

CHELSEA CENTER FOR RECYCLING AND ECONOMIC DEVELOPMENT

UNIVERSITY OF MASSACHUSETTS

RBED Report

SPRINGFIELD ECO-INDUSTRIAL BASELINE STUDY

May, 2001

SPRINGFIELD ECO-INDUSTRIAL BASELINE STUDY

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Community Economic Development
through Recycling Program

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The Chelsea Center for Recycling and Economic Development, a part of the University of Massachusetts' Lowell Center for Sustainable Production, was created by the Commonwealth of Massachusetts in 1995 to create jobs, support recycling efforts, and help the economy and the environment by increasing the use of recyclables by manufacturers. The mission of the Chelsea Center is to develop an infrastructure for a sustainable materials economy in Massachusetts, where businesses will thrive that rely on locally discarded goods as their feedstock and that minimize pressure on the environment by reducing waste, pollution, dependence on virgin materials, and dependence on disposal facilities. Further information can be obtained by contacting the Chelsea Center for Recycling and Economic Development, 80 Everett Avenue, Suite 221, Chelsea, MA 02150, 617-887-2300.

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TABLE OF CONTENTS

INTRODUCTION.....	4
AN ECO-INDUSTRIAL APPROACH TO ECONOMIC DEVELOPMENT.....	4
PROJECT DESCRIPTION.....	5
PROJECT GOALS AND OBJECTIVES.....	5
PROJECT ACTIVITIES.....	6
<i>Eco-Industrial Development Strategy Workshops.....</i>	<i>6</i>
<i>Eco-Industrial Advisory Council Meetings.....</i>	<i>6</i>
<i>Final Meeting to Discuss Next Steps.....</i>	<i>6</i>
<i>Baseline Study of Eco-Industrial Opportunities.....</i>	<i>7</i>
<i>Interviews with Key Stakeholders.....</i>	<i>8</i>
<i>Interactive GIS database.....</i>	<i>8</i>
<i>Final Presentation.....</i>	<i>9</i>
RESEARCH: LIMITATIONS AND RECOMMENDATIONS.....	9
SPRINGFIELD’S CURRENT INDUSTRIAL ECOLOGY.....	10
LOCATION AND TRANSPORTATION.....	10
INFRASTRUCTURE.....	10
MARKETS.....	11
MAJOR EMPLOYERS.....	11
INDUSTRIAL COMPOSITION.....	12
EXISTING NETWORKS.....	17
EMPLOYMENT RESOURCES.....	18
WASTE AND RECYCLING IN SPRINGFIELD.....	19
<i>Solid Waste Concerns of Businesses.....</i>	<i>19</i>
<i>Past and Current Recycling Experience.....</i>	<i>19</i>
ECO-INDUSTRIAL DEVELOPMENT OPPORTUNITIES IN SPRINGFIELD.....	20
BYPRODUCT EXCHANGE AND REUSE.....	20
<i>Exchange, Recycling, and Remanufacturing Opportunities.....</i>	<i>20</i>
<i>Opportunities for Small Businesses.....</i>	<i>22</i>
<i>Interest in Waste Exchange Program and Related Services.....</i>	<i>22</i>
<i>Perceived Risks of Involvement.....</i>	<i>23</i>
BYPRODUCT EXCHANGE INFRASTRUCTURE.....	23
R&D AND BUSINESS INCUBATORS.....	24
TRAINING AND WORKFORCE DEVELOPMENT.....	24
BUSINESS CLUSTERING.....	25
REDEVELOPING THE CRANE/CHAPMAN VALVE SITE.....	25
RECOMMENDATIONS.....	27
1. RESEARCH AND DEVELOPMENT: IDENTIFY FURTHER ECO-INDUSTRIAL OPPORTUNITIES.....	27
2. LOCATE RECYCLING-BASED AND REMANUFACTURING COMPANIES.....	27
3. FACILITATE BUSINESS-TO-BUSINESS EXCHANGES.....	27
4. PROMOTION AND AWARENESS: MARKET ENVIRONMENTAL PRACTICES AND SPRINGFIELD’S “ECO-INDUSTRIAL VALLEY”.....	27
5. CATALYZE INFORMATION EXCHANGE.....	28

INTRODUCTION

The Springfield Eco-Industrial Baseline Study examines the materials flows in the City of Springfield that can support economic development and business retention and attraction. The aim is to identify material byproducts produced by local manufacturers that can be used as feedstock resources for existing production processes and manufacturers of recycled and remanufactured products. With an eye on business retention, the City seeks to help existing businesses become more competitive through lower waste disposal costs and potential profit from symbiotic waste exchange partnerships with other firms. At the same time, by better understanding available byproducts, Springfield can attract new businesses that require those byproducts as production inputs. The ultimate goal is the creation of new jobs and the retention of old ones to fuel sustainable economic development in the City.

The study additionally investigates alternatives for developing an eco-industrial park on a brownfield site, the former location of the Crane Company and Chapman Valve, nestled within a mixed residential/commercial neighborhood that has been vacant for twenty years. Indian Orchard, the neighborhood that hosts this site, is in desperate need of new jobs, new vitality, and a new reputation as a progressive, non-polluted community. The City and the neighborhood have together decided that this site will be a new symbol of pride representing the intersection of a clean environment and a thriving economy.

The City of Springfield has donated the land at the future eco-park site for several reasons. Recognizing that this former manufacturing site had been on the decline since 1960, with a current vacancy rate of 95 percent, the City hopes to find creative, state-of-the-art solutions for its redevelopment. Community planning plays a crucial role in this planning so that the needs and interests of the surrounding Indian Orchard community are well integrated. The City additionally saw redevelopment of the Crane/Chapman site as an opportunity to create jobs and broaden the tax base. Eco-industrial development offers an approach that meets these needs in a way that both responds to market conditions and improves the environment.

The Mayor's Office and the Springfield Planning and Development Offices have partnered with Indian Orchard residents, neighborhood groups, and TerraSphere/BSC Team consultants to create a joint Chapman Valve Redevelopment Plan. These partners participated in a public planning process that included three visioning workshops and target meetings with key individuals within the neighborhood. This process was intended to expand community involvement and aggressively respond to neighborhood concerns and needs, while realistically addressing current and projected economic market conditions. The Springfield Eco-Industrial Baseline draws upon the ideas generated through these earlier activities and identifies ways in which the eco-industrial redevelopment of the Crane/Chapman site can support and be a part of a larger eco-industrial network in the greater Springfield area.

