Solid Waste Management Plan for Lincoln and Lancaster County

Solid Waste Plan 2040

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CITY OF LINCOLN NEBRASKA

LANCASTER COUNTY NEBRASKA

HDR

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SOLID WASTE MANAGEMENT PLAN
FOR
LINCOLN AND LANCASTER COUNTY

City of Lincoln, Nebraska

November 2013

Prepared by the
City of Lincoln

With assistance from
HDR Engineering, Inc.

Printed on Recycled Paper

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ACKNOWLEDGEMENTS

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SOLID WASTE PLAN 2040 - SUMMARY

The Solid Waste Plan 2040 for Lincoln and Lancaster County ("Solid Waste Plan 2040" or the "Plan") was prepared as a guidance document, communication tool, and a resource for policy decisions regarding solid waste management systems, facilities and programs for the City of Lincoln (City) and Lancaster County.

The planning process included the following:

1. the appointment of an Advisory Committee by the Mayor;
2. an evaluation of existing solid waste practices and a projection of future needs;
3. an evaluation of solid waste management programs and alternatives;
4. the development of strategy options/alternatives for further evaluation; and
5. the development of recommendations by the Advisory Committee to guide future solid waste systems, facilities, and programs.

The recommendations will move the current solid waste management system toward a more comprehensive and integrated strategy and reduced quantities of solid waste going to disposal in landfills. The recommendations are based on a hierarchy of solid waste management practices and guiding principles established in the planning process.

S.1 Purpose and Background

In October 2011 the development of a comprehensive, integrated solid waste management plan was identified as a strategy in the Lincoln-Lancaster County 2040 Comprehensive Plan (LPlan 2040). In fulfillment of that strategy, the City's Public Works and Utilities Department and the Lincoln-Lancaster County Health Department (LLCHD) facilitated the development of the Solid Waste Plan 2040 with technical support from the solid waste consulting specialty firm of HDR Engineering, Inc. (HDR).

As part of the process to create the Solid Waste Plan 2040, the Mayor appointed an Advisory Committee comprised of a broad cross-section of community leaders; their names are listed in the Acknowledgements section. The Advisory Committee met monthly from June 2012 through November 2013. During those meetings they reviewed the components of the Plan, provided guidance and feedback, evaluated community inputs, and provided the recommendations included in the Plan.

S.2 Public Involvement

From the beginning of the planning process the public was invited to participate and provide comments. All Advisory Committee meetings were open to the public and included time for public comment. All documents distributed to the Advisory Committee were made available to the public. The planning process included numerous opportunities and means for public participation and involvement. Public outreach was an ongoing activity throughout the planning process and involved a wide array of communication tools. In-person and on-line Open House Meetings were held at the following key milestones in the planning process:

- Needs Assessment
  - Open House - November 13, 2012
  - On-Line Town Hall Meeting - November 6 to November 20, 2012
- System Definition
  - Open House - August 13, 2013
  - On-Line Town Hall Meeting - August 6 to August 20, 2013

Community outreach, public involvement, and public comments are further described in Section 5.

S.3 Vision, Guiding Principles, and Goals

An initial part of the planning process was to establish a vision statement with guiding principles and plan goals (Vision, Guiding Principles and Goals); these served as overarching guidance for the Advisory Committee and the development of the Plan. The Vision Statement and Guiding Principles were developed to complement similar statements in the LPlan 2040. The Vision Statement read:

> "Solid Waste Plan 2040 acknowledges and will reflect the core promise embedded in LPlan 2040; that being a commitment to 'maintain and enhance the health, safety and welfare of our community during times of change, to promote our ideals and values as changes occur, and to meet the needs of today without sacrificing the ability of future generations to meet their needs.' The Solid Waste Plan 2040 will also reflect the 'importance and interconnectedness of the economic, environmental, and socio-cultural domains, and the ways in which technology and public policy are applied and affect outcomes of these domains' as is likewise stated in the LPlan 2040 Vision."

The guiding principles and goals are included in Section 1.3.1 of the Plan.

S.4 Needs Assessment

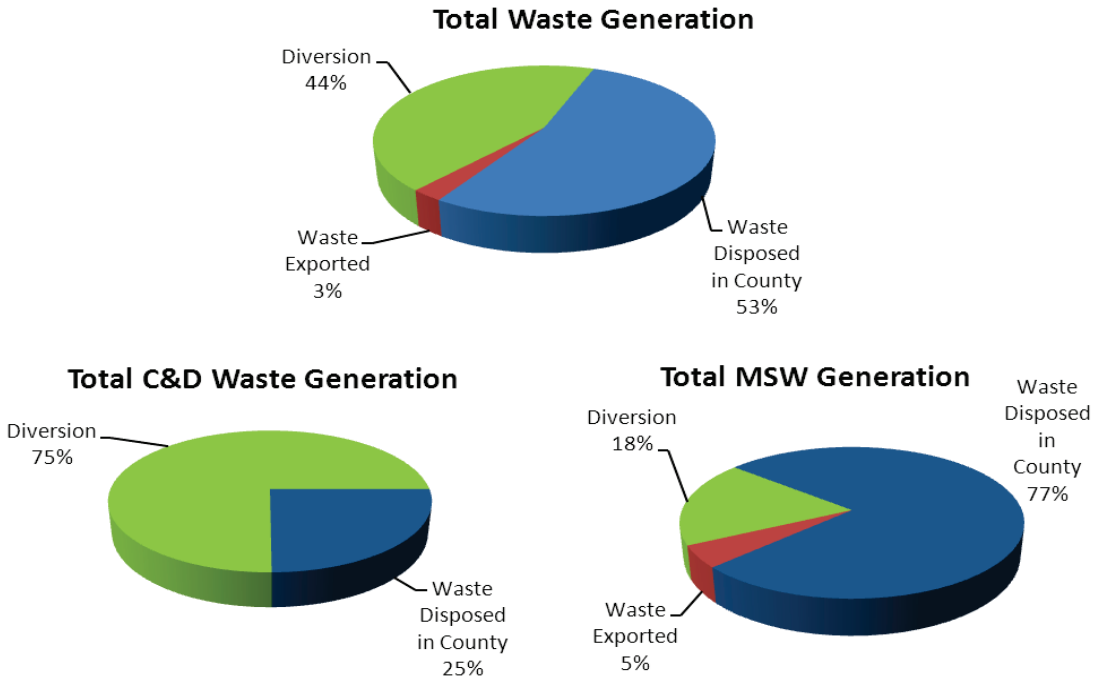
A random Baseline Assessment/Survey of over 400 Lincoln residents was conducted in August 2012 to provide a quantitative assessment of public opinion on: garbage collection, residential recycling, management of yard waste, household hazardous waste collections, and satisfaction levels regarding various solid waste management services and current costs for services. As shown in Figure S-1, there is strong interest in having residential recycling services as part of garbage service. (See Appendix D5 for complete survey results.)

Figure S-1 – Baseline Assessment/ Survey Response to Questions 2d

A Needs Assessment was completed in November 2012 to identify the current (baseline) conditions for solid waste management in Lincoln and Lancaster County. The Needs Assessment addressed the volumes and types of waste being generated, the existing waste management practices, and future needs. Figure S-2 summarizes waste disposal and waste diversion data for the Planning Area for 2011. (The complete Needs Assessment can be found in Appendix A1 and is summarized in Section 2 of the Plan.)

The Needs Assessment established the foundation for solid waste management planning, and subsequent evaluation of system, facility and other solid waste management alternatives. Regulatory and environmental information was included to provide a broad-based perspective on existing conditions and possible future practices.

Figure S-2 – 2011 Waste Disposal and Diversion, Percentage by Weight



As shown in Figure S-2, approximately 77 percent of the generated municipal solid waste (MSW) is disposed in the City's Bluff Road Municipal Solid Waste Landfill, another 5 percent is exported to out-of-county landfills and the remaining 18 percent is diverted by reuse, recycling, and composting.

The key needs of the Planning Area, identified in the Needs Assessment, were as follows:

- Compliance with state and local laws, regulations and policies.
- Under the status quo, a new MSW landfill will be needed by 2032 prior to the end of the planning period.
- Under the status quo, a new Construction and Demolition ("C&D") Wastes landfill will be needed by 2030 prior to the end of the planning period.

- Additional mechanisms may be necessary to better collect information on types and quantities of materials being diverted and possibly on waste exports.

S.5 Solid Waste Management Alternatives and Technical Evaluations

Detailed technical papers were provided to the Advisory Committee and the public on a wide range of solid waste management topics. These were presented and discussed with the Advisory Committee. The technical papers include the following:

- Source Reduction (Definitions/Framework/Options) (Appendix B1)
- Product Stewardship (Appendix B2)
- Zero Waste (Appendix B3)
- Household Hazardous & Conditionally-Exempt Small Quantity Generator (Small Business) Hazardous Waste (Appendix B4)
- Yard Waste (Appendix B5)
- Universal, Special and Unique Wastes (Appendix B6)
- Residential Recycling and Diversion (Appendix B7)
- Commercial Recycling and Diversion (Appendix B8)
- Organic Waste Diversion (Composting) (Appendix B9)
- Construction and Demolition Materials Recycling (Appendix B10)
- Recycling Incentives (Appendix B11)
- Waste Conversion Technologies (Appendix B12)
- Municipal Solid Waste Disposal (Appendix B13)
- Bioreactor/Bio-Stabilization Technologies (Appendix B14)
- Construction and Demolition Waste Disposal (Appendix B15)
- Collection Systems (Appendix B16)
- Transfer Station and Processing Facilities (Appendix B17)
- Markets (for recovered/recycled materials) (Appendix B18)

In general, each of the technical papers followed a similar format as outlined below:

- Overview
- Current Programs
- Generation and Diversion
- Program (Facility/System) Options
- Options Evaluation
- Relationship to Guiding Principles and Goals
- Summary

Prior to the development of technical topic papers a common set of evaluation/screening criteria were developed under the following categories:

- Waste reduction/diversion
- Technical requirements
- Environmental impacts
- Economic impacts
- Implementation viability

The system, facilities, and program options presented in these technical papers were compared using the established evaluation/screening criteria. The evaluation/screening criteria are discussed in further detail in Section 3.2.

Key aspects of these technical evaluations are summarized in Section 3 of this Plan. Throughout the planning process, the Vision, Guiding Principles, and Plan Goals were displayed (along with the graphic on the Waste Management Hierarchy) at the Advisory Committee meetings to help communicate and reinforce the core values that served as the basis for the planning effort.

S.6 System Definition

Following discussion of the technical papers and various options the Advisory Committee was guided through a facilitated and structured process to identify a general direction for further evaluation of various system, facilities, and program options. The outcome of this process was the "Preferred Paths." In developing these Preferred Paths a set of options were presented to the Advisory Committee and the committee voted on the Preferred Paths. A five step process (depicted graphically below) was utilized for each of the solid waste management topics reviewed by the Advisory Committee. Table S-1 summarizes the Preferred Paths.

Table S-1 – Preferred Paths for System Definition

Option/Topic	Options Decision for System Definition
Source Reduction	Expand Programs that Lead to Greater Source Reduction.
Toxics Reduction	Expand the Toxics Reduction program and create a place to provide year round access.
Yard Waste	Maintain Status Quo (Seasonal Ban)
Residential Recycling and Diversion	Residential Curbside Recycling to be provided to all single family and duplex dwellings City wide.
Commercial Recycling and Diversion	Commercial Recycling to be provided to multi-family dwellings, businesses, industries and institutions.
Construction and Demolition Materials Recycling	Develop/Support programs to reduce the quantities of construction and demolition waste going to the City's disposal site(s).
Organic Waste Diversion (Composting)	Develop/Support programs to reduce the quantity of organics, especially food waste, going to the City's MSW disposal site.
Waste Conversion Technologies	Pursue the development of Waste Conversion Technology(ies) as a part of a long-term strategy for energy recovery and resource conservation.

Municipal Solid Waste Disposal	Expand on City-owned property to the east of the currently permitted site.
Construction and Demolition Waste Disposal	Expand on City-owned property.
Bioreactor/Bio-Stabilization Technologies	No further consideration is given in the System Definition to pursuing the development of a bioreactor/bio-stabilization technology.
Transfer Station and Processing Facilities	Develop a municipal solid waste Transfer Station if a feasibility study shows it can be cost effective.

Notes from System Definition:

1. The term "provided" was explained in the meeting as meaning "Universally Available" which was further defined as being mandatory that recycling services be provided to all single family and duplex dwellings but resident participation would be voluntary.
2. The term "provided" was explained in the meeting as meaning "provided by ordinance" which would mean it would be mandatory that it be provided to all multi-family dwellings, businesses, industries and institutions either as hauler provided or building owner/operator provided.

The resulting Preferred Paths were then used in developing the System Definition (summarized in Section 4). The System Definition was developed to serve as the basis for the development of the Solid Waste Plan 2040 and combines information on existing solid waste management programs and program options considered for managing solid waste in the future. Based on the Preferred Paths three system scenarios were created to illustrate potential landfill diversion rates associated with components of the integrated waste management strategies. These three system scenarios reflected different levels of waste diversion and resource recovery strategies as well as short- and long-term program options. The System Definition describes programs that would move the integrated solid waste management system from current levels of waste diversion and existing disposal practices toward greater resource conservation, waste reduction, waste diversion and resource recovery efforts. The System Definition also included information on the following:

- Strategies
- Qualitative/Quantitative Goals
- Benefits
- Cost Considerations
- Capital Costs
- Operating Costs
- Funding
- Diversion

Prior to the Advisory Committee formulating Plan recommendations, the System Definition was provided to the public, and Open House and Virtual Town Hall meetings were conducted to allow for public input on key topics. The results of the public comments are provided in Appendix D6.

Following the review of all public comments received throughout the planning process, the Advisory Committee met and formulated recommendations for future solid waste management in Lincoln and Lancaster County.

S.7 Advisory Committee Recommendations

The Advisory Committee developed specific recommendations on solid waste management in two phases. The first was in the facilitated process described above to develop the Preferred Paths. The Committee Chair led the second phase of the process in which the Advisory Committee was asked to suggest recommendations and these were discussed and voted on. The following is a list of recommendations that were approved by the Advisory Committee. In addition, a complete list of recommendations offered and/or discussed by the Advisory Committee is provided in Appendix E.

- **Overall Waste Reduction and Recycling Goal**
  - Reduce the per capita rate of municipal solid waste disposed of in landfills to:
    - 1,940 pounds per capita per year by 2018
    - 1,720 pounds per capita per year by 2025
    - 1,510 pounds per capita per year by 2040

    Metric: 2011 rate is 2,150 pounds per capita per year. This is calculated by dividing the total municipal solid waste sent to disposal in landfills (from Lincoln and Lancaster County) by the current Lancaster County population (estimates prepared by the City's Planning Department). The recommended goal should be revisited and adjusted in 2015 and every five (5) years thereafter.
- **Source Reduction**
  - Expand programs that lead to greater source reduction.
- **Toxics Reduction**
  - Expand the toxics reduction program and create a place to provide year round access.
- **Yard Waste**
  - Maintain the status quo (seasonal ban on grass and leaves).
- **Residential Recycling**
  - Residential curbside recycling to be provided to all single family and duplex dwellings City-wide.
    - The preferred path would require (mandate by ordinance) that curbside collection of recyclables be provided to all single family and duplex dwellings. All single family and duplex residential dwellings would receive recyclables collection service but resident participation would be voluntary (e.g., they would not be required/mandated to recycle).
- **Commercial Recycling**
  - Commercial recycling to be provided to multi-family dwellings, businesses, industries and institutions.
    - The preferred path would require (mandate by ordinance) that collection of recyclables be provided to all multi-family dwellings, businesses, industries and institutions. All multi-family dwellings, businesses, industries and institutions would receive recyclables

collection service but their participation would be voluntary (e.g., they would not be required/mandated to recycle).

