons, costs to nearest $1,000

10.1 General Considerations

MRFs receive and process recovered recyclables from collection programs to sort, if necessary, and bale materials for shipment to markets. Most MRFs process source-separated or commingled recyclables. MRFs that recover recyclables from the solid waste stream, sometimes called “dirty” MRFs are not discussed in this report.

Development of a regional MRF to serve rural and larger geographical areas works with the “hub-and-spoke” or H&S recycling model. Hubs, or regional MRF, typically take materials from a number of smaller spokes for processing - i.e., sorting, baling, aggregating for transport to market or some combination thereof. The MRF also serves as a storage center for processed bales, protecting these commodities from weather that may reduce their value. Hubs are tasked with marketing the materials processed and consolidated.

10.2 Hub & Spoke Recycling System

In its simplest form, the H&S recycling model consists of a centralized processing center for recyclables, or "hub", where material is sorted, baled, and/or sold to market. The "spokes" consist of surrounding communities that feed the recyclables they collect to the main hub. Typically the hub and spoke communities have a formal agreement that ensures the recyclables collected in the region flow from the spokes to the hub for processing.

Rural areas' recycling efforts can be hampered by low population and tax base, limited local government budgets and personnel, low-density housing and limited commercial development. A regional H&S recycling approach can help overcome the barriers facing individual rural governments. Benefits include:

- Increased volumes of recyclables, which opens marketing opportunities
- Potential for cooperative marketing, which can substantially increase revenues
- Conserved landfill capacity and avoided tipping fees
- Regional economic stimulus from new collection and processing jobs
- Shared costs for equipment, personnel, processing, transportation, marketing and facility capital and operating costs
- Supporting recycling in a rural area that may otherwise not be able to afford a program

H&S systems create economies of scale that avoid the need for communities to invest in duplicative recycling infrastructure. Costs for equipment, personnel, processing, transportation, and marketing are shared. Additionally, the long-haul transport of recyclables to market from multiple remote areas is avoided.

Equally important is the development of a regional partnership to sustain the H&S system. Many small communities struggle to generate enough recyclables to attract investment from large recyclers, as well as be able to financially support a full-scale recycling program. Consolidating recyclables from multiple communities via a H&S partnership increases the volume of recyclables collected, and, hence revenue potential.

H&S Examples

The concept of an H&S regional collection program is not new. Many areas of the country have utilized this approach in an informal manner even though it may not have been called H&S at the time. For example, in the Eureka-Kalispell area of Montana, the smaller community of Eureka collects recyclables and transports them to the larger community of Kalispell for processing and sales. In Colorado, the South East and East Central Recycling program collects materials from drop off sites in 14 counties and takes them to a central location for processing and transportation to either end markets or a larger processing facility. The ARK program in southeastern WY is also a model of the H&S approach (serving 11 communities in southern/central Wyoming, Nebraska and Colorado as well as several institutions and businesses in the southeastern part of the state). Collection bins are located throughout surrounding communities, which are then transported to Laramie for processing and shipment to end markets. However, all these examples are informal and incomplete examples of a true H&S program. The New Mexico case study below presents one of the best H&S examples available.

Case Study - New Mexico Hub & Spoke System

New Mexico, under the leadership of the New Mexico Recycling Coalition (NMRC), is in the process of building a formal H&S system throughout the state, setting up 10 new 'hubs' (in addition to the 10 existing hubs) that work with various 'spokes' in their waste sheds. The H&S design there has the smaller communities (spokes) collecting and baling materials locally. The bales are then shipped to the larger, more central hub communities with which they have formal agreements to accept the spoke's recyclables. These agreements usually take the form of a Memorandum of Understanding (MOU) between governments or some form of signed contract if between private entities. This ensures the spoke of a market for their materials. NMRC is currently evaluating the development of a cooperative marketing system to address the relatively small quantities generated state-wide.

Wyoming Status - Wyoming would benefit from a formal H&S system. Most communities in the state have some sort of collection system already and there are a few hubs established as well (e.g., Cheyenne, Laramie, Casper, Gillette and Jackson). The challenge will be to encourage communities to work together in a cooperative fashion in order to be successful. If the state were to take a more proactive and planned approach to pinpoint which communities could act as hubs and facilitate relational agreements between the communities acting as spokes, this would solidify a system that can collect and market materials from a more powerful position.

10.3 Implementation

An H&S system can be started at any time and can be set up in one area before being introduced in another. This way, locations that already have existing infrastructure can more easily get a H&S program running, and be used as an example for other areas of the state to follow. The regional MRF concept, or hub, will need to be implemented at the regional planning area level with cooperation of local jurisdictions. Regional MRFs should be coordinated with existing and future recycling collection programs (i.e., curbside collection and drop-sites).

Development of facilities such as regional MRF will take time to develop concept, identify location, obtain agreements and funding, coordinate implementation of collection programs, and build the facility. As noted in Table 10-1, the regional organization and function should be in place by 2015, such that expanded/new MRF infrastructure can be designed, permitted and constructed by 2020. The specific timeline may include:

- Complete facility planning & obtain funding - one to two years
- Identify & purchase land - one to two years
- Design & bid facility - one year
- Seek applicable permits if necessary
- Construction & start-up - one to two years

Specific implementation steps include:

1. Developing a State-Wide H&S Model – A state-wide approach may/may not be the ultimate direction for Wyoming - individual H&S systems with discrete regional MRFs may be implemented instead. However, recommendations for developing a state-wide model are included below;

- State-wide resources to research and build a H&S model will be important but will vary depending on locations selected as hubs and spokes, and whether or not infrastructure is already in place - staffing at the state level (WDEQ, WSWRA or a combination of the two) may be needed
- Facilitate agreements between hubs & spokes - a critical aspect of a fully functional and successful H&S program (if communities cannot agree on which should be the spokes and which the hub, and if intergovernmental agreements regarding the sale and transportation of materials are not in place, the program will not work)
- Obtain funding - this will provide added leverage to the H&S sustainability (MOUs may be required before funding is fully available)
- Marketing at the state level may also be a strong benefit to a state-wide H&S system (this is the direction that NMRC is going as well) - this may be a role especially well-suited for WSWRA[37]

2. Mapping;
   Look at waste sheds (what makes the most sense for communities to be grouped together)
   - Identify central location for region (i.e., "hub")
   - Identify the collection programs/sources of recovered materials (i.e., "spokes")
   - Work to create agreements between hubs and spokes

3. Infrastructure Planning;
   - Expand/improve existing processing facilities to serve as "hubs"
   - Conceptually size/design new MRFs
     - Determine potential quantities
     - Utilize Regional MRF Sizing and Cost Model to develop conceptual size; INPUT sheet provides location for recovered materials quantities and collection programs
     - Identify level of processing needed – source separated materials and/or commingled (single stream)
     - Identify number and type of processing equipment
   - Determine facility ownership and operations
   - Identify funding options (loans, bonds, grants)
   - Acquire necessary permits

4. Build Infrastructure (can be done waste shed by waste shed);
   - If not in place, hubs need storage buildings, forklifts, balers, sorting systems, transportation (rail or truck most common)
   - If not in place, spokes need collection bins, small baler and transport to hub, unless hub collects from spokes
   - Look for backhauling or milk run opportunities for transporting

5. Market Materials Collected;

[37] The Cooperative Teamwork & Recycling Assistance (CTRA) of Texas began as a marketing cooperative within the state recycling organization but eventually branched off to become its own entity. This organization is now fully independent and self-supporting.

- Determine best marketing strategy – state coop, regional coop, MOUs, brokers, etc.
- Develop cooperative agreements as needed
- Create mechanism for sales (i.e., actually form cooperative, if that is the chosen strategy)

6. Review State & Local Regulations - Identify any disincentives to the use of recycled materials. A common example is state transportation agencies not prioritizing compost in their highway specifications.

7. Evaluate Program;
   - Review all aspects of program
     - Are waste sheds working?
     - How could they function more efficiently?
     - What additional infrastructure is needed?
     - Are materials being marketed or used most effectively?
   - Adjust as needed

10.4 Estimated Diversion Potential, Costs & Revenues

Diversion Potential - An estimate of 6,600 to 17,700 tpy for each MRF is based on the assumptions below (11,000 tpy was used to develop the cost estimates below). Based on a state-wide potential, this level could be as high as 66,000 to 177,000 tpy.

- Facility will be a regional MRF for a service area equivalent to an average Wyoming RPA (or approximately 10% of the state - see Table 2-1) with an haul distance (assuming that hubs are located near the geographic centroid of Wyoming RPAs for estimation purposes) in the range of 30 to 100 miles
- MRF accepts traditional paper (all materials except Other Paper in Appendix D) & containers (plastics #1-#7, mixed glass & metal can) recyclables from the MSW stream
- MRF is designed for 2020 MSW quantities
- A diversion rate of 30% to 50% by 2020 (average of 40%)[38] - it is recommended, however, that Wyoming utilize NMRC's H&S data, when it becomes available, to refine the MRF design parameters

Clarification About RPA Service - The assumption of a regional MRF serving one or more of Wyoming's RPAs is made to facilitate estimations about design capacity, diversion and costs only for the purpose of this Study. It is not intended to suggest that existing MRFs are inadequate, should be expanded or moved - some existing MRFs do not currently have the capacity or authority to expand their service areas, some RPAs may need multiple MRFs and some MRFs might serve more than one RPA. Individual MRF service area and services will need to be an independent evaluation - although the ability to evaluate the need for regional recyclables processing on a state-wide level is strongly recommended, as noted below elsewhere in this section.

[38] US recycling rates: 2009 plastic bottle - 28% (Earth911.com); 2011 aluminum can - 58% (Aluminum Association); 2007 glass - 28% (USEPA); 2009 paper - 63% (American Forest & Paper Association); 2010 overall MSW recycling rate - 34% (USEPA).

Capital Costs - *Specific costs for this processing option were developed using the MRF Cost Model in Appendix I. This model both supports the costs estimated in this section and provides a user-friendly Excel-based model for running alternative MRF scenarios in the future. The Cost Model uses a red font to indicate values or assumptions that can be changed – actual calculations used in the model can be viewed by clicking on specific cells in the worksheet. The READ ME worksheet explains how each model can be used. The INPUTS sheet includes assumed values that can be revised for specific local conditions and planned operations. The SUMMARY sheet provides a concise summary of costs and revenues.*

MRF development is capital-intensive. Regional MRFs are more cost effective than several individual processing facilities since economies of scale can be realized on the building construction and processing equipment with a greater facility throughput. The Appendix I MRF Cost Model includes costing components for capital development (site, building and processing equipment), engineering and permitting, annual operations and maintenance, and recyclables haul analysis (to markets). Table 10-2 (next page) summarizes estimated capital costs (see MULTI-STREAM ANALYSIS, MRF BUILDING SIZING and CAPITAL COSTS sheets in the Appendix I Cost Model). Assumptions for this estimate include:

- Public ownership and operations
- Cost of land not included – to be determined at local/regional level
- Pre-development costs (planning & siting) not included
- Permitting, design engineering, and construction inspection costs estimated as percentage of capital construction costs
- Site development
  - Assumes level site with good soil bearing pressures
  - Site work grading and either structural fill (or excavation) for loading docks – permanent docks recommended with one trailer load or more per day or when utilizing trailers for baled material storage (smaller operations may be able to utilize portable docks)
  - Utility services (water, electricity, sanitary sewer) available adjacent to site
  - Gravel roadways with option for concrete or asphalt
  - Storm water management/erosion control – lump sum allowance to be adjusted for site specific evaluation
  - Minimal allowances for landscaping, signage, bollards and other miscellaneous site features – to be adjusted for site specific evaluation
- Concrete & foundations (building and site)
  - Building concrete slab on grade and foundations

TABLE10-2 TYPICAL REGIONAL MRF CAPITAL COST ESTIMATE (2011$, rounded to nearest $1,000)[a]

COST CENTER	COST ESTIMATE
CONSTRUCTION COMPONENTS	**CONSTRUCTION COST ESTIMATE**
Site Acquisition (2 acres)	$0
Site Work & Utilities	$555,000
Concrete & Foundations	$441,000
MRF Building (10,300-sf building)	$1,356,000
Optional: Office Area (Interior to MRF building)	$43,000
Estimated General Contractor Fees	$196,000
Estimated Contingency (20%)	$518,000
Subtotal Construction Cost	$3,109,000
DEVELOPMENT COSTS	**DEVELOPMENT COST ESTIMATE (as percentage of direct construction)**
Design/Engineering	$311,000
Soils Report & Permitting	$93,000
Construction Inspection	$311,000
Subtotal Development Costs	$715,000
CAPITAL COST SUBTOTAL	**$3,824,000**
MOBILE & PROCESSING EQUIPMENT COSTS	**EQUIPMENT COST ESTIMATE**
Front-End Loader	$250,000
Forklift	$50,000
Baler – Closed Door, Manual Tie	$120,000
Baler In-feed Conveyor	$25,000
Optional: Sorting Line/Platform (in-floor/incline feed conveyor, 48"' sorting conveyor & 40' sort stations)	$148,000
Optional: Drum Magnet/Belt Magnet	$50,000
Optional: Skid Loader	$60,000
Estimated Contingency (20%)	$141,000
Subtotal Equipment Costs	$844,000 $504,000 (without optional equipment)
PROJECT TOTALS	**$4,668,000 (base)** **$4,328,000 (without optional equipment)**
OPTIONAL CONSTRUCTION	**OPTIONAL COST ESTIMATE**
Scale House and Scale	$201,000

[a] Annual debt service for the construction, development & equipment costs are included (see Appendix I for full cost details)

- Concrete and foundation assumptions (continued)
  - Concrete aprons at collection vehicles entrances/exits and loading docks
  - Loading docks retaining walls
  - Interior push walls for materials (an alternative may be steel plate walls above first 3 feet)
  - Equipment foundation pads
  - In-floor conveyor and sorting line foundations (included in Cost Model but could be optional)
- Equipment based on new purchases (in some instances, good used equipment can be obtained at lower costs)

- MRF building – Fully enclosed building for Wyoming climate
  - Pre-engineered metal building – smaller building footprint would have higher unit cost
  - Building electrical (lighting, basic equipment, controls) as $/sf
  - Building mechanical (fire protection, ventilation, plumbing) as $/sf
  - Roll-up doors and loading docks – model shown assumes 5 roll-up doors, 3 of which are at the loading docks
- Office area – If MRF co-located with other solid waste facilities office/administration facility and functions can be shared (included in Cost Model but could be optional)
  - Model assumes small office area developed interior of MRF building – eliminate if separate office area existing or planned to be developed
  - Separate office/administration building will be more costly
  - Optional scale house could be expanded to serve as office/administration area
- Processing & mobile equipment – Assumed purchased for facility operations
  - Front-End Loader – to manage recyclable materials, push loose materials into bunkers, load baler hopper/infeed conveyor, or to load sorting line conveyor (smaller volumes may be served by only skid loader)
  - Forklift – to manage bales
  - Baler (closed door, manual tie) – multi-material baler to bale papers, plastics, aluminum and tin/ferrous cans (See Section 11.0 for baler options & cost ranges)
  - Baler in-feed conveyor – incline conveyor with feed hopper typically provided by baler manufacturer when specified (in-floor conveyor will be greater cost, see Section 11.0 for baler discussions)
  - Estimated unit prices for optional equipment include - sorting line conveyor, platform & in-feed/incline conveyor, drum or belt magnet (on sort line), skid steer loader, roll-off containers & truck, transfer truck tractor & trailers, two-ram horizontal baler

O&M Costs - The operations and maintenance costs (summarized in Table 10-3) are based on the quantities and level of processing. Single-stream recyclables will require greater processing (i.e., sorting line, magnets, and sorting personnel) than source-separated recyclables. See the O&M COSTS and HAULING COSTS sheets in the Appendix I Cost Model). O&M cost assumptions are listed below.

TABLE 10-3 REGIONAL MRF – POTENTIAL O&M COST ESTIMATE SUMMARY (2011$, rounded to nearest $1,000)

COST COMPONENT	ANNUAL COST ESTIMATE
Labor	$345,000
Insurance	$21,000
Facility Maintenance & Utilities	$127,000
Equipment O&M	$138,000
Estimated Contingency (10%)	$63,000
Annual Debt Service – MRF[a]	$307,000
Annual Debt Service – Mobile/Process Equipment[a]	$100,000
Hauling Costs	**$362,000**
TOTAL	**$1,101,000**

[a] Debt service assumes 5% interest rate and 20-year period for facility and 10-year period for equipment

- Throughput averages 11,000 tpy
- Labor requirements based on typical equipment, processing quantities & level of processing - a sort line & sorting labor are included in this estimate for only 20% of materials received (delivery of primarily source-separated materials is expected)
- Dedicated personnel is assumed – management may or may not be shared with other operations
- Insurance – assumes 1% of capital building and equipment costs
- Facility Maintenance – assumes percentage of capital costs, electrical usage (lighting and equipment), natural gas heating, water, sanitary sewer & mobile phones
- Mobile equipment fuel and maintenance tied to hours of material handling
- Process equipment maintenance estimated percentage of capital costs
- Administrative cost of marketing materials are not included

Hauling Costs - Hauling of prepared recyclables to markets is based on the material and whether it is baled or loose. Haul costs will depend upon several variables with the key parameters of number of trailer loads (i.e., payloads), distance from MRF to markets (for example, Salt Lake City), average speed, fuel, and labor costs (see the Appendix I Cost Model HAULING COSTS sheet). The assumptions in Appendix I can be modified for specific market conditions.

Revenue Potential - For the purpose of estimating the revenue potential for a regional MRF accepting source-separated materials, several broad assumptions (reflected in Table 10-4) are required:

- Based on 6,600 to 17,700 tpy
- Collected recyclables breakdown by weight mimic the Appendix D composition
- Hauling costs to end-markets were included above
- Broker fees are not included
- Revenues earned for each material are about 100% of the prices paid by end users for delivered product (Table 5-4) - prices will fluctuate depending on quantity, quality, processor & end user

TABLE 10-4 ESTIMATE OF POTENTIAL MRF REVENUES[a]
(2011$, costs rounded to nearest $1,000)

MATERIAL	COMPOSITION[b] (% by weight)	ESTIMATED QUANTITY (tpy)	APPROX END USER PRICING ($/ton)[b]	100% PRICING
Cardboard	36%	2,400 to 6,400	$100	$240,000 to $640,000
Mixed Paper	43%	2,800 to 7,600	$110	$308,000 to $830,000
Plastics #1-#7	10%	700 to 1,800	$300	$210,000 to $540,000
Mixed Glass	7%	500 to 1,200	$20	$10,000 to $24,000
Metal Containers	3%	200 to 500	$1,300	$260,000 to $650,000
TOTAL				**$1,028,000 to $2,684,000**

[a] From Appendix D
[b] From Table 5-4

Avoided Landfill Disposal Costs - An estimate of $482,000 to $1.292M diverted tons per year is based on a diversion range of 7,000 to 18,000 tpy at the regional MRF, and the average projected disposal cost of $73/ton for Wyoming landfills (see Table 2-4). As noted in Section 2.3, it is likely that this rate underestimates the actual average landfill costs, however, and that avoided costs may be higher.

Related Information

- Provided links below reveal the first page of the article. Please refer to the November and December 2011 issues of Resource Recycling for the full article.
  - Stockdale, Justin. "Hub and Spoke." *Resource Recycling* November 2011 - *http://resource-recycling.com/node/2257*
  - Stockdale, Justin. "Hub and Spoke, Part Two." Resource Recycling December 2011 - *http://resource-recycling.com/node/2297*
- Bird, English. "A Rural Recycling Revolution." Waste Age, November 2011 - *http://waste360.com/operation/rural-recycling-revolution*
- New Mexico Recycling Coalition PowerPoint presentation to the CDPHE Pollution Prevention Advisory Board Assistance Committee explaining how New Mexico implemented a Hub-and-Spoke recycling model - *www.cdphe.state.co.us/oeis/p2_program/docs/nmrchubspoke.pdf*

11.0 MATERIAL BALING OPTIONS (PLASTICS)

This section focusing on the value of baling plastics to better manage storage and hauling requirements and costs. While the information provided could be applied to the management of other materials, this focus is intended to provide one solution to this often problematic, high-volume materials.

TABLE 11-1 SUMMARY OF FINDINGS FOR PLASTICS BALING OPTIONS

FINDING	DESCRIPTION
Implementation - At the local or regional recycling programs level with start-up during the short-term planning period (2015)	
Potential Diversion	See Section 12.0
Estimated Capital Costs	Vary widely depending on model & options selected See Table 11-3
Estimated Costs, Cost Savings & Revenues	See Section 12.0

11.1 General Considerations

Although plastics (especially resins #1 and #2) earn high market revenues, they are one of the lightest materials in the solid waste stream. Many programs do not have the capacity to store these quantities. At a density of less than 35 lbs/cy, full truck loads of loose plastics fall far short of maximum road weights, yielding high per-unit haul costs - often too high to make local recycling programs sustainable. Baling is the best method to compact plastics (13:1 to 40:1 volume reduction), increase trailer payloads and decrease haul costs. Baling can be accomplished at the site of local collection programs, or can be a regional option when local materials are hauled a reasonably short distance[39].

It is noted that loose material storage is still required to generate enough loose material for baling, and many local programs don't have adequate space. Options often include a small vertical baler that produces low-density bales (which may require additional processing) or regionalization that provides a centralized storage and processing location, reducing storage needs at the local level. Regional facilities are also more apt to have high-density balers than can meet market specifications and obtain the highest revenues.

11.2 Baling Equipment Options

Balers for plastics include vertical and horizontal balers. Vertical balers are small, hand-fed machines creating one bale at a time. They can take up to two hours or more to make one bale of plastics. Bale weights are lower than those from a horizontal baler for the same bale size - thus, plastic bales from a vertical baler will not meet the stricter end-market specifications. Many small programs already use or are familiar with vertical balers - they are affordable, utilize a small footprint and are easy to operate. Therefore, this section focuses on the horizontal baler equipment available for recycling programs. Table 11-2 (next page) presents a summary of the pros and cons of the types of balers discussed in subsequent pages.

[39] In some instances (typical rural programs that guarantee a supply of recyclables), some brokers will assist collection programs to obtain small, vertical balers.

TABLE 11-2 GENERAL PROS & CONS OF BALERS

BALER TYPE	APPROX. SIZE[a]	NOMINAL BALE SIZE[b]/ WEIGHT	THROUGHPUT (tph)	PROS	CONS
Vertical Baler (Extra High Density)	80" Wide x 55" Depth x 164" High (Heavy Duty model)	60" x 30" x 48" HDPE 740 lbs PET 600 lbs – 800 lbs on 60" Baler	• Up to 0.5 to 0.75 bales per hour (equiv. to approx. 1 ton per 8-hr day)	• Small space requirements • Good for retail stores, warehouses, business recycling • Good for baling film plastics or OCC • Lowest Cost	• Requires hand feeding • For very low volumes
Open-End Horizontal Baler	Entry level approx. 30'L x 7'W x 10'H (add to Length or Width & Height for conveyor)	30" x 40" x 72" or 42" x 40" x 72" Perforated PET 800 lbs – 1000 lbs depending upon size of baler & bales	• Min 5 tph to operate efficiently	• Designed for high volume applications • Best for fiber materials • Auto-tie	• Requires continuous loading of same material type • Does not handle plastics well • Requires min throughput to work correctly
Closed Door Horizontal Baler	Approx. up to 19'L x 8'W x 10' H (add to Length or Width & Height for conveyor)	60"L x 48"W x 30"H HDPE 1100 lbs PET 750 lbs - 800 lbs	• 1 – 2 tph for plastics on entry level baler	• Processes many materials • Capable of continuous and intermittent loading • Signals when bale complete • Less expensive than two-ram baler	• Manual tie only (5-10 min operations) • Higher cost for manual ties • Lower throughput compared to similar size two-ram baler
Two-Ram Horizontal Baler	Approx. up to 29'L x 18'W x 10'H (add to Length or Width & Height for conveyor)	60" x 48" x 30" HDPE 900 lbs-1100 lbs PET 800 lbs	• 2 – 3 tph for plastics on entry level baler	• Processes many materials • Capable of continuous & intermittent loading • Left-hand or right-hand eject option • Auto-tier versatility over number of ties	• Most expensive baler type • Requires more space than closed door

[a] Baler machine dimensions, bale sizes and bale weights vary between manufacturers and models - space requirements do not include the additional buffer and operations area required around this equipment

[b] Plastic bales should be held together with 10- to 12-gauge, non-corrosive galvanized wire – preferably 10/18 wire (10 gauge with 18 hardness).

There are basically three different types of horizontal baler equipment for plastics and recyclable materials in various size ranges for Wyoming recycling programs:

- Closed Door Horizontal Baler
- Two-Ram Horizontal Baler
- Open-End Horizontal Auto-Tie Baler

Each type of baler is available in various sizes and throughputs and can handle a variety of recyclable materials. Baler model should be selected to meet end user specifications (in size and weights) so that revenues are not lost due to brokers re-baling the plastics. Although there could be a variety of bale sizes and weights, the standard bale dimensions are 60" long x 48" high x 30" wide with an approximate weight of 1000 pounds. The ideal density for baled plastics is about 20 lbs/cf[40]. This is heavy enough to make trailer payloads, but not so dense that the bales create problems for the buyer. Some balers will create smaller bale sizes (most Wyoming markets do not specify bale dimensions - only load weight minimums) or end-markets may require 72" long bales.

Closed-Door, Single-Ram Horizontal Baler

In a closed-door baler (see Figures 11-1 and 11-2, next page), a bale is created by compressing the material with a hydraulic ram against a closed door. The baler will bale material as it is fed and will alarm or signal when a bale is complete. The operator will then manually tie the bales (about a 5- to 10-minute operation) while the bale is still in the machine by running wire tires through ports in the machine. After the bale is tied, the operator activates the baler to open the door and shove the bale out of the machine. A forklift can then retrieve the bale and take it to the bale storage area or loading trailer.

FIGURE 11-1 CLOSED-DOOR HORIZONTAL BALER (International Baler photo)

[40] The Association of Postconsumer Plastic Recyclers recommends minimum bale size of 30"x42"x48" with bale densities of 15-18 lbs/cf and minimum shipping weight of 35,000 lbs in a 48-foot trailer.

FIGURE 11-2 CLOSED-DOOR HORIZONTAL BALER - FULL EJECT WIDE BOX (International Baler photo)

Other features of a closed-door baler include:

- Can be continuously or intermediately loaded with the same material until a bale is complete
- Handles multiple types of recyclable materials
- Costs less than other models - approximately $60K to $90K for closed-door baler
- Much lower cost to purchase compared to a two-ram baler
- Has a lower through-put compared to a similarly sized two-ram
- An entry level closed-door baler can handle approximately 1- to 2-tph of PET#1 & HDPE#2 with a 20- to 30-hp unit (depending on the manufacturer) & produce bales between 750 to 1,100 lbs (larger machine sizes are available)
- Operator must manually tie each bale
- Because wire ties for this machine are pre-cut, ties for each bale are more expensive compared to two-ram balers which use spools of wire (one manufacturer estimated $4/bale for closed door & $1/bale for two ram)
- Standard warranty varies from one to three years for parts and six months to one year on labor, depending on the manufacturer
- Maintenance is typically provided by the owners – service contracts are available
- Maintenance costs varies depending on the how the equipment is operated – standard filter changes must be completed about quarterly for approximately $100 to $300 each time (other wear parts such as shear bars will have to be replaced periodically as well)

Two-Ram Horizontal Baler

A two-ram baler, as shown in Figure 11-3 (next page), works much the same way as a closed-door baler by compressing material against a closed door with a hydraulic ram in a batch operation. However, the two-ram baler has an additional hydraulic ram that is mounted 90 degrees from the compressing ram in order to eject the bale once it has been created. The two-ram baler will automatically tie and eject the bales as material is fed into the machine.