AN ECO-INDUSTRIAL APPROACH TO ECONOMIC DEVELOPMENT

Eco-industrial development adds value to businesses and communities by optimizing the use of energy, materials, human, and other community resources. For business, value is added as waste byproducts, water, and energy are cycled back into the production stream to be used as raw materials for another product or firm. This "closing of the loop" results in the conservation of natural resources and lower disposal and production costs. Eco-industrial development potentially offers the means to achieving greater efficiency through "economies of systems integration" (Ayres 1996), where partnerships between businesses meet common service, transportation, and infrastructure needs. Industrial ecology systems, if organized well, become a built-in incentive to minimize waste of materials, energy, water, and labor time.

In a community development context, lower costs for businesses translate into greater opportunities to reinvest in new jobs, training, and environmental management practices. Eco-industrial development suggests that maximizing resource efficiency also includes assessing and optimizing community assets not typically considered. Assets include human resources, natural habitats, cultural and aesthetic resources, and existing institutions. Resources might also include elements of a community typically considered detriments, such as brownfields and abandoned buildings, which can be renewed and mined for materials.

Many current eco-industrial projects aim to revitalize and improve economically distressed communities, with particular focus on redevelopment of brownfields and decommissioned federal properties such as military bases. The benefits for communities are improved environmental health, enhanced resource efficiency, increased jobs, and viable businesses.

The eco-industrial approach has many applications. At a most basic level, it can be used to develop a strategy where each organization seeks higher performance within itself. Most eco-industrial activity, however, involves moving to a new level of performance by increasing interconnections between companies. Variations occur based on the different issues affecting participating companies and communities, such as the natural and market ecology, or how closely businesses are willing to work together for their mutual advantage. Promoting this broader interaction between companies can be a value-added service offered by the recruiting community or developer to attract new companies, as well as to improve the performance of existing firms.

Although often overlooked, cooperation between companies and improvements in their interconnections is more of a common factor in the “free economy” than pure competition. Wherever we look in nature, we see interconnected systems that work with one another to assure survival and efficient use of material and energy resources. This is also true of the business world. Strategic partnerships, networked manufacturing, and preferred supplier/customer relationships are examples of how businesses assure growth, contain costs, and reach for new opportunities.

For most businesses, the two essentials for success are responsive markets and access to cost-effective, quality resources for producing products or delivering services. Without these two factors, virtually every other incentive becomes a minor consideration. Conventional development strategies speak of how important costs, such as inexpensive labor or tax abatement, are to decisions to locate. These cost considerations, however, are secondary to evaluating market and resource access issues. From a community standpoint, presenting strengths in the primary areas—markets and resources—can move a location to a higher level of priority before having to compete with tax incentives.

Companies look for the most productive new locations for their operations. Communities such as Springfield want to retain and attract clean companies, good jobs, and businesses that will contribute to local sustainable growth. Companies will move to and stay in communities with high quality resources, including labor and materials, and with favorable market access and infrastructure. This baseline study identifies a stream of byproduct resources that can both attract new recycling-based manufacturing firms and provide opportunities for existing businesses to create exchange networks.

Springfield in particular is important in this regard. There is very little industrial land available in the city so therefore a value and niche strategy must be employed. The inevitable aftermath of its success in traditional manufacturing requires new strategies to maintain this important sector of the economy while its high tech and telecommunications successes take root for the future.

PROJECT DESCRIPTION

Project goals and objectives

The objectives of this study include the following:

1. Identify commercial and industrial sectors in the City of Springfield that may provide feedstock for recycling based businesses or other businesses that could be attracted to the city by business-to-business connections; and
2. Create community partnerships that will help develop recycling-based and sustainable community economic development initiatives.

Project Activities

The project partners gathered data from a range of sources, including public meetings, interviews with community members and businesses, a survey of businesses, and existing economic development data. The project partners formed an Eco-Industrial Advisory Council (EIAC), which actively supported the design and implementation of these activities. This council and each activity are described below.

Eco-Industrial Development Strategy Workshops

Community Workshops

The project team convened a series of meetings with community groups on the potential for eco-industrial development in Springfield. The purpose of these discussions was to identify community concerns, interests, and ideas concerning community and economic development. The aim was to gather input on community assets and constraints, underdeveloped opportunities, and potential areas of materials exchange, recycling, reuse, and remanufacturing. Discussion participants included individuals and groups interested in economic development in the larger Springfield community and in the specific development of the Crane/Chapman Valve site located in the Indian Orchard neighborhood. They included:

- Economic Development Department
- Charles Brush, Indian Orchard Mills
- Indian Orchard Main Street Partnership
- Indian Orchard Citizen Council

Eco-Industrial Advisory Council Meetings

In addition to conducting community workshops, the project team invited to the EIAC individuals whose interest and expertise in sustainable economic development and waste management would contribute to the project. The EIAC consisted of business leaders, waste management professionals, community group leaders, and economic development and planning agency members, including the following individuals:

- Russell Denver, Affiliated Chambers of Commerce of Greater Springfield, Inc.
- Charles Brush, Indian Orchard Mills
- Heather Rothenberg, Indian Orchard Main Street Partnership
- Amy Perlmutter, Chelsea Center
- Greg Supernau, Springfield Department of Public Works (DPW)
- M.J. Adams, Pioneer Valley Planning Commission (PVPC)
- John Majercak, Center for Ecological Technology (CET)
- Jim Madden, Springfield Office of Economic Development

The EIAC met three times during the course of the project. Minutes from these meetings are attached in Appendix 5. The first meeting was held on January 11, 2001, in the College Room of the First Massachusetts Building. The purpose of the first meeting was to orient the council members with the goals of the Baseline Study, present the tools that will be used, and obtain input on how to refine and use these tools.

The objective of the second meeting on February 23, 2001, was to share with EAIC members the initial results of the project and discuss the internet-based GIS database the project team has developed. The members generated a number of ideas for how to develop the project further and disseminate information on byproduct exchange opportunities.

Final Meeting to Discuss Next Steps

At the third EIAC meeting, held on April 9, 2001, members discussed the final project results and the evolving format of the GIS database (see below). The Council generated further alternatives for how to tap into the City's waste streams to retain and attract new businesses, and discussed options for continuing to build this program beyond the project period. The members agreed that a facilitator of eco-industrial

networking will be necessary for building awareness of potential waste exchange opportunities and connecting businesses.

Baseline Study of Eco-Industrial Opportunities

This report represents the baseline study findings from community workshops, a preliminary survey of industries, and interviews with key stakeholders. The purpose of these activities was to explore the potential for eco-industrial opportunities in the City of Springfield and how eco-industrial development can work. Recommendations based on the findings of these activities are provided at the end of this report.