- **Construction and Demolition Materials Recycling**
  - Develop/Support programs to reduce the quantities of construction and demolition waste going to the City's disposal site(s).
- **Organic Waste Diversion (Composting)**
  - Develop/Support programs to reduce the quantity of organics, especially food waste, going to the City's MSW disposal site.
- **Waste Conversion Technologies**
  - Pursue the development of Waste Conversion Technologies as a part of a long-term strategy for energy recovery and resource conservation.
- **Municipal Solid Waste Disposal**
  - Expand on City-owned property to the east of the currently permitted site.
- **Construction and Demolition Waste Disposal**
  - Expand on City property.
    - When additional construction and demolition waste disposal area is required the C & D landfill should be expanded to the south of the current landfill within the North 48th Street Facility. Expansion space may also be available south of the currently permitted Bluff Road disposal area.
- **Transfer Station and Processing Facilities**
  - Develop a municipal solid waste Transfer Station if a feasibility study shows it can be cost effective.
  - The City of Lincoln is encouraged to locate and secure a site for the construction of a second transfer station if supported by a feasibility study.
- **Eco-Park**
  - The City of Lincoln is encouraged to establish an "Eco-Park" at either the existing North transfer station or a future Transfer Station if supported by a feasibility study. The "Eco-Park" could be a permanent facility for the collection and storage of HHW. It could also be a one-stop shop for the recycling, repurposing and disposal of items that one may collect when selling a house, cleaning a garage, or engaging in a remodeling project. The "Eco-Park" could include drop-off facilities for the recycling of traditional recyclables (glass, plastic, paper, metal) but also for the recycling/repurposing of wood, yard waste, clothing, used construction materials, appliances, latex paint, and electronics).
- **Education/Behavior Change**
  - Targeted educational programming be developed dealing with each Preferred Path Recommendation.
  - A financial commitment be made by the City to provide staffing and resources to educate individuals and businesses as part of the implementation of the plan recommendations.

- **Data and Reporting**
  - The city and county should collect data relevant to the effectiveness of each preferred path and should use the data to analyze adjustments in the goals set by this committee.
  - A reporting system should be created and adopted to measure recycling rates. Reporting should be required by ordinance, said reports should occur on an annual basis and should be required as part of operating a recycling service.
  - The City should gather data related to each of the preferred paths. This data can be based on record keeping, experience, or other sources and would be used as part the periodic reviews of the Solid Waste Management Plan.
  - The City should collect additional data on C&D waste, recycling, and diversion rates and the amounts disposed of in the City of Lincoln.

S.8 Implementation Process

The process of implementing the Solid Waste Plan 2040 recommendations will require working closely with elected and appointed officials, recyclers, waste haulers, regulated businesses and the community as a whole. Specific implementation actions may include:

- Educating users of the system and promoting the programs and goals of the Solid Waste Plan 2040.
- Communicating with residents, businesses, and stakeholders.
- Executing cooperative agreements or arrangements between units of government or private entities.
- Performing additional studies or evaluation.
- Changing laws, regulations and ordinances.
- Monitoring and enforcing laws, regulations, ordinances and policies.

S.9 Monitoring Mechanism and Updates

The Advisory Committee made several recommendations on data collection and monitoring. In addition, there are many things that affect estimates of future diversion including: specific program elements, costs, participation levels, public education and implementation timing. For the effective realization of the recommendations in the Solid Waste Plan 2040 it will be necessary to monitor the selected systems, facilities and programs as they are implemented to assess their effectiveness and make appropriate modifications to this plan.

In order to monitor the implementation of the Solid Waste Plan 2040, the following actions are recommended:

Annual

- Annually update and report on the progress achieved in the prior year toward achieving the Solid Waste Plan 2040's recommendations.

Two-year

- As part of the biennial budgeting process identify priority systems, facilities and program changes anticipated in the next 2 years.

Five-year

- As major changes occur, review the Solid Waste Plan 2040 and modify the Plan to reflect changes in recommendations, action items and timetables.

Section 1 – Introduction

The Solid Waste Plan 2040 for Lincoln and Lancaster County ("Solid Waste Plan 2040" or the "Plan") was prepared as a guidance document, communication tool, and a resource for policy decisions regarding solid waste management systems, facilities and programs for the City of Lincoln (City) and Lancaster County. This solid waste management plan was developed through input from the Advisory Committee, the public, the City's project management team, and the consultant.

1.1 Purpose and Background

In October 2011 the development of a comprehensive, integrated solid waste management plan was identified as a strategy in the Lincoln-Lancaster County 2040 Comprehensive Plan (LPlan 2040). In fulfillment of that strategy, representatives of the City's Public Works and Utilities Department, the Lincoln-Lancaster County Health Department (LLCHD), Lincoln-Lancaster County Planning Department and the Mayor's office formed a project management team to facilitate the development of the Solid Waste Plan 2040. The management team retained technical support and public involvement services from the solid waste consulting specialty firm of HDR Engineering, Inc. (HDR). The consultant researched and prepared technical papers/documents and presentations at the request of the management team and provided a professional facilitator to help with certain aspects of the Advisory Committee meetings. The management team reviewed and contributed to the production of technical papers/documents. They also made presentations and provided available, current and historic data for inclusion in the technical documents. The management team further helped: organize Advisory Committee meetings; created, maintained and updated the website; created documents for and coordinated public outreach; and, assisted in answering questions posed by the Advisory Committee.

As part of the process to create the Solid Waste Plan 2040, the Mayor appointed an Advisory Committee comprised of a broad cross-section of community leaders; their names are listed in the Acknowledgements section. The Advisory Committee met monthly from June 2012 through November 2013. During those meetings they reviewed: background information on existing and historic practices; technical documents; discussed components of the Plan; provided guidance and feedback; evaluated community inputs; and provided recommendations included in the Plan.

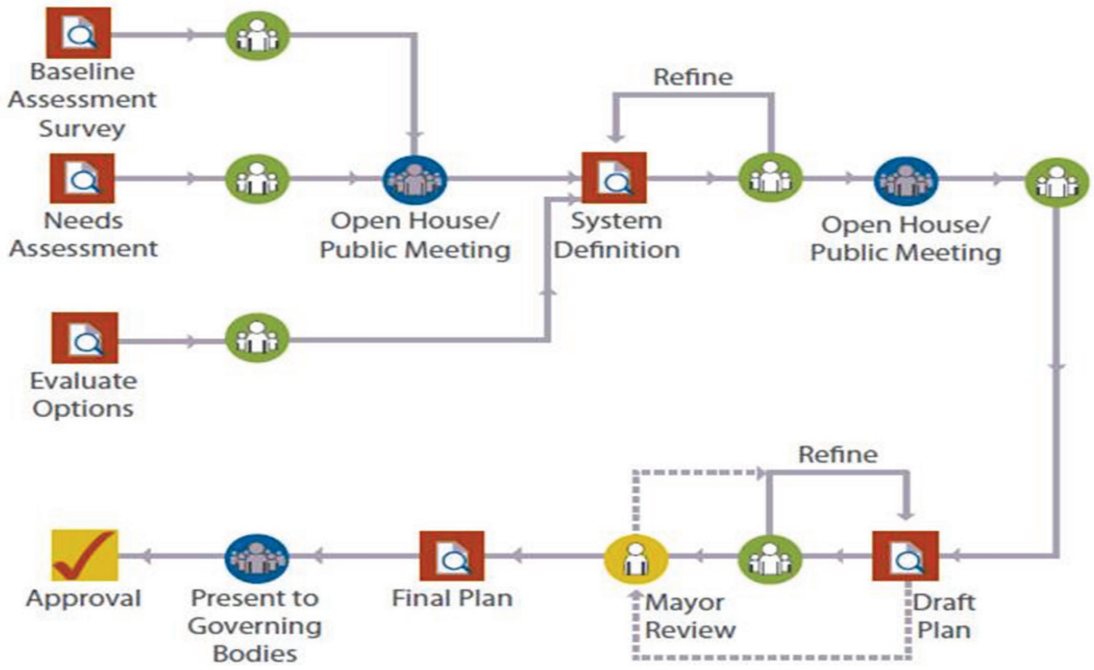
The planning process for Solid Waste Plan 2040 included numerous opportunities for public participation and involvement. Public outreach was an ongoing activity throughout the planning process and involved a wide array of communication tools. The public provided input to the Advisory Committee through participation in committee meetings, through surveys, via various avenues for comments, and at milestone meetings in the planning process.

The planning process included a summarization of existing solid waste practices and projection of future needs, an evaluation of solid waste management programs and alternatives, the development of strategy options/alternatives for further evaluation, and development of recommendations, which make up the this Plan. Figure 1-1 illustrates

the process used to develop the Solid Waste Plan 2040. Section 6 of this Solid Waste Plan 2040 includes general and specific recommendations developed by the Advisory Committee to guide future solid waste systems, facilities, and programs.

The recommendations will progressively move the current solid waste management system toward a more comprehensive and integrated strategy and reduced quantities of solid waste going to disposal in landfills. The recommendations are based on a hierarchy of solid waste management practices and guiding principles established in the planning process.

Figure 1-1 – Planning Process Diagram



1.1.1 Solid Waste Types Managed

Solid Waste, commonly known as refuse, garbage, trash and junk includes the following:

- Municipal Solid Waste (MSW)
  - From residential sources
  - From commercial (business, industrial, and institutional) sources
- Construction and Demolition ("C&D") Wastes
- Recycled and composted materials
- Other waste including:
  - Household hazardous waste (HHW)
  - Hazardous waste from small businesses (small quantity generators)
  - Waste needing special handling
  - Waste banned from disposal in City landfills

For planning purposes, MSW and C&D waste are assumed to include recyclable materials, yard waste and wood waste, and similar materials currently being diverted from disposal.

1.2 Public Involvement

From the beginning of the planning process the public was invited to participate and provide comments. All Advisory Committee meetings were open to the public and included time for public comment. All documents distributed to the Advisory Committee were made available to the public. The planning process included numerous opportunities and means for public participation and involvement. Public outreach was an ongoing activity throughout the planning process and involved a wide array of communication tools. In-person and on-line Open House Meetings were held at the following key milestones in the planning process:

- Needs Assessment
    - Open House - November 13, 2012
    - On-Line Town Hall Meeting November 6 to November 20, 2012
- System Definition
    - Open House - August 13, 2013
    - On-Line Town Hall Meeting August 6 to August 20, 2013

Community outreach, public involvement, and public comments are further described in Section 5 of the Plan.

1.3 Advisory Committee

As part of the process to create the Solid Waste Plan 2040, the Mayor appointed an Advisory Committee comprised of a broad cross-section of community leaders; their names are listed in the Acknowledgements section. The Advisory Committee reviewed the components of the Plan, evaluated community inputs, provided guidance and feedback, and proposed changes appropriate for inclusion in plan. The Advisory Committee was charged with:

- Reflecting input from the community and stakeholders on topics such as resource conservation, waste prevention, waste diversion, material reuse, recycling, energy recovery from waste, and land disposal of wastes;
- Providing input that reflected the unique nature of the communities in Lincoln and Lancaster County and their commitment to quality of life, investments, ideas, values, and partnerships;
- Reviewing waste management strategies based on criteria related to protection of the public health, risk for environmental impacts, conservation and preservation of resources, and economic and social benefits;
- Ensuring transparent decision making; and,
- Ensuring the final Plan complemented other relevant City and County planning initiatives, including the most current Lincoln-Lancaster County 2040 Comprehensive Plan (LPlan 2040) and the Sustainable Lincoln plan.

The Advisory Committee met 17 times as noted below. Each of these meetings included an agenda, (copies in Appendix D1) that was public noticed; presentations, that were made available to the public via the project website (copies in Appendix D1); meeting notes (copies in Appendix D1); and, other meeting materials (copies in Appendix D1) and technical papers (copies included in Appendices A, B and C). All meetings were open to the public and included opportunities for public input; public comments at these meetings were included in the meeting notes (copies in Appendix D1).

Advisory Committee Meeting Dates:

- June 13, 2012
- July 10, 2012
- August 14, 2012
- September 11, 2012
- October 9, 2012
- November 13, 2012
- December 11, 2012
- February 12, 2013
- March 12, 2013
- April 9, 2013
- May 14, 2013
- June 25, 2013
- July 9, 2013
- August 27, 2013
- September 10, 2013
- October 8, 2013
- November 5, 2013

1.3.1 Vision, Guiding Principles, and Plan Goals

An initial part of the planning process was to establish a vision statement with guiding principles and plan goals (Vision, Guiding Principles and Goals); these serve as overarching guidance for the Advisory Committee and the development of the Plan. The Vision Statement and Guiding Principles were developed to complement similar statements in the LPlan 2040, Lincoln and Lancaster County's long range land use plan. The Vision Statement read:

> "Solid Waste Plan 2040 acknowledges and will reflect the core promise embedded in LP2040; that being a commitment to 'maintain and enhance the health, safety and welfare of our community during times of change, to promote our ideals and values as changes occur, and to meet the needs of today without sacrificing the ability of future generations to meet their needs.' The Solid Waste Plan 2040 will also reflect the 'importance and interconnectedness of the economic, environmental, and socio-cultural domains, and the ways in which technology and public policy are applied and affect outcomes of these domains' as is likewise stated in the LPlan 2040 Vision."

The guiding principles and goals are listed below.

The LPlan 2040 has two main Guiding Principles, presented below, relative to solid waste management. The two principles provided a broad framework for the Solid Waste Plan 2040.

LPlan 2040 Guiding Principle:

"The City policy of privately owned and operated collection of refuse and recyclables coupled with public ownership, operation and financing of disposal and select integrated solid waste management services will continue during the planning period"

LPlan 2040 Guiding Principle:

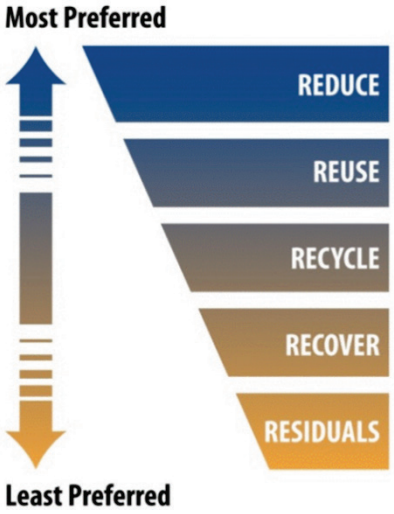
"No out-of-county waste is accepted for landfill disposal. This policy reserves landfill capacity for city and county residents and allow administration of programs under existing authorities"

In addition, five Guiding Principles were identified specific to the Solid Waste Plan 2040. With each of these principles, Plan Goals were created. The Plan Goals established a structure from which measurable objectives could be developed. The Plan Goals are associated with five Guiding Principles established for the Solid Waste Plan 2040:

- engage the **COMMUNITY**
- encourage **PUBLIC-PRIVATE PARTNERSHIPS**
- ensure sufficient **SYSTEM CAPACITY**
- emphasize the **WASTE MANAGEMENT HIERARCHY**
- embrace **SUSTAINABLE PRINCIPLES**

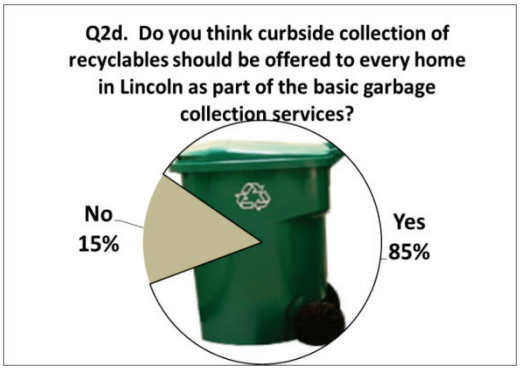
Periodically, throughout the planning process, the Vision, Guiding Principles, and Plan Goals were displayed (along with the graphic on the Waste Management Hierarchy – Figure 1-2) at the Advisory Committee meetings to help communicate and reinforce the core values that would serve as the basis for the planning effort.