FIGURE 11-3 TWO-RAM BALERS
(International Baler, Excel Manufacturing photos)

Other features of the two-ram baler include:

- Can be continuously or intermediately loaded with the same material until a bale is complete
- Handles multiple recyclable materials
- Costs more than a closed door baler - approximately $145K to $210K
- Has a higher through-put capacity compared to a closed-door baler
- An entry level two ram baler can handle approximately 2- to 3-tph of PET#1 & HDPE#2 with a 20- to 50-hp unit (depending on manufacturer) & produce bales between 800 and 1,100 lbs (larger machine sizes are available)
- Bales are automatically tied
- Slightly larger footprint compared to the closed door
- Material cost for tying each bale is less than for closed door baler (one manufacturer estimated $4/bale for closed door & $1/bale for two-ram baler)
- Standard warranty varies from one to three years for parts and six months to one year on labor, depending on the manufacturer
- Maintenance is typically provided by the owners – service contracts are available
- Maintenance costs varies depending on the how the equipment is operated – standard filter changes must be completed about quarterly for approximately $100 to $300 each time (other wear parts such as shear bars will have to be replaced periodically as well)

Open-End Horizontal Auto-Tie Baler

This is an open-ended machine that will bale continuously as the baler is fed material (see Figure 11-4). The bale is created by a narrowing at the end of the bale chamber and compressing by a hydraulic ram. The machine automatically forms and ties the bales as the material is fed and will continue to push bales out onto the floor until the operator is ready to haul the bales to storage. Other features of the open-end horizontal auto-tie baler include:

- Most efficient baler that works best with fibrous material, but does not handle other materials such as plastics and aluminum cans as well
- Can be configured specifically for plastics baling, but then cannot be used to bale other materials without significant change to set up
- Needs a minimum throughput (at least 5 tph) to operate efficiently

FIGURE 11-4 OPEN-END HORIZONTAL AUTO-TIE BALER (International Baler photo)

This machine is not likely a good option for most Wyoming recycling programs due to low quantities of plastic materials and the material restrictions of the machine (i.e., best for fiber materials). Table 11-1 summarized the typical space requirements, pros and cons of each baler option.

Baler Feeding Options

The baler can be fed in a few different ways and configurations depending on the operation and cost requirements. The feeding options include hand feed, direct feed, and conveyor feed and are further discussed in this section:

1. Hand feed - an operator can directly feed into the baler hopper by hand;
   - This is not recommended due to the increased labor and required through-puts
   - Vertical balers, handling low volumes, are typically hand fed

2. Direct feed - an operator can feed directly into the baler hopper by a skid steer or similar equipment;
   - This option is less expensive compared to the conveyor option (because there is no additional cost for installation and maintenance of conveyor)

- Increases the possibility of jamming the baler due to a surge of material entering the baler at one time
- This option is not generally recommended for higher volume operations due to the potential difficulty in lifting material into hopper and the increase jamming potential

3. Conveyor feed - an operator will use a skid steer or similar equipment to move the recyclable material onto an incline conveyor which will feed into the baler's hopper;
   - The incline conveyor will also spread and meter the material that will go into the baler, creating a more efficient operation and will help to eliminate jamming of the baler
   - This is the more expensive option (additional $15K to $25K for installation of the simple incline conveyor with low feed hopper, plus additional future maintenance costs)
   - The same incline conveyor can be used for either baler option
   - There are also a few different options for conveyor configuration including:
     - Above-grade conveyor - operator will have to lift material onto the end of the conveyor (a hopper type connection at the end of the conveyor is included for loading)
       - This is the least expensive conveyor configuration
       - Less efficient due to lifting of material (i.e., more labor time), however could work well with low to mid-range volumes of materials
     - Incline conveyor set into pit (see Figure 11-5) - the end of the conveyor will be set below floor level with an opening and hopper built into the floor.
       - This allows the operator to shove (as oppose to lift) material onto the conveyor, creating a more efficient operation
       - Additional cost compared to the above-grade conveyor; however, the cost can be minimized for a new facility since this can be included in the facility design and construction

FIGURE 11-5 INCLINE CONVEYOR PIT (Nexgen-Marathon photo)

     - In-floor horizontal conveyor (see Figure 11-6, next page) with an approximately 10-foot horizontal conveyor (installed into the floor) which will feed onto the incline conveyor.
       - This allows the operator greater area to shove material onto the in-floor conveyor, creating a slightly more efficient operation
       - Most expensive in initial and maintenance costs compared to the other conveyor options (additional approximately $10K - $20K capital cost for the conveyor)

FIGURE 11-6 IN-FLOOR CONVEYOR (Excel Manufacturing photo)

11.3 No Baler Option

As some rural programs will be unable to fund even the most economic balers, it is worth noting that storing/hauling plastics loose may still be viable, especially when short hauls to regional processing facilities with high-density baling is available. Where low recyclable throughputs are expected at a facility, it may be possible to avoid baling and collect plastics directly in trailers, roll-off containers, or tip onto a tipping floor (at transfer station or solid waste baling facility for loading loose into roll-off containers). Once the roll-off containers are full with the loose recyclable material, they can be shipped to a regional facility for baling or processing. Other considerations for this option include the following:

- May reduce up front equipment costs by eliminating the baler and conveyor (unless additional truck and/or trailer purchases are required)
- May reduce construction costs by eliminating hoppers and bunkers - but will require consideration of future provisions to accommodate a baling system, including space for baling operations
- Would require more hauling trips due lower density of loose recyclables with associated increased hauling costs – this is especially an issue with plastics. If hauling distances significant, program should consider a vertical baler

Where no baling is considered at local collection programs, then further analysis of the economic viability of this option compared to a baling operation should be completed:

- Staffing requirements (additional drivers/baler operators)
- Fuel usage comparison between hauling operations (number loads loose vs. baled)
- Electrical usage (balers)
- Equipment and facility capital costs
- Equipment operation and maintenance costs

11.4 Implementation

Plastics baling is most likely to be implemented at the local jurisdictional or regional level in Wyoming at material recovery facilities (MRFs), transfer stations, or solid waste baling facilities. Key implementation steps should include:

1. Determine Quantities Projections for Plastics Recovery & Processing Operations (i.e., daily baling or periodic) – Working with other communities/region will increase processing efficiency due to economies of scale (see Section 15.0).

2. Work with Recycling Brokers & End-Markets – This will help identify required bale sizes, trailer payloads, & materials separation (PET#1, HDPE#2, etc.). If markets will accept all plastic resins, existing and new programs should consider the mixed plastics #3- #7 stream in addition to the traditional PET#1 and HDPE#2 material streams.

3. Identify Space Availability – Also evaluate electrical needs & any equipment pad improvements for proposed baler location.

4. Contact Baler Vendor(s) – Solicit baler recommendations, detailed baler information & budgetary quote(s).

5. Estimate Costs – See Section 11.5 for guidance.

6. Obtain Funding – Sources may include reserve funds, operations revenues (i.e., solid waste tip fees), loans and/or grants.

7. Bid Out Supply & Installation for Baler & Building Improvements (if needed).

11.5 Estimated Diversion Potential, Costs & Revenues

Diversion Potential - The diversion potential associated with baling any materials using the horizontal baling equipment described in this section will most likely occur at the regional level. The materials recovery facility analysis in Section 10.0 represented similar diversion levels and is not repeated here.

Costs - Horizontal baler pricing:

- Closed-door balers are approximately $60,000 to $90,000 (for the lower volume models) - compared to approximately $145,000 to $210,000 for a two-ram baler
- Higher volume two-ram balers can run as much as $400,000
- Prices do not include delivery - freight cost will depend upon manufacturers' factory locations and final destination in Wyoming, but could run from $10,000 to $20,000
- Installation, assembly & start-up - are estimated to be an additional $25,000 to $45,000 depending upon baler and complexity (installation of optional equipment such as incline conveyors will be additional)
- Additional site/building electrical wiring and concrete pad will also add to these costs
- Other excluded costs include ancillary requirements for baling operations - indoor space for baler & feeding; structural floor/concrete equipment foundation/pad; electrical service; labor & mobile equipment to feed the baler, tie bales (if manual tie), move bales to storage & perform routine maintenance (mobile equipment could include skid or front-end loader and forklift)

Vertical baler costs for 60" models are provided in Table 11-3 for comparison. Price will vary among manufacturers and model options. Installation of a vertical baler is expected to be minimal, provided electrical service is adequate, and may be included in the freight charge.

TABLE 11-3 ESTIMATED COSTS OF BALERS (2011$)

BALER TYPE	CAPITAL COST	ESTIMATED FREIGHT	ESTIMATE INSTALLATION	TOTAL COST
60" Vertical Baler	$10K - $20K	$2K - $3K	NA	$12K to $23K
Closed-Door Horizontal Baler	$60K – $90K	$10K - $20K	$25K - $35K	$95K to $145K
Two-Ram Horizontal Baler	$145K - $210K	$10K - $20K	$35K - $45K	$190K to $275K

No cost provided for the open-end baler option since it is not recommended for plastics baling and low volumes

Other system options:

- Conveyor feed options can be added to either of the baler types
- Installation of an incline feed conveyor with raised hopper (provided by baler manufacturer) - will be an additional $15,000 to $25,000
- In-floor conveyor - will be an additional $10,000 to $20,000 along with the incline conveyor cost
- Used recycling equipment may be an option - a baler in good condition and/or refurbished may be 60% to 80% of new capital cost & older models could be less (unless manufacturer-refurbished, used equipment will not have warranties & installation services)

Revenue Potential & Avoided Landfill Disposal Costs - Section 10.0 described both the cost savings and revenue potential anticipated for a regional MRF (this section also includes a detailed cost model).

Related Information

- Excel Balers - *www.excelmfg.com/*, Greg Cannard, (507) 269-3061
- Nexgen (Marathon Equipment Company) - *www.nexgenbalers.com/*, Wyoming Service Contact – Gary Krumwiede at *gary.krumwiede@marathonequipment.com*
- International Baler - *www.intl-baler.com/equipment/*
- IPS Balers Manufacturing - *www.ipsbalers.com/*, service contact Ken Korney at (912) 366-9460
- Harris Equipment - *www.harrisequip.com/*
- Guidelines for Proper Handling, Loading, Safety & Bale Specifications - *www.caplasticsmarkets.com/info.php?p=handling*
- Model bale specifications from APPR - *www.plasticsrecycling.org/rigid-plastics/public-access-rigid-plastics-information/model-bale-specifications*

Links to example videos of baling operations are shown below. These videos may not show the exact operation as is suggested in this section, but they do show balers in operation:

- Two-Ram Baler Example Videos - *www.youtube.com/excelmfg#p/u/5/YdHtxvKZ5-g*, *www.nexgenbalers.com/videoGalaxy2R-OCC.htm*
- Closed Door Baler Example Video - *www.youtube.com/excelmfg#p/u/3/9d7KcZxiGGw*

12.0 REGIONAL YARD & WOOD WASTE COMPOSTING FACILITY

This section includes user-friendly costs model for yard and wood waste composting, created to both support the cost analysis in this section and to provide future users the ability to run alternative drop-off collection scenarios in the future.

TABLE 12-1 SUMMARY OF FINDINGS FOR YARD/WOOD WASTE COMPOSTING FACILITY

FINDING	DESCRIPTION
Implementation - At the local or regional level by public, private, and/or non-profit partnerships with planning & start-up completed during the short-term planning period (2015)	
Potential Diversion	1,000 to 4,000 tpy per Cost Model Could be as high as 37,000 to 73,000 tpy state-wide
Estimated Capital Costs (including equipment)	($216,000 to $461,000) Annual debt service included in O&M costs Excluding land siting & purchase
Estimated O&M Costs	$96,000 to $274,000/year Including annual debt service for capital & equipment
O&M costs/ton	*$96/ton to $69/ton*
Estimated Revenue Earnings	$53,000 to $210,000/year
Estimated Net Cost	$43,000 to $64,000/year
Potential facility tip fee	*$16/ton to $43/ton*
Estimate Avoided Disposal Costs	$73,000 to $292,000 Some savings would be from current wood burning practices

All costs estimated in 2011$ - quantities rounded to nearest 1,000 tons, costs to nearest $1,000

12.1 General Considerations

Although there are variations practiced in some programs, yard waste composting is typically achieved through low-tech options of static pile or windrow composting. Static piles involve stacking the yard waste in piles to decompose over a long time period (1 to 2 years). These piles are turned rarely and are low maintenance and have previously been referred to as “passive composting". However, the static pile method requires greater land area than the windrow method and material in the center may not fully compost. To be effective, static pile composting piles should be placed in rows less than 6 feet high and 12 feet wide to allow passive air movement.

Conventional windrowing uses triangular-shaped piles and turning equipment that ranges from front-end loaders to specialized turners. Yard waste is placed in long narrow piles (or windrows) which are turned on a regular basis. Size of windrows is typically determined by the equipment and compost method. Windrows turned by a front-end loader will typically be 6 to 12 feet high and 10 to 20 feet wide at the base. Windrows turned by a self-propelled or tractor-drawn windrow turner can only be 4 to 9 feet high depending upon the height of the windrow turner.

An alternative to the conventional technology is the trapezohedron windrow method. The primary advantage of this technology is the smaller land area required by larger, trapezohedron-shaped piles stacked 10 to 12 feet high, up to 100 feet wide and 450 feet long. The trapezoidal stacking system uses a specially designed "scalping" turner that shaves 12 to 15 inches of material off the side of the compost windrow pile for placement on the other side of the machine using a stacking conveyor. Slower pile turning time with this technology can sometimes be balanced by decreased turning frequency, such that processing time is approximately the same as conventional windrowing. However, reduced turning frequency and wider piles can result in odor generation when the piles are turned.

Wood waste is often ground into mulch instead of composted, especially when wood quantities are high. In order to compost a mix of wood and yard waste effectively, manure and/or biosolids stream would be needed to both add moisture (ideally 40% to 65%) and create a suitable C:N ration (approximately 20-40:1 C:N).

12.2 Wyoming Composting Considerations

Facilities & Programs

There are approximately 20 yard waste compost facilities in Wyoming (see Table 2-3)[41] - with the exception of a limited number of private sites (e.g., Jackson, Torrington), these are public operations. Most of these are co-located at landfill facilities. Those facilities that are "passive" static pile sites have minimal management. This is due to limited resources, lack of demand for compost product and a general yard waste compost exemption from WDEQ permit status (some are loosely covered under the landfill permit).

Markets

Wyoming mulch and compost product markets are typically very local. Many public operators give mulch away to the public or use mulch and compost on city projects. Those facilities that can generate high-quality compost (subject to national product testing) are able to sell their product to landscapers, homeowners, developers and others[42]. Programs must carefully identify and balance the product demand by existing markets against the level of processing to avoid processing costs that cannot be balanced by tip fees and sales.

Demand at the state level is weak. WYDOT (which contracts out a majority of its landscape construction and maintenance) allows compost as a Type V Fertilizer. This material is limited to composted manure, however, with "at least 50% organic matter from domestic animals". WYDOT acknowledges the lack of available compost product state-wide but as of early 2012 no efforts were underway to expand the specification. A WYDOT specification that not only allowed a broad range of yard waste, wood and biosolids[43] compost product - but provided incentives for its use - would significantly improve the sustainability of composting operations state-wide.

[41] Most collections are through DOCs although there are curbside collections operated by Buffalo, Casper (initial implementation in 2012), Cheyenne, Gillette and Riverton.
[42] Casper, Cheyenne, Gillette and Terra Firma (Teton County) count among this number.
[43] Both Casper and Gillette co-compost with wastewater treatment plant biosolids.

Small Communities & Other Options

Some small, rural Wyoming communities may not generate enough yard/wood tonnage to support a sustainable compost facility or to create a demand for compost products. These towns may also be so isolated that even regional composting operations do not make economic sense. In these cases, mulching clean wood and back yard composting of food and yard waste may be a preferred management alternative.

It is also noted that composting is not the only reasonable option for processing organics. While anaerobic digestion has greater applicability to manures and food waste, it has also been used to process yard waste. There are a number of other conversion technologies that produce energy and other fuels under development in other countries that may have suitability to yard waste management in the future. These options require further research.

12.3 Implementation

Yard and wood waste are some of the easiest materials to keep separate from solid waste and provide an immediate increase in diversion. As such, it is recommended that yard/wood waste composting be implemented and/or expanded during the short-term planning period of this study. Many landfill sites already accept source separate yard waste/wood waste. Key implementation steps should include:

1. Identify Quantities – Projections should include increases reasonably expected from future policies that encourage organics diversion (Table 4-1 illustrated that nearly 20% of the waste stream is yard & wood waste);
   - Small communities would review viability of DOC collection (Section 6.0) with haul to regional facility for processing
   - Larger communities with no compost facility would review viability for compost facility
   - Existing facilities to consider greater regionalization

2. Design/Expand Yard and Wood Waste Facility – Appendix J includes a Compost Facility Cost Models with SIZING worksheets. These sheets can be used to evaluate development requirements for new composting sites and improvements/expansions to existing sites. The sizing is based on conventional windrow composting of yard waste and grinding wood waste into mulch;
   - Identify composting method and operations (i.e., windrow sizes, length of composting stages, etc.)
   - Identify equipment for compost operations
   - Determine whether construction will be completed in-house or contracted out - contracting out may require engineering design and bid document expenses not included in the model

3. Identify Site Location - The location should include adequate acreage with minimal grade change & ideally cleared & ready for facility development.

4. Estimate Annual Costs – The Appendix J Compost Facility Cost Models can be modified for site specific conditions including expansion or improvements to an existing compost facility. Required input include;

- Identify facility features for construction
- Identify labor requirements that match operational plan
- Review and modify equipment O&M, site maintenance and operating assumptions

5. Develop/Improve Compost Markets – Develop additional markets for the products beyond residential and commercial landscapers & determine sales prices for compost and mulch products. These additional markets can include local and state road projects, soil remediation projects (mines, brownfields, etc.), plant disease control, reforestation, wetlands restoration, habitat revitalization & for bio-filtration. Cheyenne's city code requires that the top 6" of soil have a high-organic content on any project requiring a site plan or water permit - this drives the use of compost city-wide[44].

6. Determine Compost Facility Tip Fee for Source-Separated Yard Waste – The Appendix J CAPITAL COST, O&M COST & MAINTENANCE COST worksheets will help provide preliminary analysis so that capital and operating expenses are covered by tip fee and material sale revenues.

7. Track Progress Against Baseline - Use this data to monitor diversion levels & the adequacy of tip fees;
   - Collect weigh data across the scales to record quantities
   - Review material sales and pricing periodically

12.4 Estimated Diversion Potential, Costs & Revenues

Ideally, Wyoming composting facilities would be developed as regional facilities to minimize capital and operating costs. There may be one or more regional facilities that serve all or part of an equivalent-sized RPA service area as discussed for regional MRFs in Section 10.0. However, many yard waste composting facilities are already in place throughout the state and are co-located with individual city or county landfills. As a result, it is more likely that many of these facilities will be expanded to accommodate future quantities rather than replaced by new regional operations. Therefore, the Appendix J Cost Models analyzed two facilities with 1,000-tpy and 4,000-tpy design capacities (2015 quantities).

On a state-wide level, it is assumed that yard and wood waste would be diverted from the total solid waste stream at a diversion rate of 40% to 60% by 2015 (average of 50%) was assumed[45]. Using the Appendix D MSW diversion projections, this equates to as much as 37,000 to 73,000 tpy in 2015. This quantity does not include clean wood debris generated from non-MSW streams (especially C&D debris), which would only increase the diversion potential by these facilities. It is also noted that additional diversion policies (such as PAYT residential trash pricing or - especially - a yard waste disposal ban, see Section 16.0) would also bolster the diversion potential significantly.

Costs - *Specific costs for this processing option were developed using the Composting Facility Cost Models in Appendix J. This model both supports the costs estimated in this section and provides a user-friendly Excel-based model for running alternative compost facility scenarios in the future. The Cost Models use a red font to indicate values or assumptions that can be changed – actual calculations used in*

[44] City of Cheyenne Municipal Code 17-136-050K.
[45] USEPA reported a MSW yard waste diversion rate of 58% in 2010.

the model can be viewed by clicking on specific cells in the worksheet. The READ ME worksheet explains how each model can be used. The INPUTS sheet includes assumed values that can be revised for specific local conditions and planned operations. The SUMMARY sheet provides a concise summary of costs and revenues.

The Compost Facility Cost Model assumptions include costing components for site development, equipment purchase, annual labor, operations and maintenance for a new windrow composting facility at two different capacity levels - 1,000 tpy and 4,000 tpy. Assumptions for these cost estimates (shown in Table 12-2) include:

- Public ownership and operations Pre-development costs (planning, siting & permitting) and engineering costs are excluded – yard waste composting facilities are generally exempt from WDEQ regulations & are typically co-located at landfills
- Available land at no cost (cleared and only moderately sloped) & available water
- Product testing costs excluded - these are currently not required by WDEQ for materials used by the owner or given away
- Site development costs include;
  - Material receiving pad – earthen
  - Composting pad – firm surface of compacted earth, graded and sloped 2% to 4% for storm water/leachate collection (firm surface can be asphaltic at added cost)
  - Drainage controls – earthern berms, channels, detention pond/leachate lagoon
  - No building and fencing required – assumed existing as part of co-located facilities

TABLE 12-2 COMPOST COST SUMMARY

COST COMPONENTS	1,000-TPY CAPACITY	4,000-TPY CAPACITY
Quantities (assumed 50% yard waste, 50% wood waste)	1,000 tpy	4,000 tpy
Acreage Required	3.4 acres	7.5 acres
Site Development	$216,000 total or $17,000 annual debt (20 years, 5%)	$461,000 total or $37,000 annual debt (20 years, 5%)
Annual O&M (including equipment & labor costs)	$79,000/year	$237,000/year
Potential Revenues (assumed $20/cy for compost, $12/cy for mulch)[a]	$53,000/year	$210,000/year
Net Costs	$43,000/year	$64,000/year
Potential Tip Fee	$43/ton	$16/ton

[a] Casper is currently selling its mulch/compost for $18/cy & $14-$18/cy; Cheyenne for $12-$17/cy & $27/cy, respectively

- Equipment – while this equipment has been costed at the full purchase price in the Appendix J O&M COST sheets, in reality some units may be shared with other operations (see Section 14.0) or leased
  - Front-end loader – to manage raw materials, form windrows, feed other equipment, and manage finished compost and mulch
  - Compost turner – self-propelled or tractor-drawn to turn the windrows weekly
  - Tractor – to power tractor-drawn compost turner

  - Trommel screen – portable unit to remove large pieces of finished compost for additional composting, increasing opportunities to utilize at other diversion programs will reduce cost allocation to compost operations
- Annual Labor, Operations and Maintenance
  - Tub or horizontal grinder – to grind wood waste into mulch, increasing opportunities to utilize at other diversion programs will reduce cost allocation to compost operations
  - Skid steer and water truck – to manage finished compost and provide water to windrows, shared between solid waste facilities
  - Labor requirements based on typical equipment and processing quantities (0.3 to 1.3 FTE)
  - Other non-dedicated staff labor is minimal and shared from other solid waste operations
  - Equipment fuel and maintenance tied to hours of operation
  - Equipment amortized capital cost based on percentage share with other operations – significant increase in costs if lower utilized equipment cannot be shared with other operations
  - Revenues based
  - Compost and mulch marketing costs are not included
  - Compost testing costs, if required, are not included
  - Feedstock and finished product hauling costs are not included

Revenue Potential - This estimate is based on finished compost quantities of 1,450 cy (the smaller facility modeled in Appendix J) and 5,700 cy (from the larger facility) at $20/cy and wood mulch quantities of 2,000 to 8,000 cubic yards per year at $12/cy (see the O&M COSTS sheet). These prices are based on those set by Casper and Cheyenne's existing programs.

Avoided Landfill Disposal Costs - An estimate of $73,000 to $292,000 diverted tons per year is based on a diversion range of 1,000 to 4,000 tpy at the regional MRF, and the average projected disposal cost of $73/ton for Wyoming landfills (see Table 2-4). It is noted that many of these savings may currently be obtained through burning rather than composting wood waste (ash management costs are not considered in this analysis).

Related Information

- "On-Farm Composting Handbook", Northeast Regional Agricultural Engineering Service Cooperative Extension, 1992 – portions of handbook scanned in on website http://compost.css.cornell.edu/OnFarmHandbook/onfarm_TOC.html
- Compost Use on State Highway Applications, funded by EPA, the Composting Council Research and Education Foundation, in conjunction with the US Composting Council http://www.epa.gov/osw/conserve/rrr/composting/highway/index.htm
- A Guide to Backyard Composting in Wyoming, now available from WDEQ

13.0 REGIONAL MOBILE PROCESSING EQUIPMENT (CONCRETE, WOOD & TIRES)

This section examines concrete crushing, wood grinding and tire shredding for examples or processing equipment that could be owned and operated by multiple organizations in a region to maximize productivity and minimize costs. While the information provided could be applied to the management of other materials, this focus is intended to provide a potential solution to the management of relatively low volume, sporadically-generated materials that require expensive equipment to process.

TABLE 13-1 SUMMARY OF FINDINGS FOR MOBILE PROCESSING EQUIPMENT (serving equivalent of 3 RPAs)

FINDING	DESCRIPTION
Implementation - At the local or regional recycling programs level during the short-term planning period (2015)	
Potential Diversion	3,000 to 6,000 tpy crushed aggregate 1,000 to 4,000 tpy C&D wood 0 to 1,000 tpy shredded tires Could collectively be 12,000 to 38,000 tpy state-wide
Estimated Capital Costs	Varies widely depending on model & options selected See Section 13.4
Estimated Revenues	$26,000 to $105,000 Excludes haul from processing site to market

13.1 General Considerations

Wyoming, as a rural state with huge distances between landfills, is faced with challenges to reduce the volume of several of the larger, harder to manage fractions of the waste stream including aggregate materials; large wood limbs, brush and untreated lumber; scrap tires. Volume reduction makes every subsequent aspect of materials management easier, whether the material is being used locally, shipped to a recycling end market, composted, or simply landfilled. Volume reduction occurs via shredding, chipping, grinding or crushing, depending on the material and the intended end use.

Because the quantity of these materials is relatively small in the waste-generating population centers in Wyoming, and because the equipment to process these materials depends on economies of scale to be cost-effective, regional ownership and operation of such equipment should be considered[46]. For example, processing equipment can cost from $100,000 to $500,000 depending on specifications and whether new or used equipment is purchased. Several regional planning authorities or other communities could jointly own and operate this type of equipment, since most communities probably could not justify its use on an annual basis.

Some regions may not even have the annual quantities to justify purchase of mobile processing equipment. In these cases, the communities in one or more RPAs should consider coordinated rental and operations of processing equipment or bidding of processing services every few years for multiple

[46] Some of the available equipment, such as concrete crushers, is provided by companies also serving other industries (e.g., the mining industry). Given the capacity of this equipment, the need to accumulate reasonable quantities prior to processing for batch operations increases efficiency.

collection/storage sites. This would help spread the up-front high mobilization cost over several batch jobs and achieve better economies of scale.