Preliminary Survey of Industries

The project team developed and implemented a preliminary survey of existing Springfield businesses (Appendix 1). The purpose of this survey was to identify partnership opportunities within Springfield's business community. The survey included questions regarding general company information, product line, materials flows (i.e., primary inputs and outputs), waste disposal and recycling, and water. The Chamber of Commerce and the Eco-Industrial Advisory Council assisted with development of the survey instrument and generated a number of additional ideas for the project.

The survey was sent with a cover letter on Chamber of Commerce letterhead encouraging participation (Appendix 1). This letter emphasized that the survey is an educational tool to help the city identify ways to save businesses money. The survey packet contained a list of materials that can be exchanged, recycled or reused, and a description of other potential areas of eco-industrial networking. The project team conducted follow-up calls to remind and encourage businesses to respond and schedule in-person interviews. The active support of the Chamber of Commerce and the use of its letterhead contributed to the above-average response rate of 24%.

Potential respondents were selected from a Chamber of Commerce database, based on type of industry and/or level of waste. Specific selection criteria included:

1. Manufacturers
2. Construction-related businesses
3. Repair services (e.g., machine, auto, equipment)
4. Other machine shops
5. Businesses that might generate wastes that are commonly recycled (glass, plastics, paper, cardboard, textiles, wood, etc.) or remanufactured (machines, electronic equipment, computers, etc.).
6. Some retailers and wholesalers, particularly those that might use substantial packaging or generate organic wastes.

The 34 businesses responding to the survey represent the following sectors:

<i>Sector</i>	<i>Products/Services</i>	<i>% of Responses</i>
Manufacturing	Electronic parts, chemicals, packaging, handguns, textiles (flags, banners), food processing and packaging, specialty packaging, heater elements, coated/laminated paper, fuel oil, pipe tubing, newspaper printing)	55
Construction	Roofing, mechanical contractors, general contractors	15
Services	Auto/auto glass repair, industrial equipment rebuilding, courier service, packing and shipping, tree service, sales office, cleaners, computer consulting	24
Retail	Paint & paint supplies, floral and retail sales	6

Interviews with Key Stakeholders

Business Interviews

During the course of the project, seven interviews were conducted with businesses to follow up on their survey responses. The project team limited interviews to those companies expressing interest in participating in a waste exchange network. The objective of the interviews was to obtain more detailed information on materials flows and other possible interconnections. These discussions additionally focused on labor requirements and the availability and skills of the local workforce, as well as infrastructure and transportation concerns. The interview guide used by the project team is provided in Appendix 3.

Other Stakeholders

In addition to business interviews, the project team held discussions with other groups concerned with economic development in the Springfield area. These individuals and offices provided informed views of the current business climate in the City of Springfield and opinions on the potential for application of eco-industrial development strategies for the business recruitment and attraction. Interviewees included:

- Thomas Holland, Springfield Enterprise Center, Springfield Technical Community College (STCC)
- Kevin Kennedy, Office of Congressman Richard Neal
- Russell Denver, President, Affiliated Chambers of Commerce of Greater Springfield, Inc.
- Jim Madden, Springfield Office of Economic Development
- Ken Delude and Bob Pyers, Western Massachusetts Economic Development Council

Interactive GIS database

The project team has developed an interactive database to document and analyze the survey and interview results. This database will be located on a web site that will allow businesses and other users to search for possible resource matches between local firms. This data will be linked with GIS data to create maps of potential webs of exchanges (see Appendix 7).

The GIS was used for two reasons: 1) to look for geographic partnerships and 2) to create a user interface to find material exchange possibilities. Using GIS will be a useful visual tool in stimulating thinking about potential partnerships and waste exchanges. Because distance and logistical considerations have been shown to affect the financial viability of byproduct exchanges, this mapping will demonstrate spatial relationships between potential exchange partners, allowing users to identify potential partners that are conveniently located.

Users will search the database for facilities using or discarding the same material, and then review the results for promising matches. Follow up interviews and calls will be necessary to gather the required level of detail regarding quantity and quality of inputs and outputs. Once the baseline study is conducted and initial potential partnerships are identified, we suggest convening workshops with representatives from clusters of local businesses to discuss potential partnerships.

The database was created in Microsoft Excel and stored in three separate worksheets within one workbook. The worksheets were:

- “Company information” – which contains data on products, suppliers, disposal costs and customers,
- “Inputs” – which contains data on the type and amount of material inputs, and
- “Outputs” – which contains data on the type and amounts of outputs, whether any recycling was done and the revenue generated by recycling

Data was provided through both surveys and interviews. Each worksheet was then saved as an excel file and then as a dBase file (*.dbf) so that the city’s GIS could access it. ArcView was used as the GIS. For the identification of geographic partnerships, the city’s street theme was used as a base. The companies were then loaded onto the GIS according to their addresses. They appeared as points on the GIS.

The EIAC has generated some helpful ideas on how to best promote this web resource. The Center for Ecological Technology, which is represented on the EIAC, is launching its own new user-developed website at WasteExchange.org. A number of waste exchange sites currently exist on the web; however, these sites face the challenge of promoting their services. CET is marketing its services through direct mail, trade shows, and personal contacts. To ensure confidentiality of participating companies, some of the web-based databases provide a service where the companies indicate which materials they need as inputs or have available. When someone has or needs those materials, the network then faxes or emails automatic notices to the company. The eco-industrial project team and CET will discuss the possibilities of linking databases. The City can further develop the site, with possible maintenance by Springfield Technical Community College (STCC) students.

Final Presentation

The City of Springfield and the Cornell Work and Environment Initiative will present the findings to local businesses, community leaders, and citizens.

Research: Limitations and Recommendations

The 24% response rate for the Preliminary Surveys of Industries was higher than the average for similarly administered surveys. This can most likely be attributed to the project team’s follow-up calls to non-respondents, the active involvement of the Affiliated Chambers of Commerce of Greater Springfield and the use of its letterhead, and the EIAC’s early suggestions for improving the survey instrument. We believe these three facts added to respondent perceptions of the legitimacy and trustworthiness of the survey. On the other hand, several non-respondents indicated they did not return the survey because they felt the study was not relevant to their business or industry, or they lacked the time to complete it. Future versions of the study might therefore be designed with questions more directly relevant to particular sectors.

The business interviews proved highly effective in eliciting further information on business operations, recycling activities, waste management issues, and available byproducts. Interviews in which the respondent provided a tour of the facilities were particularly helpful in revealing materials that had been

overlooked in the survey. The personal interaction allowed by the interview process has been shown in similar projects to provide a basis for relationship building to help facilitate eco-industrial networks. Scheduling interviews, however, proved to be time-consuming and challenging due to a need to call individuals an average of two to three times and conflicting schedules.