Figure 1-2 – Waste Management Hierarchy



1.3.2 Needs Assessment and Baseline Assessment/Survey

A random Baseline Assessment/Survey (included in Appendix D5) of over 400 Lincoln residents was conducted in August 2010 to provide a quantitative assessment of public opinion on: garbage collection, residential recycling, management of yard waste, household hazardous waste collections, and satisfaction levels regarding various solid waste management services and current costs for services.



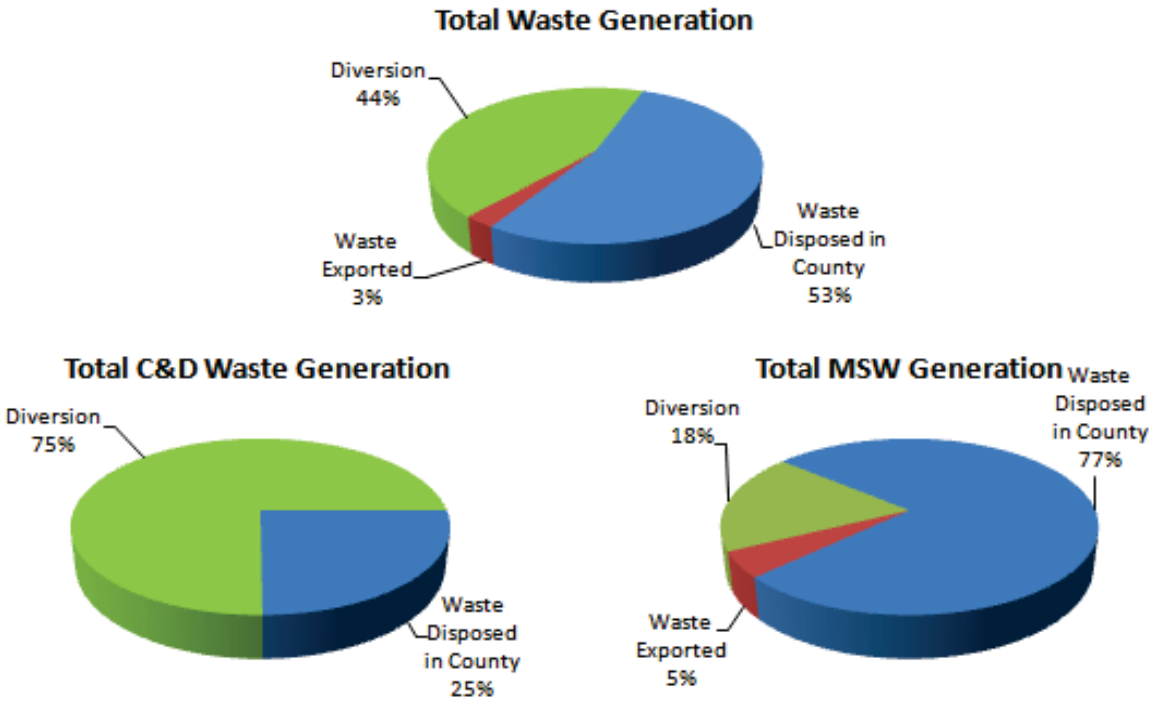
A Needs Assessment was completed in November 2012 to identify the current (baseline) conditions for solid waste management in Lincoln and Lancaster County (the

"Planning Area"). The Needs Assessment addressed the volumes and types of waste being generated, the existing waste management practices, and future needs.

Figure 1-3 summarizes waste disposal and waste diversion data for the Planning Area for 2011. (The complete Needs Assessment can be found in Appendix A1 and is summarized in Section 2 of the Plan.)

The Needs Assessment established the foundation for solid waste management planning, and subsequent evaluation of system, facility and other solid waste management alternatives. Regulatory and environmental information was included to provide a broad-based perspective on existing conditions and possible future practices.

Figure 1-3 – 2011 Waste Disposal and Diversion, Percentage by Weight



As shown in Figure 1-3, approximately 77 percent of the generated municipal solid waste (MSW) is disposed in the City's Bluff Road Municipal Solid Waste Landfill, another 5 percent is exported to out-of-county landfills and the remaining 18 percent is diverted by reuse, recycling, and composting.

The key needs of the Planning Area, identified in the Needs Assessment, were as follows:

- Compliance with state and local laws, regulations and policies.
- Under the status quo, a new MSW landfill will be needed by 2032, prior to the end of the planning period.
- Under the status quo, a new C&D landfill will be needed by 2030, prior to the end of the planning period.

- Additional mechanisms may be necessary to better collect information on types and quantities of materials being diverted and possibly on waste exports.

1.3.3 Solid Waste Management Alternatives and Technical Evaluations

To prepare this Plan, supplemental analyses were completed. Technical evaluations were prepared by the City's Management Team and HDR Engineering, Inc. ("HDR") using input from the Advisory Committee and data collected from a wide variety of sources. Detailed technical papers were provided to the Advisory Committee and the public on a wide range of solid waste management topics. These were presented and discussed with the Advisory Committee. The technical papers focused on specific topics relevant to current and future needs of the Planning Area. The technical papers include the following:

- Source Reduction (Definitions/Framework/Options) (Appendix B1)
- Product Stewardship (Appendix B2)
- Zero Waste (Appendix B3)
- Household Hazardous & Conditionally-Exempt Small Quantity Generator (Small Business) Hazardous Waste (Appendix B4)
- Yard Waste (Appendix B5)
- Universal, Special and Unique Wastes (Appendix B6)
- Residential Recycling and Diversion (Appendix B7)
- Commercial Recycling and Diversion (Appendix B8)
- Organic Waste Diversion (Composting) (Appendix B9)
- Construction and Demolition Materials Recycling (Appendix B10)
- Recycling Incentives (Appendix B11)
- Waste Conversion Technologies (Appendix B12)
- Municipal Solid Waste Disposal (Appendix B13)
- Bioreactor/Bio-Stabilization Technologies (Appendix B14)
- Construction and Demolition Waste Disposal (Appendix B15)
- Collection Systems (Appendix B16)
- Transfer Station and Processing Facilities (Appendix B17)
- Markets (for recovered/recycled materials) (Appendix B18)

The system/facilities/program options presented in these technical papers were compared using established evaluation/screening criteria. Prior to the development of technical topic papers a common set of evaluation/screening criteria were developed under the following categories:

- Waste reduction/diversion
- Technical requirements
- Environmental impacts
- Economic impacts
- Implementation viability

The system, facilities, and program options presented in these technical papers were compared using the established evaluation/screening criteria. The evaluation/screening criteria are discussed in further detail in Section 3.2.

1.3.4 System Definition

Following discussion of the technical papers and various options the Advisory Committee was guided through a facilitated and structured process to identify a general direction for further evaluation of various system, facilities, and program options. The outcome of this process was the "Preferred Paths". In developing these preferred paths a set of options were presented to the Advisory Committee and the committee voted on the Preferred Paths. A five step process (depicted graphically in Figure 1-4) was utilized for each of the solid waste management topics reviewed by the Advisory Committee. The resulting preferred paths were then used in developing the System Definition (summarized in Section 4).

Figure 1-4 – Process to Establish Preferred Paths

The System Definition served as the basis for the development of the Solid Waste Plan 2040 and combined information on existing solid waste management programs and program options considered for managing solid waste in the future. Based on the preferred paths three system scenarios were created to illustrate potential landfill diversion rates (see Table 4-1 in Section 4) associated with components of integrated waste management strategies. These three system scenarios reflected different levels of waste diversion and resource recovery strategies as well as short- and long-term program options. The System Definition described programs that would move the integrated solid waste management system from current levels of waste diversion and existing disposal practices toward greater resource conservation, waste reduction, waste diversion and resource recovery efforts. The System Definition also included information on the following:

- Strategies
- Qualitative/Quantitative Goals
- Benefits
- Cost Considerations
- Capital Costs
- Operating Costs
- Funding
- Diversion

Prior to the Advisory Committee formulating Plan recommendations the System Definition was provided to the public, and Open House and Virtual Town Hall meetings

were conducted to allow for public input on key topics. The results of the public comments are provided in Appendix D6.

Following the review of all public comments received throughout the planning process, the Advisory Committee met and formulated recommendations for future solid waste management in Lincoln and Lancaster County. These recommendations are included in Section 6.

1.3.5 Implementation Process

The process of implementing the Solid Waste Plan 2040 recommendations will require working closely with elected and appointed officials, recyclers, waste haulers, regulated businesses and the community as a whole. Specific implementation actions may include:

- Educating users of the system and promoting the programs and goals of the Solid Waste Plan 2040.
- Communicating with residents, businesses, and stakeholders.
- Executing cooperative agreements or arrangements between units of government or private entities.
- Performing additional studies or evaluation.
- Changing laws, regulations and ordinances.
- Monitoring and enforcing laws, regulations, ordinances and policies.

There are arrays of variables that affect estimates of future diversion, including: specific program elements, costs, participation levels, public education and implementation timing. Therefore, it will be necessary to monitor systems, facilities and programs as they are implemented to assess their effectiveness and make appropriate modifications. For the effective realization of actions recommended in the Solid Waste Plan 2040 it will be necessary to monitor the selected systems, facilities and programs as they are implemented to assess their effectiveness and make appropriate modifications to this plan. Section 6 further discusses monitoring mechanisms and updates.

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Section 2 – System Evaluation and Needs Assessment

A random Baseline Assessment/Survey of over 400 Lincoln residents was conducted in August 2012 to provide a quantitative assessment of public opinion on: garbage collection, residential recycling, management of yard waste, household hazardous waste collections, and satisfaction levels regarding various solid waste management services and current costs for services. (See Appendix D5 for complete survey results.)

A Needs Assessment was completed in November 2012 to identify the current (baseline) conditions for solid waste management in Lincoln and Lancaster County. The Needs Assessment addressed the volumes and types of waste being generated, the existing waste management practices, and the future needs. (The complete Needs Assessment can be found in Appendix A1)

The Needs Assessment established the foundation for solid waste management planning, and subsequent evaluation of system, facility and other solid waste management alternatives. Regulatory and environmental information was included to provide a broad-based perspective on existing conditions and possible future practices.

2.1 Purpose

The purpose of the Needs Assessment was to assist the City of Lincoln (City) and Lancaster County (County) (collectively City-County) in assessing their existing solid waste management systems, facilities, programs and planning for future needs in the Planning Area. The information and projections presented in the Needs Assessment were prepared to establish a basis for the development of the long-term, comprehensive, integrated solid waste management plan – the Solid Waste Plan 2040.

2.1.1 Needs Assessment Contents

To achieve the planning objective, it was necessary to compile and update data available on the existing solid waste management systems, facilities and programs and to project the types and quantities of waste that need to be managed in the future. The Needs Assessment document is divided into five sections.

Section 1 – Introduction describes the regulatory and planning background, and guiding principles.

Section 2 – Planning Area describes the various demographic and geographic data sources for the City-County. The population data include projections that are used to help identify and project future solid waste quantities.

Section 3 – Current Waste Management Practices describes current waste management practices, including the collection, transportation, waste diversion/ reduction, and disposal of solid waste generated in the City-County.

Section 4 – Generation and Composition presents waste generation and compositional data and establishes relationships and the methodology used to estimate future waste quantities.

Section 5 – Future Management and Disposal Needs presents waste quantity projections and addresses such topics as (landfill) waste disposal capacity, facility needs, management programs, regulatory/permit requirements, and related systems, facilities and program management needs.

2.2 Planning Area

The solid waste Planning Area is Lancaster County; but because most of the population resides in the City of Lincoln, the majority of the systems evaluation focused on the City. The County has a large urbanized area with the City in its geographic center. The County covers a geographic area of approximately 847 square miles; the City has corporate limits of approximately 80 square miles.

In 2010, the U.S. Census reported that the total population of the County was 285,407. The City is the second largest community in the State of Nebraska, with a 2010 census reported population of 258,379. This represents 91 percent of the County's population. There are two other cities, ten villages and two census-designated places in the County. Population projections through 2040 were obtained from the LPlan 2040. LPlan 2040 projected growth patterns were also used to evaluate long-term solid waste needs in preparation of this Plan.

2.3 Solid Waste Management Practices

Current solid waste management practices include the following major components:

- Solid waste, lawn waste, and recyclables collection;
- Solid waste and recyclables handling facilities (transfer station, recycling centers, recycling processing centers, and composting facilities);
- Diversion programs; and,
- Disposal facilities (landfills).

The Needs Assessment also addressed regulatory and environmental information (i.e. estimated greenhouse gas emissions from the solid waste management system) to provide a broad-based perspective on existing conditions.

2.3.1 Solid Waste and Recyclables Collection Practices

Solid waste and recyclables collection in the City-County is performed by approximately forty independent, licensed waste haulers in a free-market collection system. Two villages (Roca and Firth) in the Planning Area contract with a waste hauler for solid waste collection services; three villages (Bennet, Davey and Panama) contract with a waste hauler to provide a solid waste compactor which serves as a transfer station for community residents; the remaining communities in the Planning Area have an open-subscription collection system.

Independent waste haulers generally provide a varying menu of services to residents and businesses. Optional collection services available include lawn waste collection, fall-only leaf collection, and collection of recyclable materials. Several private hauling companies provide curbside collection of recyclables on a subscription basis in Lincoln and surrounding communities. Based on the Baseline Assessment Survey conducted as part of the planning process, in 2012 an estimated 24 percent of the households in Lincoln subscribe to curbside recycling. None of the municipalities in the County provide either public or franchise curbside collection service for recyclables.

There are no reporting requirements for waste and recyclables haulers; as a result, data is not readily available on their service areas, type of services provided, type and quantity of material diverted/recycled, or the number of customers they service.

2.3.2 Waste Handling and Management Facilities

Waste handling and management facilities in the County include transfer stations, recycling processing centers, recycling centers and composting operations.

- Four transfer stations operate in the County
  - North 48th Street Transfer Station
  - Bennet Refuse Transfer Station
  - Davey Refuse Transfer Station
  - Panama Transfer Station
- Three private recycling processing centers operate in the City and accept recyclables from residential and business customers
- 36 recycling (drop-off) centers in the Planning Area
  - 29 multi-material recycling drop-off centers operated by City (8 located outside of the City)
  - 4 newspaper-only recycling drop-off centers operated by City
  - 2 multi-material recycling drop-off centers operated by two of the private recycling processing centers
  - 1 multi-material recycling drop-off center operated by Village of Hallam
- Composting facilities
  - Composting facility at Bluff Road Landfill
  - Private yard waste composting facility near Lincoln
  - Yard waste drop-off at North 48th Street Transfer Station site
  - Brush drop-off areas at Villages of Bennet, Davey, Firth, Panama and Roca; Cities of Hickman and Waverly – all but Village of Roca and City of Waverly also accept grass clippings

2.3.3 Waste Diversion Programs

Waste diversion includes waste source reduction, reuse, recycling, composting and other resource recovery techniques. Source reduction (diversion and minimization) strategies focus on conservation of resources, reduction in waste toxicity, environmental protection (of air and groundwater), reuse, and methods to increase the useful life of manufactured products. Information on existing waste diversion and minimization programs was gathered from City, County and various private companies currently

active in waste management, waste reduction and recycling programs, in the Planning Area. Programs include:

- Source reduction activities, best illustrated in the *Lincoln-Lancaster County's Official Waste Reduction & Recycling Guide* (updated annually)
- Recycling and diversion through:
  - Subscription curbside recyclables collection
  - Private buyback centers (metal cans and scrap metal)
  - Private material recovery facilities
  - Public recycling drop-off centers
  - Christmas tree grinding and mulching
  - C&D contractors diversion
- Composting
  - Public and private lawn waste composting facilities
  - Wood chip grinding
  - Private livestock composting operations
- Toxics reduction/hazardous materials management for households and small businesses
  - Community education
  - HHW collection events
  - Conditionally Exempt Small Quantity (hazardous waste) Generator (CESQG) events (two per year)
- Universal, special and unique wastes
  - LLCHD administers Special Waste permit program
  - Private and not-for profit initiatives
  - Drop-off areas for appliances, tires, automobile batteries and used oil
  - City-owned appliance de-manufacturing facility

2.3.4 Disposal Facilities

The Lincoln Municipal Code (LMC) and the City-Council by resolution have designated two public landfills for purposes of dumping and disposal of solid waste (and other offensive and obnoxious substances); these are the Bluff Road and the North 48th Street sites. The Bluff Road Landfill is permitted as a Municipal Solid Waste Disposal Area with permitted disposal area currently projected to reach capacity in 2032. The North 48th Street C&D Landfill is permitted as a Construction and Demolition Waste Disposal Area with permitted disposal area currently projected to reach capacity in approximately 2030.