13.2 Concrete, Wood & Tire Processing

Concrete Crushing

Many private construction companies already recover clean concrete from construction and demolition projects across Wyoming. The concrete remaining will typically be dirtier product or from small projects not economically viable for the private companies. However, as demonstrated below in the Nebraska case study, concrete can be accumulated over several years at a solid waste facility and processed economically through periodic bids or equipment rental. Purchase or rental of concrete crushing equipment should consider the following items:

- Choose right equipment;
  - Mobile concrete pulverizer or universal processor for manageable pieces of concrete
  - Hydraulic hammer to fracture larger pieces (e.g., concrete footers 6-foot thick)
  - Backhoe shear attachment to break/shear excessive rebar from concrete prior to crushing
  - Jaw crusher works best for large amounts of steel in concrete
  - Magnet (e.g., overhead belt magnet) to remove the metals from concrete (typically installed near discharge conveyor after the crusher)
  - Grinding is a different process than crushing (grinding is more of a scraping/scarifying process for concrete slabs or structures to improve appearance & evenness)
- Provide space – adjacent to the concrete pile for the equipment to minimize distance and time for loader feeding the crusher
- Pre-process – pre-screen for dirt and mud for cleaner product and avoid clogging hoppers, chutes or inside of crusher; cut and remove extruding rebar >5 feet long; break/shear larger concrete
- Adjust crusher when necessary – set crushing gap at least double diameter of largest piece of steel rebar (to prevent overloading/damaging the crusher, limit bucket load to match crusher opening)

Case Study - Nebraska Concrete Crushing

In 2010, the Solid Waste Association of Northwest Nebraska (SWANN) received a recycling grant to process concrete for aggregate reuse. With the grant, SWANN issued request for bids to crush approximately 12,000 tons of more than 20,000 tons concrete rubble accumulated over 20 years at their transfer station site in Chadron, Nebraska. The concrete was processed to less than 1-1/2" nominal size, free of dirt and rebar. The bidders needed to not only provide the mobile crushing service, but magnet(s) for removal of rebar and screen(s) for removal of dirt. The winning bid (from a construction company in Gering, Nebraska) crushed and processed the concrete for about $6 to $7 per ton plus a mobilization fee of between $4,000 to $5,000. SWANN sold the crushed concrete aggregate for $10 per ton with the revenue directed to a fund account to be used for future concrete crushing projects. The revenues from the first project paid for a second round in 2011 to crush the remaining concrete at the site. Some of the concrete aggregate was utilized by SWANN for improving roads at their transfer station and landfill sites. The recovered metals were also sold to scrap metal processors. With the high mobilization fee, SWANN recommended that at least 10,000 tons of concrete be accumulated at one location (or few nearby locations) to keep the mobilization fee per ton processed below $1/ ton.

Wood Waste Processing

A variety of equipment exists for processing wood waste. This equipment can come in stationary or mobile type, manually or automatically fed. Table 13-2 provides brief description of the available equipment. Most large grinders, chippers and shredders will travel as over-sized loads that require special permits. Such mobilizing, moving and setting up these large machines require a job of economically justifiable size. Small road-legal grinders will be too limited in material infeed size and throughput for most wood waste received at the solid waste facilities. However, grinders marketed as mid-size (with horsepower from 160 hp to 500 hp) may offer the right combination of mobility, throughput, and material size handling. Diesel engine air quality restrictions have added to engine complexity and cost. As result, electric-powered units have become more popular in recent years.

Table 13-2 WOOD WASTE PROCESSING EQUIPMENT SUMMARY

EQUIP-MENT	DESCRIPTION	PROS	CONS
Tub Grinder	Vertical feed into large diameter "tub" with high-speed hammermills; grapple loader option; output screens control size; produces shredded landscape mulch	• Perform better with heavy, large-diameter material (large units handle up to 8" diameter/6' long, stumps, root balls; pallets, brush, yard waste • Handles non-woody contaminants such as nails, rocks and dirt • Higher production rates	• Stump pieces can remain in bottom of tub • Difficulty handling longer material • Higher feed height – larger loading equipment required
Horizontal Grinders	Horizontal end-feed table and conveyor guide material into grinder; high-speed hammermills; produces shredded landscape mulch; screens control size; throughput Small/mid-size up to 200 CY/hr Larger 400 CY/hr to 600 CY/hr	• Perform better with longer, bushier material – also pallets, brush, yard waste • Smaller loading equipment can be used (i.e. lower feeding height than a tub grinder) • Handles non-woody contaminants such as nails, rocks and dirt	• Some limits to material infeed size • Not recommended for tree stumps and root balls
Chipper	Rotary sharp knives cut and produce thin, uniform, chip product; can be high or low speed depending upon intended material	• Large chippers – good for processing whole trees/big limbs • Small chippers – good for processing branches/ brush • Small chippers lowest cost option	• Not used for wood waste • Not tolerant of non-wood contaminants - Nails, rock and dirt can cause substantial damage • Further processing required for mulch
Shear Shredder	Rotary cutters or guillotine-style knives to cut materials; Feed types, speeds, type/ number of knives differ according to application	• Potential for processing multi-materials – however best machine for wood waste may not be best for tires, etc.	• Limited on material infeed size

Scrap Tire Shredding

Scrap tires can be shredded, ground into crumb rubber, baled, or simply halved prior to landfilling. End markets and beneficial uses for diverting scrap tires which may be viable in Wyoming in the short-term planning horizon, include:

- Ground crumb rubber - civil engineering and transportation applications (use of crumb rubber made from scrap tires as a feedstock in making rubber-modified asphalt is growing in use around the Rocky Mountain West, after successful application in Flagstaff, AZ
- Shredded tires - many civil engineering uses and reclamation projects
- Baled tires - agricultural applications & many civil engineering uses (tire bales in home construction have been an approved use in Wyoming, for example)

Another scrap tire end market that is less likely to occur in Wyoming by 2015 include is tire-derived fuel applications (economies of scale are larger than annual scrap tire generation in Wyoming[47]). However, there is strong demand from cement mills in Utah that can use shredded tires as feedstock, and are not currently sourcing as much tire shred as needed in state[48]. Note that use of tire shreds as alternative daily cover at landfills is not really recycling but better than having scrap tires end up in illegal tire piles or stockpiles/tire mono-fills with no planned use or end market.

A viable tire diversion program should plan on eventually diverting all scrap tires which are generated annually, and should ideally also clean up illegal tire piles while stimulating end-markets. Many states have achieved this in their scrap tire management programs.

Case Study - Colorado Rural Counties Mobile Waste Tire Shredding

Faced with growing stockpiles of waste tires at rural landfills, in 2005 Alamosa County obtained a grant (for about half the $250,000 cost) to purchase a waste tire shredder from Colorado's Energy & Mineral Impact Assistance Fund. The "Colorado Counties Waste Tire Authority" was formed through a Joint Powers Agreement for ownership of the shredder. Twenty-two rural Colorado counties "joined" the Authority for a $5,000 buy-in. This amount was then applied to the cost of shredding tires for that county (i.e., if a member county needed $6,000 worth of shredding in its first visit from the shredder, it would only pay $1,000). This raised the money for the balance of the shredder unit, which was mounted on a trailer and rigged with a small tool shop and power washer. The shredder produced tire shreds about 6" in size. Counties could subsequently apply to Colorado's Waste Tire fund[49] for reimbursement for shredded tires to be used for alternative daily cover at the landfill or for other beneficial use (such as use of tire shreds as fill in septic systems, shreds incorporated into recreational surfaces, burning for energy recovery, and more). However, the assessed fees did not fully cover the cost of maintaining and repairing the shredder - and the project was retired in 2010.

[47] Despite the fact that Wyoming tire generation may be higher than the average rate of one 33.4-lb tire per person-year (Wyoming may have a higher per-capita generation of truck, ranch and heavy-duty tires) - date from Rubber Manufacturers Association www.rma.org/publications/scrap_tires/index.cfm?PublicationID=11517.

[48] Personal communication, Chad Baker, Liberty Tire, UT (801-364-3056, cbaker@libertytire.com) - Liberty Tire currently sources scrap tires out of southeast WY).

[49] CO's Waste Tire program provides grants for processors & end users of scrap tires as well as for cleanup of illegal tire piles and for purchase by local government of products made from recycled tires. See www.cdphe.state.co.us/oeis/wtprog/wastetire.html for details.

Wyoming Status - Some of the existing compost facilities in the state already crush aggregate with existing equipment - others have a grinder or shredder for processing wood waste. Private companies (construction, landscapers, etc.) may also have mobile processing equipment for their own business use.

Due to the typically low annual quantities and high purchase price of equipment capable of effectively processing wood, tires or concrete, most communities will not have this equipment on hand. For example, the City of Cheyenne recently rented a shredder for a month to process accumulated tires. It may be a few years before they need to process tires again.

13.3 Implementation

A mobile piece of equipment that can be used to reduce volume of aggregates, wood and/or tires can be set up to be jointly owned by several communities. Ownership can be jointly shared by all parties or by one party with clearly defined relationships with all other parties. Appendix K presents pros and cons of various ownership and operator scenarios.

The piece of processing equipment would then be moved around a region, with a staff person who knows how to operate and maintain the equipment (and do record-keeping), and would process piles of the materials on a prescribed schedule, or on an as-needed basis. The party that owns the material to be processed (e.g., a landfill with a large clean wood pile) would pay for the processing service, either via a tip fee or other negotiated arrangement. This method also works for periodic rental of equipment from dealerships or request for bids from private companies to process the materials. Further key implementation steps specific to mobile processing equipment should include the following:

1. Determine Need – Determine estimated material quantities & examine local records/storage of these materials. Hold discussions with other regions, jurisdictions, and agencies to compile information to determine potential processing quantities, funding options, and cost-benefit equations for all parties.

2. Preliminary Assessment – If this looks promising, investigate cost of equipment & calculate processing costs on a per-ton basis based on quantities to be processed.

3. Evaluate Ownership/Operational Expenses – To run this jointly-owned mobile processing equipment, create a preliminary business plan, mapping out capital and operational costs (including contingency) against potential revenue from tipping fees, possible sales of materials, or other funding sources. This operation should be economically sustainable, generating revenues to offset costs, which may include annual debt service on capital investments. A funding source beyond material revenue or tip fees could include membership "dues" which could be paid on the basis of population, household or property value or other metric.

4. Initiate an Inter-Government Collaboration – Work with the attorneys of participating communities to determine feasibility of establishing the entity that will own and operate the equipment. If feasible, set up governance structure for the joint powers entity. Then, initiate the steps to specify, purchase, staff and operate the mobile processing equipment.

Section 15.0 describes the authority for communities to collaborate on solid waste facilities under the Wyoming Joint Powers Act, as well as the steps for developing and implementing a workable agreement. To set up a joint agreement for the purposes of jointly owning and operating a one or more pieces of mobile processing equipment, interested parties should consult with their jurisdiction's legal counsel.

13.4 Estimated Diversion Potential, Costs & Revenues

It is difficult to estimate the quantity of materials diverted through the use of regionally owned/operated mobile equipment. For the purpose of illustration, the following diversion assumptions have been made:

- Any piece of equipment would be shared between the programs in the equivalent service area of at least three of Wyoming's RPAs (to approach a reasonable economy of scale)
- Materials processed would be from the total waste stream quantified in Appendix D (not just MSW)
- Diversion levels for the concrete & tire streams range from 20% to 40% (average 30%) by 2015
- Wood waste has two components each with a diversion level of 20% to 30% (average 25%)[50];
  - MSW clean wood (including pallets) - this material is not counted in Table 13-3 as it was considered in the yard/wood waste composting facility analysis (Section 12.0)
  - C&D wood waste stream

TABLE 13-3 DIVERSION POTENTIAL SUMMARY FOR MOBILE EQUIPMENT OPERATION

MATERIAL	POTENTIAL DIVERSION FOR THREE-RPA AREA (tpy)	
	30% Average Diversion	25% Average Diversion
Concrete (aggregates)	2,400 to 6,300	NA
C&D Wood[a]	NA	1,200 to 3,900
Tires	0 to 1,200	NA

[a] Quantity excludes MSW clean wood as it was previously considered in Section 12.0

Concrete Crushing Costs - Cost observations include:

- Mobile crushing equipment can range from $200,000 to $800,000 depending on size & features (e.g., hopper size, magnets, screens, handling rebar, etc.) - to adequately process chunks of reinforced concrete, the equipment must be substantial enough to handle the material & will be more than adequate for the projected diversion quantities
- Used equipment can cost approximately 50% of new units
- Freight to move the equipment around a regional planning area could be approximately $4,000 per move (similar to the mobilization fee charged in the Nebraska case study described above)
- Cost of crushing concrete will be about $5/ton
- Crushed concrete product at nominal 1-1/2-inch, revenue may be $5 to $10 per ton - customers will consist of local contractors, county roads departments, businesses & residents
- Annual costs of owning the crushing equipment will likely negate any revenues

[50] USEPA measured a wood waste-only diversion rate of 15% in 2010 (MSW stream).

Wood Waste Processing Costs - Cost observations include:

- Mobile grinding equipment can range from $100,00 to $500,000 depending on size, capacity & used/new- most grinders are substantial pieces of equipment to handle large quantities (i.e., stumps, root balls, branches, pallets, untreated wood)
- Freight to move the equipment is estimated to be similar to concrete crushers - having haulers bring all wood waste to one or two locations within the region would reduce this cost (ideally, this equipment will be co-located with compost operations (see Section 12.0)
- There are several used grinders on the market with substantial capital cost savings[51] - this would be a lower capital cost option while the implementation issues are worked initially
- Clean, good quality mulch may sell for as much as $12/cy (as in Casper & Cheyenne) - in some parts of the state, however, mulch may be difficult to sell (in those areas grass, leaves & brush feedstock & final size & contamination should be evaluated - tip fees were discussed in Section 13.0 & are not considered here (wood fees need to be lower than landfill fees to encourage source-separation)
- In most cases, tip fees are set to achieve a zero-cost operation (at least for public & non-profit operations)

Scrap Tire Shredding Costs - Cost observations include:

- Shredder costs may range from $100,000 to $400,000 - depending on size, capacity, new or used
- Unit needs a 5- to 10-tph throughput to handle commercial tires up to 120 lbs - ideally, a shredder would produce a 6-inch shred
- Some end users may further process the shred to make crumb rubber for use in further civil engineering or transportation (e.g., rubber-modified asphalt) applications - charges for accepting even shredded tires, however, may be as high as $40/ton (see Table 5-4)

Revenue Potential - For the purpose of estimating the revenue potential for regional mobile equipment use, the tons estimated in Table 13-3 were used together with the pricing noted below(all prices exclude delivery):

- Crushed concrete $5 to $10 (see discussion above) - or $12,000 to $63,000 revenue
- Ground wood $12/ton (from Section 13.0) - $14,4000 to $46,800 revenue
- Shredded tires $40 cost (per Table 5-4) - $0 to $48,000 cost

Avoided Landfill Disposal Costs - This estimate is not valid due to the potential disposal of non-MSW in inert landfills and wood burning practices.

Related Information

Table 13-4 (next page) includes a list of manufacturers for the types of processing equipment discussed in this section, and it intended to provide a good sampling of the industry.

[51] See used rental equipment from dealers or from websites such as *www.grindertrader.com*.

TABLE 13-4 MANUFACTURE LIST FOR MATERIALS PROCESSING EQUIPMENT

VENDORS		EQUIPMENT		
Vendor, Website	**Contact Info**	**Wood Grind & Chipping**	**Concrete, Aggregates Crushing**	**Tire Shred-ding**
BCA Industries http://wisconsinmachining.com	Chad Scherf 414-353-1002; 262-707-9919			X
Construction Equipment Company www.ceccrushers.com/productdetail.aspx?id=47 or www.ceccrushers.com	Wyoming: Brett Jumps (303) 710-2841 bjumps@ceccrushers.com		X	
CW Mill Equipment Co., Inc. www.hogzilla.com	Tim Wenger 785-284-3454	X		X
Diamond Z www.diamondz.com	Jens Jensen 800-949-2383	X		X
DoppstadtUS www.doppstadtus.com	Sean Grieve 440-937-3225	X		
DuraTech Industries www.duratechindustries.net	Bob Strahm 800-243-4601	X		
Eagle Crusher Company, Inc. www.eaglecrusher.com	800-25-EAGLE or 419-468-2288 sales@eaglecrusher.com		X	
Franklin Miller www.franklinmiller.com	James Heyden 973-535-9200 ext. 108	X		X
Granutech Saturn Systems www.granutech.com	Scott White 1-888-387-9650			X
Grasan Equipment Co., Inc. www.grasan.com/crushing.htm	419-526-4440 Fax: 419-524-2176		X	
HAMMEL New York, LLC www.hammelny.com	Gert Semler 219-929-5824	X		
Inertia Machine Corporation www.inertiamachine.com	815-233-1619 Fax: 815-233-4446		X	
IROCK Crushers www.irockcrushers.com	866-240-0201 sales@irockcrushers.com		X	
Kleeman (part of Wirtgen Group) **Wirtgen America Inc.** http://wirtgenamerica.com/us/ www.kleemann.info/en/products	615-0501-0600 info@wirtgenamerica.com		X	
Komatsu Equipment Company http://www.komatsueq.com	Gillette: 307-682-1445 Fax: 307-687-1043		X	
Komptech USA, Inc. www.komptechusa.com	(720) 890-9090	X		
KPI-JCI www.kpijci.com/track-mount/impactor-tracks Local KPI-JCI Dealer: **Tri-State Truck & Equip.,** Casper www.tste.com	Portable: Terry Cummings Track-Mounted: Dave Fierros 307-472-1818 or 307-472-3272 ronc@tste.com,		X	
Metso Minerals Industries Inc. www.metso.com	Garland Everist 303-478-7202 garland.everist@metso.com		X	
Morbark Inc. www.morbark.com	Kevin Yuncker 800-233-6065	X		
Norco Equipment, LLC www.norcoequipment.com	Nate Burton 920-264-0235	X		

VENDORS		EQUIPMENT		
Vendor, Website	**Contact Info**	**Wood Grind & Chipping**	**Concrete, Aggregates Crushing**	**Tire Shred-ding**
Rayco Mfg Inc. www.raycomfg.com	JR Bowling 800-392-2686	**X**		
Rockster Recycler www.rocksternorthamerica.com	Phone: 514-909-2200 sales@rocksternorthamerica.com		**X**	
Rubble Master Americas Corp. www.rubblemaster-americas.com	Alexander Taubinger 800-230-0418 alexander.taubinger@rubblemaster.com		**X**	
Sandvik Mining and Construction www.miningandconstruction.sandvik.com	Gillette: 307-685-6881 Rock Springs: 307-362-7295 info.smc-us@sandvik.com		**X**	
SSI Shredding Systems, Inc. www.ssiworld.com	Dave Fleming 800-537-4733 or 503-682-6472			**X**
Telsmith	Bruce Jedwabny 920-470-8500 bjedwabny@telsmith.com		**X**	
Terex Cedarapids www.cedarapids.com/content/	John Garrison 800-821-5600; 989-288-9280 john.garrison@terex.com; info@cedarapids.com		**X**	
Titan Machinery www.titanmachinery.com	Titan Machinery - Casper 307-234-5381; 800-442-0010	**X**	X	
Vecoplan www.vecoplanllc.com	Bob Gilmore (336) 210-0961	**X**		**X**
Vermeer Mfg. Co. www.vermeer.com	Mike Byram 641-621-8029	**X**		
WEIMA America, Inc. www.weimaamerica.com	Audrey Mosley 803-802-7170	**X**		
West Salem Machinery Co. www.westsalem.com	Bob DeSouza 800-722-3530	**X**		

14.0 OTHER PROCESSING CONSIDERATIONS

14.1 Hard-to-Recycle Materials

Facilities that process hard-to-recycle (or HTR) items such as books, textiles, plastic bags and cooking oil are an advanced component of any diversion system. These facilities vary widely in service levels but are most commonly operated by public or non-profit organizations. Because of the low economy of scale and low revenue potential of these materials, most HTR programs require subsidies, fees or other funding. These programs may be limited to low volume materials which can be reused (e.g., running shoes partnered with Nike Reuse-a-Shoe program) or recycled (e.g., yoga mats) through existing or developed markets. They may also target high-volume materials with special handling needs (e.g., electronic waste). Depending on the facility, more traditional materials may be accepted as well.

A nearby HTR example is the EcoCycle/City of Boulder, CO Center for Hard-to-Recycle Materials (CHaRM)[52]. EcoCycle, a non-profit recycling advocacy and recyclables processing organization, operates the facility, which is open six days a week and accepts the materials listed below. Boulder's CHaRM charges a $3 facility fee for all users (except those delivering only scrap metal and single-stream recyclables) as well as unit fees for most materials ranging from $2 to $8 (and offers a "punch card" membership to City/County residents, with lower per-unit costs). Eco-Cycle also receives operational subsidies for CHaRM from Boulder County and the City of Boulder (and a free location on city-owned property). CHaRM also provides fee-based Freon-removal service, shredding service, zero-waste party kits, business collection and community collection events. Materials accepted include:

- #2 and #4 plastic bags, including bubble wrap
- #6 white block foam packaging (Styrofoam)
- Athletic shoes
- Big durable #2 plastics
- Bicycles, bike parts, and bike tires & tubes
- Books and manuals
- Cooking oil
- Electronic devices - including audio/video equipment, cables, computers (all types), copiers and fax machines, peripherals, printers & printer cartridges, small electronic items, telephones, televisions (all types), etc.; through a partnership with Samsung, will take Samsung-branded items for free
- Fire extinguishers
- Paired shoes
- Porcelain items (toilets, sinks, and urinals)
- Textiles (clean, used beyond what a thrift store would accept for resale)
- Yoga mats

To make it a "one-stop drop", the CHaRM also accepts traditional single-stream recyclables, scrap metals, and organics for composting from users.

[52] *www.ecocycle.org/charm*

14.2 Food Waste Composting

Food waste composting can be completed on-site where it is generated (using low or high tech strategies) or done off-site at a commercial composting facility. In Wyoming, food waste operations require either a WDEQ permit, permit exemption or beneficial use determination. Processing of food waste collected in commercial and residential programs will occur through one or more of the following methods:

- Windrow composting organic materials mixed into windrows or piles - best used with full organic composting (i.e. yard waste, wood waste, and food waste) in aerated static piles or aerated windrow piles at a composting facility (See Section 12.0) but can also can handle meat & grease with frequent turning and temperature and moisture control
- In-vessel composting – using an enclosed reactor with temperature & moisture-control to contain and expedite composting (especially suited for processing food wastes, biosolids & sludges)
- Vermi-composting using red worms to break down organic materials into compost (best used for small-scale on-site composting systems but cannot handle animal products or grease very well)
- Pre-processing (sink food waste disposal) and direct piping to sanitary sewer system

Other food recovery options include food donations, processing into animal feed and rendering. Liquid fats and solid meat products would be used as raw materials in the rendering industry. Renderers may provide storage barrels and free pickup service for locations near their facilities.

In-vessel composters come in a variety of sizes and have some type of mechanical mixing or aeration system. In-vessel composting can process larger quantities in a relatively small area more quickly than windrow composting and can accommodate animal products. This technology is capital-intensive, but is well-adapted for processes that are likely to require odor control, facility acceptance by adjacent property users and reduced buffer requirements. There are three basic configurations with several subcategories in each configuration:

- Vertical flow reactors (anaerobic digesters) - agitated bed (multiple hearths or multiple floors), packed bed or silo
- Horizontal or inclined flow reactors - rotating drums or kilns, agitated beds (channels or bins, circular or rectangular shape) or static beds (tunnel reactors, ram or conveyor type)
- Batch reactors – bags or boxes

The vertical flow reactors and the agitated beds have generally been used at waste water treatment plants for sludge and biosolids. When municipal solid waste was the feedstock, the technologies used in the U.S. generally focused on the rotating drums, agitated channels or tunnel reactors. The rotating drums are used primarily to mix the feedstock and microorganisms, open bagged material, and macerate the waste. Once the material passes through the drums, it is usually placed in windrows to complete the process through curing.

Batch reactor systems, such as the NaturTech and AgBag trademark technologies, utilize multiple modular, aerated containers for active composting, followed by curing in secondary containers or open-air windrow piles. Although the modules themselves are relatively economical, the system typically requires a building and equipment for mixing and hydrating, transfer equipment for material and module handling, elevated utility requirements for modules and biofilters as well as moderate land requirements if supplemental windrowing is used. On-going labor needs can also be significant as the quantities

requiring batch processing increase. These cumulative requirements can significantly increase the capital and operating costs of this technology. As a result, batch processing is generally limited to small operations processing wet and putrescible waste materials. Additionally, batch reactors are susceptible to air and moisture distribution problems, which lead to odors and inconsistent end-product. The most successful operations, however, produce premium quality compost. Table 14-1 compares some in-vessel technologies.

TABLE 14-1 SAMPLE IN-VESSEL TECHNOLOGIES

COMPANY (system name)	TYPE	FEED SYSTEM	CAPACITY (tons per unit or container)
NaturTech (Naturtech)	Aerated bin	Batch	20
Green Mountain (Comptainer)	Aerated bin	Batch	15-25
Wright Environmental (Wright Tunnel)	Plug flow static bed	Continuous	Depends on unit size
Celto Canadian (BioReactor)	Aerated silo	Continuous	4-5
Farmer Automatic (Compost-Matic)	Agitated bay	Continuous	80
Stinnes Enerco (BioContainer)	Aerated bin	Batch	5-15
ABCTI (Ag Bag)	Aerated bags	Semi-batch	Depends

Source: Applied Compost Consulting Inc., Oakland, California (December 1995)

A thorough assessment of these in-vessel systems is beyond the scope of this report. Ultimate selection of a technology is largely dependent on the final feedstock mix, market, regulatory restrictions and adjacent land uses. Typical in-vessel requirements may include:

- Processing equipment - include drums, bags, channels or agitated beds
- Buildings - needed to house in-vessel technology & windrow curing (typically aerated)
- Truck scale - typically an integral component to weigh feedstock & end-product
- Bunkers - covered &d paved units to store cured compost prior to distribution
- Front-end loaders - loaders, trucks & conveyance systems required to move materials between buildings
- Trommel screen - to remove oversized end-product for additional composting

Another food waste processing alternative gaining support over the past few years is the use of in-sink food waste disposals or other pre-processing prior to direct piping or trucking to anaerobic digesters at the local waste water treatment plant. Anaerobic digesters convert organic carbon in bio-waste into methane and carbon dioxide gas by using methanogenic bacteria. Typically the gas is recovered to power treatment plant facilities. Food waste grinders or pulpers can be implemented on-site for each kitchen facility or centralized center. The processed food waste would then be piped directly to sanitary sewer system or trucked. Considerations of this method include:

- Review of piping system to handle quantity and modifications required for direct sewer routing
- Increased water consumption to properly flush solids - 3 to 7 gpm as per recommendations from a recent Wisconsin Department of Natural Resources food waste study[53]

[53] Final Report: Food Waste to Energy and Fertilizer, March 2010, Wisconsin Department of Natural Resources.

- Wastewater treatment plant must have the capacity to handle the increased volumes – there will be impacts on biochemical oxygen demand (BOD), amount of nitrogen & phosphorus in the wastewater, & increase in overall amount of solids in the system

In the commercial sector, the following basic steps can facilitate food recovery and processing:

- Identify large food waste generators
- Assess the possibility of establishing on-site composting systems (in-vessel systems, windrows, or vermicomposting) - both available space & staff time to properly operate & maintain the system
- Identify businesses that use food discards (such as composters, vermicomposters, animal feeders, animal feed manufacturers, tallow companies, renders) - finding or developing a regional composting facility that is permitted to take all types of food waste will result in greater flexibility and higher diversion (if composting facilities can only take vegetative materials, these materials are still worth targeting)
- Distribute information on users to generators so they can make their own matches

14.3 Regional C&D Transfer Facility

Recycling of C&D materials can be challenging. The C&D waste stream varies significantly depending on the type of project. The debris generated can include many different materials - each of which has different handling needs and diversion potential. Diversion can depend on the cost of landfill disposal, the ability for contractors to store both diverted and disposed materials at their site, ease of diversion, and quality/quantities generated. Once diverted, the need for a dedicated C&D facility can vary by material[54]. Finally, the capital and operating costs of a C&D processing facility are significant, and require a reasonable economy of scale to yield sustainable unit costs. Table 14-2 (next page) weighs these factors in terms of a C&D infrastructure option for Wyoming.

Some smaller communities may find that crushing aggregate for solid waste facility or other local use - ideally using a mobile crusher (see Section 13.0) - meets their needs. Other communities may find that a C&D transfer facility that accepts only source-separated materials may be feasible due to lower quantity requirements and lower costs than full-scale C&D waste processing facilities. This section will evaluate the development of a regional transfer facility over the mid-term planning period (approximately ten years).

[54] Some materials (such as aggregates and cardboard) are most cost-effectively hauled directly to end-markets (i.e., a transfer or processing facility add no value). Other high value materials may be marketed directly by the contractor (e.g., scrap metal).