This study captures an initial impression of Springfield's industrial composition, with a focused consideration of available byproduct resources. Though the survey and interviews proved valuable in eliciting information on potential eco-industrial networking opportunities, this research only tapped into a small fraction of Springfield's total business establishments. A longer-term study of the area's businesses is required to obtain a more complete picture of available materials streams and other possible business connections.

While models, such as the U.S. EPA's DIET/FAST models and Bechtel Corporation's materials exchange modeling programs, are useful in identifying possible input-output exchanges between certain industries, they have shown themselves to have limited effectiveness. These models can spark ideas for eco-industrial networking, but they rely on outdated manufacturing data and therefore fail to capture current industrial practices. Industry is continually innovating in its use of materials and processes, so input-output analyses relying on 1997 Census data, for example, will fall short of actual 2001 practice. Eco-industrial projects around the world have therefore relied more upon relationship-building and personal interaction between business people—usually with the aid of a facilitator—to forge cost-effective and profitable partnerships.

In Springfield, building rapport and trust in this way will be a crucial element in establishing a strong eco-industrial program in Springfield. Continued contact through surveys, interviews, and other forms of interpersonal interaction will allow program partners to gather more accurate information and promote partnerships. We recommend developing a pilot project focused on one or several available materials and convening discussions among industries producing or using each resource to assess exchange opportunities and other end uses.

SPRINGFIELD'S CURRENT INDUSTRIAL ECOLOGY

Location and Transportation

The City of Springfield, located on the eastern side of the Connecticut River, is positioned along two major interstate highways: I-90 and I-91. These highways connect Springfield businesses to the major cities of the Northeast and widen the commuter range for Springfield workers. Conrail and the Springfield Terminal Railway (STRR) offer freight service to Springfield, site of an intermodal facility, and Amtrak provides passenger rail service to Boston, New York, and Washington, DC. The Bradley International Airport, located in Windsor Locks, CT, 16 miles south of Springfield and 12 miles north of Hartford, CT, is the primary airport for the region. Springfield is a member of the Pioneer Valley Transit Authority (PVRTA), which provides fixed route service in two counties.

Infrastructure

Springfield is at the crossroads of all major fiber optic networks in the Northeast, providing significant opportunity for the growth of high-tech industries in the area. The City of Springfield's Office of Economic Development states that the growth of the high-tech telecommunications and financial services firms has helped offset the gradual decline in traditional manufacturing. The greater Springfield telecommunications infrastructure provides wide access to long distance carriers, points of presence (POPs), capacity, diverse routing, redundancy and local loop competition.

Springfield possesses an abundant water supply of high quality. The West Parish Water Treatment Facility processes source water from Cobble Mountain Reservoir, a protected water supply. This facility filters and disinfects an average of 30 million gallons of source water each day for distribution through over 500 miles

of transmission lines. The quality of water is appropriate to the development of high-tech industries in the area.

Industrial waste is treated at the Springfield Regional Wastewater Treatment Facility (SRWTF), which is owned and operated by the Springfield Water and Sewer Commission.¹ SRWTF is the largest of 171 activated sludge facilities in New England. The SRWTF treats the domestic and industrial wastes from the eight greater Springfield communities, with a combined population of 260,000. The Industrial Pretreatment Division (IPD) controls wastewater discharges from commercial and industrial users to the treatment facility through the use of discharge permits, frequent monitoring, educational and technical assistance referrals, and enforcement of Federal, State, and Municipal wastewater codes.

The SRWTF is an activated sludge system permitted for treatment of an average daily flow of 67 million gallons. Treatment consists of primary settling, grit removal, secondary aeration, flocculation, final settling, chlorination and dechlorination. Solids collected from the primary and secondary systems, are gravity thickened and combined in mixing tanks. After further processing by the belt filter presses, solids are conveyed to a privately owned sludge composting facility or trucked to a landfill. The plant effluent is discharged into the Connecticut River.

Markets

Springfield's central location allows 35 percent access to the U.S. consumer market. Approximate driving time to major cities in the Northeast U.S. and Southeast Canada are shown below.

City	Driving time (hours)	Distance (miles)
Albany, NY	1.5	85
Baltimore, MD	6	345
Boston, MA	1.5	90
Hartford, CT	.5	25
Montreal, QUE	5	315
New York, NY	3	150
Philadelphia, PA	4.25	245
Portland, ME	3.5	190
Providence, RI	1.5	75
Rochester, NY	5.5	310
Toronto, ONT	8	485
Washington, DC	6.5	380

Source: Economic Development of Western Massachusetts, www.ecdev-wma.com/infra_markac.html.

The region consists of both urban and rural areas, offering firms both access to markets and space to grow. High-tech firms are increasingly moving to this area to benefit from the area's high tech incubators.

Major Employers

The Springfield area has a diverse economy, with significant chemical, paper, educational, health care, and government facilities. The City of Springfield's Office of Economic Development lists 29 of the area's largest employers (Box 1). These businesses represent the following sectors:

- Manufacturers (8)
- Higher education (8)
- Health care (5)
- Insurance (2)
- Retail (supermarket/grocery) (2)
- Communications (telephone, postal) (2)

- Electric utility (1)
- Military (1)
- Financial services (1)
- Labor association (1)

Box 1: Major Employers in the Pioneer Valley

American International College	Smith & Wesson
American Saw & Manufacturing	Smith College
Amherst College	Solutia, Inc. (formerly Monsanto)
Baystate Medical Center	Spalding Sports Worldwide
Bell Atlantic	Springfield College
Big Y Supermarket	Springfield Technical Community College (STCC)
C&S: Wholesale Grocers	The Republican Company
Cooley Dickinson Hospital	Titeflex Tubed Products
Dow Jones & Company	Unicare
Friendly Ice Cream Corp.	University of Massachusetts
Holyoke Hospital	US Postal Service
IBEW	Veterans Health Administration
Massachusetts Mutual Life Insurance	Western Mass Electric Co.
Milton Bradley	Western New England College
Mt. Holyoke College	Westover Air Reserve Base
Rexam Graphics	Wing Memorial Hospital

Source: City of Springfield Office of Economic Development.

Industrial Composition

The project team used U.S. Census data on manufacturing firms within the metro-Springfield area to identify potential input and output exchanges. This data suggests that small- and medium-sized businesses make up a significant portion of Springfield’s economic base. Table 1 shows the number of businesses and employees, as well as the amounts of sales receipts or shipments and annual payroll by industry sector and NAICS code. Figure 1 depicts sectors as a percentage of the total number of establishments.