A portion of the waste generated in the City and County is also transported by private waste haulers to landfills outside of the County.

The City has landfill gas (LFG) recovery and flaring operations at its Bluff Road Landfill. Construction was completed on a LFG to energy system by Lincoln Electric Service (LES) in October 2013.

2.3.5 Regulatory/Permit Requirements

Solid waste systems, facilities and programs generally fall within the regulatory requirements of Nebraska's Integrated Solid Waste Management Act (Nebr. Rev. Statutes Chapter 13, Section 13-2001 to 2043), LMC Section 8.32 - Solid Waste, and NDEQ Title 132 - Integrated Solid Waste Management Regulations and Title 129 – Nebraska Air Quality Regulation. Other rules, regulations and requirements may exist, which are specific to elements of solid waste systems, facilities and programs, such as permits associated with construction, operation, zoning, stormwater management and other aspects.

2.4 Generation and Composition

The solid waste generated from residential, commercial and industrial sources in the County increased over the last 20 years in terms of total tons generated, which is generally attributed to population growth, while the pound per capita per year (generation rate) has shown a slight decline over the same period. Since the collection of waste is handled solely by the private sector and is not subject to reporting requirements, the data used for determining waste generation in the County relied on two sources:

- The City's annual surveys of the recycling and C&D processors servicing the County and the information they voluntarily report
- Available waste disposal records from the City solid waste operations, HHW collection events and from limited waste export records.

2.4.1 Generation Rates

As shown in Table 2-1, the average MSW generation rate for the entire County over the last 10-year period is approximately 7.53 pounds per capita per day. This waste generation rate was utilized for planning projections and in conjunction with waste disposal composition data for evaluation of potential future waste reduction and diversion options. While data collected at the Bluff Road Landfill does not allow a clear distinction between residential and commercial MSW, the City utilized information on vehicle types and tonnages over the past five years and concluded that approximately one-half of the waste delivered to the Bluff Road Landfill represents residential waste (the other one-half would represent commercial waste). Using these City values, the residential generation rate was estimated equivalent to 3.77 pounds per capita per day.

Table 2-1 – Historical Solid Waste Generation Tonnage in Lancaster County

Fiscal Year	MSW Landfilled in County	MSW Exported	Recyclables/ Composted Materials Diverted	Total MSW Generation	Per Capita Generation (lbs/day)	C&D Landfilled in County	C&D Diverted	Total C&D Generation	Total MSW and C&D Generation	County Population (Mid-Yr)
01-02	265,027	32,854	58,742	356,623	7.68	88,227	373,007	461,234	817,857	254,357
02-03	275,049	27,092	65,015	367,156	7.80	78,649	367,910	446,559	813,715	257,876
03-04	282,263	29,477	65,641	377,381	7.90	98,174	314,752	412,926	790,307	261,814
04-05	280,105	29,888	70,615	380,608	7.90	76,746	368,591	445,337	825,945	263,849
05-06	285,253	36,515	68,899	390,667	8.01	86,159	416,815	502,974	893,641	267,233
06-07	288,102	31,618	74,992	394,712	8.00	75,491	360,634	436,125	830,837	270,288
07-08	288,298	22,165	62,894	373,357	7.47	89,446	372,377	461,823	835,180	273,857
08-09	261,910	16,397	58,313	336,620	6.65	53,185	361,628	414,813	751,433	277,266
09-10	272,443	15,880	71,437	359,760	7.03	59,119	341,908	401,027	760,787	280,554
10-11	287,211	17,709	69,013	373,932	7.23	76,337	230,747	307,084	681,016	283,428

2.4.2 Waste Composition

NDEQ conducted a series of waste composition studies in 2007 and 2008; this study included four seasonal sampling events at the Bluff Road Landfill. Table 4-2 in the Needs Assessment (Appendix A) shows the results of the NDEQ composition study for all waste types at the Bluff Road Landfill. The data represents a consolidation of composition information on material disposed of in Bluff Road Landfill and does not include waste sent to the North 48th Street C&D landfill disposal sites. Because of the extensive nature of the composition study and the fact that the Bluff Road Landfill is the principal MSW disposal site in the Planning Area, this composition information was considered accurate for planning additional diversion programs.

2.4.3 Waste Diversion

Waste diversion includes many types of activities including source reduction, recycling and composting. Estimates of waste diversion, for purposes of this document are limited to recycling and composting (including wood waste management) that are reasonably documentable from City activities and private efforts. The data provided by these private-sector recycling programs is provided on a voluntary basis; while it is assumed accurate for purposes of planning, there is no way to confirm the accuracy or completeness.

2.5 Future Management and Disposal Needs

Projections of future waste generation quantities for the Planning Area are presented below. In planning for waste management facilities, it is important to reasonably and realistically project the potential quantity of waste expected to be managed or disposed of by the various systems, facilities and programs.

2.5.1 Future Quantity Forecasts

Future waste quantities were forecasted using the unit waste generation rates derived in Table 2-1, above, and population projections. These forecasts represent the waste quantities baseline expected to be generated and disposed from the Planning Area as shown in Table 2-2. The difference between total generation and total disposal is considered to be diversion quantities, based on status quo.

Table 2-2 – Waste Generation Projections

Waste Generation	FY2011	FY2015	FY2020	FY2025	FY2030	FY2035	FY2040
MSW Generation - Total	373,932	423,600	451,433	479,364	509,412	539,788	569,977
MSW Diversion	69,013	78,179	83,316	88,471	94,016	99,623	105,194
MSW Disposal Total	304,920	345,420	368,117	390,893	415,395	440,165	464,783
MSW Disposal - In County	287,211	325,360	346,738	368,192	391,270	414,602	437,790
MSW Disposal - Export	17,709	20,061	21,379	22,702	24,125	25,563	26,993
C&D Generation - Total	307,084	490,770	523,017	555,378	590,190	625,383	660,359
C&D Diversion	230,747	401,362	427,734	454,199	482,669	511,451	540,055
C&D Disposal	76,337	89,408	95,283	101,179	107,521	113,932	120,304

2.5.2 Waste Disposal Capacity

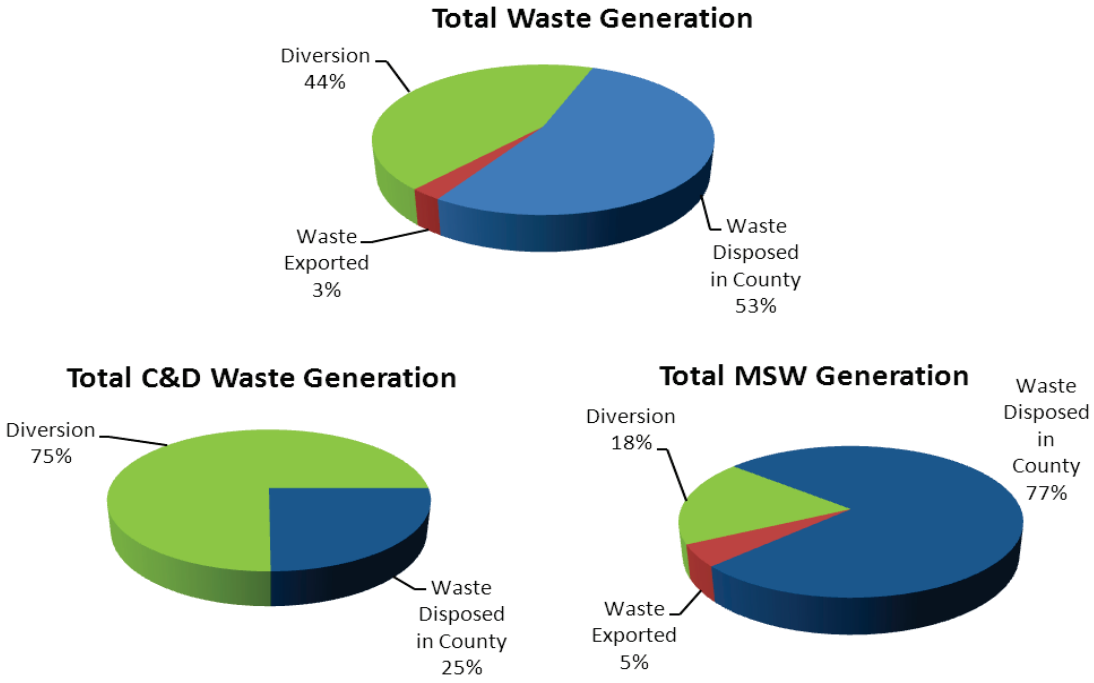
As shown in Figure 2-1 below, approximately 77 percent of the generated municipal solid waste (MSW) is disposed in the City's Bluff Road Municipal Solid Waste Landfill, another 5 percent is exported to out-of-county landfills and the remaining 18 percent is diverted by reuse, recycling, and composting.

2.5.3 Facilities Needs and Management Programs

The baseline estimates for waste generation were status quo management practices were used to project remaining life of the City's MSW and C&D landfills. The results of these baseline projections are shown graphically in Figure 2-2, below, for both the City's MSW and C&D landfills. Figure 2-2 is intended to further illustrate the effects of uncertainties on the overall life of the City's landfills. The baselines and banding are intended to be used to as a basis of evaluation for future diversion options and to illustrate how future programs may affect disposal capacity (existing or required).

Since the baseline estimate of remaining life at the Bluff Road and North 48th Street landfills site suggests that the will reach capacity prior to 2040, the planning effort addressed means to provide future disposal capacity beyond 2040. The need for such additional long-term disposal capacity was also identified in the LPlan 2040.

Figure 2-1 – 2011 Waste Disposal and Diversion, by Percentage



The Solid Waste Plan 2040 considers the need for new facilities, including a permanent facility for HHW, new or expanded transfer station operations, facilities to handle or divert other wastes, the existing recycling drop-off centers and possibly others. The data collected through the public awareness baseline survey and further evaluations examined the need for and options to modify existing programs or develop new programs.

2.5.4 Summary of Solid Waste Management Needs

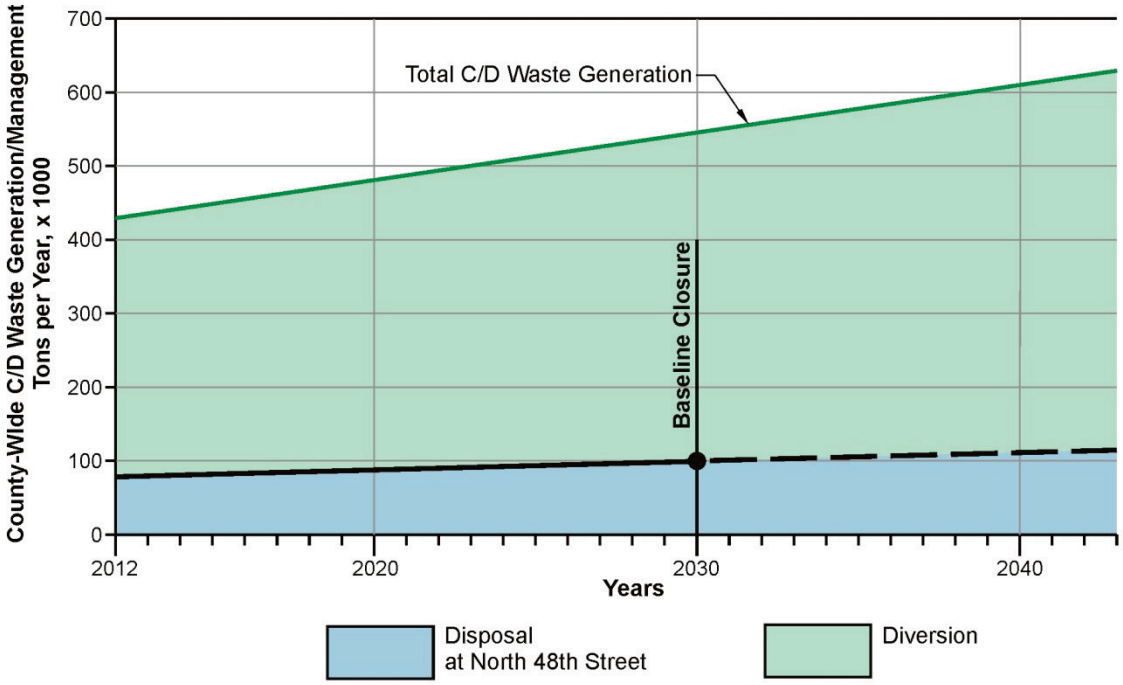
The key needs of the Planning Area, identified in the Needs Assessment, were as follows:

- Compliance with state and local laws, regulations and policies.
- Under the status quo, a new MSW landfill will be needed prior to the end of the planning period (estimated to be required by 2032).
- Under the status quo, a new C&D landfill will be needed prior to the end of the planning period (estimated to be required by 2030).
- Additional mechanisms may be necessary to better collect information on types and quantities of materials being diverted and possibly on waste exports.

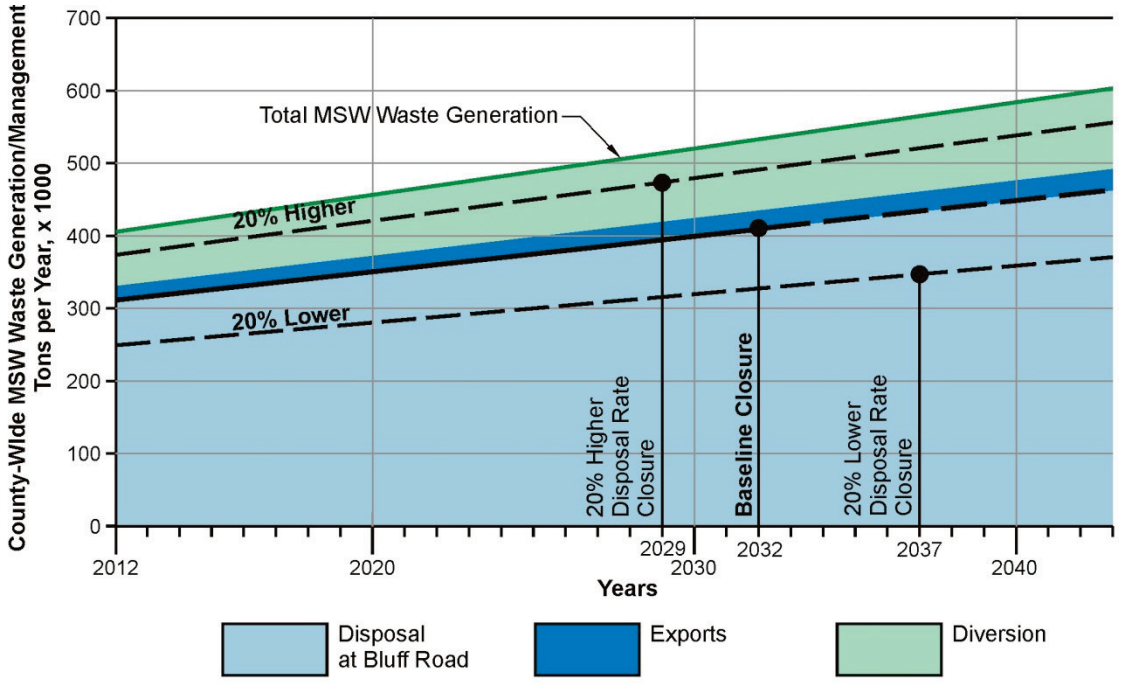
The planning process was designed to identify additional systems, facilities or programs that are deemed necessary or appropriate to meet societal demands, or environmental and economic goals and objectives identified in the planning process (e.g. household hazardous waste facility, additional recycling, transfer station/processing facilities).