TABLE 14-2 KEY FACTORS ASSOCIATED WITH C&D PROCESSING

ISSUES	CONSIDERATIONS	
MARKETS VARY	**MARKET STATUS**	**FACTORS (materials listed in descending order with respect to quantities likely managed by C&D facility)**
	Existing National Markets	▫ Clean wood ▫ Aggregates (asphalt, concrete, brick) ▫ Cardboard (generally low quantities in C&D) ▫ Wood pallets ▫ Scrap metal (low quantities as contractors sell directly to high-paying markets) ▫ Durable goods (appliances, re-useable items) ▫ Ceiling tiles (out-of-state market but economical) ▫ Vinyl composite tiles (same market as ceiling tiles)
	Developing Markets	▫ Asphalt shingles (especially critical following hail storms, supply can easily exceed demand in new asphalt use) ▫ Plastic (rigid & film plastic, generally "clean" plastics generated in low quantities) ▫ Plate glass (cannot be recycled with container glass) ▫ Clean drywall (in demand where compost operations exist) ▫ Carpet (unique testing & processing requirements)
	Future Markets?	▫ Cement fiberboard ▫ Commercial roofing membrane ▫ Fiberglass insulation ▫ Dirty drywall ▫ Treated wood (can be burned for its BTU value in industrial boiler or burner with appropriate air pollution control equipment)
DIVERSION QUANTITIES CAN BE UNCERTAIN	Contractors need means for separating, collecting & storing at project site	
	Haul requirements, distance & costs to diversion facility have to be feasible and less than haul + disposal costs	
	Facility must be accessible & have reasonable access for material delivery	
FACILITY COSTS CAN BE HIGH	**OPTIONS**	**FEATURES**
	Transfer Facility	▫ Accept only source-separated materials that aren't directly transferred to end-user ▫ Reduced processing costs decrease facility size, capital & operating costs ▫ Can accommodate lower quantities for efficient operation ▫ Reduced diversion levels (less convenient for contractors)
	Processing Facility	Accept commingled materials that require sorting & processing (manual/automatic sorting, screening, volume reduction) ▫ Larger facility size, higher capital & operating costs[a] ▫ Greater minimum quantities required to control unit cost of operation ▫ Greater diversion (more convenient for contractors)

[a] The recent Boulder County study (UHG, "Boulder County Construction & Demolition Infrastructure Study, Materials Generation Estimate & Market Analysis," December 2011) estimated that each sorting line required for processing commingled C&D materials would cost between $1M & $2M to construct - labor & operating expenses would be additional (see report excerpts in Appendix L)

While several Wyoming planning entities (Eastern Laramie County, Green River, Lusk, Park County, Sheridan, Gillette, Fremont County, Sweetwater County, Uinta County and Washakie County) divert

asphalt and concrete for their own use, Cheyenne has the only C&D diversion facility that provides some level of separation and volume-reduction of materials. The Cheyenne facility is nearly 100,000 square feet and is housed in a moveable fabric building using basic sorting equipment, and a large material handler with grapple. Cheyenne is currently evaluating markets and future equipment needs[55].

No discussion of diversion of C&D would be complete without mentioning the role that used building materials (UBM) stores and yards have in keeping these materials from landfilling. While accurate estimates of the amount of C&D materials diverted nationwide are hard to come by, it is noteworthy that Habitat for Humanity's ReStores are present in six Wyoming locations (see Appendix E). Several of these locations accept UBMs from deconstruction, remodeling, and construction wastes, and build new homes for lower-income citizens, providing a strong social as well as environmental benefit. There are many profitable UBM operations around the country, most of which are non-profits of one type or another. Promotion of C&D diversion should begin with reuse of salvageable items through the existing ReStore network in Wyoming or through consideration of starting a UBM operation in any area not currently served by a ReStore.

Implementation

C&D facilities in Wyoming are likely to be developed as regional operations near larger population centers. They may be publicly or privately owned & operated (see Appendix K for guidance on these differences).

It is probable that research into the feasibility of new C&D transfer operations in Wyoming will take one to two years. As a result, it is expected that new facilities will be operational during the long-term planning period of this study. Key implementation steps include:

- Evaluate feasibility for C&D transfer
- Determine which materials will be accepted
- Determine ownership/operational status (see Appendix K for more information)
- Evaluate funding sources
- Consider where the facility will be located
- Evaluate policies, programs & education

Costs

Construction costs for a transfer C&D facility will vary depending on the size, location and capabilities. Operations costs will depend upon labor, markets and any requirements for transportation of materials to market. Table 14-3 (next page) includes a summary of capital and operations cost for a 98,000-square foot transfer facility researched for Boulder County in 2011. This facility was designed as a 20-year facility capable of transferring approximately 20,000 tpy of diverted C&D[56] to downstream processors/end-users. Excluded from this summary are costs for site selection, land purchase and expenses associated with material delivery and transportation to markets.

[55] Cheyenne uses this facility to manage nearly 70,000 tpy of non-MSW material (which is approximately 41% of the city's total waste stream - notably higher that the statewide average of 29% in 2010). Cheyenne utilizes differential tip fees to encourage the diversion of C&D materials.

[56] The Boulder County C&D transfer facility as evaluated by UHG would service the construction, renovation, demolition & deconstruction needs of the 295,000-person county as well as surrounding areas.

TABLE 14-3 CONCEPTUAL COSTS FOR A C&D TRANSFER FACILITY[a] (2011$, rounded to nearest $100,000)

COMPONENTS	APPROXIMATE COSTS
CAPITAL COSTS[b] Design, site preparation, building construction, scale/scale house, contractor costs & contingency	$7,100,000 to $15,300,000
EQUIPMENT COSTS[c] Processing (stationary compactor, 6 roll-off boxes) & Rolling stock (loader, skid steer, forklift, sweeper)	$400,000 - $500,000
ANNUAL OPERATING COSTS Personnel (3 to 7 FTEs), equipment maintenance, utilities, supplies, 3-month operating reserve & miscellaneous	$400,000 - $700,000
REVENUES[d]	$50,000 - $300,000
AVERAGE TIP FEE NEEDED[e] **($/ton)**	$29 - $47

[a] UHG, "Boulder County Construction & Demolition Infrastructure Study, Materials Generation Estimate & Market Analysis," December 2011 (see Appendix L)
[b] Estimated debt service on this investment (6% over 20 years) was $600,000 to $1,300,000
[c] Equipment life ranges from approximately 5 years for compactor to 10 or more years for loader
[d] Estimated revenues were based on materials with existing Colorado markets only
[e] Specific material tip fees would vary on the basis of per-ton cost to manage at the facility and estimated tonnage

Other resources required by owner/developers that pursue a C&D transfer operation will need to allocate resources for a feasibility assessment, siting, permitting, procurement of material contracts, operator procurement (if needed), market agreements and education of generators as well as public do-it-yourselfers.

PART IV
PRIORITY POLICY OPTIONS

Policy improvements that prioritize waste diversion are arguably the most powerful type of solid waste system options. Policies can be voluntary incentives (or "carrots") or they can be mandatory requirements ("sticks"). If mandatory, policy typically takes the form of regulation or ordinance, established through the legislative (state) or council/commission (local and regional) actions. They can be implemented at the municipal, county, regional, state or national level. The types of policies vary as broadly as the communities that implement them, and can range from established diversion goals to recycling mandates. This part of the Study report includes a detailed analysis of policies at the regional, state and local levels - all targeted to improve Wyoming's waste diversion success in the future:

- Regional Waste Diversion Collaboration
- State Yard Waste Disposal Ban
- State Beneficial Use Guidelines
- State Requirements for Data Collection & Reporting
- Local Pay-as-You-Throw Pricing

The Wyoming Statewide Study of Waste Diversion was commissioned by the Wyoming Department of Environmental Quality using funds appropriated by the Wyoming Legislature. LBA Associates, Inc. was contracted by the Department to undertake the study. Any recommendations made or conclusions reached in the study are solely those of LBA Associates, Inc., and not necessarily the State of Wyoming.

15.0 REGIONAL WASTE DIVERSION COLLABORATION

TABLE 15-1 SUMMARY OF FINDINGS FOR REGIONAL ORGANIZATIONS

FINDING	DESCRIPTION
Implementation - By regional partnerships of public, private or non-profit organizations with collaborative organization & planning completed during the short-term planning period (2015) & any infrastructure in place in 2020	
Potential Diversion	See Sections 10.0-14.0
Estimated Costs, Cost Savings & Revenues	See Sections 10.0-14.0

15.1 General Considerations

Regionalizing operations to increase efficiencies and reduce unit costs may benefit reuse, recycling transfer/processing (see Section 10.0), composting (Section 12.0 and 14.2), sharing mobile equipment (Section 13.0), hard-to-recycle (Section 14.1), used building materials or C&D transfer/processing facilities (Section 14.3). With all waste diversion facilities, Wyoming operators must deal with low quantities and – for recycling programs - long hauling distances to processing facilities and/or end markets. A key strategy for decreasing the cost of materials management, decreasing hauling costs and increasing market leverage (and hopefully revenues), is to regionalize with neighboring communities, institutions and businesses to collectively manage more materials. Whether operators organize formally or informally, the benefits of collaborating typically outweigh the associated politics and logistics.

Regional cooperatives can be on a regional level with multiple operators in the same county or multiple counties, at the state level or at a multi-state level. Many recycling organizations focus on the critical services of marketing recovered materials as well as additional services:

1. Regional Cooperative Examples;
   - Upper Area Arkansas Council of Governments (UAACOG) – a Colorado inter-governmental agreement between Chaffee, Custer and Fremont Counties to provide collection, marketing & special events (see the case study below & Appendix M)
   - Boulder County, CO Solid Waste Authority - was based on inter-governmental agreements with 11 communities & operated for a prescribed number of years to collect sales revenues ear-marked for the construction & start-up of a regional MRF/DOC facility (see the case study below & Appendix N)
   - ARK - operates a unique type of cooperative (doesn't work with communities in a given region, but instead develops agreements with local governments throughout southern Wyoming) to provide equipment, hauling, processing & marketing services

2. State Cooperative Example - The Cooperative Teamwork and Recycling Association (CTRA) is a 501c(3) organization in Texas that provides program & marketing assistance to over 500 private, public and non-profit recycling programs (CTRA was originated by the state recycling association but is now a separate entity).

3. Multi-State Cooperative Example - Many years ago, the Southwest Public Recycling Association

(also a non-profit organization) provided marketing services for Arizona, New Mexico, Utah and Colorado including education, transportation and negotiating contracts (although no longer in business, SPRA was a good regional example for Wyoming).

Case Study - Upper Arkansas Area Council of Governments Recycling Program (Colorado)

UAACOG is an umbrella organization of 15 different human service and community development programs whose mission is to promote self-sufficiency and healthy lifestyles for individuals and families. Its Recycling Program is a multi-year program serving 69,300 citizens in the rural communities of Chaffee, Custer and Fremont Counties (Colorado). Its services include the provision of recycling containers, collection and marketing of traditional container and paper recyclables (the exception is cardboard, which is collected by another non-profit organization). Operating revenues are obtained through membership dues, based on population. UAACOG's aim is to continually increase collection efficiencies and market revenues so that costs to members is maintained or dropped. Over the last three years, dues have dropped from $1.30 to $0.72/person-year. The 2012 operating budget is $50,000. Appendix M includes a copy of UAACOG's inter-governmental agreement with the counties.

Case Study - Boulder County Solid Waste Authority (Colorado)

In 1994, Boulder County citizens voted to support a 0.1 cent sales and use tax to support waste diversion infrastructure - over several years, this tax raised $24M in revenues and interest earning. In 1995, the County and 11 municipal members implemented an inter-governmental agreement to form a Solid Waste Authority whose board included one member from each community. An executive director and supporting staff were hired, and in 2001, the Boulder County Materials Recovery Facility was brought on-line. The dual-stream facility included an expansive DOC, education center and rail spur for shipping recyclables - a non-profit organization was contracted for operation. The facility processes approximately 50,000 tpy, markets materials through long-term end-use contracts and is able to share material revenues with generators and haulers or delivered recyclables. Other Authority activities included community outreach, special events and development of a permanent HHW facility. In late 2001, per its resolution and bylaws, the tax ceased and the Authority dissolved. Since that time, Boulder County has continued to own and operate (through contract) the various facilities. Appendix N includes a copy of the original ballot resolution, as well as the Authority's inter-governmental agreement and bylaws.

Wyoming Status - While there are some regional waste and recycling-related partnerships in Wyoming, few of these examples were truly planned as such:

Government + Government

- Casper's regional landfill operation – accepting trash tons from Douglas, Rawlins & Midwest
- Green River - currently working to develop a regional cooperative in southeast Wyoming[57]
- Jackson Community Recycling - working with & serving Teton County (JCR is also willing to accept good quality materials from other communities on a case-by-case basis)

Non-Profit + Government

- ARK (which operates like a hub-and-spoke) – partnering with cities & towns but not consistent service areas or entire regions/counties (clients include Douglas, Hanna, Guernsey, Kemmerer, Lander, Lusk, Rawlins, Saratoga, Torrington, Wheatland plus colleges, prisons, businesses & communities in NE & CO)
- Uinta Recycling Inc. – working with & serving Evanston & western Uinta County (also working on a partnership with Park City, UT)
- Community Entry Services (CES) - working with and servicing Fremont County Solid Waste Disposal District's communities of Lander, Riverton, Shoshoni and Dubois

15.2 Implementation

It is likely that regional cooperatives in Wyoming will be between one or more local or county governments, disposal districts, non-profits or businesses. Ownership can be jointly shared by all parties or by one party with clearly defined relationships with all other parties.

Given the significant benefits of regionalizing and the knowledge that regional cooperatives can be initiated on the basis of a small activity list, it is expected that planning and preliminary development can be undertaken during the short-term planning period of this Study. Any processing infrastructure needed to support the region (such as a materials recovery facility), could subsequently be designed, permitted & constructed. Key implementation steps include:

1. Determine the Facility Focus (recycling, composting, C&D, etc) & Investigate Possibilities for Regionalizing – This will include considering partner options based on proximity, geographical boundaries, need, material quantities, existing infrastructure, political compatibility & other factors.

2. Evaluate Activities the Organization Should Undertake – These can include one or more services;
   - Drop-site management and/or collections
   - Centralized processing (anything from baling source-separated materials to sorting and baling commingled streams) - equipment capability can often be greater than that afforded by individual recycling programs (e.g., larger-capacity balers)
   - Mobile processing (maintenance/operation of mobile grinders, crushers and similar equipment or coordinated rental/bidding services of such processing equipment)

[57] Green River developed the 2011 Regional Recycling/Recovery Program Strategic Plan for its previous partnership with the City of Rock Springs and Sweetwater County Solid Waste Disposal District #1.

- Short-term materials storage
- Managing transportation networks (including back hauling)
- Negotiating contracts with multiple markets (to obtain better pricing than each individual program would obtain on their own)
- Miscellaneous activities (education/outreach/publicity)

In analyzing which services to provide, include an assessment of capital investment, equipment needs and annual operating and maintenance costs for each. Available property and/or siting needs may also be a consideration, depending on available resources.

Most importantly, regional collaboration of recycling activities should consider the hub-and-spoke approach (discussed in Section 10.0). "Smart" hubs and reasonable spokes should be identified to maximize efficiencies and service-area coverage.

3. Determine Governance – This will likely take the form of a joint powers agreement. The Wyoming Joint Powers Act[58] allows two or more agencies to jointly plan, own, lease, assign, sell, create, expand, finance and operate public works facilities including solid waste facilities. Agencies are defined as any counties, municipal corporations, tribes, school districts, special districts, public institutions, agencies, boards, commissions and political subdivisions. The level of collaboration can be informal or formal (i.e., through resolution, ordinance or other). Steps to establish a formal agreement are spelled out in the Joint Powers Act, and include;
   - Approval of the governing body of the collaborating agencies
   - Approval by the Wyoming Attorney General
   - Filing agreement with each agency which includes;
     - Purpose of the agreement
     - Percent ownership of any facility by each participating agency
     - Description of joint powers board
     - Joint operation & maintenance of any facility
     - Details on financing & budgeting
     - How/when the agreement may be terminated

4. Evaluate Funding Sources – Funding may be needed to pay for and/or offset;
   - Capital and/or equipment costs
   - Operating costs
   - Emergency or unexpected costs only

   Ideally, the program will be developed as an economically sustainable operation that will generate revenues needed to balance costs, which may include annual debt service on capital investments. Common funding sources may include one or more of the following;
   - Membership "dues" are typically paid on the basis of population, household or property value or other metric (see the UAACOG example in Appendix M)
   - Taxes (see the Boulder County example in Appendix N)

[58] Per Title 16, Chapter 1 "Intergovernmental Cooperation".

- User fees
- Material revenues
- Grants to fund portion of initial capital/operating costs with material revenues and/or fees sustaining ongoing operations

15.3 Estimated Diversion Potential, Costs & Revenues

Diversion Potential - The diversion potential associated with regionalization will vary as a function of the type of cooperative (i.e., services, programs, facilities) and usage by members. As it is likely that a regional organization will center around processing and marketing capabilities, the materials recovery facility analysis in Section 10.0 and yard/wood waste composting analysis in Section 12.0 represents similar diversion levels and is not repeated here.

Costs - It is expected that the cost of the initial planning and organizing a regional recycling cooperative will be limited to personnel time within the organizations involved:

- Solid waste planning staff - for coordination with other organizations & overall development
- Accounting staff - for negotiating & establishing payments
- Legal counsel - to review & approve organizational business model
- Council/commission members - to approve the final cooperative formation & agreement

This time commitment is expected to be limited primarily to the planning period (first one to two years) and will taper off once the organization is running effectively. On-going oversight will also be needed to oversee materials delivery and acceptable execution of cooperative agreements with all members. It is expected that this will be accomplished by the regional MRF staff (which is included in Section 10.0).

Revenue Potential & Avoided Landfill Disposal Costs - The sections in Part III describe both the cost savings and revenue potential anticipated for a regional MRF (this section also includes a detailed cost model).

Related Information

- Appendix K - includes advantages & disadvantages of various public, private & non-profit ownership & operations scenarios
- Appendix M - includes the UAACOG inter-governmental agreements with Chaffee, Custer & Fremont Counties (Colorado)
- Appendix N - includes the Boulder County, CO Solid Waste Authority ballot resolution, inter-governmental agreement authority bylaws

16.0 STATE YARD WASTE DISPOSAL BAN

TABLE 16-1 SUMMARY OF FINDINGS FOR YARD WASTE DISPOSAL BAN

FINDING	DESCRIPTION
Implementation - At the state level by 2015 (with effective dates over a three-year period & waivers for challenged communities)	
Potential Diversion	See Section 12.0
Estimated Costs, Cost Savings & Revenues	See Section 12.0

16.1 General Considerations

Landfill bans are effective public policy to encourage diversion of materials by prohibiting the disposal of the selected materials. Bans can be imposed on landfills, transfer stations, haulers, municipalities and/or generators. By the mid-1990's, 27 states had originally enacted bans on disposal of yard wastes resulting in the development of hundreds of compost facilities. Yard waste was an easily segregated component of the municipal solid waste stream and since composition studies showed that yard waste was a significant percentage of the solid waste stream, a yard waste disposal ban provided an immediate, significant jump in recycling diversion rates for many of these states[59].

The definition of yard waste can vary from state to state - for some it means grass clippings, leaves, or both while others include woody vegetative matter, shrub trimmings, landscaping debris, and/or small branches. The disposal ban of yard waste not only reduces landfill volumes, thereby extending landfill life, but yard waste composting provides a useful product that can enrich Wyoming soils. A disposal ban, if enforced at either the point of collection or at the landfill, is generally expected to yield the highest yard waste diversion rate. The general pros and cons of a yard waste ban are described in Table 16-2.

TABLE 16-2 GENERAL PROS & CONS OF YARD WASTE DISPOSAL BAN

PROS	CONS
Proven diversion incentive	Represents change to status quo
Relatively easy to implement once policy is in place	Policy-making/state law is required
Flexibility to adapt to most existing programs (see Implementation/program design alternatives below)	Concerns about illegal dumping (generally a non-issue after initial implementation)
Minimal costs for local solid waste agencies with existing composting facilities	Concerns about raising rates (would apply to curbside collection of yard waste)
Provides opportunity to educate public on importance & ease of diversion	Additional/new composting site capacity required
Increases yard waste composting which produces a useful product – finished compost can be used as low cost landscaping material and provides nutrients and organic matter back into the soil	Difficult for communities without the feedstock or product demand to operate an economical, sustainable yard waste management facility

[59] Surveys of several states with existing yard waste disposal bans indicate success rates (in terms of keeping yard waste out of landfills) of 77% to 99%.

Currently, 23 states ban yard waste from landfill disposal to some extent (see Table 16-3). States such as Nebraska and Florida, whose bans were revised, now allow yard waste disposal year round in a landfill as long as the landfill has an active gas collection system with energy recovery (i.e., generate electricity or direct use).

TABLE 16-3 STATES WITH EXISTING YARD WASTE BANS in 2012[a]

STATE	DESCRIPTION
Arkansas	Leaves and grass (AR Regulation 22)
Connecticut	Grass clippings only, 1995
Florida	Yard waste
Georgia	Yard waste
Illinois	Yard waste
Indiana	Leaves, grass and woody vegetative matter - Adopted in 1997
Iowa	Yard waste
Maryland	Separately collected loads of yard trimmings are banned from disposal
Massachusetts	Leaves in 1992, all other yard waste in 1993 including grass clippings, weeds, garden materials, shrub trimmings, and brush one-inch or less in diameter
Michigan	Yard waste
Minnesota	Effective in 1995
Missouri	Solid Waste Law bans yard waste as of January 1992
Nebraska	Effective in 1994 (banned from April 1 – November 30)
New Hampshire	Yard waste
New Jersey	Leaves only
North Carolina	As of January 1, 1993, banned in landfills
Ohio	Yard waste restriction for solid waste facilities effective November 30, 1994
Oregon	No details available
Pennsylvania	Applicable for truckloads containing more than 50% leaves
South Carolina	Includes landscaping debris
South Dakota	Yard waste, effective 1995
West Virginia	Enacted in 1997
Wisconsin	Enacted in 1993

[a] Source: "Analysis of the Impact of a Yard Waste Ban on Landfill Quantities and Household Costs", September 15, 2004, prepared for Delaware Solid Waste Authority by DWM Environmental Services, Inc.

Wyoming - The state of Wyoming does not ban yard waste from landfills, although some bans have been implemented at the local level. The landfill serving the City of Cheyenne banned yard waste starting March of 2003 (at disposal point). The City of Cheyenne provides curbside yard waste collection on a subscription basis. Starting May 1, 2012, the City of Casper will be banning yard waste and branches from trash containers (at collection point). To ease the transition, the ban in Casper will be instituted over a five-year period through the trash collection routes[60].

Several other Wyoming communities provide yard waste drop-off sites for no cost to residents and a reduced tip fee at the compost facility for commercial customers. Yard waste is managed through low-

[60] Optional yard waste collection services (weekly May through October) are being offered at a subscription fee of $10/month for the first 95-gallon container. Each additional container is $7 per month per container.

tech composting (a combination of active and "passive"/static pile windrow composting) and grinding of wood waste into mulch.

16.2 Implementation

Although some larger communities in Wyoming have banned yard waste from trash collection or landfill disposal, a yard waste disposal ban at the state level is recommended. The ban would be implemented through legislation[61] and would most likely be championed by WDEQ, WSWRA, compost operators and/or other stakeholders.

Given the proven and immediate diversion of yard waste from disposal facilities after a ban, it is recommended that a state-wide yard waste disposal ban be implemented during the short-term planning period of this study. Efforts should be started immediately to allow time to work through the legislative approval and rule-making process and allow a phase-in period (i.e., at least one year or more) for local governments to educate the public regarding both the importance of diversion and how the ban would be implemented, as well as to prepare additional yard waste collection and management infrastructure. Key implementation steps should include:

1. Identify Stakeholders - Stakeholders are likely to include state and local elected officials, landfill owners/operators, solid waste agencies, residents and haulers.

2. Educate Stakeholders on Ban Features & Phase-In Schedule - This should cover the values of a yard waste ban;
   - Educate state and local elected officials, solid waste agencies before beginning public outreach
   - Have facts about yard waste diversion/composting benefits and alternatives clearly presented for public outreach process – build support among residents and affected businesses
   - Make ban dates clear – ensure alternate management methods can be put in place before the ban starts ("no ban without a plan")

3. Design Yard Waste Ban Policy;
   - Define yard waste to be included in the ban
   - Identify phase-in schedule – allow up to three years from approval prior to full ban in order to provide stakeholders to phase in collection methods and composting facilities
   - Identify the need for waivers for communities who would face undue hardship in complying with this policy (such as very small communities located far from other towns) - waivers can be difficult to include, however, & must be balanced against the need for fair enforcement state-wide
   - Identify an enforcement mechanism – most commonly disposal bans are enforced at the landfill with the landfill's liability being limited to educating commercial & self-haulers, and controlling gross negligence in terms of tipping banned items
   - Work with local government/solid waste agencies/haulers to prepare for changes

[61] Local level implementation is feasible - numerous counties & municipalities in states without state-level bans (e.g., Colorado/e-waste & California/yard waste) have implemented yard waste bans and other recyclable material bans to help reach diversion goals.

- Work with Wyoming state legislature to develop legislation and enforcement authority needed for successful implementation

4. Develop Statutory Language – Key components of yard waste ban legislation will vary depending on the responses to the design list above. It is also possible that other changes will be implemented together with a yard waste disposal ban to take advantage of the rule-making process. These might include banning additional materials, streamlining compost facility permitting requirements for yard waste facilities to receive other organic materials (i.e., food waste or biosolids), and/or requirements for compost product testing or for quantity data reporting.

5. Implement Local Yard Waste Collection & Composting Changes;
   - Local governments/solid waste agencies – determine changes necessary to existing compost facilities to handle greater quantities (this may include larger facility size, more active management/turning of material, equipment needs), develop new compost facility, and/or develop additional yard waste drop-sites; identify procedures or fines for violators
   - Haulers – develop and offer yard waste curbside collection as part of mandatory services or optional subscription service

6. Track Progress Against Baseline to Monitor Diversion;
   - Compost facilities – need to record weight or volume of all incoming loads of yard waste (self-haul, drop-site haul, and curbside collection)
   - Local governments/solid waste agencies – recommend to perform future waste composition study on wastes received for disposal at the landfill (at least 3 to 5 years after ban implementation)

16.3 Estimated Diversion Potential, Costs & Revenues

Section 12.0 considered yard (and wood) waste diversion levels associated with composting operations. To avoid double-counting, diversion quantities are not considered again here. It should be noted that clean wood may not specifically be included in a yard waste disposal ban (but was considered in Section 12.0), but greater diversion of clean wood and pallets will likely occur in tandem with a yard waste ban as these materials are closely aligned with yard waste programs and wood processing equipment.

Policy Costs – Yard waste disposal ban expenses will include initial legislative and rule-making efforts. Once these are completed, expenses will generally be limited to on-going enforcement. Enforcement costs will likely be incurred by WDEQ, WSWRA and a number of volunteer individuals and organizations. Overall expenses may include:

1. Policy Development – Resources needed for any organization to lead or assist in the legislative and regulatory process;
   - WDEQ staff – this will likely involve existing WDEQ and Wyoming's Attorney General staff only
   - WSWRA – as this organization comprises volunteer members only, there will be no direct costs incurred
   - Other organizations – this effort will be volunteer as well

2. On-Going Enforcement – Resources needed to verify that landfill facilities are generally in compliance with the disposal ban are expected to be provided by WDEQ inspectors during their normal landfill inspections or in response to a report of violation. As such, these costs are not expected to exceed current budgetary amounts. Other enforcements costs not quantified here will include;
    - Enforcement of illegal dumping prohibitions by state and local officials
    - Landfill improvements for ban enforcement
    - Yard waste drop site collection improvements (where applicable) to accommodate additional quantities (may include additional containers)
    - Hauler requirements for curbside collection (where applicable) - both to collect additional quantities (may require additional equipment, routing & labor) & to enforce the ban if imposed at the collection point
    - Residential services fees – for those who choose curbside collection of yard waste[62]

Composting Facility Capital/Operating Costs, Avoided Landfill Disposal Costs & Revenue Potential – These were previously estimated in Section 12.0.