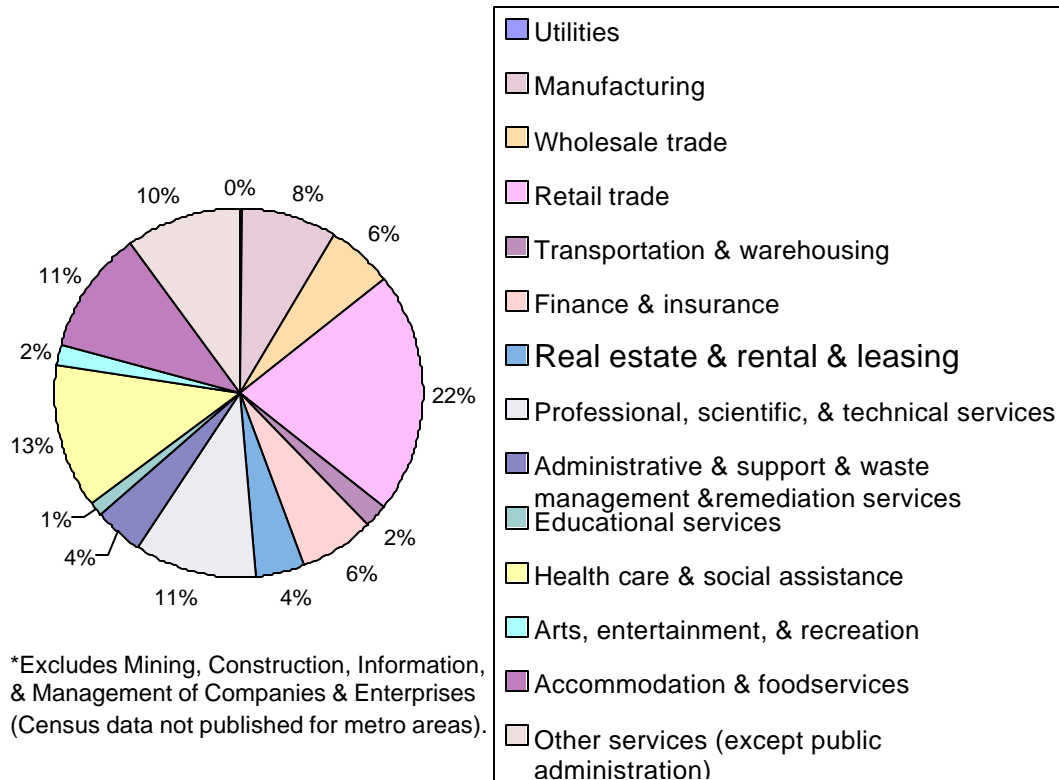
Table 1: 1997 Economic Census: Summary Statistics For Springfield, MA (1997 North American Industry Classification System, NAICS)

NAICS code	Description	Establishments	Sales, receipts, or shipments (\$1,000)	Annual Payroll (\$1,000)	Paid Employees	
21	Mining (not published for metro areas)	N	N	N	N	
22	Utilities	25	942,731	63,816	1,096	
23	Construction (not published for metro areas)	N	N	N	N	
31-33	Manufacturing	962	6,974,558	1,389,569	38,854	
42	Wholesale trade	673	6,247,315	342,289	9,554	
44-45	Retail trade	2,446	4,868,840	490,912	31,552	
48-49	Transportation & warehousing	252	355,064	118,602	5,073	
51	Information (total not published for metro areas)	N	N	N	N	
52	Finance & insurance	734	N	809,310	20,802	
53	Real estate & rental & leasing	496	297,351	48,500	2,322	
54	Professional, scientific, & technical services	Taxable	989	491,016	207,182	6,495
		Exempt	16	D	D	(250-499)
55	Management of companies & enterprises (not published for metro areas)	N	N	N	N	
56	Administrative & support & waste management & remediation services	499	418,213	175,620	9,615	
61	Educational services	Taxable	104	33,739	13,159	610
		Exempt	38	10,204	3,554	243
62	Health care & social assistance	Taxable	1,029	937,624	433,230	15,681
		Exempt	449	1,278,332	572,077	23,197
71	Arts, entertainment, & recreation	Taxable	134	74,194	20,662	1,255
		Exempt	46	41,280	13,779	557
72	Accommodation & foodservices	1,256	579,508	163,346	18,364	
81	Other services (except public administration)	Taxable	932	329,821	99,946	4,891
		Exempt	217	116,198	23,694	1,728

D = Withheld to avoid disclosure; N = Not available

Source: 1997 Economic Census, U.S. Census Bureau

Figure 1: Percentage of Total Establishment by Sector, Springfield, MA, 1997.



The project team has reviewed specific information on the types of manufacturing and service/repair businesses are operating in the area (Tables 2-3 and Figures 2-3). In terms of number of establishments and value of shipments, fabricated metal products, printing, and machinery manufacturing are the top three sub-sectors of the manufacturing sector. There are 490 service/repair shops offering vehicle, computer, machine, and other repair services.

Table 2: Springfield Manufacturing Establishments 1997 NAICS

NAICS	Description	Establishments	Value of Shipments (\$1,000)	Annual Payroll (\$1,000)	Paid Employees
31-33	Manufacturing	962	6,974,558	1,389,569	38,854
311	Food mfg	45	497,156	82,090	2,202
313	Textile mills	15	142,045	27,350	883
321	Wood product mfg	35	117,931	9,928	435
322	Paper mfg	62	1,207,067	181,105	5,317
323	Printing & related support activities	119	486,811	103,999	3,478
325	Chemical mfg	23	533,533	80,903	1,862
326	Plastics & rubber products mfg	60	607,752	143,977	3,862
327	Nonmetallic mineral product mfg	27	49,512	12,129	420
331	Primary metal mfg	21	191,728	35,406	1,112
332	Fabricated metal product mfg	251	1,034,182	300,778	7,700
333	Machinery mfg	115	668,924	148,945	3,724
334	Computer & electronic product mfg	30	138,025	33,827	1,012
335	Electrical equipment, appliance, & component mfg	9	D	D	(500-999)
336	Transportation equipment mfg	12	43,558	13,278	342
337	Furniture & related product mfg	33	79,394	16,956	610
339	Miscellaneous mfg	60	936,095	165,579	4,702

Figure 2: Manufacturing sub-sectors, by percentage of total manufacturing establishments, Springfield, MA, 1997.