Figure 2-2 – Waste Generation and Management Baseline

C&D Disposal Requirements



MSW Disposal Requirements



Due to the limited uncertainty associated with preparing waste projections, there are three major factors that have the potential to significantly impact the estimates of local disposal capacity needed:

- Regulatory changes related to management of biosolids and coal combustion residuals (CCR)
- Changes in waste export quantities or imports
- Changes in diversion practices associated with NDEQ regulations, which now allow disposal of yard waste in the Bluff Road Landfill

2.5.5 Waste Tracking Needs

To more accurately assess the quantity of waste generated and materials diverted from disposal, a better waste tracking system is needed. Currently, information on waste collection and recycling done on a free market and voluntary basis is provided on a voluntary basis, is not always readily available and in some instance is guarded by the businesses as confidential information. Because of this, more precise estimates of the true waste generation and diversion rates are not possible.

If the Planning Area members wish to have a more accurate assessment of these quantities, added regulations may be required; it is not currently anticipated that totally voluntary reporting efforts will provide this information. It is generally anticipated that the most reliable means of obtaining accurate records will be through business and hauler licensing and reporting requirements tied to those licenses.

Section 3 – Waste Management Alternatives

To prepare this Plan, supplemental analyses were completed. Technical evaluations were prepared by the City's Management Team and HDR Engineering, Inc. ("HDR") using input from the Advisory Committee and data collected from a wide variety of sources. Detailed technical papers were provided to the Advisory Committee and the public on a wide range of solid waste management topics. These were presented and discussed with Advisory Committee. The technical papers focused on specific topics relevant to current and future needs of the Planning Area. The technical papers include the following:

3.1 Introduction

For the Solid Waste Plan 2040, the review of alternatives focused on those systems, facilities and program elements that were identified as having relevance to the Plan by the City Management Team and the Advisory Committee. The topics and these technical papers (topic alternatives assessments) include the following:

- Source Reduction (Definitions/Framework/Options) (Appendix B1)
- Product Stewardship (Appendix B2)
- Zero Waste (Appendix B3)
- Household Hazardous & Conditionally-Exempt Small Quantity Generator (Small Business) Hazardous Waste (Appendix B4)
- Yard Waste (Appendix B5)
- Universal, Special and Unique Wastes (Appendix B6)
- Residential Recycling and Diversion (Appendix B7)
- Commercial Recycling and Diversion (Appendix B8)
- Organic Waste Diversion (Composting) (Appendix B9)
- Construction and Demolition Materials Recycling (Appendix B10)
- Recycling Incentives (Appendix B11)
- Waste Conversion Technologies (Appendix B12)
- Municipal Solid Waste Disposal (Appendix B13)
- Bioreactor/Bio-Stabilization Technologies (Appendix B14)
- Construction and Demolition Waste Disposal (Appendix B15)
- Collection Systems (Appendix B16)
- Transfer Station and Processing Facilities (Appendix B17)
- Markets (for recovered/recycled materials) (Appendix B18)

Each of the alternatives or options was presented in the form of technical papers/memoranda; these technical papers make up Appendix B. The system/facilities/program options presented in these technical papers were compared using established evaluation/screening criteria. Prior to the development of technical topic papers a common set of evaluation/screening criteria were developed under the following categories:

- Waste reduction/diversion

- Technical requirements
- Environmental impacts
- Economic impacts
- Implementation viability

Throughout the planning process, the Vision, Guiding Principles, and Plan Goals were displayed (along with the graphic on the Waste Management Hierarchy) at the Advisory Committee meetings to help communicate and reinforce the core values that served as the basis for the planning effort.

The Advisory Committee discussed, in general, solid waste management program options which progressively move the community toward an integrated solid waste management system that further reduces dependence on landfilling and places greater emphasis on resource conservation, source reduction, waste diversion and resource recovery efforts. The Advisory Committee discussed program options that were consistent with the Waste Management Hierarchy (Figure 1-3) and reviewed key aspects of Nebraska's Integrated Solid Waste Management Act and the Federal Resource Conservation and Recovery Act (RCRA) of 1976 (Regulatory Background).

3.2 Evaluation/Screening Criteria

The planning process contemplated various options and strategies for managing solid wastes. Prior to the development of technical topic papers a common set of evaluation/screening criteria were developed. The following are the criteria that were used to evaluate and help screen the options/strategies contemplated; those criteria listed below may not be applicable to or used to evaluate all the options/strategies. This list illustrates that a balanced approach was taken to evaluate/screen a wide variety of options/strategies.

Waste Reduction/Diversion:

- Contributes toward source reduction and/or recycling goals
- Market availability for recovered materials or energy
- Minimizes solid waste exportation
- Minimizes landfill dependence

Technical Requirements:

- Capacity requirements (new and existing)
- Compatibility to other program elements
- Level of risk and uncertainty
- Reliable performance and redundancy options
- Effective, compatible and flexible operations

Environmental Impacts:

- Conservation of resources (materials and energy)
- Air emissions (criteria pollutants, greenhouse gas)
- Water quality impacts
- Reduction of toxicity

- Health and safety

Economic Impacts:

- Capital investment
- Cost to residents and businesses
- Funding mechanisms
- Economic development potential

Implementation Viability:

- Legislative and regulatory changes
- Social/political acceptability
- Responsible parties
- Land requirements and siting considerations
- Permitting requirements
- Scheduling factors

3.3 Solid Waste Management Topics – Technical Papers

Alternatives were examined as a foundation for the development of the System Definitions presented in Section 4 and Solid Waste Plan 2040 recommendations. Key elements of each of these technical papers are summarized below.

In general, each of the technical papers followed similar format as outlined below:

- Overview
- Current Programs
- Generation and Diversion
- Program (Facility/System) Options
- Options Evaluation
- Relationship to Guiding Principles and Goals
- Summary

3.3.1 Source Reduction

The Source Reduction (Appendix B1) paper provided definitions, a framework and overview for source reduction concepts and programs. Source reduction activities reduce the amount of materials entering the waste stream and are considered the most preferred approaches under the USEPA, NDEQ and City-County waste management hierarchy. Source reduction includes conservation, waste reduction, and material reuse. Most waste reduction activities require the individual residences, businesses and governments to take steps to adopt or change their waste generating and disposal habits; these typically involve an educational or promotional component. Other waste reduction activities use economic measures (e.g., purchasing practices, subsidies, take back programs) to further incentivize waste minimization, toxicity reduction and producer responsibility. The recommendations and programs resulting from the Solid Waste Plan 2040 would encourage changes in habits by implementing programs that target a wide array of source reduction practices as described in the various technical papers. Programs for source reduction would target residential waste, as well as wastes

from the business, industry and institutional community. Source reduction options can be mandatory or voluntary. To be effective they will likely need to consider broad perspective approaches such as zero waste and product stewardship and specific material focused programs such as HHW and yard waste.

There are a wide range of source reduction options. Basic options associated with Source Reduction include the following broad categories:

- Education
- System, Facilities and Program Alternatives
- Purchasing Practices
- Bans and Restrictions
- Incentives

Consistent with the waste management hierarchy, reducing the quantity of waste generated is important in conserving resources and reducing the amount of waste to be managed by other means.

3.3.1.1 Product Stewardship

Product Stewardship (Appendix B2) and extended producer responsibility (EPR) focus on minimizing health, safety, environmental and social impacts and maximizing economic benefits of a product and its packaging throughout all lifecycle stages, in part by imposing requirements that extend the producer's responsibility for their product to post-consumer management of the product and its packaging. Product stewardship can be either voluntary or mandatory and can serve as a mechanism to fund various waste reduction strategies.

There may be many challenges in attempting to shift waste management of specific products from a focus on government funded and ratepayer financed waste diversion to one that includes greater reliance on producer responsibility. It would appear that one of the most effective means of implementing product stewardship and EPR would be to continue to support efforts of Nebraska Product Stewardship Coalition (NPSC) to integrate principles of environmental stewardship into the policy and economic structures of Nebraska through support of educational initiatives and legislative changes. While product stewardship is a much discussed topic in the waste management and environmental community, it needs top-down legislation of business and development of new environmental laws at the local, state and/or at the federal level to realize its full potential.

3.3.1.2 Zero Waste

Zero Waste (Appendix B3) is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use. Zero Waste is a philosophy and a design principle that maximizes recycling, minimizes waste, reduces consumption and encourages the development of products that are made to be reused, repaired or recycled back into nature or the marketplace. It is an overarching concept that encompasses all waste diversion options, many of which were addressed as separate topical discussion in the development of the Solid Waste

Plan 2040. Certain components of this philosophy are more easily implemented at a local governmental level; others, involve large scale societal and industrial changes in such things as mining and manufacturing.

3.3.1.3 Household Hazardous & Conditionally Exempt Small Quantity Generator (Small Business) Hazardous Waste

Federal and state laws allow for disposal of HHW and CESQG hazardous waste in a municipal waste landfill. Lincoln and Lancaster County have implemented toxics reduction programs to reduce the amount of hazardous waste going into the City's landfill and to protect public health and the environment. Participation in any toxics reduction program and related HHW/CESQG collection efforts can be significantly influenced by convenience and level of educational outreach. Improperly managed HHW/CESQG hazardous wastes can pose a threat to human health and the environment. Removal of hazardous materials/waste from the solid waste stream, along with proper management, can mitigate these risks and reduce the toxicity of the waste stream.

Currently Lincoln and Lancaster County provide programs through collection events at various sites, to allow residents of Lincoln and Lancaster County to safely manage hazardous materials and waste. The LLCHD's toxics reduction programs have received significant value from volunteer time and participation by corporate sponsors.

Of the many program options available, a permanent HHW/CESQG hazardous materials/waste facility (alone or in conjunction with existing periodic/ mobile collection events and local business collection site) appears to provide the greatest benefit in terms of increasing reuse, diversion, and minimizing disposal, by providing year round accessibility (increasing participation rates), increasing material management options, lowering risk associated with improper management of hazardous materials and waste, improving safety to users and staff, greater efficiencies of operation, and allowing integration with other existing (and future) programs.

3.3.1.4 Yard Waste

Nebraska statutes ban yard waste from landfills from April 1 until December 1st of each year, but provide certain exceptions that would allow the City to accept it in their landfill on a year round basis. Seasonal yard waste bans have created the need for separate collection and management systems for those individuals that choose to collect and "bag" their yard waste for off-site management. From an overall source reduction strategy leaving it on the lawn (e.g., mulching mower) and collecting it and reusing it for compost or mulch on the site where it was generated are the most preferred options.

Composting of yard waste off-site is not a source reduction option but is considered a form of recycling. In response to Nebraska's seasonal ban, the City constructed a large scale (13 acre) commercial composting facility adjacent to the Bluff Road Landfill, and provided separate material receiving and handling facilities at the City's North 48th Street Transfer Station site.

Three percent of what is currently received for disposed at the City's MSW landfill is yard waste; five percent of what is currently diverted from the City's landfill is yard waste.

3.3.1.5 Universal, Special and Unique Waste

Programs for Universal, Special and Unique Wastes (Appendix B6) target those materials that could pose a threat to the environment and human health. Universal Wastes are hazardous wastes and many of the Special Wastes also exhibit hazardous characteristics and require special handling. The City-County currently support a wide range of public and private waste management and reduction programs for these wastes. The existing LLCHD (LMC 8.32.080) Special Waste permitting program is unique within Nebraska and provides a very effective mean of minimizing the quantity of potentially hazardous or toxic waste disposed in the City's Bluff Road Landfill.

While residential and certain types of Universal and Special Wastes (e.g., CESQG waste) can be accepted at the Bluff Road Landfill, the landfill is not obligated to take commercial Special Waste and as such can be selective in the materials it receives. Current diversion programs include private take-back facilities, City-County programs, non-profit organizations and educational efforts.

Programs that eliminate or minimize household or business related hazardous waste or reduce the toxicity of materials going to the City's landfill are consistent with the waste management hierarchy and are protective of human health and the environment.

3.3.2 Recycling and Composting

Recycling turns materials that would otherwise become waste into valuable resources. It also reduces greenhouse gas emissions and conserves space in landfills. Recycling includes: 1) collecting materials that would otherwise be considered waste; 2) sorting and processing recyclables into raw materials that can be used to produce new products; and, 3) purchasing recycled product. As illustrated by the traditional recycling logo, using the collected material, in whole or in part, in new products is necessary to complete the "recycling" cycle. Individual technical papers were developed for the following recycling and composting topics:

- Residential Recycling and Diversion (Appendix B7)
- Commercial Recycling and Diversion (Appendix B8)
- Organics Waste Diversion (Composting) (Appendix B9)
- Construction and Demolition Materials Recycling(Appendix B10)
- Recycling Incentives (Appendix B11)

3.3.2.1 Residential Recycling and Diversion

The City supports and promotes public and private recycling efforts by providing a wide array of services. Currently an estimated 24 percent of the residential households voluntarily subscribe to curbside recycling services. It is estimated that approximately 18.8 percent of the residential MSW is currently recycled. It is likely that a major increase in the number of residents using curbside recycling will required some form of market regulation or mandate. Market regulation refers to the establishment of

requirements for services or that programs operate under a set of rules (regulations) established by the community. There are numerous examples across the United States of voluntary and mandatory recycling programs that achieve higher levels of residential waste diversion than are currently achieved in the Lincoln and Lancaster County.

To significantly increase diversion of residential waste through recycling, a combination of Citywide, curbside recycling collection along with strategic drop-off centers and continuation of private and non-profit organizations collection sites would likely be necessary. Drop-off centers are not as effective as curbside recycling in encouraging regular participation in recycling and are not viewed as a singular option to optimize diversion.

The general issues associated with the current residential recycling programs are convenience, participation and diversion levels, costs of services, efficiencies, funding of new programs, service providers, processing capacity, and implementation considerations.

There are many types of program options available, all of which are essentially consistent with the Solid Waste Plan 2040 guiding principles and the waste management hierarchy. Of the program options available, city-wide curbside recycling appears to provide the greatest opportunity to maximize residential recycling (rates and quantities) and minimize landfill disposal of solid waste. Based on the Baseline Assessment/Survey 85 percent of respondent thought curbside collection of recyclables should be offered to every home in Lincoln as part of the basic garbage collection services.

3.3.2.2 Commercial Recycling and Diversion

The City supports and promotes public and private recycling efforts through its website and by providing a wide array of services. Commercial recycling is a largely unregulated business. The number of waste haulers providing commercial recycling services and participation levels are not known; while data is limited on commercial recycling rates, using information voluntarily provided to the City it was estimated that in 2011, the level of commercial recycling was approximately 18.1 percent.

Higher levels of waste diversion (capture more resources) could be achieved with more convenient program options for commercial waste recycling. Commercial recycling provides the greatest opportunity for increased diversion rates.

To significantly increase diversion of commercial waste, through recycling, will likely require some form of market regulation or mandated program (e.g., minimum levels of service through refuse hauler or building owner/operators). Market regulation refers to the establishment of requirements for services or that programs operate under a set of rules (regulations) established by the community.

High quality, source separated recyclables (papers, metals and plastics) can often be obtained from commercial waste generation sources. Commercial recycling program options can take many forms and will need to be tailored to the specific opportunities

and needs of a given commercial waste generator. This is one factor that makes the concept of commercial recycling potentially more complex than residential recycling. Commercial recycling programs will need to adapt to the differences in types of business, business infrastructure, participants, program/services, and available/targeted materials.

Of the expanded program options available, City-wide (universally available – refuse hauler or building owner/operator provide) programs appear to provide the greatest opportunity to maximize commercial recycling (rates and quantities) and minimize landfill disposal of solid waste.