Related Information

- "Analysis of the Impact of a Yard Waste Ban on Landfill Quantities and Household Costs", prepared for Delaware Solid Waste Authority, September 15, 2004 – posted on Composting Council website at *http://compostingcouncil.org/admin/wp-content/uploads/2012/03/DSM-Yard-Waste-Report.pdf*
- U.S. Composting Council webinar "Preserving and Promoting Bans on Landfilling Yard Trimmings" –*http://compostingcouncil.org/preserving-and-promoting-bans-on-landfilling-yard-trimmings/*
- Nebraska Revised Statutes, Chapter 13-2039. Land disposal of certain solid wastes; prohibited; when; exceptions - *www.nebraskalegislature.gov/laws/statutes.php?statute=13-2039*
- South Dakota Codified Laws, Chapter 34A-6 Solid Waste Management, 34A-6-67. Landfill waste reduction targets - *http://legis.state.sd.us/statutes/DisplayStatute.aspx?Type=Statute&Statute=34A-6-67*

[62] In 2004, the Delaware Solid Waste Authority observed that curbside collection costs increased by $4-$5/household-month when a yard waste ban was implemented (if escalated, this might be $5-$6 or more in 2012 depending upon fuel surcharges).

17.0 STATE BENEFICIAL USE GUIDELINES

TABLE 17-1 SUMMARY OF FINDINGS FOR BENEFICIAL USE (ASPHALT SHINGLE EXAMPLE)

FINDING	DESCRIPTION
Implementation - At the state level by 2015	
Potential Diversion	2,000 to 10,000 tpy state-wide
Estimated Tip Fee Costs	$70,000 to $350,000/year Excluding hauling costs
Estimated Avoided Landfill Disposal Costs	$146,000 to $730,000/year

All costs estimated in 2011$ - quantities rounded to nearest $1,000

17.1 General Considerations

Many states including Montana, Colorado, North Carolina, Texas, Maine, Massachusetts, Oregon and Washington have implemented procedures and adopted definitions and/or rules which allow certain solid wastes to be exempt from solid waste permitting regulations and in turn be used in a beneficial process or product. It is the intent of these states' regulatory agencies to encourage waste reduction and recycling of certain solid wastes as long as they do not harm human health or the environment. Montana, for example, has targeted and approved beneficial use end uses for crushed post-consumer glass in order to create potential markets for that material (see case study below). Montana allows for its use in septic systems, as bedding for pipes, in road projects, landscaping and more. Colorado allows for tire shreds to be used in septic drainage systems (see discussion below).

- Asphalt shingles
- Fly ash
- Glass
- Non-chemically treated wood
- Steel slag
- Used concrete
- Crumb rubber
- Shredded tires

Montana Department of Environmental Quality Case Study

Montana's Integrated Waste Management Act[63] specifically prioritizes "a technology assessment element that assesses the availability and practicality of alternative technologies for solid waste management". This has led MDEQ to allow numerous pilot projects focused on alternative markets / uses for recycled materials. For example, glass projects have included research into glass mixed with fly ash as a cement substitute in floors and buildings, in roadway base, as a replacement for sand filtration in septic drainage fields, replacing aggregate in pipe beds, in landscaping applications, with geotextile fabric to create porous pavement parking lots and in a uniquely innovative wastewater treatment application[64]. Most of this work and testing is done by private enterprise, such the MDEQ resources are only needed for oversight and approval.

[63] http://data.opi.mt.gov/bills/mca_toc/75_10_8.htm
[64] http://deq.mt.gov/Recycle/Glass/MarketDevelopment.mcpx

Elements of beneficial use in other states include these six main concepts:

1. Definition of Beneficial Use – The definition of beneficial use varies from state to state (links to a compilation of state beneficial use definitions are included on page 17-3).

2. Adopted or Changed Solid Waste Rules – A partial list of states that have rules/regulation pertaining to Beneficial Use is available on the US EPA website (see Related Information for website link).

3. Procedure to apply for Beneficial Use Determination (BUD) – Many states have created a process for which an individual, business or even agency can apply to receive approval to beneficially use a material and/or possibly receive an exemption from certain state solid waste regulations. The process usually entails providing detailed information to the state agency responsible for solid waste. Detailed information could include, but is by no means limited to;
   - Characteristics of the solid waste
   - Estimated tonnages to be used annually
   - How the waste would be transported
   - Proposed beneficial use
   - Demonstration of how the product is will be used
   - Physical and chemical characteristics of the material
   - How it compares to using a 'standard' product in that application
   - End product

   An important element of this process is the development of specified criteria for granting or denying a BUD.

4. Pre-Approved Materials – Many states have developed a pre-determined list of materials that can be beneficially used or provide a registry of uses for reference. For example, in Washington, all approved beneficial uses are listed on the state's website in a Beneficial Use Registry. Recently, Colorado stakeholders (regulators, recyclers, solid waste managers and industry representatives) have worked together on regulations pertaining to permitting beneficial uses of certain solid wastes (see Table 17-2, next page). In order to encourage beneficial use, the Colorado Department of Public Health and Environment adopted rule changes to create categories of approved materials and use categories[65].

5. Exemptions/Credits to Promote Beneficial Use – Some states are also providing incentives and credits to businesses. For example, Montana now provides a credit to individuals against certain permitting fees in its air quality rules for using post-consumer glass in projects.[66]

6. Conduct Follow-Up Inspections for Approved Projects – In spite of staff shortages, many states are making efforts to conduct inspections or have an enforcement process to evaluate BUDs.

[65] *www.cdphe.state.co.us/hm/sw/section8/sect8.pdf*
[66] *http://deq.mt.gov/Recycle/Tax_Incentives.mcpx#fertilizer*

TABLE 17-2 NEW COLORADO BENEFICIAL USE REGULATION COMPOMENTS[66]

MATERIAL	PRE-APPROVED BENEFICIAL USE
Waste Tires	Crumb rubber manufacturing applications
Aggregates	Road base
Crushed Concrete	Road base Concrete aggregate
Non-chemically treated wood	Mulch
Glass	Concrete aggregate Pavement aggregate Filter pavement

In 2007, the Association of State and Territorial Solid Waste Management Officials (ASTSWMO) received input from 40 states via a survey on beneficial use, which was conducted as a follow-up to an initial survey done in 1998. The survey was designed to gather information about the status and nature of BU programs across the country. In summary, ASTSWMO found that states have considered beneficial use requests for at least 67 different waste types. They also report that one of the greatest barriers to issuing approval for BU is the lack of sufficient information to evaluate the risk to human health and the environment. This should be addressed by an increase in the available information on BUDs through compiling and publishing data to help regulators. This survey has information on states' relevant websites, definitions, and lists of wastes evaluated (through uses and requests).[67]

Wyoming - Currently Wyoming's Solid Waste Rules and Regulations do not include a specific definition for Beneficial Use, although WDEQ intends to develop a definition and guidelines in 2013. In the meantime, the rules spell out permit application and renewal procedures for solid waste management facilities and allows an exemption for the "reuse of wastes in a manner which is both beneficial and protective of human health and the environment, as approved by the administrator." An example of this exemption is implemented by Intermountain Concrete and Materials, a company based in Gillette that worked with the Campbell County Landfill to obtain a BUD for using asphalt shingles in hot mix asphalt.

17.2 Implementation

Development of a beneficial use policy should be implemented by WDEQ and its stakeholders during the short-term planning period of this study. Based on Colorado's experience and Wyoming's on-going need for BUD guidelines, it is expected that the development of a beneficial use definition and rulemaking in Wyoming could be accomplished in less than three years. The following steps are recommended for implementing a formal beneficial use policy in Wyoming:

1. Create & Adopt a Definition of Beneficial Use – This should include the wastes & current rules and regulations governing it (this may fit into WDEQ's Chapter 15, Section 2 of Solid Waste Regulations);
   - Identify a stakeholder group with representatives from industry, agencies, solid waste managers, recycling users and WDEQ to review and modify current regulations (other stakeholders may

[67] *http://www.astswmo.org/Files/Policies_and_Publications/Solid_Waste/2007BUSurveyReport11-30-07.pdf*

include representatives from the gravel and paving, roofing, tire recycling and power generation industries, WYDOT)
- This process can take up to two years and will create additional work in the short-term (these will be out-weighed by the long-term resources saved, however)

2. Create Process/Procedure for Applying to WDEQ for a BUD – Include criteria for WDEQ staff to use in the evaluation of applications and grant exemptions.

3. Create a Database of BUDs – Make the information available in an easy-to-follow format on website and to the public.

4. Proactively Review List of Pre-Approved Beneficial Use Determinations (once this is completed, application review time will be notable reduced) – Create material categories in order to streamline the process for utilizing approved materials in future BU approvals (subsequently reducing the need for case-by-case determinations and also to avoid further disposal);
   - Initial consideration may be given to materials such as presented in Table 17-2 or in ASTSWMO's survey
   - Consideration should also be given to the use of both compost (produced from a variety of feedstocks) & recycled asphalt pavement in WYDOT highway projects - current WYDOT specifications do not encourage (compost) or discourage (asphalt) use
   - Develop detailed specifications for each material (to obtain approval from all parities and facilitate actual material use)
   - WDEQ needs to fully involve WYDOT to improve/change language for beneficial use of materials in road projects (this is one of the best uses for fly ash, asphalt shingles and waste tires)

5. Review Incentives & Other Credits (such as preferential consideration during the bidding process) that could be adopted or implemented to encourage beneficial use.

17.3 Estimated Diversion Potential, Costs & Revenues

Without targeted BUD materials, it is difficult to estimate diversion or costs. For the purpose of this Study, however, an asphalt shingle example is used.

Diversion Potential - Using Appendix D's projected diversion quantities for asphalt shingles and an assumed diversion rate of 10% to 30% (20% average) from the total waste stream (not MSW) in 2015, as many as 2,000 to 10,000 tpy may be diverted from Wyoming landfills on a state-wide basis[68].

Costs - Implementing a BUD policy will require some WDEQ resources, and possibly WSWRA as well. However, this process is already underway at WDEQ and is not expected to incur any new costs in the future. The estimated costs for actually managing shingles in the Study example are based on the $35/ton tip fee quoted in Table 5-4 for asphalt shingles and the diversion range estimated above, the cost of diverting these materials may be $70,000 to $350,000. These costs do not include hauling.

[68] Intermountain Construction and Materials in Gillette has recently accepted approximately 12,000 tpy from local Campbell County for future use as recycled asphalt pavement.

Avoided Landfill Disposal Costs - This estimate is based on the diversion range estimated above and the average projected disposal cost of $73/ton for Wyoming landfills (see Table 2-4) for a potential savings of $146,000 to $730,000. As noted in Section 2.3, it is likely that this rate underestimates the actual average landfill costs, however, and that avoided costs may be higher once landfill owners make their final facility improvement decisions and confirm costs.

Related Information

- EPA website - *www.epa.gov/osw/conserve/rrr/imr/live.htm*
- Example Definitions:
  - *www.michigan.gov/documents/deq/DEQ-WHMD-STSWS_States_Definitions_Beneficial_Use_286313_7.pdf*
  - *www.astswmo.org/Files/Policies_and_Publications/Solid_Waste/2007BUSurveyReport11-30-07.pdf*
- Examples applications, and BUD registers from Washington, Oregon and Vermont:
  - *www.deq.state.or.us/lq/pubs/factsheets/sw/BeneficialUseofSolidWaste.pdf*
  - *www.ecy.wa.gov/programs/swfa/bud/*
  - *www.deq.state.or.us/lq/sw/disposal/beneficialuse.htm*
  - *www.anr.state.vt.us/dec/wastediv/solid/pubs/Acceptable_Uses.pdf*
  - *www.deq.state.or.us/lq/pubs/docs/sw/BUD/BUDEvaluationFormDEQStaffOnly.pdf*
- Indiana tire beneficial use - *www.in.gov/idem/4805.htm*

18.0 STATE REQUIREMENT FOR DATA COLLECTION & REPORTING

TABLE 18-1 SUMMARY OF FINDINGS FOR DATA COLLECTION

FINDING	DESCRIPTION
Implementation - At the state level by 2015 or sooner	
Estimated Operating Costs (WDEQ)	Cost for 0.5 FTE included in Section 21.0 staff costs

All costs estimated in 2011$ - quantities rounded to nearest $1,000

18.1 General Considerations

A common adage in the waste industry is “you can't manage what you can't measure". Sound data can be critical to successful waste diversion programs, and typically includes participation levels, material quantities, material quality, environmental impacts, job creation and program costs/revenues. This data allows:

- Planners to track solid waste trends, identify jobs potential & identify market development opportunities
- Managers to track the program progress, service gaps & funding needs
- Elected officials & legislators to justify new policies & programs and to tout successes
- Regulators to collect and aggregate data, potentially serving as a clearinghouse for that information, as well as verifying code compliance
- Citizens to see that their efforts make a difference
- Developers and investors to judge the feasibility of expanding or creating new infrastructure
- Economic development professionals to measure and report on job growth, tax revenues, capital investment, and other metrics showing economic growth

The collection and analysis of good databases is often an on-going process that begins with establishing a baseline scenario (such as in an initial year of implementation or a program change). The baseline data is then used as a basis of comparison for future program measurement. Data can be collected at any point in the waste management process by any stakeholder - but can be difficult for some programs:

- Public programs may voluntarily collect & share data - private programs rarely do the same
- Very few local or state programs require data collection
- Those programs that do regulate data may not have an established methodology to ensure that collected data is “apples to apples" and can be compared or aggregated as needed
- Private sector companies keep detailed records to characterize their business status - however, these records are not typically available to the public for competitive reasons
- Collection data can be especially challenging as different haulers may have different service areas (making comparisons difficult) and may only track subscription versus actual generation quantities

It can be argued that data does not in itself directly lead to waste diversion. Sound data collection, however, should be considered an essential starting point for any solid waste system because of its role in

identifying obstacles, opportunities, efficiencies and progress[69]. RockTenn's on-going evaluation of a new MRF in the Cheyenne area is a current example of the value of data in Wyoming. This company needs comprehensive information on the potential service area, materials, quantities, commingling, pre-processing, collection and many other factors before determining whether or not this investment makes sense. In part due to limited data, RockTenn's decision has been delayed, which in turn prevents neighboring communities from making decisions about their own program improvements.

Wyoming - Wyoming is currently working with USEPA Region 8 (EPA8) to collect waste diversion data from each state (Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming) and aggregate it to a regional level. This group worked together for over a year to develop voluntary standards for data collection that each state agreed to use when communicating program results[70]. These standards included a shared definition of diverted materials and a methodology for calculating diversion. Implementation has been determined on a state-by-state basis, but is typically a survey of public and private recycling facilities. This program has been in place for two years with mixed results - due primarily to the spotty responses obtained from voluntary surveys. The difficulty in identifying appropriate parties to survey, the inability to track material destinations creating the possibility of double-counting, and exemptions allowed some material streams to escape tabulation altogether.

Data collection and reporting issues that are specific to Wyoming include:

- Voluntary reporting only yields partial reporting from primarily public recyclers) - even if reasonable data is collected from voluntary reuse, recycling and composting programs, it is difficult to describe the overall solid waste management system or calculate state-wide diversion levels accurately (alternatively, Colorado has mandatory annual reporting[71])
- Limited recycling data currently provided by private sector
- No requirement for reporting disposal quantities - both disposal & diversion quantities are needed to evaluate waste generation & diversion progress

18.2 Implementation

It is recommended that Wyoming implement mandatory reporting requirements for both disposal and diversion facilities during the short-term planning period of this study. It is likely that stakeholder group discussions and legislative efforts may require the next two to three years, and that initial data reporting may occur in early 2015 (for the 2014 reporting year). The following is a sequential listing of activities that WDEQ should implement to begin collecting sound, state-wide solid waste data:

1. Continue to Work with EPA8 to Voluntarily Collect Annual Data from Recyclers – This gets WDEQ accustomed to reporting and tracking that data.

[69] As a result of the absence of useful waste diversion data in Colorado, the General Assembly passed HB-1288 in 2007 to create/fund two FTEs within CDPHE to study recycling and collect state-wide data, and fund a state recycling grant and rebate program.

[70] Colorado is unique in the region in that it mandates data reporting by generators & facilities (confidentiality is available). Scrap metal dealers, aggregate recyclers & other miscellaneous waste streams are exempted (primarily as they are regulated under other sections of Colorado's solid waste rules) - which produces incomplete results even with this mandatory program.

[71] Colorado landfill operators must report quantities by May 1st (beginning in 2013, this changes to March 1st). CDPHE maintains a detailed website with all quantities (*www. cdphe.state.co.us/hm/swreport/swreport.htm*).

2. Begin Requesting Landfills to Voluntarily Submit Landfill Disposal Data (ideally tracking MSW separately from C&D) – As there are very few scales at Wyoming landfills, this data can be accepted on a volume basis, for subsequent conversion to weight. This will likely require WDEQ to develop a reporting form, establish the ability for website reporting & establish standard volume-to-weight conversion factors for MSW and C&D.

3. Obtain Statutory Authority to Require Reporting – This would require legislation to allow the revision of existing permitting regulations (landfills and compost facilities) & implement basic requirements for diversion facilities. The stakeholder process (below) will likely be more successful if this authority is obtained before the stakeholders convene.

4. Develop Mandatory Reporting Requirements for Recyclers & Landfills;
   - Determine industries/organizations whose data will be targeted through this policy:
     - Recyclers – these are likely to be generators who ship recyclables directly out of state, recycling facilities and Wyoming-based end-users
     - Organics recovery facilities – ideally these will be tapped for quantity data as well (many may be covered under consolidated landfill permits)
     - Landfills – all permitted landfills accepting MSW & C&D wastes
   - Form a stakeholder group to provide implementation input & build support - this process may reduce industry opposition:
     - Discuss specific legislative/regulatory language
     - Discuss exemptions (if any) – exempted recyclers or organics recovery facilities will reduce the quality of data ultimately collected
     - Verify the ability to provide confidentiality under the non-emission/non-pollution trade secret waiver in Section 35-11-1101 of the Wyoming Environmental Quality Act
   - Develop criteria:
     - Definitions (recycling, reuse, diversion, etc. – may use EPA Region 8 standards)
     - Activities that will be counted (e.g., slash pile burning and materials used as ADC would not be counted towards diversion)
     - Materials to be tracked (may use EPA Region 8 materials)
     - Strategy to avoid double-counting (such as requesting the destination of materials once processed)
     - Measurements such as weight-to-volume conversion factors & diversion calculations (may use EPA Region 8 standards)
     - Reporting requirements (reporting form, annual due date, etc.)
   - Develop implementation pieces:
     - Reporting guidance (recommendations for estimating quantities, separately tracking MSW, C&D, etc.)
     - Reporting form with confidentiality information
     - Reporting mechanism (hard copy mailing, website posting, etc.)
     - Standard volume-to-weight conversion factors

5. Implement Final Rule-Making.

6. Begin Collecting, Aggregating & Reporting Data at State Level – Realize that data will not be available for over one full year following the effective date. Report the state results promptly to the legislature, general public & industry stakeholders.

7. Refine the Methodology in Subsequent Years – It is likely that the quality of data will evolve over the first few years as regulated entities begin pro-actively collecting data & increasingly comply with reporting requirements. As the survey pool increases, the data gaps will shrink & double-counting will be reduced.

8. Consider the Collection of Waste Composition Data to Add Material-Specificity to Quantities – These may be most valuable if collected in multiple regions of the state over all seasons.

18.3 Estimated Costs

It is expected that mandatory data collection and reporting will require legislation (Colorado successfully implemented this requirement in 2008). Once the policy is firmly in place, new WDEQ staff resources will be needed to enforce mandatory data collection and reporting - and to aggregate/report collected data on an on-going basis. Annual, on-going staff needs will be more significant in the first two to three years, but will taper off over time. Approximately 0.5 FTE will be required for the following annual tasks:

- Support any future policy adjustments (such as changing the regulated facilities over time)
- Develop & regularly revise a survey form that can be distributed & responded to on-line (the EPA Region 8 survey is a good starting point)
- Develop & maintain a database of landfill facilities & recycling operations
- Follow-up with regulated facilities during the reporting period
- Build & regularly populate data base of quantity information
- Analyze & interpret the data
- Follow-up on data gaps or faulty reporting
- Report & present the data throughout the state & on-line
- Necessary supervision by WDEQ management

The equivalent costs of adding agency staff is considered in terms of new potential funding sources in Section 25.0.

Related Information

- Colorado data reporting requirements for recycling facilities (Section 8)- *www.cdphe.state.co.us/regulations/solidwaste/100702part1SWRegs.pdf*
- Colorado Recycling Facility Annual Reporting Form - *www.cdphe.state.co.us/hm/forms/sw/recycling.pdf*

19.0 LOCAL PAY-AS-YOU-THROW PRICING

TABLE 19-1 SUMMARY OF FINDINGS FOR PAYT PRICING

FINDING	DESCRIPTION
Implementation - At the local community level by 2015	
Estimate Potential Diversion	See Sections 10.0 & 12.0
Estimated Avoided Landfill Disposal Costs	See Sections 10.0 & 12.0

19.1 General Considerations

Variable rate pricing (also known as pay-as-you-throw of "PAYT") is most typically applied to the residential collection of refuse and diverted materials as a way to encourage waste diversion. It is a policy approach that has been shown to increase recycling rates across the U.S. by 30% to 100% (with a 50% average)[72].

PAYT is unit pricing that provides rate equity by charging customers for the amount of refuse they generate (i.e., higher fees for more refuse, lower fees when refuse is reduced through recycling, composting and source reduction). Key to PAYT is the ability to have discrete units with differential pricing. As such it is similar to other utilities like electricity and water. Table 9-2 describes the pros and cons of PAYT refuse pricing.

TABLE 19-2 GENERAL PROS & CONS OF PAYT PRICING

PROS	CONS
Proven diversion incentive	Represents change to status quo
Easy to implement once policy is in place	Policy-making is required
Flexibility to adapt to most existing programs (see Implementation/program design alternatives below)	Concerns about raising rates to cover container & extra collection costs (may increase for those who don't divert but will likely decrease for those who do)
Virtually no cost for local government (as policy-maker)	Difficulty implementing where multiple households share containers
Provides rate equity for customers	Concerns about illegal dumping (proven to generally be a non-issue after initial implementation)
Provides customers with direct control over rates	
May provide better diversion service than customers currently receive	Some risk to haulers in setting rates until customer service level is known (off-set but creating level playing field, see Resource Requirements below)
Easily coupled with other program improvements (new containers, added materials collected, etc.)	Impression that recycling is "free" when rates are bundled (bundled rates cover cost of both refuse & recycling in one fee)
Provides opportunity to educate public on importance & ease of diversion	Can be difficult to implement at unstaffed collection sites

[72] Skumatz, "Recycling Incentives", *Resource Recycling* Magazine, February 2011.

Nationally, over 7,000 cities use PAYT as a means for incentivizing waste diversion. This represents approximately 25% of the communities in the U.S. and 75 million people. Several Colorado communities have successfully implemented PAYT pricing in public, contract and open hauler systems.

While PAYT is generally accepted to be effective and "easy" to implement (logistically if not always politically), there is at least one type of collection system that is an obstacle for PAYT pricing. In communities where multiple households share trash containers and residents are charged flat fees for service, allocation of individual trash levels may not be possible. Denver, Colorado is stymied by multi-home dumpster service. Approximately one-third of Denver's residents use dumpsters. Until the city replaces those dumpsters with individual carts, PAYT will not be an option for those accounts and as a result, will not likely be implemented at any level.

Wyoming - The City of Cheyenne currently uses a PAYT pricing structure for an automated system that includes mandatory refuse and single-stream recyclables collection for residents. This is a bundled, on-fee service with a maximum price differential of:

- $21.20/month for 95-gallon refuse and 95-gallon recycling service
- $16.15/month for 60-gallon refuse and 60-gallon recycling service

19.2 Implementation

PAYT is most likely to be implemented at the local jurisdictional level in Wyoming through municipal policy-making[73]. Given the proven ability to increase diversion rates, it is recommended that PAYT be implemented during the short-term planning period of this study by any municipality that wants to increase its landfill diversion and has the political will to make a policy change. PAYT can be implemented city-wide all at once or can be phased in over multiple years by regions of the service area to provide both haulers and residents more time to accommodate program changes. Key implementation steps should include:

1. Identify Stakeholders – These are likely to include local community's senior staff, elected officials, residents and haulers.

2. Educate Stakeholders – This should include the values of PAYT and implementation alternatives (see some common misperceptions in Table 19-2, above);
   - Educate staff and elected officials before beginning public outreach – if community leaders are well-versed in pros, cons and misperceptions the public process will go more smoothly
   - Have facts about PAYT benefits and alternatives clearly presented for public outreach process (see a good listing of fact and faction related to recycling from the CAFR in Related Information below)

3. Design PAYT Program - Key policy alternatives include;
   - Based on existing program – can be applied to
     - Curbside or drop-site collection programs – for recyclables and organics

[73] State level implementation is feasible, however - Iowa, Minnesota, Washington and Wisconsin all currently require PAYT for some or all residents.

  - Recyclables processing and compost operations
- Based on hauler scenario – can be applied when
  - Local government provides collection – simple public policy change to implement unit/container and pricing changes
  - Local government contracts for collection services with one or more haulers – PAYT can be included in part of the request for bid process and negotiated into the service contract
  - Open hauler system – local government typically develops a new city ordinance describing PAYT requirements applicable to all haulers serving residential customers
- Based on unit/container scenario for refuse – can include
  - Pre-paid tags
  - Bags or cans in a manual or semi-automated system
  - Automated carts
  - Containers can be provided in multiple size options (e.g., 32-, 64- and 96-gallon carts) or just multiple bags/containers of the same size
- Bundled rates – the cost of collecting and managing refuse and diverted materials do not have to be bundled. However, most communities have found that bundling these costs into one fee for the customer is simpler to implement and is a more direct incentive for residents

4. Develop Policy Language – Key components of PAYT policy will vary depending on the hauler scenario in place (see above), but will generally include those requirements included in the table below. PAYT policy may also be developed as part of a larger collection policy in an open haulers system that requires haulers to obtain a hauler license that goes beyond typical business licensing (see Table 19-3, next page, for how these policies may dove-tail). Several examples of similar policy language are included in Related Information below.

   Finally, it is possible that other changes are implemented together with PAYT - these might include adding materials for diversion, changing collection schedules, new educational materials, etc.

5. Work with Haulers on Pricing – While most local governments cannot typically influence hauler rates in an open hauler system, they can impose a pricing structure (such as minimum unit sizing, increments, etc.) PAYT includes an element of risk for haulers, whose pricing schedule may need to be adjusted initially to accommodate new containers, developing of new fee schedules, software and other expenses. As time goes on, fee schedules may require further ongoing adjustment (i.e., as more residents recycle, reduce their refuse and pay less for collection services). Local governments may be able to assist haulers with customer data and public education.