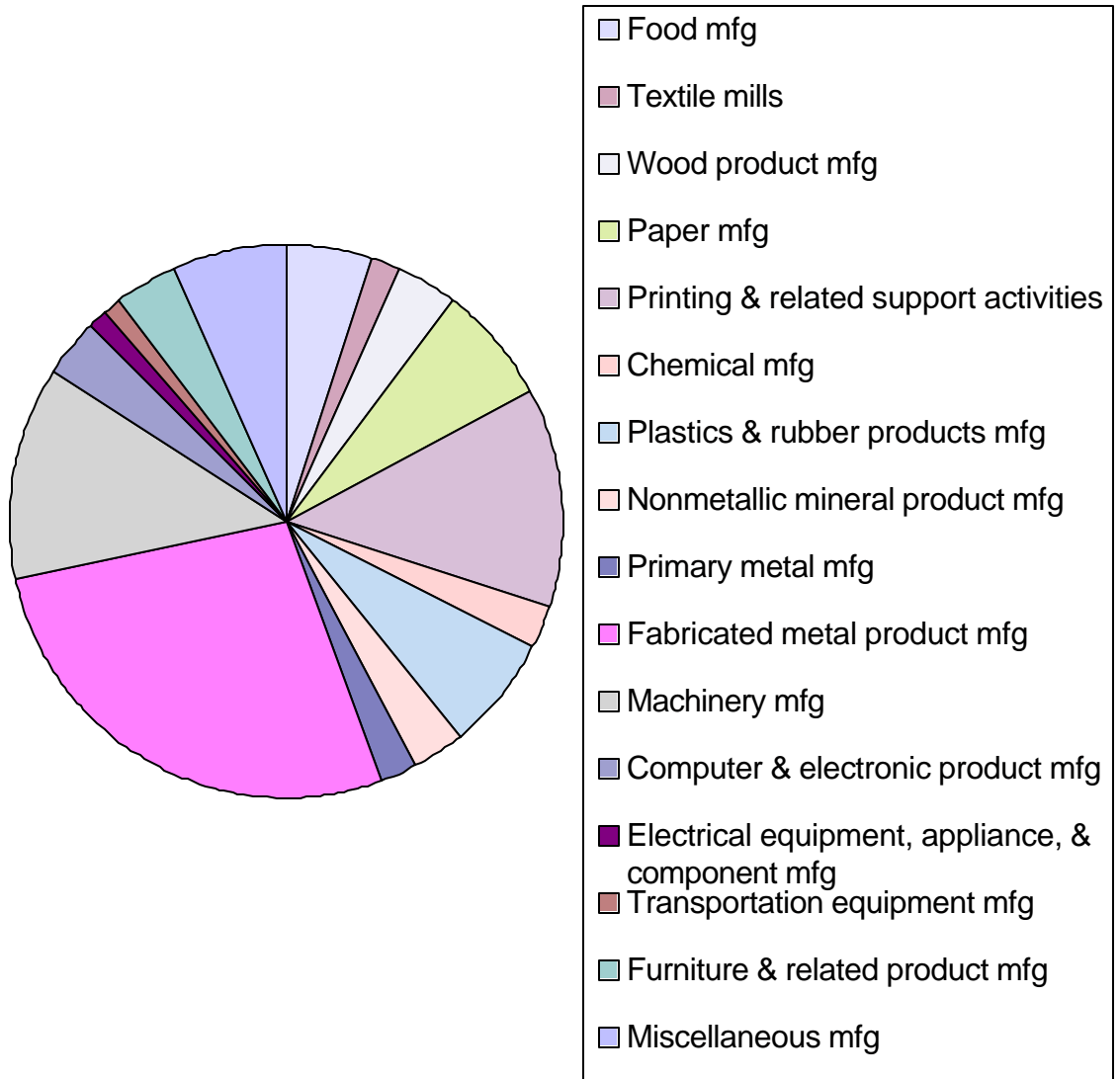
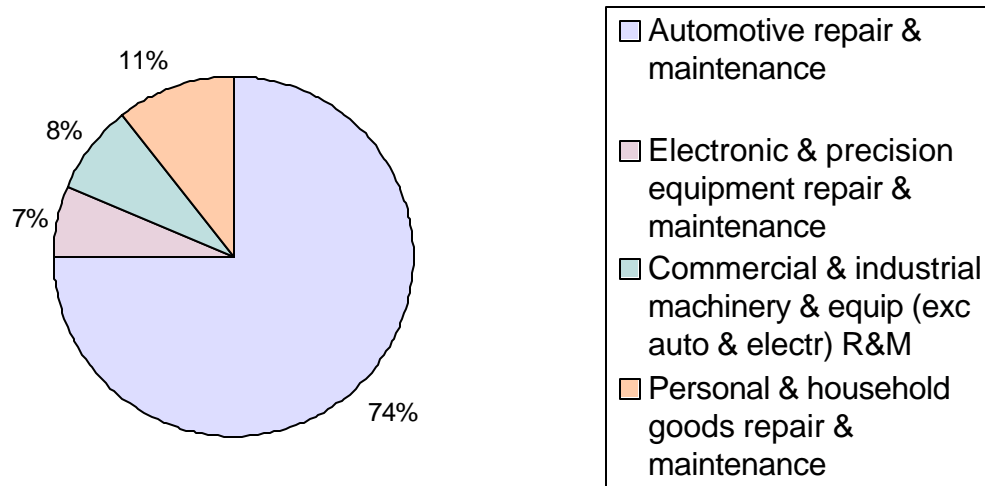


Table 3: Other Services (taxable), Springfield, MA, 1997

NAICS code	Description	Establishments	Receipts (\$1,000)	Annual Payroll (\$1,000)	Paid Employees	
81	Other services (except public administration)	Taxable	932	329,821	99,946	4,891
811	Repair & maintenance	Taxable	490	219,789	61,918	2,500
8111	Automotive repair & maintenance	Taxable	367	156,178	40,575	1,766
8112	Electronic & precision equipment repair & maintenance	Taxable	32	12,692	4,404	160
8113	Commercial & industrial machinery & equip (exc auto & electr) R&M	Taxable	39	31,555	10,638	305
8114	Personal & household goods repair & maintenance	Taxable	52	19,364	6,301	269
812	Personal & laundry services	Taxable	442	110,032	38,028	2,391

Source: US Census, 1997

Figure 3: Other services, sub-sectors as percentage of total Other Services Establishments, Springfield, MA, 1997.