3.3.2.3 Organics Composting

Organic (waste) refer to a broad range of materials, often derived from plants and living things. In traditional, municipal solid waste (MSW) management and for purposes of the technical paper the term organic waste referred to: yard trimmings, food scraps, wood waste, and paper/fibers, including paperboard products. Organic wastes biologically decompose (resulting in air emissions) and as a category of waste, organic waste is the largest component of the solid waste stream. Food waste represents approximately 16 percent of the MSW stream disposed of at the Bluff Road Landfill. Reducing the organic waste in landfills reduces air emission and can help reduce long-term liabilities associated with MSW landfilling.

Implementation of expanded organics diversion programs (e.g., food waste composting) will likely require laws/ordinances to mandate a basic program and define levels of service. While the technologies to undertake composting and food waste digestion are well known, the most significant risk may lie in long-term, viable and economically sustainable markets for the compost/digestate. Large scale, source separated, organics (food and soiled papers) is an emerging strategy in the US, with a somewhat tainted history of unsuccessful MSW composting projects/programs.

3.3.2.4 Construction and Demolition Materials Recycling

In FY 2010/2011 an estimated 75 percent of C&D materials were diverted, based upon the quantities of concrete and asphalt diversion (voluntarily) reported to the City. Diversion of metals from C&D waste is known to be occurring, but quantities are difficult to estimate and as such are not reflected in the C&D diversion estimates. When materials are hauled to C&D recycling and processing facilities, these materials are considered source separated and trucking operations are exempt from both licensing requirements and the Occupation Tax; they are further exempt from reporting any information regarding the type of services provided and type and quantity of material diverted/recycled.

The City derives some benefit from the C&D materials currently disposed of at the N. 48th Street Construction and Demolition Waste Landfill because such materials are beneficially used to correct grading and drainage above the historic MSW landfill area. By reducing the quantities of C&D material this site accepts it has the benefit of prolonging the life of the site, but it may also require the City to purchase soil for grading

and drainage purposes, as opposed to deriving revenue from accepting C&D materials and using it for the same purposes.

A portion of the C&D waste generated in the Planning Area is also disposed of in the Bluff Road MSW Landfill, but the quantities are unknown. With any new or expanded program, markets for the recycled C&D materials will be a key factor in determining that such a diversion program is viable and sustainable.

3.3.2.5 Recycling Incentives

There are many types of incentive program options available; most of which are consistent with the Solid Waste Plan 2040 guiding principles and the waste management hierarchy. From the perspective of significantly increasing the overall magnitude of diversion of materials from disposal there are various incentives/disincentive options. In general incentives refer to items that would motivate or induce positive actions. Many of the changes required to significantly increase recycling will require changes in law, regulation or ordinances; these changes are also forms of incentives/disincentives. Lincoln and Lancaster County provides incentives to current recycling efforts through a variety of mechanisms, including subsidies. Private and not-for-profits organizations also provide a wide variety of recycling incentives.

Where added fees apply to recycling, above and beyond what is deemed necessary for disposal, it can be a disincentive to recycling. Bans and restriction are an indirect means of providing recycling incentives (disincentives targeting behavioral change); they do not necessarily reduce the overall quantity of materials generated but rather use legislation to change to management options.

3.3.3 Disposal Capacity

Individual technical papers were developed on waste disposal and mean of increasing disposal capacity in the following documents:

- Waste Conversion Technologies (Appendix B12)
- Municipal Solid Waste Disposal (Appendix B13)
- Bioreactor/Bio-Stabilization Technologies (Appendix B14)
- Construction and Demolition Waste Disposal (Appendix B15)

3.3.3.1 Waste Conversion Technologies

Materials destined for disposal in a landfill contain one additional major resource that can be recovered – renewable energy. The energy output of 500 tons of MSW is equivalent to the energy demands of approximately 5,000 to 8,000 homes or 10 percent of the total number of occupied residential housing units in single- to four-unit dwellings in the Planning Area. In addition to energy recovery and significant reductions in the volume of waste landfilled, most waste conversion technology facilities reduce the biologically active waste to an inert material and provide opportunities to further recover other resources such as metals. A further argument for conversion technologies is that once materials have reached a state when physical reuse and recovery are no longer viable (technically or economically) the remaining energy and metals resources should be recovered prior to disposal (thus this technology is also sometimes referred to as

resource recovery). Additionally, the energy recovered can be credited toward an offset of fossil fuel impacts on the environment and from a life-cycle basis the United States Environmental Protection Agency (USEPA) estimates that combustion of mixed MSW at mass burn and refuse-derived fuel (RDF) facilities reduce net postconsumer greenhouse gas (GHG) emissions.

Data for communities with waste-to-energy (WTE) facilities has shown that WTE is compatible with recycling and other waste reduction and resource recovery strategies.

Implementing a waste conversion facility is complex and typically involves a combination of social, political, economic, environmental, and technical matters. Waste conversion technologies are typically more expensive than landfilling on the basis of tipping fees. Key factors in implementing an energy recovery facility include a guaranteed supply of waste and a secure long-term energy market, as well as an approved site, regulatory approvals, and public and political support. Under the current free market system (in the Planning Area) for solid waste collection some means of flow control would be required to direct the waste to such a facility; flow control may be contractual, statutory, or economic.

3.3.3.2 Municipal Solid Waste Disposal

Until such time as waste is eliminated, landfills will be a necessary part of an integrated solid waste management strategy. State law and City policies and regulations make the City responsible for ownership, operation and financing of disposal facilities.

Baseline estimates of waste generation and disposal suggests that the existing Bluff Road MSW Landfill will reach capacity prior to 2040.

One option identified as anticipated in the LPlan 2040 is to plan "for expansion of the Bluff Road Landfill on City owned property just east of the existing site…The expansion into this additional landfill area has not been permitted by the State of Nebraska Department of Environmental Quality." A proactive program may be of significant value in securing such land for future solid waste management uses.

The capacity that would be created within the City owned property east of the current Bluff Road MSW Landfill has not been estimated; however, it is reasonable to assume that under the baseline projections of waste generation and disposal needs that this site would provide added disposal capacity well beyond the end of the planning period.

3.3.3.3 Bioreactor/Bio-Stabilization Technologies

Landfills represent a long-term liability and risk to the environment because the waste remains biologically active for many decades. Bioreactor and bio-stabilization technologies accelerate decomposition and stabilization of landfilled waste and have the potential to reduce long-term risks, in comparison to conventional "dry tomb" MSW landfills. They also provide an opportunity to increase the quantity of waste placed within a given landfill space. Bioreactor landfill technology can extend the life of a landfill by 30 percent (range 15 to 50 percent).

In essentially all instances the acceleration of the decomposition process involves adding large volumes of liquid from sources other than the liquids generated from the

landfill operation. Both federal and state regulations prohibit the disposal of bulk liquid wastes in conventional landfills. Because of these regulatory limitations, bioreactor landfills cannot be considered without special approval by state and federal regulators, and then only as demonstration projects.

Issues that would need to be evaluated in further considering implementation of this technology would include: potential for increased revenues, benefits of accelerating site stabilization, odor controls, increase landfill gas production, and added costs for construction and operation.

3.3.3.4 Construction and Demolition Wastes Disposal

Until such time as C&D waste is eliminated, landfills will be a necessary part of an integrated solid waste management strategy. City policies and regulations make the City responsible for ownership, operation and financing of disposal facilities

Baseline estimates of waste generation and disposal suggests that the existing North 48th Street Construction & Demolition Waste Landfill will reach capacity prior to 2040. A proactive program may be of significant value in securing such land for future solid waste management uses.

3.3.4 Collection and Handling Methods

Individual technical papers were developed on general collection and handling methods for the following:

- Collection Systems (Appendix B16)
- Transfer Station and Processing Facilities (Appendix B17)

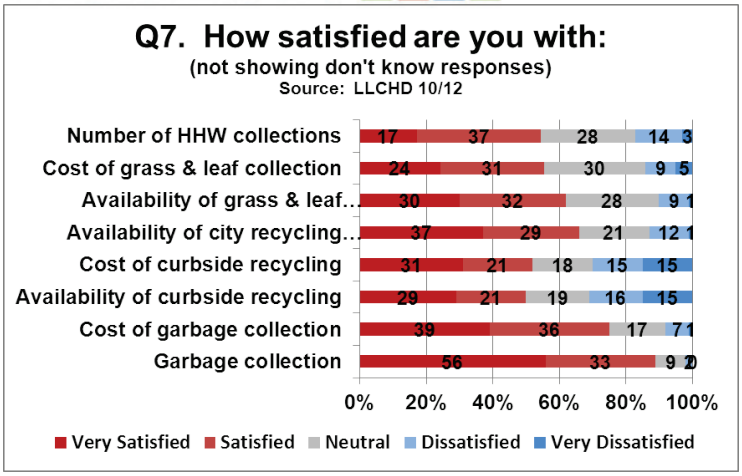
3.3.4.1 Collection Systems

The City's charter provides the City the powers to: prescribe and enforce methods of segregation of different kinds of garbage by residents of the City; to provide for the collection of garbage and refuse either by equipment owned and operated by the City or by letting contracts; and, to divide the City into convenient garbage districts. The City Council may also fix charges for the collection of garbage to be paid by the persons, firms or corporations. Currently the City has not used these powers to undertake City operated collection systems, to contract for collection services, to create districts, or to fix charges for garbage collection.

As stated in LPlan 2040, *"The City policy of privately owned and operated collection of refuse and recyclables….will continue during the planning period."*

A comparison of current residential solid waste and recyclables collection rates with communities using municipal contracts and franchises indicates that Lincoln and Lancaster County residents pay higher collection rates. The current system of independent waste haulers provides a high quality of refuse collection services and helps keep Lincoln clean. The Baseline Assessment Survey indicates City residents are very satisfied with garbage collection services and satisfied with garbage collection costs. The Baseline Assessment Survey also indicates that 85 percent of respondents felt curbside collection of recyclables should be offered to every home as part of the basic garbage collection service.

Implementing municipal contracts or franchises have the potential to reduce costs to residents and businesses, reduce traffic in neighborhoods, and reduce fuel consumption. These options also provide an opportunity to implement more comprehensive and standardized residential curbside recycling City-wide with potentially no increase in cost to households. Collection system changes will affect current collection firms.



3.3.4.2 Transfer Station and Processing Facilities

Both transfer stations and processing facilities fall under the NDEQ Title 132 definition of solid waste management facility, which includes both public and private facilities. Solid waste processing facilities currently in use in Lancaster County include transfer stations, material recovery facilities (recycling processing centers), recycling centers, drop-off sites and composting operations. Collected and transported materials are directed to these various waste handling and management facilities based on convenience, cost, vehicle size and material characteristics. None of the state or local regulations requires transfer stations or processing facilities to report tonnages handled or information on type, source or destination of waste/materials received.

While transfer stations are often discussed in the context of saving money through reduced transportation costs, transfer stations are commonly developed to satisfy several purposes, not all of which are cost savings.

Properly located transfer stations can result in cost savings to waste haulers, reduced traffic at the landfills and provide other benefits to a waste management system. Based on rule-of-thumb distances a transfer station may be economically advantageous to waste haulers operating in the southern part of the Planning Area. Such a facility could also be located to correspond to the tiered growth pattern in the LPlan 2040 that is forecasted to be mostly to the south and east in the near term. Before multi-million dollar commitments are made to construct and operate a transfer station, it is appropriate to perform a detailed analysis to confirm such rules-of-thumbs and provide support to questions which will be raised in the siting process and the political, social and possibly regulatory approval processes.

Conceptually, co-locating a processing facility(s) with a transfer station is an option that could further enhance the recycling opportunities, increase tonnage diversion, and provide customers a one-stop site for most of their solid waste management needs. Transfer stations and processing facilities can also be combined to provide for efficient transportation and handling of solid waste, recovered materials, processed recyclables, compostable materials, and compost products. They can also be combined operationally to share staff, equipment, building space and to allow materials delivered to a transfer station as waste to be diverted from disposal. Any options for a co-located facility would need to consider the fact that as facilities currently exist in the Planning

Area, the City owns and operates the North 48th Street Transfer Station (and ancillary diversion programs) and private industry has taken on the role of ownership and operation of the recycling processing facilities.

3.3.5 Markets

The technical paper on Markets (for recovered/recycled materials) (Appendix B18) notes that markets and prices for recovered materials can be volatile and are influenced by supply and demand, as well as other factors such as material quantity and quality. Papers, metals and plastics (and possibly glass) generally targeted for diversion are often sorted locally and shipped to manufacturer's or secondary processors outside the Planning Area. For over a decade markets have existed for:

- Paper
- PET and HDPE Plastics
- Ferrous and Non-Ferrous Metals
- Yard Waste Compost
- Wood Mulch

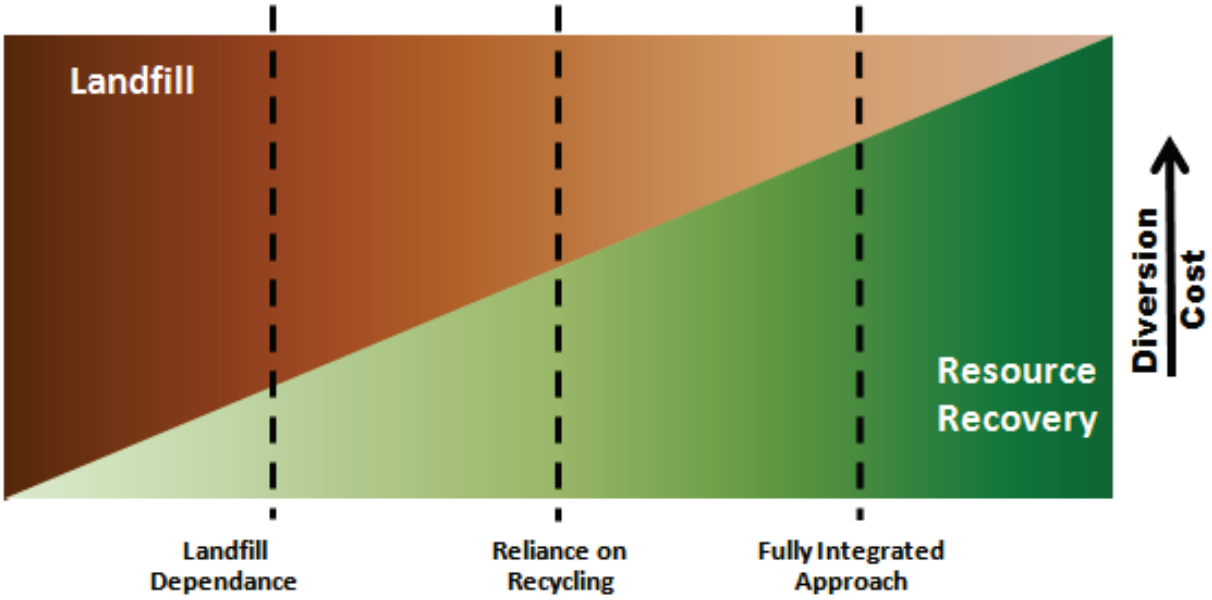
While free market efforts tend to find markets, where opportunities exist, it is possible that the combined efforts of the public and private entities may be necessary to create markets or increase market opportunities.

As a part of the overall plan implementation strategy, local market opportunities should be sought out to provide sustainable revenue streams, to help off-set collection and management costs associated with diverted/recycled materials. Where national or regional markets are utilized, local efforts should also support the consolidation, processing and transport of recovered materials to enhance their marketability. Additional attention may also need to be given to development of new local markets to reduce reliance on national markets or markets outside the Planning Area. In looking at local market development opportunities, Planning Area members may also need to consider the added potential to attract businesses and create green jobs in the Planning Area.

3.4 Solid Waste Management Continuum and Waste Management Hierarchy

The Advisory Committee discussed solid waste management program options which progressively move the community toward an integrated solid waste management system that further reduces dependence on landfilling and places greater emphasis on resource conservation, source reduction, waste diversion and resource recovery efforts. Prior to establishing preferred paths for use in developing the System Definition, the Advisory Committee discussed program options that were consistent with the waste management hierarchy (Figure 1-2) and the solid waste management continuum (Figure 3-1), and reviewed key aspects of Nebraska's Integrated Solid Waste Management Act and the Federal Resource Conservation and Recovery Act (RCRA) of 1976 (Regulatory Background).