6. Track Progress Against Baseline – To both monitor diversion & adequacy of rate-setting;
   - Local governments – need to monitor changes in diversion rates associated with PAYT - this will require quantity reporting from haulers in a contract or open hauler scenario (see Implementation/policy language above)
   - Haulers – need to track service levels (e.g., X% at 32-gallon cart refuse level, Y% at 64-gallon, and Z% at 96-gallon) of customers against revenues and costs to identify need for adjusting rates (local governments may also be interested in service levels as a metric of the public's recycling habits)

TABLE 19-3 KEY PAYT & HAULER LICENSING POLICY COMPONENTS

PAYT	HAULER LICENSING	MISCELLANEOUS
Define Service Area (single-family, multi-family size, etc.)	Description of services provided, customer description, service area (if less than city-wide), range of rates	Mandatory operating hours (e.g., not before 7 am)
Establish unit/container standards (tags/containers & size options for refuse& diverted materials)	Description/number of vehicles, proof of Dept of Revenue registration & Dept of Transportation inspection	Data reporting (typically annual) of disposed & diverted tons (allow exceptions like conversion of volumes to weights, estimating loads from multiple jurisdictions, etc.)
Establish unit sizing basis (e.g., minimum unit and incremental sizing for refuse commonly (64 gal) while minimum for recycling 64 gallons)	Ability for city to inspect vehicles at any time	Education requirements for hauler (for new program roll-out, new residents & on-going reminders)
Establish requirement for bundling refuse & recycling rates	Identify permitted landfill, MRF or composting facilities used	
Establish maximum (refuse) & minimum (recycling or organics) collection frequency	Annual renewal period	
Establish minimum list of diverted materials - may also specify source-separated or commingled collection	Licensing fee to offset administration	

19.3 Estimated Diversion Potential, Costs & Revenues

Diversion Potential - Based on national research it is possible that Wyoming's current MSW recycling rate (18.5% in 2010 as shown in Table 2-2) could increase by 50% to a 25% to 30% recycling rate through PAYT mechanisms alone. These quantities include recyclables already diverted and would overlap with other collection, programs and policy options discussed in this report (especially Sections 10.0 and 12.0).

It is most likely that PAYT would be implemented on the local level and predicting diversion levels is difficult. For example, if Thermopolis (with a mix of town and private refuse haulers) and Green River (public refuse collection) moved to PAYT, recycling diversion might increase to:

- Thermopolis (currently 2% MSW recycling) - may increase to upwards of 5% diversion
- Green River (currently 32% MSW recycling) - may increase to between 50% and 65%

Costs - The cost of implementing PAYT policy will vary depending on the stakeholder:

- Local governments/policy makers - typically no extra cost once policy is implemented (policy development will require initial effort by existing staff to educate city leaders, organize public outreach materials/campaign and draft policy language (see examples in Related Information below)
- Haulers - will likely incur initial costs for new containers, software, etc. (these costs are typically passed on to residents as part of the new PAYT fee structure)

- Residents - despite ultimately paying the cost of program change, residents who reduce their refuse quantities under PAYT will see a reduction in collection costs while those who don't, may see an increase (the important factor is residents' ability to directly control their solid waste bill through PAYT)

Avoided Landfill Disposal Costs & Revenue Potential - These will be accrued on a local level and will depend upon the success of the program, which is likely to increase over time. As noted in the diversion potential discussion, these estimates are difficult to make and would like overlap the MRF and composting facility analyses (Sections 10.0 and 12.0)

Related Information

- "Common Facts & Misperceptions About Recycling" - posted on the CAFR website at *www.cafr.org/resources/government.php*
- Cheyenne, WY collection fees - *www.cheyennecity.org/DocumentView.aspx?DID=5157* (PAYT implemented late 2010)
- Fort Collins, CO PAYT ordinance - *www.fcgov.com/recycling/ordinances.php* (private hauler system, PAYT implemented in 1995 for residents up to 7 units and homeowners associations)
- Lafayette, CO - *www.paytnow.org/PAYTNow_DougShort_Presentation.pdf*

20.0 OTHER POLICY CONSIDERATIONS

20.1 State EPR Framework

Typically implemented at the state level, extended producer responsibility (EPR) and product stewardship (PS), are often used interchangeably to refer to an approach used to create financing mechanisms for the management of materials that are challenging, hazardous, cost-intensive to manage. Those materials most frequently targeted by EPR and PS legislation and programs in the US include electronics, mercury-containing products, batteries, paint, pharmaceuticals, sharps, carpet and pesticide containers.

1. Product Stewardship - PS looks at waste problems through a product lens – a relatively new perspective in the solid waste world. A new definition was adopted in 2012 by all key stakeholders[74]:

> "Product Stewardship is the act of minimizing health, safety, environmental and social impacts, and maximizing economic benefits of a product and its packaging throughout all lifecycle stages. The producer of the product has the greatest ability to minimize adverse impacts, but other stakeholders, such as suppliers, retailers, and consumers, also play a role. Stewardship can be either voluntary or required by law."

PS can be implemented through voluntary, market-driven initiatives as well as policy-based strategies. The principles of PS include cost internalization (no visible fee for consumer), shared responsibility (for all stakeholders), performance goals, and program flexibility[75].

2. Extended Producer Responsibility - EPR is a policy-based approach making the producer responsible for management of its product (and packaging) at the product's end of life – i.e., the producer pays for all or some of the recycling/responsible management costs. EPR shifts costs of managing the waste product to the producer and away from direct citizen expense (often a municipality in much of the US). As well, EPR policies seek to incentivize producers to design products with positive environmental attributes (e.g., less toxic materials and packaging) and that are easier to recycle. Key stakeholders recently adopted a new definition of EPR[64]:

> "Extended Producer Responsibility (EPR) is a mandatory type of product stewardship that includes, at a minimum, the requirement that the producer's responsibility for their product extends to post-consumer management of that product and its packaging. There are two related features of EPR policy: (1) shifting financial and management responsibility, with government oversight, upstream to the producer and away from the public sector; and (2) providing incentives to producers to incorporate environmental considerations into the design of their products and packaging."

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[74] "Product Stewardship and Extended Producer Responsibility: Definitions and Principles". March 21, 2012, see: www.productstewardship.us/displaycommon.cfm?an=1&subarticlenbr=231. Leading authors of these definitions include the Product Stewardship Institute, Product Policy Inst., and CA Product Stewardship Council.

[75] "A Comprehensive Product Stewardship Approach for Rhode Island: Study, Options and Recommendation" by Product Stewardship Inst. for the RI Dept. of Environmental Management, July 2010. Accessed 2/21/12 from www.productstewardship.us/associations/6596/files/FINAL_RI_Framework_Report_and_meeting_summary.pdf.

The principles of EPR include: producer responsibility; a level playing field for all producers; results-based systems driven by producers; transparency and accountability; clear roles for government, retailers, and consumers.

Framework EPR Legislation – Framework legislation is overarching legislation enabling the creation, typically by a state agency, of a transparent strategy by which producers can be made responsible for end-of-life management of their products. Producers and their products become legally obligated by agency determination or regulatory action, rather than legislation. Products may be obligated under the framework when they meet pre-defined environmental and other impact criteria (and the criteria may be spelled out in the framework legislation or established through rulemaking – in either case, criteria are applied consistently and transparently to each product category).

Typically framework criteria used to determine product obligation under an EPR law include threats to the environment, public health and safety; the opportunity for better resource conservation; the burden placed on current waste management system; and the possibility for new business opportunities or job creation. Further requirements can include:

- Performance goals (e.g., recycling and collection access targets)
- Producer set up and financing of the responsible management system
- Accountability of producer to state environmental agency (e.g., plans, reporting)
- Prohibiting producers that do not take part in a system from selling their products in state
- Reporting by all stakeholders covered by the law

An electronics case study is included in Appendix O.

20.2 Differential Landfill Tip Fees

Establishing a landfill tip fee pricing schedule can have a strong influence on how waste is collected and managed before it is disposed. In addition to covering costs of hard to manage materials, differential fees can be used to discourage the disposal of materials or to encourage separation of mixed loads. Differential rates are often used to encourage waste generators to:

- Separate out inert C&D materials from mixed loads - for either reuse, recycling or disposal in less expensive landfill cells
- Separate out organics - for separate processing
- Separate out metals & other recyclables - for processing & resale
- Separate out hazardous materials (e.g., appliance with Freon) - for safe & segregated management
- Pre-process materials (e.g., shredding tires) - to reduce management costs at the landfill

Differential tip fees can also be used to discourage waste from outside the service area. Examples of effective tip fees vary with the incentives landfill operators want to create:

- Casper accepts clean yard waste (processed at the city's compost facility) for free - *www.casperwy.gov/WaterSewerandTrash/CityLandfill/Solidwastefacilityrates/tabid/1011/Default.aspx* (Cheyenne and Sheridan also accepts yard waste for free)
- Casper also charges a higher fee ($58.50 instead of $45/ton) for out of county waste

- Cheyenne charges the reduced fee of $23.75 instead of $47.50/ton for segregated C&D loads - *www.cheyennecity.org/DocumentCenter/Home/View/4838* (Cheyenne also adds $4.55/tire for any still on the rim)
- Teton County requires all loads to be separated at its transfer station & imposes a $200/ton segregation fee for loads that don't comply - *www.tetonwyo.org/AgencyTopic.asp?topicID=251525*
- Summit County, CO charges $12/ton for clean wood & $31/ton for green waste (against a mixed load tip fee of $60/ton compacted) - *www.co.summit.co.us/DocumentView.aspx?DID=231*
- Pitkin County, CO charges about $5/ton for clean concrete (against a mixed load tip fee of $40/ton) - *www.aspenpitkin.com/Departments/Resource-Recovery/Price-List/*

PART V
STATE-LEVEL RESOURCES

To notably increase waste diversion rates in Wyoming, the work of many individuals, governments, non-profit and private organizations will be needed. This work will be maximized through leadership at the state level. This leadership will ideally be a coordinated effort of both state government agencies (primarily WDEQ) and a state-wide professional waste diversion organization (such as the Wyoming Solid Waste & Recycling Association). This leadership has the potential to develop funding sources and to provide data to help programs grow and operate effectively; to encourage regional cooperatives, organize state-wide outreach and recognize strong diversion progress; and develop policies that create incentives for waste diversion as an immediate priority for Wyoming. This part of the Study report includes a detailed analysis of improvements to both the WDEQ and WSWRA organizations, as well as a state grant program that would provide funding to waste diversion infrastructure and programs throughout Wyoming:

- State Agency & Association Roles & Responsibilities
- New State Waste Diversion Grant Program

The Wyoming Statewide Study of Waste Diversion was commissioned by the Wyoming Department of Environmental Quality using funds appropriated by the Wyoming Legislature. LBA Associates, Inc. was contracted by the Department to undertake the study. Any recommendations made or conclusions reached in the study are solely those of LBA Associates, Inc., and not necessarily the State of Wyoming.

21.0 AGENCY & ASSOCIATION ROLES & RESPONSIBILITIES

TABLE 21-1 SUMMARY OF FINDINGS FOR AGENCY & ASSOCIATION ROLE & RESPONSIBILITIES

FINDING	DESCRIPTION
Implementation - At the state level by 2015 or sooner	
Estimated Operating Costs (WDEQ)	$87,000 to $102,000/year For 1.5 FTEs (includes 0.5 FTE staff for data collection evaluated in Section 18.0)

All costs estimated in 2011$ - quantities rounded to nearest $1,000

21.1 General Considerations

Many waste diversion programs in Wyoming are best suited for implementation and operation at the local government, business, non-profit county or regional level. Some of these programs require the support of state-wide resources, networks and coordination to reach their full potential. Other programs can only be practically implemented state-wide.

The resource gaps often seen at the state level in any state can be evaluated in three categories that can reasonably be expected to directly or indirectly advance waste diversion - infrastructure, programs and policies. It is noted that all three components should operate in tandem to effectively support one another:

1. Infrastructure – Future waste diversion infrastructure in Wyoming may arguably include facilities for recycling both traditional paper/containers and hard-to-recycle materials, organics recovery, reuse/used building materials and C&D. Several of these facilities are specifically addressed elsewhere in this report (see Part III).

2. Programs – Waste diversion programs are needed to feed materials to infrastructure and may include many options, including curbside collection, drop-site collection, regional cooperatives, stakeholder organizations and public outreach (see Part II and Sections 15.0 and 23.1 for additional discussions on these programs). Many of these programs are best suited for local implementation. Outreach efforts (especially program-specific education) may also be local - however, there is a valuable opportunity at the state level to develop an effective and compelling outreach program that can provide consistent messaging state-wide.

3. Policy – As programs and infrastructure are being put in place to direct and manage diverted materials, policies are often needed to encourage waste generators to divert materials. Policies can be “upstream" (which reduce waste generation), “midstream" (which reuse and repair resources before discarding) or “downstream" (which divert discarded materials). There are many downstream policy options ranging from incentives (i.e., PAYT, RecycleBank-type rewards, award programs, recognition) to mandates (i.e., trash service, recyclables collection, disposal bans, minimum C&D recycling).

Existing Wyoming Resources & Needs

The State of Wyoming has several existing organizational resources that support solid waste diversion, although none of these resources are exclusively/solely dedicated to diversion efforts:

1. WDEQ State Recycling Coordinator (SRC) – In 2006 a full-time position was created within WDEQ's Solid and Hazardous Waste Division. The position's duties include both local government planning and waste diversion activities state-wide. Planning activities have largely focused on landfill disposal and regionalization over the last decade, including the development of 20-year ISWM plans by local landfills and planning entities (see Section 2.0). This SRC position has become a part-time SRC role including efforts associated with recycling operations at landfills and transfer stations, beneficial use determinations, and as a advisory role for solid waste issues to the Office of State Lands Investment Board. The SRC position is not dedicated full-time to waste diversion. Additionally, WDEQ does not have a budget for waste diversion activities.

2. WDEQ Citizens Advisory Group (CAG) – CAG was formed by WDEQ during its initial ISWM planning efforts in 2004. It includes volunteer representatives from both the private and public sector from around the state. This group is most active during periods of proposed solid waste legislation. Many CAG members are WSWRA members.

3. Wyoming Solid Waste and Recycling Association (WSWRA) – WSWRA is a 501c(3) organization whose mission is "the advancement of knowledge in the planning, operation and management of solid waste and recycling systems within the State of Wyoming, to protect the health and well-being of Wyoming's residents and resources". WSWRA's breadth includes all solid waste in Wyoming;
   - Membership includes individuals, governmental agencies, businesses, industry and nonprofit organizations
   - Governance is by a volunteer Board of Directors (BOD) – there are no paid staff
   - Primary activities include an annual conference with technical presentations & networking on solid waste and some waste diversion topics - additionally WSWRA conducts some lobbying around disposal & transfer station issues including funding (has recently been engaged with the WDEQ rule making process on solid waste issues and landfill remediation)
   - Miscellaneous activities include an awards program & quarterly newsletter
   - A Recycling Task Force subcommittee was formed in the 1990's & became inactive for a period - in 2006 the group began meeting again (the task force is primarily charged with WSWRA's recycling awards but could be tapped to champion recommendations provided in this Study)

   Not surprisingly, most of WSWRA's members are public agency employees and organizations.

As noted above, waste diversion leadership at the state level is essentially limited to the part-time activities conducted by the WDEQ SRC. The resource gaps that remain are expected to be filled by two types of organizations - a state regulatory agency(ies) & a state waste diversion organization (WDO). It is likely that the primary state agency will be WDEQ, although other state agencies may support some of these options. It is also expected that the WDO will either stem from a modified WSWRA association or will be a new organization altogether.

Table 21-2 describes critical actions that should be considered for implementation in each category and how WDEQ and a WDO could accommodate these new tasks. Other national organizations that may provide a support role (but are not evaluated in this report) include the Solid Waste Association of North America (SWANA - there is currently not a Wyoming SWANA chapter), the Recycling Organizations of North America (RONA), the National Recycling Association (NRC), and ASTSWMO.

TABLE 21-2 STATE RESOURCE NEEDS

NEEDS	POSSIBLE MECHANISMS	EFFORT NEEDED	BEST IIMPLE-MENTED BY
INFRASTRUCTURE			
Facilitation of private sector ownership or operation of diversion facilities	Provide tax, rebate or permitting incentives	Legislative or regulatory changes	WDEQ and/or WDO
Funding assistance for research, construction, operations, markets	Provide funding through grants, loans, revolving funds or revenue-generating programs (sales, waste, property taxes; advanced disposal fees; litter tax; landfill tip fee surcharge; etc.) - coordinate with Supplement Environmental Project, State Land & Investment Board	Legislation	WDEQ
Data to evaluate feasibility & design parameters (also see Section 18.0)	Collect/share data to assess material quantities (see Section8.3 - should be consistent with EPA Region 8 reporting efforts)	Legislative or regulatory changes if landfills & recyclers are required to report annually	WDEQ and WDO (see data reporting below - need to provide confidentiality)
True Cost of Landfill Disposal (also see Section 2.3)	Require landfill owners to assess/report full landfill costs (may require state-wide guidance)	Legislative or regulatory changes, guidance document	WDEQ
PROGRAMS			
Regional cooperatives (also see Section 15.0)	Encourage regional collaboration with technical assistance, funding (e.g., mobile equipment)	Build on funding options under Infrastructure	WDEQ
State-wide stakeholder organization	Provide regular networking opportunities, industry updates, website resources, etc.	Expand WSWRA with diversion focus or form separate SRO	WDO
Mandatory data reporting	Identify regulated entities (both disposal & diversion facilities) & require quantity reporting annual	Legislation	WDEQ
Information clearinghouse	Develop/maintain marketing data base & produce annual recycling directory	Can also be contracted out	WDEQ and/or WDO

NEEDS	POSSIBLE MECHANISMS	EFFORT NEEDED	BEST IIMPLE-MENTED BY
PROGRAMS, continued			
Diversion challenges & award program	Develop challenges, reward/recognition program for schools, businesses		WDEQ and/or WDO
Public outreach (also see Section 23.1)	Develop state-wide waste diversion brand & key message(s) that can also be used at local level	Includes message testing, on- going implementation	WDEQ and/or WDO
POLICIES			
Upstream	Evaluate framework EPR (e.g., paint, pesticides, mercury-containing products)	Legislation	WDEQ
	Evaluate environmentally preferable purchasing (EPP) practices in state government that can be also be adopted at local level, create and provide sample contracting language	Legislation or policy	All state agencies (may originate in WDAI)
	Prioritize diversion state-wide (Governor's proclamation, diversion goals, P2 programs, EPA Waste-Wise, etc.)	Voluntary, incentive-based	WDEQ and/or WDO
Midstream	Create incentives for reuse/used building material programs through tax, rebate, award incentives	Legislative or regulatory changes for tax, rebate incentives	WDEQ and WDO
	Establish green building practices for state government (including minimum C&D diversion)	Legislation or policy	All state agencies
Downstream	Establish disposal bans for well-recycled materials (e.g., OCC, UBCs, metals, e-waste, etc.)	Legislation	WDEQ and WDO
	Revise WYDOT highway specifications to prioritize compost, asphalt & other (may be part of BUD)	Guidelines & stream-lined permitted	WDEQ/WYDOT
	Develop/support markets for mulch/compost, glass, C&D materials		WDEQ and/or WDO

21.2 Implementation

As noted above, the primary parties are expected to be WDEQ and the WDO. Expanded state waste diversion leadership can be developed during the short-term planning period of this study. It is expected that WDEQ and the WDO would prioritize activities and phase them in over the next two to three years.

Both WDEQ and a WDO will be needed to effectively provide the leadership and fill the gaps described above. Although most successful state recycling organizations focus on waste diversion only, it is likely that modifying WSWRA will be more feasible than developing a new, stand-alone WDO. As a result, only expanded WDEQ responsibilities and modified WSWRA activities will be analyzed in this section.

Wyoming Department of Environmental Quality

If the State of Wyoming intends to increase waste diversion levels to any notable degree in the future, the state government's waste diversion responsibilities must expand. A state agency such as WDEQ is best suited to develop enabling regulation, policy and guidance documents that implement legislation (including a state-wide grant funding program). It is recommended that 1.5 full-time, permanent employees that are dedicated to waste diversion be added to WDEQ's Solid and Hazardous Waste Division (Table 21-3 describes specific job activities and FTE requirements). These positions should report to the existing SRC (which includes about 0.5 FTE already dedicated to waste diversion). A portion of these positions may come from existing staff, with new priorities and duties. Otherwise, legislation may be required to add these positions to WDEQ. Legislation could be initiated jointly by WDEQ and WSWRA as early as 2013 that encompasses the key components of:

- Requirements for data collection of disposal and diversion quantities
- Resources to develop a public outreach strategy
- A state funding program
- 1.5 FTEs needed to support waste diversion over the next several years

TABLE 21-3: WDEQ WASTE DIVERSION EMPLOYEE JOB ACTIVITIES

RESPONSIBILITY	WDEQ FTE ALLOCATION YEARS 1 to 3	OTHER STAFF NEEDS	WDEQ FTE ALLOCATION AFTER YEAR 3
Provide input to diversion-related legislation (i.e., bill positions and assessment of fiscal impacts)	0.05 FTE	Legal counsel, administrator	0.05 FTE
Work with stakeholders to revise and/or develop specific regulatory language & WYDOT specifications	0.2 FTE	Legal counsel, administrator	0.1 FTE
Produce guidance documents as needed to clarify policy[a]	0.05 FTE		0.05 FTE
Develop internal agency policies/legislation (i.e., EPP, green building practices, diversion goals)	0.1 FTE	Legal counsel, administrator, WDAI	0 FTE
Provide regulatory enforcement including review of program exemptions	0.1 FTE	Legal counsel	0.15 FTE
Collect mandated/voluntary data (e.g., programs, markets) & report	0.5 FTE		0.4 FTE
Implement funding programs (especially a state grant program)	0.2 FTE	(WSWRA)	0.3 FTE
Provide specific waste diversion support (especially regional and school programs)	0.2 FTE		0.25 FTE
Support of state-wide public outreach (i.e., branding and messaging)	0.2 FTE	(WSWRA)	0.1 FTE
TOTAL FTES	**1.5 FTE**		**1.5 FTE**

[a] WDEQ is currently considering regulatory changes that will increase the threshold for low hazard/low volume facility permitting requirements, as well as specific beneficial use guidance

As noted below, the job description for these employees will change over time (the first two to three years will concentrate on regulatory development). It is likely that WDEQ will not be able to initiate all legislation or be the primary leader for all activities due to both limited resources and perceived limits of a regulatory agency. Given its regulatory responsibilities, WDEQ may not be perceived as an appropriate leader for some activities (see recommended roles for WSWRA below).

Wyoming Solid Waste & Recycling Association

Expand WSWRA Waste Diversion Leadership - Currently, WSWRA's focus is largely solid waste landfilling related issues. A strong waste diversion focus is needed in this organization to combine with WDEQ efforts described above to provide the leadership Wyoming needs to increase diversion in the short- and long-term. The non-profit status of WSWRA would provide autonomy and the ability to actively promote legislative actions and state prioritization of waste diversion. Specific diversion-related leadership activities recommended for WSWRA include:

- Represent a state-wide stakeholder group of private, public, non-profit and student industry representatives
- Adopt a state-wide waste diversion resolution (this may eventually be expanded to include specific diversion goals)
- Educate stakeholders including legislators about the economic and environmental benefits of waste diversion
- Develop, campaign and lobby for legislative policies and funding to support more aggressive diversion programs
- Assist WDEQ in implementing a state grant program
- Develop award recognition programs
- Assist in identifying/encouraging end-markets
- Help develop and implement a state-wide public outreach campaign with WDEQ
- With WDEQ, continue to produce annual or bi-annual directory of recycling collection programs, processors, brokers and end-markets available to the state

Currently WSWRA is not organized to undertake these activities. The organization needs to develop and implement a stronger vision, mission or strategic plan that supports waste diversion as a key priority. WSWRA needs greater volunteer member/director support (and perhaps staff) to complete this work.

As noted above, the most effective professional recycling organizations are dedicated to waste diversion - those that encompass all solid waste (such as WSWRA and most SWANA chapters) have less impact and provide less leadership in this arena. Table 21-4 (next page) includes a summary of several solid waste organizations in states surrounding Wyoming. As shown, most organizations are dedicated to waste diversion and all have some staff to ensure that their mission is implemented.

While there are several strong diversion advocates throughout Wyoming, most of these individuals are also involved in waste disposal. It is not expected that a second, diversion-only organization would be successful in Wyoming in the short-term. As a result, the following discussion considers ways that WSWRA could be modified to better address waste diversion.

TABLE 21-4 OTHER STATE SOLID WASTE/RECYCLING ORGANIZATIONS

ORGANIZATION	DATE FOUNDED	STAFF	CONTACT INFORMATION (as of March 2012)
North Dakota Solid Waste & Recycling Association (NDSWRA)	1996	Executive Director (part-time contractor)	Jerry Volk (701)-590-0488 www.sdswma.org
South Dakota Solid Waste Management Association (SDSWMA)	1991	Executive Director (part-time contractor)	Carolyn Trautman (605) 216-3256 www.sdswma.org
Colorado Association for Recycling (CAFR)	1991	Executive Director (7/8 time) & Executive Assistant (1/4 time)	Marjorie Griek (303) 975-6975 www.cafr.org
New Mexico Recycling Coalition (NMRC)	1991	Executive Director, Deputy Director, Project Director and Outreach Specialist	Ms. English Bird (505) 983-4470 http://recyclenewmexico.com/
Recycle Montana 501c(3)[a]	2008	Executive Director & Educator (half-time) but supported by MDEQ staff	Mark Nelson (406) 883-7325 trashman@compuplus.net www.recycle.mt.gov
Nebraska State Recycling Association (NSRA)	1980	Executive Director (part-time)	Deb Rost (402) 933-3059 http://recyclenebraska.org/

[a] A 501c(6) Montana Recycling Association (1989) was founded by industry to oppose state bottle bill (it is expected that this organization will be folded into Recycle Montana in the near future)

Short-term (two to three years, beginning in 2012) actions should be undertaken in the following sequence:

1. Develop Board of Directors Composition to Include Waste Diversion Leaders - This should include;
   - Bylaws or policy language that establishes at least 50% of the directors whose individual industry roles focus on waste diversion and who are committed to advancing waste diversion in Wyoming (the policy should also address industry and geographical representation)
   - A Nominating Committee (typically chaired by the Past President) to implement this policy when developing candidates for Board of Director elections
   - Consideration that not all policy components will be met during every election (these guidelines should improve the ability for WSWRA to accomplish more waste diversion activities)

2. Revise Organizational Vision, Mission and Strategic Plan - These should address waste diversion as a key priority.

3. Establish a Waste Diversion Division (or expanded the roles & responsibilities of the Recycling Task Force) – The sole focus of this division (task force, council or committee) should be waste diversion. The division should have a chair, vice chair and dedicated list of directors and members. The first task undertaken by the division should be a five-year activities plan including fund-raising, membership, staffing and lobbying.

4. Evaluate/Pursue Funding Options - New/expanded options will be necessary to support additional diversion activities and may include;
   - Membership dues
   - Conference revenues
   - Sponsorships
   - Contract project payments
   - Grants
   - Other sources

   For example, CAFR's 2011 revenues exceeded $173,000 (52% annual conference revenues, 23% membership dues, 10% grants and other miscellaneous). NMRC's core association budget was $80,000 in 2011, but exceeds $1M if grant programs (e.g., its current hub-and-spoke work) are added in. Recycle Montana generates approximately 50% (about $13,000) of their 2011 revenues from specialty license plates purchased by individuals, fleets (like Pepsi) and others.