Existing Networks

A number of business networks, both formal and informal, already exist in Springfield to help local firms connect with one another in ways that make them more competitive in the marketplace. These networks support economic development in Springfield both by strengthening existing firms and promoting the area as a favorable locale for new or relocating firms. These networks have already established webs of relationships and communication that can be used in building an eco-industrial development program. A number of community groups, too, can support these networks by facilitating community involvement in

economic development. A brief description of some of these organizations and networks is provided below:

For the past 107 years, the **Affiliated Chambers of Commerce of Greater Springfield, Inc.** (GSCC) has served the Springfield areas affiliated chambers, organizations, and the businesses they represent, “to meet individual and collective goals promoting prosperity for the region.” Driving its activities is the mission to support area businesses and communities in seeking solutions to the challenges they face in growing and developing new and existing organizations. The Affiliate Chambers of Commerce provides a forum for the exchange of ideas and opportunities by offering access to a range of direct member services. The Affiliated Chambers link hundreds of businesses that could be involved in an eco-industrial development program.

The **Center for Ecological Technology** (CET) is a non-profit organization that helps the businesses and communities of Western Massachusetts identify affordable and environmentally sound alternatives in the areas of energy and natural resource conservation. CET's mission is to "research, develop, demonstrate and promote technologies that have the least destructive impact on the natural ecology of the Earth." CET facilitates several projects and networks focusing on enhancing the environmental and economic sustainability of small- and medium-sized businesses. Examples include the Buy Recycled Business Alliance, the Pittsfield Office Paper Recycling Cooperative, the Food Waste Recycling Project, and the Massachusetts Materials Exchange online service.

The **Economic Development Council of Western Massachusetts** is a public-private partnership among the region's prominent public and private sector leaders. The EDC's Board of Directors includes local mayors, CEO's of the region's largest employers and institutions, and the heads of several area economic development organizations. The EDC's mission is to improve the industrial, commercial and retail base of the region and to streamline economic development services and activities for both existing and prospective firms.

The **Office of Economic Development** assists communities, businesses, and developers in the areas of business retention, new business development, commercial/industrial permitting and site selection, property tax relief, potential Enterprise Community benefits and job training and workforce development.

The **Pioneer Valley Planning Commission** (PVPC) is the designated planning body for the Pioneer Valley region. The PVPC, which is a public sector agency, is a consortium of local governments formed under the provisions of state law to address problems and opportunities that are regional in scope. The PVPC advises member communities and private business groups, performing research and analysis services in a wide range of planning areas, including economic development, environment and land use, municipal services, community and rural development, transportation and transit, GIS mapping, and more. PVPC's reach to 43 communities in Western Massachusetts could help support a broader eco-industrial network in the Pioneer Valley.

Employment Resources

Springfield's large labor pool and relatively low average wages make the area attractive to businesses in site selection. The City's potential labor pool consists of over 1.4 million people (ages 18-62 who live within one hour of Springfield). The 1997 regional manufacturing and non-manufacturing employment growth was 1.9%. Springfield's workforce is educated, with 78% of adults graduating from high school and the second highest concentration of college students in New England. In addition, the region has a variety of educational and training programs, as well as one-stop career centers, which provide employment and training assistance to area employers and employees.

The manufacturing sector employs by far the most workers, with nearly 38,854 paid employees.

Waste and Recycling in Springfield

Solid Waste Concerns of Businesses

Study respondents indicated that disposal costs are high and play an important role in the bottom line of their businesses. One respondent indicated a concern that the government is closing down too many landfills, while in the meantime, incinerators are contaminating the land, air, and water, with substantial negative health effects to humans and wildlife. In Springfield there are serious logistical problems with finding space for disposal containers/dumpsters.

Past and Current Recycling Experience

Responding businesses demonstrate a range of involvement with recycling and reuse activities. Recycling of paper, cardboard, and metals is relatively common, while some companies have developed more advanced recycling arrangements. Some of these activities have reduced the respective business' disposal costs, while others only allow the business to break even. In the latter cases, the respondent ascribed a desire to be environmentally responsible as the motivation for participating. A few examples of these activities are described below:

A company has compiled a list of all hazardous wastes, their attributes, and searched for alternative methods of disposal (specifically reuse). This company was granted a Class A recycling permit from the DEP allowing the company to ship some of its hazardous chemical byproducts to a company in Lowell. This company utilizes the chemicals in its production process. As a result, the company's cost of disposal for the chemical has lowered by almost two-thirds.

A box company takes a packaging firm's intact pallets free of charge for reuse in its own operations. This firm collects approximately 300 pallets a day by truck from area companies. Damaged pallets go into the dumpster.

A company receives thousands of high-grade sheets of white chipboard separator paper produced by International Paper with shipments of paper. Art supply stores sell this paper for \$.70 for four sheets. The company donates this to the local school system, the school for the deaf, and churches, to be used for art projects, etc. The company has asked local art stores if they were interested, but repackaging would be too costly.

A company owns plastic and cardboard balers. A manufacturer located adjacent to the company provides free use of its dumpster in exchange for use of the balers.

A company reuses and recycles computer parts (though with limited success due to compatibility issues)

A company operates a closed water loop, cooling water from its vacuum heaters in cooling towers. This system recycles approximately 128.3 million gallons per year.

A company sends metal scraps to a metal recycler in Connecticut. It puts its metal scraps out for bid every two to three years.

This anecdotal evidence suggests that considerable recycling and networking activities are already occurring in Springfield. A program documenting and highlighting these successes—for example, through the media and an environmental awards program—can further promote eco-industrial networking and environmental and economic improvement in Springfield.

ECO-INDUSTRIAL DEVELOPMENT OPPORTUNITIES IN SPRINGFIELD

Through the survey, interviews, and economic analysis, the project team identified a number of opportunities and concerns related to materials exchange and reuse, business clustering, training partnerships, and more specifically, redevelopment of the Crane/Chapman Valve site.

Byproduct Exchange and Reuse

Exchange, Recycling, and Remanufacturing Opportunities

The project results indicate several materials to drive recruitment of recycling-based industries and to provide exchange opportunities for existing companies. Table 4 presents all byproducts mentioned by survey respondents. Byproducts most often mentioned by survey respondents include paper products (32%), cardboard (32%), equipment and electronics (21%), metals (21%), plastics (18%), and wood (18%). Chemicals/paint (12%), rubber (12%), and glass (9%) were also mentioned. Because in many cases survey respondents did not specify quantities of waste their businesses generate, further study as to whether a significant feedstock is available must be conducted on a case-by-case basis.