Figure 3-1 - Progression of Solid Waste Management Alternatives along a Continuum



The Solid Waste Management Continuum illustrates several ideas: 1) as waste diversion and resource recovery efforts increase the cost of managing wastes generally increases; and, 2) at low levels of waste diversion the community is largely dependent on landfilling. The Solid Waste Management Continuum recognizes that even with progressive resource conservation, source reduction, material reuse, and recycling and composting programs a significant amount of resources are still available for recovery from the waste stream, and the community would still be dependent on landfilling as a solid waste management strategy.

Even with very progressive waste reduction and waste diversion programs targeting both residential and commercial waste generators, it is unlikely that the combined efforts will exceed a 40 to 50 percent reduction in the amount of wastes requiring disposal (landfilled). Additional systems, facilities, programs and strategies, such as organic waste diversion and waste conversion technologies, would likely be required to increase the amount of waste materials diverted beyond the 40 to 50 percent range.

3.5 Preferred Paths

Following discussion of the technical papers and various options the Advisory Committee was guided through a facilitated and structured process to identify a general direction for further evaluation of various system, facilities, and program options. The outcome of this process was the "Preferred Paths". In developing these Preferred Paths a set of options were presented to the Advisory Committee and the committee voted on the Preferred Paths. A five step process (depicted graphically below and in Figure 1-4) was utilized for each of the solid waste management topics reviewed by the Advisory Committee. The resulting preferred paths were then used in developing the System Definition document (summarized in Section 4). Table 3-1 summarizes the Preferred Path.

Table 3-1 – Preferred Paths for System Definition

Option/Topic	Options Decision for System Definition
Source Reduction	Expand Programs that Lead to Greater Source Reduction.
Toxics Reduction	Expand the Toxics Reduction program and create a place to provide year round access.
Yard Waste	Maintain Status Quo (Seasonal Ban)
Residential Recycling and Diversion	Residential Curbside Recycling to be provided to all single family and duplex dwellings City wide.
Commercial Recycling and Diversion	Commercial Recycling to be provided to multi-family dwellings, businesses, industries and institutions.
Construction and Demolition Materials Recycling	Develop/Support programs to reduce the quantities of construction and demolition waste going to the City's disposal site(s).
Organic Waste Diversion (Composting)	Develop/Support programs to reduce the quantity of organics, especially food waste, going to the City's MSW disposal site.
Waste Conversion Technologies	Pursue the development of Waste Conversion Technology(ies) as a part of a long-term strategy for energy recovery and resource conservation.
Municipal Solid Waste Disposal	Expand on City-owned property to the east of the currently permitted site.
Construction and Demolition Waste Disposal	Expand on City-owned property.
Bioreactor/Bio-Stabilization Technologies	No further consideration is given in the System Definition to pursuing the development of a bioreactor/bio-stabilization technology.
Transfer Station and Processing Facilities	Develop a municipal solid waste Transfer Station if a feasibility study shows it can be cost effective.

Notes from System Definition:

1. The term "provided" was explained in the meeting as meaning "Universally Available" which was further defined as being mandatory that recycling services be provided to all single family and duplex dwellings but resident participation would be voluntary.
2. The term "provided" was explained in the meeting as meaning "provided by ordinance" which would mean it would be mandatory that it be provided to all multi-family dwellings, businesses, industries and institutions either as hauler provided or building owner/operator provided.

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Section 4 - System Definition

The System Definition was developed to serve as the basis for the development of the Solid Waste Plan 2040 and combines information on existing solid waste management programs and program options considered for managing solid waste in the future. Based on the Preferred Paths three system scenarios were created to illustrate potential landfill diversion rates (see Table 4-1) associated with components of integrated waste management strategies. These three system scenarios reflected different levels of waste diversion and resource recovery strategies as well as short- and long-term program options.

4.1 Introduction

The System Definition describes programs that move the integrated solid waste management system from current levels of waste diversion and existing disposal practices toward greater resource conservation, waste reduction, waste diversion and resource recovery efforts. The System Definition also included information on the following:

- Strategies
- Qualitative/Quantitative Goals
- Benefits
- Cost Considerations
- Capital Costs
- Operating Costs
- Funding
- Diversion

Prior to the Advisory Committee formulating Plan recommendations, the System Definition was provided to the public, and Open House and Virtual Town Hall meetings were conducted to allow for public input on key topics. The results of the public comments are discussed in Section 5 and provided in Appendix D.

Following the review of all public comments received throughout the planning process, the Advisory Committee met and formulated recommendations for future solid waste management in Lincoln and Lancaster County. These recommendations are included in Section 6.

The System Definition was developed based on the preferred paths determined by the Advisory Committee.

4.2 Benefits and Costs

The Advisory Committee received general information on the costs and benefits associated with various resource conservation, waste reduction, waste diversion and resource conservation program options, through the technical papers prepared and reviewed for each solid waste management topic. For each of the program options identified from the preferred paths, the following information was summarized:

- Strategies

- Qualitative/Quantitative Goals
- Benefits
- Cost Considerations
- Capital Costs
- Operating Costs
- Funding
- Diversion

Not all program options were quantifiable in terms of short-term economic benefit, nor were they evaluated with a traditional cost/benefit ratio type analysis.

4.3 Diversion Rates and Resource Recovery

Diversion rates and levels of resource recovery are dependent upon a wide range of variables, including program specific elements, degree of promotion and education/behavior change, and level of participation.

Based on the Preferred Paths (see Table 3-1) identified by the Advisory Committee, three system scenarios were created to illustrate potential landfill diversion rates (see Table 4-1). These three system scenarios reflect different levels of effort in terms of waste diversion and resource recovery strategies as well as short- and long-term program outcomes.

The three scenarios presented are based on the concepts presented relative to the Solid Waste Management Continuum (Figure 3-1) and progressive programs leading to greater diversion of waste from landfills and a fully integrated approach to solid waste management.

4.4 System Costs

Table 4-2 summarizes cost information based on the above described programs and the Preferred Paths (options) identified for this System Definition. Table 4-3 summarizes the estimated annualized capital and operating cost information for the described programs and the Preferred Paths. Where annualized capital costs are provided they were generally based on an assumed 20-year financing or amortization of capital costs.

It is important to recognize that the values in Table 4-2 and 4-3 were created to provide a general perspective on how various options relate to increases in management costs. The timing of such expenditures and refinement of values can, in most instances, only be determined when more specific implementation strategies are determined. Additionally, while costs were forecasted for expansion of the City owned/operated landfill it is important to recognize that the option of expanding on City owned property represents a substantial cost savings over other options for a future disposal facility; no credit is provided for cost saving because no revenue is generated by avoiding such expenditures.

For the residential recycling element where cost increases are shown as “No increase if franchised/contracted with solid waste collection” this is based on information in the technical papers on Residential Recycling and Diversion and Collection Systems which

show that with community wide franchised or contracted collection of refuse and recyclables (and yard waste) that these communities are providing both refuse and recyclables (and yard waste) collection services for a cost lower than the current mean rate for refuse collection only in the City of Lincoln.

Table 4-1 – Estimated Diversion by Scenario

	Scenario 1		Scenario 2		Scenario 3	
Program Area	**Strategy**	**% increase in TOTAL MSW Diversion**	**Strategy**	**% increase in TOTAL MSW Diversion**	**Strategy**	**% increase in TOTAL MSW Diversion**
Source Reduction	Increased Education	1 - 2%	Increased Education in conjunction with more progressive diversion efforts	2-4%	Increased Education in conjunction with incentivized programs (e.g., "volume-based" residential recycling and waste exchanges)	4-6%
Toxics Reduction	Year round facility	<1%	Year round facility	<1%	Year round facility	<1%
Yard Waste	Status Quo	0%	Status Quo	0%	Year round landfill ban for grass and leaves	1-2%
Residential Recycling	Universal with Minimum Levels of Service	5-7%	Universal - more enhanced program	6-8%	Universal with incentives (e.g. volume based rates)	8-10%
Commercial Recycling	Universal with Minimum Levels of Service	6-8%	Universal - more enhanced program	8-10%	Universal with incentives (e.g. volume based rates and space provisions for recycling in new construction)	10-12%
Organic Waste Diversion	Status Quo with added educational emphasis	<1%	Pilot program for food composting	1%	Commercial scale organics composting/digestion, food and soiled papers	5-10%
Waste Conversion Technologies	Status Quo	0%	Status Quo	0%	Waste Conversion facility targeting majority of non-diverted wastes	40 to 50%
Transfer Station	Transfer Station with no processing	<1%	Transfer Station with no processing	<1%	Transfer Station with limited diversion of materials delivered as waste	2-5%
% INCREASE in TOTAL MSW Diversion (above current 18%)		12-18%		17-24%		57-62% (1)
% TOTAL MSW Diversion (including current 18%)		30-36%		35-42%		75-80% (1)

Notes: (1) Values cannot be added directly. If direct addition is required it will be necessary to determine the split of waste materials to organics diversion, various recycling programs and waste conversion technologies. The likely result being approximately 20 to 25% of waste goes to landfill.

Table 4-2 – Cost Information

Program Area	% increase in TOTAL MSW Diversion [1]	Estimated Tons Diverted, per Year[1] (Increase Over Current)		Range of Annualized Cost Equivalent (2013$) (Increase Over Current)[2]		Range of Cost/Household/Month (2013$) (Increase Over Current)[2][3][4]	
Source Reduction	1-6%	4,100	16,500	$300,000	$900,000	$0.21	$0.63
Toxics Reduction	less than 1%						
Modular Storage Container(s)				$2,300[5]	$4,600[5]	$0.00	$0.00
Small Storage Building				$3,100[5]	$7,600[5]	$0.00	$0.01
Permanent Facility		50	50	$126,000[5]	$417,000[5]	$0.08	$0.29
Yard Waste							
Status Quo	0%						
Year Round Ban	1-2%	4,100	8,200	No Estimate	No Estimate	No Estimate	
Residential Recycling							
Containers	N/A	N/A	N/A	$500,000	$700,000	$0.50	$0.67
Universal with Minimum Levels of Service	5-7%	20,600	28,800	$5,100,000[6]	$7,100,000[6]	$5 - $7 Free Market	
				$3,600,000[6]	$5,100,000[6]	$3.50 - $5.00 Franchise/Contract	
				N/A	N/A	No increase if Franchised/Contracted with Solid Waste Collection	
Universal - More Enhanced Program	6-8%	24,700	32,900	$5,100,000	$7,100,000	$5 - $7 Free Market	
				$3,600,000	$5,100,000	$3.50 - $5.00 Franchise/Contract	
				N/A	N/A	No increase if Franchised/Contracted with Solid Waste Collection	
Universal - Incentivized	8-10%	32,900	41,200	No Estimate	No Estimate	No Estimate	
Commercial Recycling	6-12%	24,700	49,400	No Estimate	No Estimate	Not Applicable	
Organic Waste Diversion	5-10%	20,600	41,200	$824,000	$4,100,000	No Estimate[6]	
Waste Conversion Technologies	40-50%	168,000	206,000	No Estimate	$20,000,000	No Estimate[6]	

(2013$) refers to value expressed in current day (2013) dollars.

Notes: (1) Based on estimates of Total MSW generated in the Planning Area in 2013 (411,576 tons from Waste Generation Projections in Appendix B of the Needs Assessment (November 2012)).
(2) Ranges of costs are generally related to ranges of increased diversion.
(3) Costs are based on the City of Lincoln; additional analysis would be needed to determine costs in rural areas and villages.
(4) Based on approximately 84,700 occupied single-family to four-plex households in the County.
(5) Annualized costs are for capital expenditures, assumed to be amortized (financed) over a period of 20 years.
(6) Because these are viewed as long-term options with numerous implementation considerations, which would require further evaluation and integration of costs with other systems, facilities and programs, no estimate is provided.

Table 4-3 – Estimated Annualized Capital and Operating Expenses (2013$)

Option/Topic	Annualized Capital Expense	Annual Operating Expense	Total Annual Expenses
Source Reduction (Education/Behavior Change)	0	$300,000 - $900,000	$300,000 - $900,000
Toxics Reduction • Modular Storage Container • Small Storage Building • Permanent Facility	 $2,300 – $4,600 $3,100 - $7,600 $76,400 - $267,000	 $0 Not Estimated $50,000-$150,000	 $2,300 - $4,600 Not Estimated $126,000 - $417,000(1)
Yard Waste	$0	N/A	$0
Residential Recycling and Diversion • Containers • At $5 to $7 per household/month • At $3.50 - $5.00 per household/month	Containers Only $500,000 -$700,000	Collection Only $5,100,000 - $7,100,000 $3,600,000 - $5,100,000	Collection plus Containers $5,600,000 - $7,800,000(2) $4,100,000 - $5,800,000(2)
Commercial Recycling and Diversion	(3)	(3)	(3)
Construction and Demolition Materials Recycling	(3)	(3)	(3)
Organic Waste Diversion (Composting)	(3)	(3)	$824,000 - $4,100,000(7)
Waste Conversion Technologies	(3)	(3)	$20,000,000(4)
Municipal Solid Waste Disposal • Expand on adjacent City property	$487,000-$722,000(5)	N/A	$487,000-$722,000(5)
Construction and Demolition Waste Disposal • Expand on adjacent City property	$7,900(5)	N/A	$7,900(5)
Transfer Station and Processing Facilities	$450,000 - $610,000	Not Estimated	Not Estimated(6)

N/A – Not Applicable
(2013$) refers to value expressed in current day (2013) dollars.

Notes: (1) Annual costs are assumed to be reduced by grants and other funding sources for both capital and operations costs.
(2) Costs are a function of program and method of providing added services. Annual costs are estimated increases for City-wide service and reflect the overall program cost. Collection costs are assumed to include all labor, equipment, fuel, and other incidental costs and any revenue off-sets.
(3) No estimates of annual capital or operating costs are provided.
(4) Costs are based on $120 per ton and an assumed 168,000 tons per year managed by this technology.
(5) Assumes costs are accrued annually to fund future capital expenditures. Actual costs may need to be incurred on per ton basis to reflect the effects of variations in tonnage on site life. This assumes advanced funding of future construction, which has not been the method of cost accounting utilized in the past.
(6) Annual costs for debt, operations, maintenance, and hauling are assumed to be off-set by user fees if a facility is deemed economically feasible.
(7) Costs are based on $40 to $100 per ton and 20,000 to 41,200 tons per year assumed to be managed by this technology. Costs do not include collection.

Section 5 – Public Involvement

From the beginning of the Solid Waste Plan 2040 planning process the public was invited to participate and provide comments. All Advisory Committee meetings were open to the public and all documents distributed to the Advisory Committee were made available to the public/community (see Appendix D1). All meetings of the Advisory Committee allotted time for the public to comment and those comments were documented in meeting notes. At key milestone in the planning process, Open House meetings were held to provide further opportunities for the public/community to obtain information and provide comments. Through various media, efforts were made to engage the community and provide outreach. This was done to ensure that they were aware of the planning efforts, were provided opportunities to participate and that there was transparency in the planning process.

5.1 Advisory Committee

The Advisory Committee Charge Statement indicated that the committee is to evaluate community inputs; reflect input from the community and stakeholders on topics; and, ensure transparent decision making. Public comments were summarized and provided to the Advisory Committee to assist them in carrying out this charge.

5.2 Public Involvement

At the initiation of the planning process an effort was undertaken to identify a wide range of public involvement and public outreach tools and techniques that could be used to support the development of the Solid Waste Plan2040. The intent was to establish a comprehensive communications and outreach program that maximized opportunities for residents, businesses and stakeholders to become engagement in the solid waste management planning process. Outreach was identified to be an ongoing project activity through various communication tools, at Advisory Committee meetings, and at key milestones in the project.

5.2.1 Communication Tools

The following tools were used to communicate information. Additionally, various means were used to gather input from the public, businesses, and stakeholders.