5. Evaluate Ability to Hire Part-Time Staff - An Executive Director that focuses on waste diversion or a Waste Diversion staff position will likely be needed in the near term to implement the leadership activities identified for WSWRA. This may be a contract or part-time employee. Based on the organizations described in Table 3, it is likely that a half-time employee will cost in the range of $30,000 without expenses or benefits (note that staff hiring should include the development of contract language or job description, as well as an annual performance review procedure). This position should be responsible for;
   - Help develop appropriate vision, mission and strategic planning for waste diversion (Board of Directors should have leading role as well)
   - Coordinate Board of Director functions
   - Coordinate/lead fund-raising (Board of Directors should have leading role as well)
   - Coordinating membership drive (WSWRA should have a dedicated Membership Drive Committee)
   - Leading legislative efforts (working with the Board of Directors and contract lobbyist, if in place)

6. Develop/Implement Membership Drive - This effort would seek to expand the waste diversion professionals in the organization. Companion activities will need to include;
   - Review of dues structure (membership should be a key revenue source) - this may include differential dues for students, individuals, non-profits, governments, businesses, etc. weighted to encourage the addition of more waste diversion organization members
   - Review/implement member services to justify any dues increase (such as regular newsletter, e-updates, annual conferences/technical sessions, technical assistance, etc.)
   - Consider the value of formally melding the CAG & WSWRA

7. Evaluate Legislative Advocacy/Lobbying Legal Parameters, Priorities & Needs - The 501c(3) status constrains the resources spent on lobbying activities, but does not prohibit these activities. 501(C)3 organizations that file Form 5768 (an Internal Revenue Service election to "make expenditures that influence legislation) may spend a specific percentage of their budget on direct and grassroots lobbying depending on their income level"[76]. A tax attorney should be consulted when clarifying the

[76] There are miscellaneous limitations - but an organization that file form 5768 & earn less than $1m/year may be able to spend 20% of its budget on lobbying & 25% on grassroots lobbying (such as calls to actions for members).

organization's legal parameters for lobbying. Lobbying activities for any particular piece of legislation may include;

- Developing bill concepts and amendments
- Securing legislative sponsors
- Motivating organizational contacts to generate support from legislators
- Testifying before legislative committees/bodies
- Actively monitoring and responding to any potentially negative-impact legislation

These activities will be especially critical as Wyoming begins to prioritize diversion and establish a regulatory framework for implementation.

21.3 Estimated Costs

WDEQ - It is expected that the addition of WDEQ staff will require a legislative process (Colorado successfully implemented this requirement in 2008). Once the policy is firmly in place, new and moderately significant WDEQ staff resources will be needed to conduct the activities identified in Table 21-3, or 1.5 FTEs. The equivalent cost of adding agency staffing in terms of new potential funding is considered in Section 25.0.

WDO/WSWRA - It is likely that efforts to expand the WSWRA (or even create a new organization) will be completed on a volunteer basis, at least until part-time staff is obtained. Exceptions may include contracting for legal, accounting or lobbying services on a part-time basis to verify the organization's legal constraints, expand book-keeping activities or tackle specific legislative efforts[77].

Related Information

- Colorado Association for Recycling for CAFR board of director information, membership, legislative updates, event & general information provided (current news, grant opportunities & other resources) - *www.cafr.org*

CAFR is a low-income 501c(3) that spends approximately 10% of its total budget on a part-time lobbyist in 2011 plus staff & volunteer time on both legislative & grassroots lobbying.

[77] For example, CAFR obtains legal advice only as needed, pays a part-time book-keeper about $4,000 per year and paid a part-time lobbyist $14,000 in 2011.

22.0 NEW STATE WASTE DIVERSION GRANT PROGRAM

TABLE 22-1 SUMMARY OF FINDINGS FOR STATE GRANT PROGRAM

FINDING	DESCRIPTION
Implementation - Put policy in place by 2015 with an effective date as early as 2016	
Estimated Operating Costs (WDEQ)	$1.35M (2015$)

22.1 General Considerations

Grant funding to further waste diversion has been used for over three decades around the U.S. Grants can be issued by state governments (environmental, economic development and local development agencies), local governments, nonprofits, and even from corporations. State-level grant programs can be found in California, Indiana, Kentucky, Maryland, Mississippi, Missouri, New Jersey, Ohio, Oregon, Tennessee, Washington and others.[78] Table 22-2 identifies the various pros and cons of grant programming.

TABLE 22-2 PROS & CONS OF GRANT PROGRAMS

PROS	CONS
Establishes stable funding source for recycling for grant period	Perception of expanding state government
Yields dramatic & usually permanent diversion of MSW as grant dollars that start diversion in year 1 continue to yield diversion in later years, with no additional dollars (especially if sustainability is a grant criteria)	Grantor needs to understand recycling & composting market drivers in the state/region to ensure grants are given to build the diversion infrastructure strategically
Builds waste diversion infrastructure	Multiple funding sources are ideal - reliance on landfill tip fee surcharges may backfire in future years as recycling successes increase & landfilled tons decrease (this "death spiral" is discussed further in Section 25.0)
Creates jobs in a number of sectors	
Builds professional knowledge base in various aspects of waste diversion in a region, such as composting, recycling, etc.	
Extends landfill life	

Key components for a new state-level or regional recycling grant program may include:

- Enabling legislation with parameters included such as start/sunset dates & allowable grant recipients
- Funding sources:
  - Most typically landfill surcharges – although these can decrease as diversion successes increase over time
  - Point-of-sale charges (such as that levied on tire sales in some states)
  - Sales taxes
  - Property taxes
  - Waste generation fees (based on subscription levels)
  - Pass-through of grant funds (such as from the federal programs)
  - Unclaimed beverage deposit funds (bottle bill monies)

[78] See *www.epa.gov/region4/rcra/mgtoolkit/starting.html* for case studies on recycling grants and further information on how to start a recycling program.

- Administration - includes grant officers (runs program, conducts site visits, provides advice, etc.), contract administrator & purchasing staff (involved in grant selection)
- Advisory committee comprised of key stakeholders, often with voting authority for grant selection
- Guidelines on allowable waste diversion projects, often developed based on research, state-established diversion goals, market development needs, etc. - some grant programs favor capital investments while others exclude capital investments in favor of program development, education, rebates for purchase of products made with recycled materials, or other strategies to achieve waste diversion
- Accountability mechanisms for grantees (reporting, fiscal accounting, etc.)
- Reporting on grant program effectiveness, including metrics such as tons diverted, jobs created, programs started, greenhouse gas diversion, capital investment, etc.

Wyoming - Wyoming currently has no grant programs specifically dedicated to developing waste diversion infrastructure, whether public or private, nor does it have grants related to education for waste diversion.

The Colorado Recycling Resources Economic Opportunity (RREO) Grant Program Case Study[79] *- Colorado passed a law creating this grant fund in 2007. Initially the landfill tip fee surcharge was $.07/cy and the law was designed to sunset after three years. The Colorado Department of Public Health and the Environment (CDPHE) was tasked with administering the program, which it does with the help of an advisory board consisting of rural, urban, government, non-profit, business, and economic development parties. Because of the success of the grant fund in its early years, the Colorado General Assembly renewed the RREO program in 2010 for an extended sunset date of 2020. The program generates approximately $1.3M per fiscal year in revenue.*[80] *These funds pay for one FTE to administer the program and 60% of an FTE fiscal officer to manage contracting, payments, etc.*[81] *Of the funds remaining after administration costs, 75% of all revenue goes to grants and 25% to recycling rebates. The program includes both rebates and grant funding to private, public and non-profit applicants. For the FY2010 grant cycle, approximately $1.2M was granted with a result of over 11 permanent jobs created and 41,000 tons diverted annually. This was roughly equivalent to an investment of $30/ton of waste diverted. Given that those tons of waste will continue to be diverted year after year (with no additional state funds), this is an excellent investment for Colorado.*

[79] Information obtained from Eric Heyboer, Recycling Grants Administrator, CDPHE - eric.heyboer@state.co.us.
[80] CO's Waste Tire grant fund originally contributed to the RREO grant fund through a point-of-return surcharge levied by tire retailers. This program is now separate from RREO. Also administered by CDPHE, this fund provides rebates to processors/end users and supports illegal tire pile cleanups.
[81] These two salaries for FY12 equal $117,000 including all benefits, etc.

22.2 Implementation

It is advised that key stakeholders begin evaluating viable strategies for establishing a new grant program during the short-term planning period of this study. If a program needs to be created through the state legislature, this can sometimes take a year or two of educating and informing elected officials of the benefits, in order to obtain needed support. Should a statewide recycling grant program be of interest to Wyoming, the following steps are suggested:

1. Evaluate Viability of State Grant Program;
   - A state-level program likely will need to be passed by the Wyoming Legislature – a champion will be needed to move this through
     - In Colorado, CAFR was the champion that successfully built a political coalition including CO's county & city associations, environmental groups, economic development advocates, etc. – and even obtained the support of the state environmental agency
     - California's decades-old recycling grant programs were established in the early 1990s, pursuant to CA adopting waste diversion goals in statute - CA now enjoys a recycling diversion rate over 60% (2010)[82]
   - Optional Regional Grant Funds - can usually be created via a surcharge on a regionally-owned landfill without needing state legislation – a vote of the governing board of the landfill authority usually is sufficient

2. Determine Funding Strategy;
   - The political acceptability and fiscal impacts of a tip fee surcharge, advance disposal fee, or other funding mechanism should be evaluated before advancing a particular strategy to decision-makers and key stakeholders, whether at the state or regional level (Section 25.0 evaluates a new landfill tip fee surcharge option)
   - One-time transfers from "other funds" occurs sometimes with state grant programs, such as a transfer of funds from a mineral extraction impact fund, general fund, or a well-publicized recycling grant cycle can be an excellent way to "test the waters" and gauge interest in a recycling grant program

3. Undertake Rule-Making – Once a grant funding mechanism is established, set detailed rules for program administration, reporting, accountability, fiscal management, etc.

4. Ensure Adequate Staffing – Including review committee for grant selection (can be temporary or standing - a standing committee can also function as a permanent advisory committee). This committee can be primarily volunteer-based with appointed members, incurring relatively minimal WDEQ costs.

5. Develop Schedule for Issuing Requests for Assistance/Requests for Proposals & Grant Cycle as necessary.

[82] CA's Estimated Statewide Diversion Rates Since 1989, *www.calrecycle.ca.gov/lgcentral/goalmeasure/DisposalRate/Graphs/EstDiversion.htm*.

6. Reporting – Plan on reporting results after year 1 or other suitable planning period.

22.3 Estimated Costs

Costs - It is expected that legislation will be needed to develop a new state-wide waste diversion grant fund and will likely require notable WDEQ staff hours, as well as volunteer hours from WSWRA and other organizations. Key stakeholders in building a recycling/composting infrastructure should be engaged and can include:

- Local governments
- Entrepreneurs
- Recycling/composting advocates
- Non-profits
- Developmentally disabled nonprofits involved in recycling
- Elected officials
- Economic development parties

Grant Revenues Needed - The new grant program should be robust enough to fund several recycling programs a year. From the policies, plans and cost models presented in Parts II through V, start-up for these programs can range from approximately $6,000 for school and multi-family recycling collection sites to nearly $5M for a new regional MRF. Subsequent grant applications for annual recycling operations assistance will also make claims on the available funds. If Wyoming establishes a statewide tip fee surcharge or other program that will generate a minimum of $1M in grant funding annually, the projects listed below could be capitalized (the 2011$ costs for these projects were identified in previous sections and are also summarized in Table 27-1). Alternatively, the funding could be used to cover research, marketing development of program/facility operations.

- 170 school or MFU collection sites OR
- 20 DOCs OR
- 4 yard/wood waste compost facilities OR
- 2 to 3 mobile equipment units

The ultimate grant revenue calculation should also consider the need for an additional 20% to cover the grant administration by WDEQ/oversight board, outreach and promotion, as well as reporting results. The 2011$ grant funds needed would therefore be $1.2M. Section 25.0 evaluates a new revenue source for this grant program and miscellaneous agency resources.

23.0 OTHER STATE-LEVEL CONSIDERATIONS

23.1 State-Wide Promotion of Waste Diversion

A state-wide public outreach program would likely have the broad goal of both raising awareness about waste diversion and increasing participation in local programs. The program would ideally be undertaken by WDEQ, WSWRA or a combination of the two organizations. Some level of professional marketing and graphic design experience will improve the quality of the program products. Key steps are likely to include:

- Develop a waste diversion brand that is uniquely Wyoming – this may be a combination of graphics & wording but should strive to be instantly recognizable
- Generate two or three key waste diversion messages – these may want to narrow in on specific needs of specific regions (e.g., rural versus urban)[83]
    - Messages may need to alert citizens & businesses about the importance of waste diversion and the need to join their peers to make diversion a way of life
    - Messages can be attention-getting like Denver Water's innovative water conservation campaigns, could personalize the Wyoming message or could use humor (such as Champaign, Il's "Feed the Thing" recycling container personification[84])
- Develop graphics that can be used both at the state level and by local governments, non-profits, schools & other recyclers – products should include;
    - Website & newsletters
    - Signage, billboards
    - Recycling containers & vehicles

Elements of successful outreach and education include:

- Messaging targeted to;
    - Specific diversion obstacles - such as areas with high contamination, lack of awareness about acceptable materials, lack of recycling containers, etc.
    - Specific recycling levels - such as those areas with waste generators who are aware of programs but aren't recycling consistently or those that simply need to take recycling to a higher level
- Budget - available funding targeted to efficiently to specific messaging
- Measurement of outreach results - this ties back to the state-wide data collection discussed in Section 18.0
- Tools for the general public & elected officials - focusing on data, economics & resources (it will be important not to reinvent the wheel – but rather a clearinghouse of information)
- Key partnerships with businesses, non-profits, haulers, processors & other government agencies
- Feedback

[83] See Curbside Value Partnerships' campaign approach methodology at *www.RecycleCurbside.org*.
[84] Champaign, Il recycling campaign slogan *http://feedthething.org/*

PART VI
FUNDING OPPORTUNITIES

Most of the collections, program and policy options developed in the previous parts of this Study will require some level of funding to capitalize and operate before off-setting revenues (and avoided landfill costs) can be earned. This Study would not be complete without a discussion of existing and possible future funding options that governments, non-profits and private organizations can use to pursue new and expanded waste diversion activities. This part of the Study report includes a detailed analysis of existing state and federal funding as well as several other state revenue options Wyoming could put in place as part of its commitment to state-wide waste diversion in the future. Study sections include:

- Existing Funding
- New State Landfill Tip Fee Surcharge Option
- Miscellaneous State Revenue Options

The Wyoming Statewide Study of Waste Diversion was commissioned by the Wyoming Department of Environmental Quality using funds appropriated by the Wyoming Legislature. LBA Associates, Inc. was contracted by the Department to undertake the study. Any recommendations made or conclusions reached in the study are solely those of LBA Associates, Inc., and not necessarily the State of Wyoming.

24.0 EXISTING FUNDING

24.1 Existing State Grant & Loan Funding

Wyoming is fortunate to have sources of funding to help better the state, including the sources described below that may be used by government, business, or non-profit organizations to cover recycling-related endeavors. Each funding source has its own unique and changing requirements and eligibility criteria – this list is meant to summarize programs that are open to funding recycling initiatives. Each program's administration needs to be checked closely to determine eligibility and if a proposed project is going to be a 'fit' with the grant or loan source. Fiscal resources can vary from year to year in any given grant-making organization, so it is best to develop a relationship with a funding source and understand its specific funding amounts and requirements, as they can change over time.

Office of State Lands & Investment (OSLI) and State Loan & Investment Board (SLIB)

There can be confusion between these two related governmental entities. OSLI is the government agency that administers all lands for extraction of surface oil and gas resources. The funds resulting from that resource extraction support the various loan and grant programs which OSLI administers. OSLI's mission is to use grant and loan program funding in order to strengthen local government infrastructures.

The SLIB is comprised of the state's top five elected officials[85] and is the legal entity with final approval over how OSLI administers grants and loans. Often Wyomingites say they've "gotten a SLIB grant" when actually funds come from OSLI and were approved by SLIB. Several grant funds from OSLI are applicable for recycling and solid waste activities. Rules and regulations should be reviewed before applying for all state-funded programs.[86]

1. Mineral Royalty Grant Program – This may be used to fund costs related to landfills, transfer stations, diversion activities and rolling stock as well as landfill closure.

2. County Wide Consensus Block Grants – These are similar in scope to the Mineral Royalty Grant program noted above, with the exception that the grant must be approved at the county level, before it is reviewed by OSLI and approved by SLIB. Under new rules that are pending, ineligible items will decrease, meaning more recycling-related efforts may be eligible. It is important to review the most current set of rules to optimize chances of obtaining a grant under this program.

3. Landfill- & MSW-Related Funding – This can also be obtained through OSLI's Clean Water State Revolving Fund (SRF) (e.g., rolling stock can now be purchased for transport to a lined landfill – which might include recycling trucks that tip at a recycling operation located at the landfill) and the Joint Powers Act Loan Program. For the JPA Loans, eligible projects must be revenue-generating and the loan security will be user fees (which qualifies most landfills or transfer stations - recycling

[85] Governor, Secretary of State, State Auditor, State Treasurer, and Superintendent of Public Instruction.

[86] See *http://soswy.state.wy.us/Rules/default.aspx*, enter as follows: Agency – 'Lands and Investments, Office of'; Program: 'Loan and Investment Board'; Rule type: 'Current Rules and Regulations'; Chapter: For MRG – enter Chapter 32; for CWCBG – enter Chapter 3.

facility user fees may qualify). To see if recycling-related activities at a landfill or transfer station would be eligible, each of program's requirements should be reviewed carefully.

For each of these OSLI funding sources, the details on timing of applications, applicant matching requirements, criteria used to award funding and organizational eligibility can vary[87].

Wyoming Business Council (WBC)

The WBC is a state agency offering a variety of grant and loan programs as well as training and education to help grow business in the state[88]. The WBC divides Wyoming into seven regions, with a regional director serving each area.[89] The WBC has three major funding programs.

Investment Ready Communities (IRC) Division - The IRC Division of the WBC manages several grant/loan initiatives that are meant to help Wyoming communities become "business-ready". The IRC programs relevant to recycling efforts are profiled below:

1. Business Ready Community Program – This program grants monies to help with infrastructure to support business startups. Cities, towns, counties and joint powers boards are the primary applicants although state and local community development organizations and tribes can assist and provide project management or program development under contract to the primary applicant.

2. The Business Committed Program's chief goal is the creation of primary jobs. Under this fund source, money flows directly to a public entity and could be used to build a building or other infrastructure for a business, which is then leased back to the job-creating business at a reasonable rate (e.g., a project developing a recycling manufacturing business would qualify).

3. Community Readiness – This program has an interest in green industry, under which a recycling business might get some funding. A government entity receiving the funds could build a spec building that could be used for some type of recycling business, for example.

4. Community Enhancement – These funds go to projects that enhance community life. For example, it recently funded a project in Buffalo that developed a well-used community park, paying for development of restrooms, a stage, etc.

5. Community Development Block Grant (CDBG) – The WBC is WY's designated agency for administering CDBG funds, which are passed through from federal US Department of Housing & Urban Development funds. In Wyoming, two cities get their own direct CDBG allocation (Casper & Cheyenne), with WBC managing CDBG funds for the rest of the state. Eligible projects must meet

[87] *http://lands.state.wy.us* - a chart of eligibility of all funding sources and project types is located at *http://slf-web.state.wy.us/grantsloans/chart.pdf*.
[88] WBC's 2010 directory of funding is available at *www.wyomingbusiness.org and www.wyomingbusiness.org/DocumentLibrary/B%20and%20I/Financial%20Resources%20Guide%202010%20Final.pdf*
[89] Personal Communication, Leah Bruschino, Director of Field Operations, leah.bruscino@wyo.gov 307.754.5785 - *www.wyomingbusiness.org/contacts#regional*.

the CDBG's national objectives – primarily the elimination of slum or blight and/or to benefit low/moderate income families. Example recycling projects can include;

- Recycling bins as litter cleanup tool
- Recycling bins for multi-family low-income housing
- Recycling facility that would create jobs for low/moderate income citizens (for example, an entity might receive CDBG planning grants for a feasibility study for a new recycling facility or a study for expansion of an existing facility)

CDBG funds are also eligible to be used to meet urgent needs though these are generally reserved for natural disaster response.

6. Community Facilities Grant & Loan Program (CFP) – The CFP funds are used to construct local enhancements to a school building or facility or preserve former school and government facilities that have existing or future community uses. All projects must be related to economic development or quality of life enhancement. For historic buildings, there is value placed on salvaging and recycling historic components.

7. Wyoming Rural Development Council is affiliated with the IRC and conducts community assessments throughout the state - it may assist in rural recycling development.

Agribusiness Division - This division has funding which may be used for developing agricultural-waste-related diversion efforts (e.g., making products from recycled agricultural plastics or making compost from agricultural or ranch wastes).

Business & Industry Division - This division offers a wide range of programs and resources that may be of interest to existing and new businesses as well as to local governments seeking to grow diversion opportunities. Resources include:

- Loans – see *www.wyomingbusiness.org/program/loan-programs/1265* for the current list of loan options – there are over six different loan programs. Check with WBC for details if a loan would work for a particular recycling business opportunity
- One-on-one business counseling and training, including assistance in writing business plans
- Counseling, training, and resources for manufacturers
- Small Business Development Centers (through the University of Wyoming) – provide management assistance, educational programs and other resources for Wyoming small businesses and entrepreneurs
- "Wyoming First" – Wyoming branding for products made in the state
- Industrial Development Revenue Bonds – Cities and counties may issue Industrial Development Revenue Bonds to finance economic growth within the state, and to create jobs for in-state residents. IDR Bonds are land acquisition, building and equipment loans, and are interest-exempt from federal income taxes
- Business Permitting Assistance Office – one-stop permitting and licensing information for existing Wyoming businesses and businesses wanting to relocate to the state

- In-depth assistance in human resources, intellectual property, manufacturing, marketing, product development, obtaining government contracts, leadership training, women-owned business help, business relocation, etc.

Supplemental Environmental Projects (SEP) Funds

WDEQ may, at its discretion, support waste diversion activities through alternative settlement approaches. A SEP is one such alternative settlement approach. Typically, it is preferred that a SEP be utilized in the jurisdiction where a violation(s) occurred. Implementation of a SEP requires the concurrence of all parties, including the entity benefitting from the SEP.[90]

24.2 Existing Local Funding

Specific Purpose Excise Tax – Local jurisdictions in Wyoming can pass a Specific Purpose Excise Tax (SPET) via a ballot resolution.[91]

- Setting up a SPET - Typically, local government staff (though it could include citizen input) would make the case for funding a waste diversion project, and then the County's elected officials (along with two-thirds of the governing bodies of incorporated municipalities in the county) must vote to approve to put a SPET to ballot (the amount of revenue to be collected and the proposed purpose must be specified in the proposition).
- How SPET funds must be managed;
  - Projects must be approved when the tax is approved
  - Tax sunsets when the amount of money approved has been collected
  - SPET monies cannot be used for city/county operations
  - Any debt created may also be repaid, in whole or in part, by a property tax levy if general obligation bonds are authorized by the electors

While SPET funds have not been used in Wyoming for any waste diversion project, a similar funding mechanism was used by Boulder County, Colorado from 1995 to 2001. Citizens voted to increase the property tax mill levy to raise approximately $15M, the estimated cost of a MRF, over the 7-year period dedicated to the capital costs to build a MRF. Through tax revenues and interest, the fund collected more than was needed to actually build the MRF ($24M) and remaining funds (along with interest accrued on the initial collections) have been used for an annual County-level grant program to increase recycling education, outreach, and capital investments.[92]

Solid Waste District, Property Tax Funding – Wyoming Statute Title 18, Chapter 11, Solid Waste Districts enables districts to levy up to three mils of property valuation for funding of a solid waste district. Criteria for this funding require that a vote to be held to gain voter approval to create the district. For jurisdictions that are seeking to better manage their waste, increase diversion, and create jobs, a property-tax funded district can create a more reliable stream of funding to achieve these goals. Several

[90] It is possible that SEP monies could be allocated to a waste diversion project, if all stakeholders involved agree. Lincoln County has recently received SEP monies for making DOC improvements.

[91] See *http://legisweb.state.wy.us/statutes/statutes.aspx?file=titles/Title39/T39CH12AR2.htm* for enabling statute.

[92] See *www.bouldercounty.org/env/sustainability/pages/zerowastefunding.aspx* for more about this interesting local-level grant program.

districts in Wyoming use the funding mechanism - one example is the Park County Solid Waste District. The Park County Commissioners serve as the directors of the District – and the landfills under the District operate as an enterprise fund.

24.3 Additional Long-Term Funding

Federal Sources - There are a myriad of grants and loans available through Federal agencies and offices. A group called "Reconnecting America" has put together a list of more than 50 federal programs related to sustainability. More than $125B in grant funding is available. The website includes a helpful list and matrix providing more information on upcoming opportunities, including eligibility requirements, program descriptions, and deadlines[93].

A good example of a useful federal program for recycling is the US Dept. of Agriculture (USDA) Rural Development grants – these grants can be used for solid waste planning, including planning focusing on recycling and waste diversion. While these funds are a grant/loan combination, it is reported that these funds are highly underutilized in Wyoming, and that Wyoming USDA has not expended all its funds.[94] Another source of funding for federal grants is the USEPA[95]. There are multiple EPA8-specific grant sources that may apply to recycling projects include the Environmental Education grants, tribal grants, and Performance Partnership grants (especially for recycling of hazardous wastes).

Non-Profit/Corporate Sources - There are non-profit foundations which provide grants on recycling and environmental initiatives around the country. Two that may be of interest to Wyoming recyclers include:

- Keep America Beautiful & Anheuser-Busch Foundation's "Lend-A-Bin" Grant program - provided 3,500 recycling collection bins to 76 towns and cities in 30 states (the program is meant to help local recycling programs with collection efforts at special events - see *www.kab.org*)
- The Coca-Cola Foundation - awarded $9.6M in grants to more than 40 community organizations worldwide in 2011, $1.3 million of which will support recycling along with other projects (see *www.thecoca-colacompany.com/citizenship/application_guidelines.html*)

[93] *http://reconnectingamerica.org/resource-center/federal-grant-opportunities/*

[94] For more information, contact Alanna Cannon, USDA program director for WY at 307-233-6709 - *alana.cannon@wy.usda.gov* & more about these programs at *www.rurdev.usda.gov/WYHome.html*, *www.rurdev.usda.gov/RD_Grants.html*, and *www.rurdev.usda.gov/SupportDocuments/WyomingCountyAreaJurisdictions.pdf*.

[95] *http://epa.gov/p2/pubs/grants/index.htm* & EPA Region 8 grants - *www.epa.gov/region8/grants*.

25.0 NEW STATE SOLID WASTE TIP FEE SURCHARGE OPTION

TABLE 25-1 SUMMARY OF FINDINGS FOR NEW STATE SOLID WASTE TIP FEE SURCHARGE

FINDING	DESCRIPTION
Implementation - Put policy in place & effective by 2015	
Estimated Surcharge	$2/ton (2015$)

Quantities rounded to nearest $1,000

25.1 General Considerations

Tip fee surcharges have been used since the 1980's by state governments and local governments to generate revenue for general funds or specific programs. Tip fee surcharges may or may not be used for solid waste environmental or diversion programs. State-level facility tip fee surcharges occur in Colorado, Iowa, Kansas, Montana, Nebraska, South Dakota and other states where they are levied on solid waste disposed. Table 25-2 (next page) provides a sampling of the tip fee surcharges and their designated uses.

While popular at the local and state level as funding for diversion and special waste programs, more communities have experienced the "death spiral" associated with relying on only this revenue source. As diversion programs mature and divert increasing quantities of materials, landfill quantities decrease as do both tip fee revenues and any associated surcharges. During slow economies when consumers are generating less trash and construction levels are down, this trend is exacerbated[96]. As a result, tip fee surcharges should be only part of the revenue stream in any solid waste business model.

State-imposed tip fee surcharges are also used to generate funds for state programs such as grants. They can be as high as $7.25/ton in Pennsylvania and $13/ton in Wisconsin. Some states apply the surcharge to only waste disposed in municipal solid waste landfills, others apply it to both municipal solid waste and C&D waste landfills and transfer station waste exported out-of-state. Key components of a state-level tip fee surcharge program include:

- Enabling legislation with parameters included such as:
  - Disposal tip fee surcharge amount (on $/ton or $/cy basis)
  - Designation to restricted funds – for grants, agency administration, environmental protection – additional enabling legislation may be required to create the restricted funds
  - Payment and reporting procedures
- Reporting to state legislature or others on estimated income and direction of funds

[96] Recently, Summit County, CO determined that increasing their tip fees to cover multi-program costs was back-firing as private trash haulers began hauling MSW 75 miles to an alternative landfill with lower fees. The County immediately developed a task force and in 2012 is revising its business model to improve their revenue options.