- The City of Lincoln established and maintain a website, at www.lincoln.ne.gov/city/pworks/waste/sldwaste/solidwasteplan2040.
- Advisory Committee meetings, included:
  - Agendas
  - Meeting Notes
  - Presentations
  - Handouts
- Public Open Houses, included:
  - Display Boards (Appendix D3)
  - Information Cards
  - Internet Access to Virtual Town Hall Meetings and the Website

    - Comment Forms
- Virtual Town Hall Meetings, included:
    - Links to the Website and Technical Papers
    - Copies of Public Meeting Display Boards
    - Audio/Video narration
    - Survey questions
    - Comment Forms
- Newsletters (Appendix D2) were sent out on three occasions
- City Focus TV broadcasts were undertaken on two occasions
- Mayoral Press Releases were done on three occasions
- Phone Line was available throughout the entire planning process

In addition the ongoing planning activities were covered in news and editorials in local newspaper, radio and other media.

5.2.2 Project Website

The website (content included in Appendix D4) was used throughout the planning process as: a core tool for communication; a source to obtain ongoing information; a means to distribute information and documents to the Advisory Committee, public, businesses, and stakeholders; and, a means by which the public, businesses, and stakeholders could participate and provide input. The structure of the website included the following tabs:

- Home page
- The Process
- The Committee
- Contacts page
- Frequently Asked Questions
- Get Involved
- Documents
- Comments

Meeting agendas, meeting notes, presentations, meeting handouts, and other documents were distributed to the Advisory Committee (and public) using the website. By placing all documents on the website the planning effort was totally transparent; all documents distributed to the Advisory Committee were placed on the website.

5.2.3 Outreach Materials

At the beginning of the planning effort various sources were used to create an outreach database of emails and mailing address. This list was updated as members of the public provided comments, attended meetings or requested to be added to the communications/contacts list. This database was subsequently used to distribute newsletters and announce Open House and Virtual Town Hall meetings. A full Schedule of Meeting times were always posted on the website and changes to meeting dates were communicated via email to all those in the database.

A toll-free project information line, 402-441-7738, was created to serve as an added point of contact for the public, businesses, and stakeholders. A recorded message provided information about the upcoming meetings, the planning process and allowed callers to leave messages. Messages and comments received on the project information line were transcribed and placed on the website, under the Comments tab.

The project information line was updated before and after each Advisory Committee and Public Open House meeting.

5.2.4 Surveys

In addition to providing a wide array of options to the public to comment survey tools were used to obtain additional input. At the beginning of the planning effort a Baseline/Assessment Survey (Appendix D5) was undertaken to provide a quantitative local assessment of public awareness and attitudes toward solid waste management, recycling/composting, waste reduction/diversion, and program costs. Using City zip-codes 1200 households were randomly identified to receive the survey (over 400 household actually agreed to participate). The survey was conducted by a professional survey firm and was design to be scientifically valid with a 95 percent confidence interval. One goal of the survey was to collect information that would provide a foundation for decisions on programs subsequently recommended for inclusion in the Plan.

As part of the Open House and Virtual Town Hall meetings associated with the System Definition, additional non-scientific surveys were undertaken on select topics. The results of these surveys are included in Appendix D6, and are discussed in greater detail below.

5.3 Public Comments

There was a wide array of methods by which the public/community could provide comment during the planning process. These included the following:

- Via the project website: http://lincoln.ne.gov keyword: solid waste plan. This would lead them to a Contact tab that provided a means of electronically submitting comments. The website also listed other means by which comments the public/community could provide comments.
- Via email at email@solidwasteplan.com
- Via a project phone line: (402) 441-7738
- Via mail: Solid Waste Plan 2040
  2400 Theresa Street
  Lincoln, NE 68521
- By attending an Advisory Committee meeting
- By participation in the Open House or Virtual Town Hall meetings. There were two such Open House meetings (November 13, 2012 and August 13, 2013) and two Virtual Town Hall meetings (November 6 to 20, 2012 and August 6 to 20, 2013)

Comments received via the website, email, mail, telephone and as a result of the November 6 to 20, 2012 Town Hall meeting were regularly posted in a chronological manner on the project website under the Comments tab. Copies of those comments (through November 5, 2013) are included as a Public Comments report in Appendix D6. Comments provided at the August 13, 2013 Open House and the August 6 to 20, 2013 Virtual Town Hall meeting are also included in Appendix D6. The August 2013 Open House and Virtual Town Hall meetings included a series of Topics with survey style questions, space where participants could share ideas on specific topics, and space to create additional topics for others to comment upon. There was also space provided where participants could simply add comments or exchange comments in a dialog fashion. The survey results (included in Appendix D6) reflect the input of those who chose to participate; it is considered non-scientific because it reflects only those who chose to access the website and provide their input. Tracking data suggests 390 people accessed the Virtual Town Hall meeting and 109 participated in the survey and comment process.

Comments provided at Advisory Committee meetings are included in the meeting notes, available via the Comments tab on the project website and contained in Appendix D1 this Plan.

The Open House (August 13, 2013) and Virtual Town Hall (August 6 to August 20, 2013) meetings was designed to encourage the public to "share your ideas about the future of solid waste management in Lincoln and Lancaster County" and included information presented in the solid waste System Definition document as well as summaries related to the following topics:

- Residential Recycling
- Commercial Recycling (apartments, businesses, industries and institutions)
- Toxics Reduction
- Source Waste Reduction
- Organic (Food) Waste Composting

Participants were invited to respond to short survey questions, share ideas on certain topics, provide general comments or create additional ideas for public discussion. The structure of the site allowed for comments on virtually any solid waste management related topic the participant wished to address. In addition to the five topics listed above, in the "Share Your Ideas" category, participants added nine categories with associated comments. All of these comments are included in Appendix D6.

Section 6 – Recommendations

Following the review of all public comments received throughout the planning process, the Advisory Committee met and formulated recommendations for future solid waste management in Lincoln and Lancaster County. The recommendations include both definitive items and evaluation activities, which are intended to guide in the development of future systems, facilities and programs. They are also intended to provide a framework for future decision making.

As further described under Section 1.3.1, in the development of this Plan, a vision statement with guiding principles and plan goals was established to aid in both the Plan development and in the evaluation of implementation alternatives. The formal adoption of this Plan may aid in setting policies and priorities, as well as providing guidance on options that may arise in the future. In simple terms, future systems, facilities, or programs should be in conformance with the Solid Waste Plan 2040, or the Plan should be modified to incorporate these future changes.

6.1 Advisory Committee Recommendations

The Advisory Committee developed specific recommendations on solid waste management in two phases. The first was in the facilitated process described above to develop the Preferred Paths. The Committee Chair led the second phase of the process in which the Advisory Committee was asked to suggest recommendations and these were discussed and voted on. The following is a list of recommendations that were approved by a super majority (two-thirds) of the Advisory Committee members present. In addition, a complete list of recommendations offered and/or discussed by the Advisory Committee is provided in Appendix E.

- **Overall Waste Reduction and Recycling Goal**
  - Reduce the per capita rate of municipal solid waste disposed of in landfills to:
    - 1,940 pounds per capita per year by 2018
    - 1,720 pounds per capita per year by 2025
    - 1,510 pounds per capita per year by 2040

    Metric: 2011 rate is 2,150 pounds per capita per year. This is calculated by dividing the total municipal solid waste sent to disposal in landfills (from Lincoln and Lancaster County) by the current Lancaster County population (estimates prepared by the City's Planning Department). The recommended goal should be revisited and adjusted in 2015 and every five (5) years thereafter.
- **Source Reduction**
  - Expand programs that lead to greater source reduction.
- **Toxics Reduction**
  - Expand the toxics reduction program and create a place to provide year round access.
- **Yard Waste**

  - Maintain the status quo (seasonal ban on grass and leaves).
- **Residential Recycling**
  - Residential curbside recycling to be provided to all single family and duplex dwellings City-wide.
    - The preferred path would require (mandate by ordinance) that curbside collection of recyclables be provided to all single family and duplex dwellings. All single family and duplex residential dwellings would receive recyclables collection service but resident participation would be voluntary (e.g., they would not be required/mandated to recycle).
- **Commercial Recycling**
  - Commercial recycling to be provided to multi-family dwellings, businesses, industries and institutions.
    - The preferred path would require (mandate by ordinance) that collection of recyclables be provided to all multi-family dwellings, businesses, industries and institutions. All multi-family dwellings, businesses, industries and institutions would receive recyclables collection service but their participation would be voluntary (e.g., they would not be required/mandated to recycle).
- **Construction and Demolition Materials Recycling**
  - Develop/Support programs to reduce the quantities of construction and demolition waste going to the City's disposal site(s).
- **Organic Waste Diversion (Composting)**
  - Develop/Support programs to reduce the quantity of organics, especially food waste, going to the City's MSW disposal site.
- **Waste Conversion Technologies**
  - Pursue the development of Waste Conversion Technologies as a part of a long-term strategy for energy recovery and resource conservation.
- **Municipal Solid Waste Disposal**
  - Expand on City-owned property to the east of the currently permitted site.
- **Construction and Demolition Waste Disposal**
  - Expand on City property.
    - When additional construction and demolition waste disposal area is required the C & D landfill should be expanded to the south of the current landfill within the North 48th Street Facility. Expansion space may also be available south of the currently permitted Bluff Road disposal area.
- **Transfer Station and Processing Facilities**
  - Develop a municipal solid waste Transfer Station if a feasibility study shows it can be cost effective.
  - The City of Lincoln is encouraged to locate and secure a site for the construction of a second transfer station if supported by a feasibility study.
- **Eco-Park**

  - The City of Lincoln is encouraged to establish an "Eco-Park" at either the existing North transfer station or a future Transfer Station if supported by a feasibility study. The "Eco-Park" could be a permanent facility for the collection and storage of HHW. It could also be a one-stop shop for the recycling, repurposing and disposal of items that one may collect when selling a house, cleaning a garage, or engaging in a remodeling project. The "Eco-Park" could include drop-off facilities for the recycling of traditional recyclables (glass, plastic, paper, metal) but also for the recycling/repurposing of wood, yard waste, clothing, used construction materials, appliances, latex paint, and electronics).
- **Education/Behavior Change**
  - Targeted educational programming be developed dealing with each Preferred Path Recommendation.
  - A financial commitment be made by the City to provide staffing and resources to educate individuals and businesses as part of the implementation of the plan recommendations.
- **Data and Reporting**
  - The city and county should collect data relevant to the effectiveness of each preferred path and should use the data to analyze adjustments in the goals set by this committee.
  - A reporting system should be created and adopted to measure recycling rates. Reporting should be required by ordinance, said reports should occur on an annual basis and should be required as part of operating a recycling service.
  - The City should gather data related to each of the preferred paths. This data can be based on record keeping, experience, or other sources and would be used as part the periodic reviews of the Solid Waste Management Plan.
  - The City should collect additional data on C&D waste, recycling, and diversion rates and the amounts disposed of in the City of Lincoln.

6.2 Implementation Process

The following provides a general description of actions necessary to implement these recommendations. In further evaluating, selecting or implementing a change to the current management practices it will be important to consider the following:

- Systems, facilities and programs need to be consistent with the requirements in state and local laws.
- All systems, facilities and programs must be ability to control environmental and economic risks.
- Evaluate future available waste management systems, facilities and program options using the vision, guiding principles and goals established in LPlan 2040 and the Plan.

6.2.1 Implementation Considerations

The process of implementing the Solid Waste Plan 2040 recommendations will require working closely with elected and appointed officials, recyclers, waste haulers, regulated businesses and the community as a whole. Specific implementation actions may include:

- Educating users of the system and promoting the programs and goals of the Solid Waste Plan 2040.
- Communicating with residents, businesses, and stakeholders.
- Executing cooperative agreements or arrangements between units of government or private entities.
- Performing additional studies or evaluation.
- Changing laws, regulations and ordinances.
- Monitoring and enforcing laws, regulations, ordinances and policies.

Table 6-1 provides a matrix of possible implementation actions, previously presented in the System Definition.

Table 6-1 – Implementation Actions for System Definition Options

	Changes in Laws, Regulations and Ordinances	Cooperative Agreements or Arrangements between Units of Government or Private Entities	Additional Studies or Evaluation	Monitoring and Enforcement	Costs and Funding	Educational Initiatives and Promotion of Behavioral Changes	Changes to Existing Programs	Markets
Source Reduction	No	-	No	No	Yes	Yes	No	N/A
Toxics Reduction	-	-	Possibly	No	Yes	Yes	Yes	No
Yard Waste	No	No	No	No	Yes	No	No	Yes
Residential Recycling and Diversion	Yes	Yes	Possibly	Yes	Yes	Yes	Yes	Yes
Commercial Recycling and Diversion	Yes	Yes	Possibly	Yes	Yes	Yes	Yes	Yes
Construction and Demolition Materials Recycling	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Organic Waste Diversion (Composting)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

	Changes in Laws, Regulations and Ordinances	Cooperative Agreements or Arrangements between Units of Government or Private Entities	Additional Studies or Evaluation	Monitoring and Enforcement	Costs and Funding	Educational Initiatives and Promotion of Behavioral Changes	Changes to Existing Programs	Markets
Waste Conversion Technologies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Municipal Solid Waste Disposal	No	No	No	No	No	No	No	No
Construction and Demolition Waste Disposal	No	No	No	No	No	No	No	No
Transfer Station and Processing Facilities	Possibly	Possibly	Yes	No	Yes	No	Yes	No

N/A = Not Applicable

Changes in Laws, Regulations and Ordinances refers to major actions without which implementation might not occur. An indication of "No" or "-" indicates that change would be minor in nature including clarification, changes in definitions, changes incidental to the overall program change or to accommodate program modification not anticipated to have major cost implications. This may also include changes requiring legislative approval.

Cooperative Agreements or Arrangements between Units of Government or Private Entities refers to formal agreements for services requiring approval by the City Council or Mayor. This does not include agreements for such items as building construction. Examples of this might be processing agreements, collection franchises or contracts, energy sales agreements, system operating agreements, or waste supply agreements.

Additional Studies or Evaluations refers to action that may be necessary to better define or help select specific programs, program changes or to establish feasibility. This may also include assessment of markets, costs or rate structures.

Monitoring and Enforcement refers to additional requirements anticipated to be necessary by the City to assure that systems, facilities or programs are performing in accordance with applicable laws, regulations, ordinances or agreements with the City.

Costs and Funding refers to program options where the stakeholders may incur added costs or where municipal participation in funding may be required.

Educational Initiatives and Promotion of Behavioral Changes refers to public outreach and educational efforts, efforts to promote or inform stakeholders of changes, and efforts to help ensure program success or maximize outcomes. This is considered an essential aspect in the achieving the Solid Waste Plan 2040 recommendations and maximizing participation on various systems, facilities and programs.

Changes to Existing Programs refers to changes to the status quo. These would be changes deemed necessary to implement the Preferred Path or to achieve a goal (e.g., reduced waste generation, increased diversion of waste from landfill, resource conservation and recovery, reduction in air emissions, etc.).

Markets refers to the need to evaluate or secure markets as part of the implementation of an option or program change.

6.3 Monitoring Mechanism and Updates

The Advisory Committee made several recommendations on data collection and monitoring. In addition, there are many things that affect estimates of future diversion including: specific program elements, costs, participation levels, public education and implementation timing. For the effective realization of the recommendations in the Solid Waste Plan 2040 it will be necessary to monitor the selected systems, facilities and programs as they are implemented to assess their effectiveness and make appropriate modifications to this plan.

In order to monitor the implementation of the Solid Waste Plan 2040, the following actions are recommended:

Annual

- Annually update and report on the progress achieved in the prior year toward achieving the Solid Waste Plan 2040's recommendations.

Two-year

- As part of the biennial budgeting process identify priority systems, facilities and program changes anticipated in the next 2 years.

Five-year

- As major changes occur, review the Solid Waste Plan 2040 and modify the Plan to reflect changes in recommendations, action items and timetables.