TABLE 25-2 STATE TIP FEE SURCHARGE SUMMARY

STATE	TIP FEE SURCHARGE	VOLUME CONVERSION	USES
Colorado	Total $0.28/cy or $0.93/ton a) $0.07/cy or $0.23/ton b) $0.13/cy or $0.43/ton c) $0.05/cy or $0.17/ton d) $0.03/cy or $0.10/ton	Done with conversion factors CDPHE has established	a) CO Recycling Resources Economic Opportunity Grant Program b) Supports CDPHE solid waste programs c) CO Hazardous Substance Response Fund d) Support CO Department of Law
Iowa	$3.25/ton to $4.75/ton (depends on planning area % diversion level)	Utilize scales – landfill may propose alternate method for determining weight	$1.95/ton to $3.30/ton remit to Department for solid waste account of groundwater protection fund; portion retained by facility owner to be used for plan implementation, environmental protection activities & planning
Kansas	$1.50/ton (recently increased from $1/ton)	> 50,000 tpy must use scales, < 50,000 tpy may use surveyed volume (1000 lbs/CY) or volume records with stated conversion factors	Along with permit fees, funds the entire state solid waste program (approx. 8% went to grants for waste reduction projects and public education in FY2011)
Montana	$0.40/ton, plus $0.27/ton for out of state waste	1 cy loose = 300 lbs 1 cy compacted = 700 lbs Avg tire = 20 lbs	Along with permit fees, funds the Department management and regulation of solid waste disposal
Nebraska	$1.25/ton	1 ton = 6 cy loose 1 ton = 3 cy compacted	50% goes to Waste Reduction & Recycling Grant Program (this grant program also funded by a business fee and tire fee), 5% to Illegal Dumpsite Cleanup Program, $0.10/ton rebate program to city/county with written recycled content purchasing policy approved by Department[a]
South Dakota	$1.00/ton, Plus $3/ton for facilities > 250,000 tpy	If no scale, each person served by facility considered to generate 0.8 tons per year	

[a] In the past year, these two funds have issued $2.6M in recycling grants and another $1.15M in tire recycling grants

25.2 Implementation

It is expected that regulation development, administration, enforcement and stakeholder education will fall primarily to WDEQ - and costs for these activities should be considered. Should a statewide tip fee surcharge be of interest to Wyoming, the following steps are suggested:

- Legislation - WDEQ, WSWRA, other individual & businesses will need to champion this effort
- Implementing regulation - including;
  - Disposal facility classification
  - Designated funds & use

- Phase-in timeline for start of surcharge (e.g. some existing collection contracts with private service providers may require flexibility)
- Annual reporting & recordkeeping requirements
- Portions of fund used for administration & enforcement
- Portions of fund used for outreach & educating stakeholders

25.3 Estimated Costs & Revenues

Costs - Significant resources may be needed to pass a law creating a solid waste tip fee surcharge. Key stakeholders in solid waste management should be engaged and can include:

- Public & private owners and operators of landfills & transfer stations
- Local governments
- Recycling/composting advocates
- Haulers who contracts may be impacted
- Non-profits involved in recycling
- Elected officials
- Economic development parties

Tip Fee Surcharge Amount - This analysis assumes that the primary focus of a tip fee surcharge is both development of the waste diversion grant program evaluated in Section 22.0 (or $1.2M in 2011$) and WDEQ staffing resources discussed in Sections 21.0 (approximately $150,000/year). The general assumptions needed to estimate a surcharge amount to generate this revenue includes:

- Minimum 2011$ total of $1.35M
- Equates to 2015$ of $1.5M - based on 3% annual inflation/year to 2015$ as implementation may take two to three years
- Assessment on materials from total waste stream ultimately disposed (most Wyoming landfills accept both MSW and non-MSW)
  - Total 2015 waste stream is projected to be 1,048,000 tpy (per Appendix D)
  - Estimated diversion ranges from 113,000 to 280,000 tpy in 2015 (see Table 25-3)
  - Conservatively, the surcharge would be applied to landfilled quantities as low as 768,000 tpy
- Resulting tip fee surcharge would be $2.25/ton

TABLE 25-3 PROJECTED 2015 DIVERSION LEVEL FOR KEY PROCESSING FACILITIES

PROCESSING OPTION	DIVERSION LEVEL ASSUMED	PROJECTED DIVERSION (tpy)
Materials Recovery Facility[a]	40% (see Section 12.0)	64,000 to 169,000
Yard/Wood Waste Composting	50% (see Section 13.0)	37,000 to 73,000
Mobile Equipment Processing	25-30% (see Section 14.0)	12,000 to 38,000
TOTAL		**113,000 to 280,000**

[a] MRF diversion levels (analyzed for 2020 completion) adjusted to 2015

26.0 MISCELLANEOUS STATE REVENUE OPTIONS

26.1 State Waste Tire Fund

More than 35 states have waste tire surcharges. Most states levy a retail fee of about $1/tire purchased at point of sale and use the funds to clean up illegal tire piles, make grants to governmental entities purchasing products made from scrap tires generated in the state, and subsidize scrap tire processors. These funds have proven tremendously successful over the years, and states whose tire funds have remained intact (i.e., not been swept to balance budgets or for other uses) generally are diverting all scrap tires generated each year from both illegal disposal and landfilling.

If Wyoming levied a fee of about $1/tire purchased about $564,000 would have been generated in 2010. These funds could pay for WDEQ staff to administer the fund. Once enabling legislation (of at least a five-year term) is established, key steps for Wyoming to follow in establishing its waste tire abatement program would be to:

- Inventory all illegal tire stockpiles in the state and estimate the size and quantity
- Provide training for state fire officials to ensure they know what to do if there should be a fire before the piles are abated
- Design a program of grants to ensure illegal tire piles are cleaned up; prioritize the worst piles and work down
- Consider grants to develop markets & maintain sustainability – review programs in Colorado[97], Montana, Utah and the Dakotas for best practices and what would be a "fit" for WY

26.2 Bottle Bill

The term "bottle bill" is actually another way of saying "container deposit law." A container deposit law requires a minimum refundable deposit on beer, soft drink, and/or other beverage containers in order to ensure a high rate of recycling or reuse.[98] It is a proven method of increasing recycling - the 10 states with bottle bills (California, Connecticut, Hawaii, Iowa, Massachusetts, Maine, Michigan, New York, Oregon and Vermont) enjoy higher container recycling rates than states without. Bottle bills reduce litter, help keep jobs in a state by "feeding" the recycling industry, reduce overall waste being landfilled, and are typically supported by the general public, many of whom enjoy redeeming beverage containers for the refund. Further, deposits place the cost of managing used beverage containers on those who manufacture, sell and buy them, rather than having those costs distributed to all taxpayers who fund litter pick-up and landfills.

Beverage containers comprise only 4% to 8% (see Table 4-1) of the MSW stream in Wyoming in 2010. According to the Container Recycling Institute, however, beverage containers can account for as much as 20% of the greenhouse gas emissions resulting from replacing wasted containers with new containers made from virgin materials. By increasing recycling, bottle bills mitigate containers' negative environmental effects.

[97] In 2012, Colorado's CDPHE obtained $300,000 from its waste tire fund for a tire market development study - for more information, contact Brian Gaboriau, CDPHE Waste Tire Fund Grant Administrator at *cdphe.pps@state.co.us*.
[98] Container Recycling Institute, *www.container-recycling.org*.

When bottle bills are presented at state legislatures, typically opposition emerges from beverage distributors and packagers, who oppose the increased cost of their products. The pros and cons are summarized in Table 26-1. Wyoming could consider a bottle bill to tackle roadside litter, and to help increase recycling rates, especially for areas without curbside collection or drop-off centers.

TABLE 26-1 PROS & CONS OF BOTTLE BILLS

PROS	CONS
Increases recycling rates for beverage containers, to 75% - 95%, depending on deposit amount	Beverage containers comprise about 5% of MSW so does little for overall recycling rate
Incentivizes people to recycle their containers	Deposits create dual systems for collecting recyclables in areas that already have curbside or drop-off recycling – may negatively impact existing curbside or drop-off efforts (those programs "compete" for same containers) - cost more than curbside on a per-ton basis by adding a collection infrastructure but only for a small amount of recyclables *(moot point in areas with no curbside or DOC)*
Citizen recyclers usually are amenable to container deposit legislation	Grocers, liquor stores and retailers may not have room to collect, handle and store used beverage containers, especially near food items - reverse transportation must be established *(handling fees from the deposits can be used to set up redemption centers or reverse vending machines so retailers don't need to collect, handle and store)*
Higher participation rates due to economic incentives	Limited access for the elderly, infirm or those without transportation
Everyone makes trips to the store on a regular basis so access is very convenient	Inconvenient compared to curbside recycling - (moot in areas without curbside collection, like much of WY)
Opportunities for fundraisers for clubs, non-profits, scout troops, etc	Producers may raise prices to comply with the program
Reduces litter	Comprehensive litter control programs provide a more efficient way to control litter, with a focus on all litter
Unclaimed deposit monies can be used to fund other recycling programs	Unclaimed deposits are used to offset collection costs – there may not be much additional funds
Creates 11- 38-times more direct jobs than curbside collections[99]	
Extends landfill life	

26.3 Litter Tax

Litter taxes are a means to generate funds to run a litter education program and to provide funds for litter clean-up and recycling programs. They are levied on frequently-littered consumer goods. The system of collection, reporting and submittal of the litter tax is similar to sales tax, a system already in place in WY. It is a tax on manufacturers, wholesalers, and/or retailers of the designated "littered" products. For example, in Washington state, the following 13 categories of products are subject to a litter tax:

- Food for human or pet consumption
- Groceries
- Cigarettes and tobacco products

[99] "Returning to Work", by Clarissa Morawski and Jeff Morris, Resource Recycling, December 2011.

- Soft drinks and carbonated beverages
- Beer and other malt beverages
- Wine
- Newspapers and magazines
- Household paper and paper products
- Glass containers
- Metal containers
- Plastic or fiber containers made of synthetic material
- Cleaning agents
- Non-drug drugstore sundry items

A number of other states, including Hawaii, Nebraska, New Jersey, Ohio and Washington currently have litter taxes. The total amount of revenue depends on what products are taxed and at what rate. A state can determine what items are taxable for litter impact, and how much to charge, for example:

- Virginia – tax imposed at rate of $10.00 per business establishment. In addition, businesses that manufacture, sell or distribute groceries, soft drinks, carbonated waters, beer and other malt beverages must pay an additional $15 per business establishment
- Washington – fee equal to $.015 on gross proceeds of sale of the product[100]
- Nebraska – litter fee imposed annually at the rate of $175 per $1 million of gross proceeds derived from the sale of the product subject to the litter fee

However, the litter tax can be controversial. Because everyone who purchases these products pays the tax, it doesn't target just those people who litter. And because the consumer who is paying the tax may not even be aware that they are paying it, it does little or nothing to deter littering. Others claim that the litter tax is ineffective – New Jersey is cited as an example of a state that collects a litter tax but still has a huge littering problem.

26.4 Other Revenue Options

In addition to grant and load funding, the state has other avenues it can potential explore to raise revenue to support recycling. Several of these are discussed below.

Specialty License Plates - The state of Montana issues many specialty license plates (through enabling legislation[101]), including a plate specifically for recycling[102]. Figure 26-1 (next page) illustrates the Montana plate.

- Recycle Montana (RM) started a specialty plate in October 2008, and in 2011 alone received $12,990 in income from these plates – about half of its annual income (data for 2012 not yet available)[103]

[100] Washington state's litter tax statute - *http://apps.leg.wa.gov/rcw/default.aspx?cite=82.19*

[101] License plates sponsored by qualified organizations, colleges or governmental bodies are designed with distinctive backgrounds, colors or phrases that identify the sponsoring organization. Sponsored plates are authorized under MCA Title 61, Chapter 3, Part 4 (see http://data.opi.mt.gov/bills/mca_toc/61_3_4.htm).

[102] More general information on MT specialty plates can be found at: *https://doj.mt.gov/driving/plate-designs-and-fees/*.

- At $30/vehicle plates - some 400 vehicles are featuring these pro-recycling plates

FIGURE 26-1 Sample Specialty Plate

- RM continued
  - Some of RMI's members purchase these plates for all their fleet vehicles, rather than paying large membership fees or donations to the organization - the Montana Bottlers' Association purchases these plates for all its vehicles.
- Although WY has few specialty plates, this could be a potential source of revenue generation - specialty plates are administered by the WYDOT & may be used by WSWRA to support its future state leadership activities

[103] *https://dojmt-zippykid.netdna-ssl.com/wp-content/uploads/2011/05/mvspecialtylicenseplatereportfy11.pdf* and *https://dojmt-zippykid.netdna-ssl.com/wp-content/uploads/FY12-Specialty-License-Plate-Report_2nd-Qtr.pdf*

PART VII
OBSERVATIONS & RECOMMENDATIONS

This final part of the Study pulls together observations on Wyoming's existing solid waste system with key Part II through VI findings to identify the critical gaps between the 2010 baseline and a future enhanced by less landfill disposal. This Part also assess the potential job creation associated with the infrastructure and program options, and lays out the next steps WDEQ needs to take to move this Study from a paper report to effective actions on a state-wide level.

The Wyoming Statewide Study of Waste Diversion was commissioned by the Wyoming Department of Environmental Quality using funds appropriated by the Wyoming Legislature. LBA Associates, Inc. was contracted by the Department to undertake the study. Any recommendations made or conclusions reached in the study are solely those of LBA Associates, Inc., and not necessarily the State of Wyoming.

27.0 OBSERVATIONS & RECOMMENDATIONS

27.1 Study Observations

Given the length of this Study, a brief summary of observations is presented here for both the baseline solid waste system in 2010 and the options that will support future Wyoming waste diversion efforts.

Existing Solid Waste System

Cost of Diversion - One of the most important findings was the cost of current disposal operations in Wyoming (average $73/ton per Table 2-4) compared to potential diversion activities. The Study concluded that current disposal costs are probably under-estimated - in fact, several of the $/ton landfill costs represented in Table 2-4 have already increased since 2010. The Study further recognized that the economic benefits of waste diversion compared to disposal will continue to increase as landfill operators better understand their full costs. As the collection and processing examples show on subsequent pages, the relative cost of diversion-related programs are notably less than disposal. When the savings associated with avoided landfilling of diverted tons is also considered, the argument for waste diversion becomes even stronger.

Other Observations - Other observations on Wyoming's existing solid waste system include:

- Only 15% of the total solid waste stream was diverted in 2010 - while more than 67% of the same stream included divertible paper, containers, organics, C&D materials & tires
- There are numerous recycling & organics recovery programs state-wide - but they are generally small, independent, decentralized programs that do not take advantage of each other's attributes
- Most Wyoming communities generate small quantities of recyclables that have to be shipped long distances to brokers, processors or markets at relatively high unit costs
- Most in-state processing capabilities are limited to source-separated and dual-stream materials - single-stream programs send their materials out of state
- Wyoming has very few in-state end-markets
- There are a limited number of diversion-related policies at the local level & none at the state level
- There is no dedicated funding to support research, local diversion programs or market development - in addition, some specifications (such as WYDOT's) actually create a disincentive for diversion of some materials
- There are no full-time WDEQ or WSWRA staff or budget dedicated solely to waste diversion

Market Needs

- Regional cooperatives for marketing materials - to help maximize quantities, efficiencies & market leverage (regional efforts will also reduce labor requirements at local level)
- Local market development (e.g., for glass, mulch/compost products, aggregate) - strategies could include
    - Regularly updated data that describes the waste diversion potential - to both support new markets & legislative funding
    - Removal of barriers such as those posed by WYDOT highway specifications

- Incentives for new end-markets - for example, Utah's Recycling Market Development Zone Program (provides an income tax credit to recycling businesses[104])
- Funding to develop new/expanded programs - may range from a new RockTenn facility in southeastern Wyoming to a new processing site for ARK in Laramie
- Policy development that supports markets on a state level - such as beneficial uses, mandatory data, evaluating state specifications, etc.

Collection Options

- DOC collection is a relatively low-cost option well-suited to low-density areas - to generate high-quality source-separated materials (ideally as "spokes" in an H&S system with a regional MRF)
- Curbside recycling in rural areas may require creativity to be sustainable - for example, the WE RECYCLE program in Pueblo, CO is membership-based & uses re-useable bags for containers
- School diversion programs are critical to public education & generally require minimal capital (especially for commingled paper collection) - on-site composting can be a reasonable expansion
- Multi-family recycling is challenging due to space constraints & the indirect role of residents - but can provide focused recycling in high-density areas through partnering with private haulers

Regional Processing Options

- Regionalizing waste diversion - may be the most important action needed for creating economic sustainability in Wyoming's future programs (especially important for processing facilities)
- Ability to bale recyclables is key to accepting high-volume materials - horizontal, manual-tie units are suitable for low-medium sized programs in terms of both throughput & cost
- Regional MRFs provide an economy of scale that reduces local redundancies, decreases costs & increases revenues - simple MRFs can operate near/above break-even & may share revenues
- Organics recovery may increase diversion faster than recycling - regional yard/wood waste composting facilities minimize costs over local operations but will require tip fees
- Regional usage of mobile equipment can reduce local costs for harder to recycle materials - contracting for private sector services may be the easiest & most economical approach

Policy Options

- Yard waste disposal ban would improve throughput at existing operations & increase diversion rapidly - will require legislation & strategy for communities that cannot sustain a full-scale facility
- Beneficial use guidelines are needed to reduce obstacles to reuse & diversion of "problem" materials - Montana's example of alternative glass markets is especially good
- Mandatory data collection is a needed next step to the existing voluntary program - will require legislation that addresses both disposal & diversion quantity data
- PAYT (with/without scales) is one of the least expensive local policies for diversion - it takes political will to implement & residential rates may increase for those with higher refuse generation

[104] In 2007, Utah businesses in this program created 314 new jobs and invested over $15M.

State-Level Resources

- Robust leadership from WDEQ & WSWRA - both organizations need to prioritize diversion, obtain needed resources & acknowledge that notable increase in diversion will not happen without this commitment
  - Recommend WDEQ obtain at least 1.5 new dedicated FTEs
  - Recommend WSWRA develop a diversion-focused strategic plan implemented by a dedicated waste diversion task force or committee
- Funding sources are needed to support research, new/expanded programs & infrastructure, & market development ideally through state grant program – legislation is needed for $1.5M state tip fee surcharge program (2015$)

Funding Options

- Solid waste facility tip fee surcharge is one approach for generating funding - a $2/ton tip fee on all solid waste disposed would support a reasonable state grant program
- Multiple funding options are needed to support a sound waste diversion business model

27.2 Diversion, Cost & Revenue Summary of Options

Table 27-1 (next page) includes a summary of observations on diversion potential, costs and revenues for pertinent options in Parts II through VI. While the diversion potential of individual programs and facilities may be modest, the state potential for diversion through regional MRF, yard/wood waste compost and mobile equipment usage alone may be as high as 280,000 tpy or nearly 30% of the total solid waste stream as described in Table 25.3. This rate is based on assumed diversion levels of 50% or less (depending on the materials and facility), and will likely increase as more materials are accepted and participation increases.

It is also noted that even when material revenues are factored in, most programs will have a net cost. This confirms that recycling and composting programs can be resource-intensive. However, these costs appear to be significantly less than landfilling (even at the under-estimated rate of $73/ton). These relative economics should drive diversion in Wyoming.

Table 27-2 (page 27-5) summarizes avoided landfill disposal costs from pertinent options in Parts II and III. These cost savings are under-estimated in this table, however, as the avoided disposal associated with wood and aggregates cannot reasonably be estimated.

TABLE 27-1 OBSERVATIONS FROM OPTIONS ANALYSIS[a]

WASTE DIVERSION OPTIONS	PLAN-NING PERIOD	DIVERSION POTENTIAL (tpy)	CAPITAL & EQUIP-MENT COSTS	ANNUAL OPERA-TING COSTS	ANNUAL REVE-NUES	NET COST/ REVENUE ($/ton)[b]
Local Drop-Off Center 5- to 20,000 person community	2015	<1,000 to 3,000 per DOC	$29,000 to $45,000	$13,000 to $70,000 (hauling)	$7,000 to $27,000	$6/ton COST to $14/ton COST
School Recycling 750-student school district	2015	<1,000 per district	$6,000	NA (excludes hauling)	<$1,000	NA
Multi-Family Unit Recycling 200-unit MFU complex	2015	<100 per complex	$6,000 to $7,000	NA (excludes hauling)	$1,000	NA
Materials Recovery Facility based on average RPA regional facility	2020	7,000 to 18,000 per RPA	(debt service in annual cost)	$1,101,000 (including debt service)	$1,028,000 to $2,684,000	$10/ton COST to $88/ton REVENUE
Yard/Wood Waste Composting Facility based on small to mid-sized model regional facility	2015	1,000 to 4,000 per facility	(debt service in annual cost)	$96,000 to $274,000 (including debt service)	$53,000 to $210,000	$16/ton COST to $43/ton COST (tip fee)
Mobile Equipment regional ownership based on 3 RPAs	2015	3k to 6k aggregate; 1k to 4k wood; 0-1k tires per 3 RPAs	Varies	Varies	$26,000 to $105,000 (excluding haul to market)	NA
Expanded WDEQ Functions 1.5 FTE WDEQ staff	2015	NA	$0	$87,000 to $102,000	$0	NA

[a] Those processing and policy options without diversion potential costs or revenues are not included
[b] Average landfill disposal costs in Wyoming are projected to be $73/ton (see Table 2-4)

TABLE 27-2 AVOIDED LANDFILL DISPOSAL COSTS

WASTE DIVERSION OPTIONS	AVOIDED LANDFILL DISPOSAL ($/year)
Local Drop-Off Center	$46,000 to $183,000
School Recycling	$1,000
Multi-Family Unit Recycling	$3,000
Materials Recovery Facility	$482,000 to $$1,292,000
Yard/Wood Waste Composting Facility	$73,000 to $292,000
Mobile Equipment	Varies
TOTAL	**$605,000 to $1,771,000**

27.3 Estimated Job Creation Potential

Research has shown that the waste diversion industry is a significant contributor to local economies[105]. Job creation is one important benefit. Most sources verify that there are many more jobs created to support the activities associated with diversion than there are to support landfilling[106].

Estimating potential job creation is a challenge because research is dated, spotty and specific to certain areas of the country - there are no current job studies available for the diversion industry in Wyoming. Regardless, available data provides helpful insight into the economic bonus new diversion activities will provide Wyoming communities through new jobs. Table 27-3 (next page) estimates jobs that would result for the various collection, processing and policy options evaluated in Parts II through VI. Sources include both the Institute of Local Self-Reliance (or ILSR - an aging reference but well-known by most recyclers) and the Northeast Recycling Council (NERC).

As presented below, the direct job creation potential for the waste diversion options evaluated in this Study may range from about 75 to 200 state-wide. Additional jobs would be generated through related brokering, hauling (except for the DOC option), manufacturing, reuse or remanufacturing industries.

[105] In 2008, the American Solar Energy Society estimated that the recycling, reuse and remanufacturing industry in Colorado generated $9.1M revenues and supported 8,800 directly related jobs (it is estimated that as many as 11,000 additional jobs are supported by this industry in the state).

[106] In 2010, the Tellus Institute and Sound Resource Management identified the generation of 0.1 FTE U.S. job for every 1,000 tons of solid waste disposed - and 2.0FTEs for every 1,000 tons of processed recyclables.

TABLE 27-3 ESTIMATED JOB CREATION FROM WASTE DIVERSION ACTIVITIES

WASTE DIVERSION OPTION	DIVERSION ESTIMATE (tpy)	ILSR ESTIMATE[a]	NERC ESTIMATE[b]
Local Drop-Off Center	<1,000 to 3,000	NA	0 to 6
School Recycling	<1,000	NA	0
Multi-Family Unit Recycling	<1,000	NA	0
Materials Recovery Facility	7,000 to 18,000 66,000 to 177,000 state-wide	0 to18 66 to 177	4 to 11 41 to 109
Yard/Wood Waste Composting Facility	1,000 to 4,000 37,000 to 73,000 state-wide	0 15 to 29	0 34 to 67
Mobile Equipment[c]	4,000 to 11,000 12,000 to 38,000 state-wide	NA NA	0 to 1 0 to13
Expanded WDEQ Functions	1.5 FTE per Section 21.0	NA	NA

[a] Institute of Local Self-Reliance, 1997

[b] Northeast Recycling Council "Recycling Economic Information Study Update: Delaware Maine, Massachusetts, New York and Pennsylvania", DES Environmental Services, 2009

[c] Based on NERC estimates for pavement mix producers, compost/miscellaneous organics producers and rubber product manufacturers

27.4 Recommended Next Steps for Implementation of Study Findings

1. Take the Wyoming Statewide Study of Waste Diversion Findings "On the Road" - WDEQ has made a sound investment in the Study and, in so doing, has laid the foundation for prioritizing waste diversion for Wyoming. WDEQ should use this Study to encourage communities, public officials, solid waste managers, non-profits and private companies in every corner of the state to turn the "talk" into action. To do this, WDEQ should:
   - Hold conference-type meetings in at least every RPA during the last half of 2012
   - Share the Study findings & encourage dialogue about what resources are needed to implement options at the local & regional level
   - Break-out groups should discuss how to develop/expand regional systems
   - Specific discussion should focus on potential legislation - these meetings should seek to build a strong group of advocates willing to work on a waste diversion bill, and build support within industry, local & state government

2. Pursue Legislation to Kick-Off Wyoming's Commitment to Waste Diversion - this legislation should include:
   - Funding source (state tip fee surcharge & others) to support a state waste diversion grant program of at least $1.5M/year in 2015$ (if a surcharge is implemented, payment can be tied to data reporting below)
   - Create structure for disposal & diversion facilities to report quantities annually

- Addition of at least 1.5 FTEs dedicated to waste diversion activities within WDEQ - ideally, the legislation would also include a small budget for WDEQ staff to travel regularly throughout the state, to support a modest state-wide public outreach campaign & provide some level of support to one or two regional pilot projects
- Optional - state diversion goal (which would be supported by collected data)

WDEQ, WSWRA & all other stakeholders should begin strategizing how to organize their support, craft bill language & find legislative sponsors as early as late 2012. The target effective date for this legislation should be no later than January 2015.

3. Develop Waste Diversion Strategies Within Both WDEQ & WSWRA - WDEQ will need to make a convincing argument around job descriptions for the new FTEs as well as any waste diversion budget & grant program. WSWRA (which has already begun discussion on how to create a specific waste diversion focus) needs to make any organizational changes needed & create support amongst its diversion members. It is likely that WSWRA will present a small, core group of advocates initially - their ability to increase their membership & leverage outside the public sector may take longer to achieve.

4. Develop State-Wide Outreach Campaign - this could be performed primarily by WDEQ & WSWRA and should include at a minimum a Wyoming-specific waste diversion brand, two to three focused messages & a diversion-specific website. These should be widely distributed by WDEQ & WSWRA - local programs should be encouraged to adopt & use them liberally as well. They should be used to identify diversion as a priority state-wide & generally raise awareness of the general public.

5. Identify Regional Waste Diversion Pilot Projects - WDEQ & WSWRA should identify one or two projects that exemplify regional collaboration. This support can be in the form of;
   - Facilitating discussion around future projects - such as the creation/expansion of an H&S collection system, the feasibility of a new regional processing facility, etc.
   - Facilitating regional conversations with brokers & markets - around the ability to maximize revenues through minimum material quantity & quality
   - Providing assistance with calculating performance metrics
   - Rewarding regional efforts
   - Reporting progress & success to other programs

27.5 Conclusion

Moving Wyoming from its current, decentralized diversion approach that functions only at the local level to one that has state-wide leadership and consistency will take serious effort. This Study found, however, that the state's local governments and non-profits are hungry for the chance to grow their programs and move away from a disposal focus. It also observed that the bottom line economics of jobs support diversion over disposal. Therefore WDEQ and WSWRA should begin immediately to review, consider and implement the recommended next steps for implementation of the Study findings.