Table 4: Summary of Outputs (based on survey responses)

Material	Total	Material	Total
Aluminum	2	Oil	1
Brass	1	Oil product	1
Carbon steel	1	Pallets	2
Cardboard	11	Paper products	12
Cast Iron	1	Plastic Film	1
Chemicals/Paint	4	Plastics	6
Copper	3	Rubber	4
Drums	2	Scrap Metal	1
Equip/Electronics	7	Solvents	1
Food Waste	1	Stainless steel	1
Glass	3	Steel	1
Hangers	1	Textiles	1
Laminated paper	1	Toner	1
Lead	1	Wood	6
Metals	7		

During on-site interviews, the respondents often identified additional materials they had not listed in their survey responses. Pallets, for example, while only mentioned in two surveys (6%), were identified as a disposal problem in at least four interviews (12%). Similarly, a construction company identified metal solvent pails as a disposal problem. This demonstrates the value of more in-depth discussions with businesses.

EIAC members and responding businesses identified a number of opportunities and studies on uses of some of these materials:

Pallets. A number of opportunities exist for solving the problem of pallet disposal. One business described an arrangement they have with a box manufacturer to remove intact pallets. The City can investigate the possibility of linking other box manufacturers with companies that need pallets or refurbish used ones. New England Pallet, for example, sells remanufactured pallets for \$2 a piece. A firm in the North Berkshires produces and refurbishes plastic pallets. There used to be a Springfield business that collected and chipped pallets for landscaping.

Recycled shingles. Asphalt and impregnated oils can be recovered from used roofing shingles for use in road construction. There could be a possible linkage to DPW, as well as a Chelsea study with Palmer Paving (Springfield) exploring possibilities for recovering the asphalt in shingles. CET has an asphalt chipping plant contact. One respondent noted a company in Massachusetts that recovers shingles. Cost and logistics can be a problem, however, because shingle recyclers charge for pickup.

Computer dematerialization/recycling. Computers are forming a new waste stream that further strains the City's landfills. Cathode ray tubes may not go to landfill and are disposed of separately by the city. There are no restrictions, however, on disposal of the remaining parts-- keyboard, mouse, and CPU-- and so most are sent to landfills, despite the fact that many of these parts contain recyclable and reusable materials. Fifty-five percent of respondents would be interested in participating in a computer pickup service. Springfield already has several existing resources for such a program. Goodwill Industries and several local colleges and universities (e.g. UMass Amherst) refurbish used computers and sell them to students and others. DPW takes non-functioning computers and pays for their disposal. Neighborhood Networks in Holyoke teaches students to disassemble and assemble computers.

Wood wastes. In Springfield, 35 firms manufacturer wood products. Business recruitment efforts could target companies utilizing wood scraps, such as pressboard and recycled furniture manufacturers. A burgeoning artist community could also use this wood waste.

Rubber recycling. Rubber tire chips can be used in light fill. Recovered rubber is being used in playground matting and athletic surfaces (e.g., tracks). Several groups around the country are operating tire rubber recovery businesses, e.g., the Cabazon Band of Mission Indians in Indio, CA. Nike recovers old shoe rubber for shoes and athletic/recreation surfaces. Springfield is home to 60 plastics and rubber products manufacturers, the scrap from which may provide feedstock for rubber and plastics recycling enterprises.

Cutting oil. The use of this material is prevalent among many manufacturers in the area and should be investigated for recycling or reuse.

Glass and concrete. Several companies have patented building materials comprised of recycled concrete, glass, and even computer parts. The availability of these resources in Springfield can be one factor to attract such firms. For example, the project team has been in contact with a company that has developed a tile product made of recycled glass and concrete. This company will begin its first production in 30-45 days and is considering developing satellite manufacturing facilities, possibly in Massachusetts.

Pulp and Paper. Sixty-two Springfield companies manufacture paper. Paper pulp has been composted and used as a fertilizer for agriculture and greenhousing. Virtually all companies, most particularly printing enterprises, generate paper waste that can be collected and recycled. Nevertheless, not all of Springfield's businesses participate in recycling programs. Raised awareness of recycling service, combined with cooperative recycling contracts for smaller firms, may improve the rate of paper recycling. Companies recycling paper and cardboard for multiple reuses may be attracted to Springfield.

Chemicals. Springfield's chemical manufacturing and printing firms generate a vast array of hazardous and non-hazardous chemicals. The feasibility of exchanges of these byproducts between businesses depends on the properties of the particular chemical and federal, local, and state regulations and standards for disposal and reuse. For example, as described earlier, at least one firm interviewed in this study described an arrangement it has with another company in the region to sell its hazardous byproduct. This arrangement has required a time-consuming permitting process. Each chemical must be evaluated on a case-by-case basis.

Further investigation of alternative re-uses of specific byproduct materials within Springfield's waste stream will inform recruitment of recycling- and remanufacturing-based industries to the area.

In addition to the survey findings, the EIAC and other project participants identified the following opportunities related to recycling and byproduct exchanges:

Recycling. A city ordinance requires all businesses to recycle at least two materials. There was an initiative to make the city program more efficient by creating recycling centers in certain locations around Springfield where there is a high business concentration. This initiative was never completed, but still has much potential.

Remanufacturing. Remanufacturing is a \$53 billion industry worldwide. Many of the manufacturers in the region are now building their own machines in-house using new materials and materials recovered from older machines to build the new machines. Springfield's high density of primary metal, machinery, computer and electronic, electrical equipment, appliance, component, and transportation equipment manufacturers can provide a vast number of opportunities for remanufacturing and product take-back programs. These cases should be highlighted to demonstrate that materials recovery and reuse is already occurring in the area.

Deconstruction. Deconstruction programs around the U.S. are supplying growing markets for excess deconstructed materials, for example, bricks, wood, asphalt, dry wall, and architectural hardware. One advantage of deconstruction activities is they are labor-intensive, but require minimal training. Deconstruction therefore offers a source of new jobs for local residents, while utilizing materials from Springfield's abandoned properties. In Springfield, there are existing companies that collect these materials, but they do not seem to have many customers. The City and its partners may support these businesses through promotion and development of the market for recovered materials.

Opportunities for Small Businesses

Eco-industrial networking does not only involve large-scale operations or materials feedstocks. Although small-scale businesses may not have sufficient quantities of byproducts to enter into exchange relationships with other firms, they can link in other ways that are cost-saving and mutually beneficial. In areas such as Indian Orchard's Main Street, small retailers and other businesses can link for competitive advantage through cooperative purchasing of products and services. One example discovered through this study is a cooperative agreement for waste disposal. Small-scale businesses in Springfield that are located in close proximity can similarly contract together with recyclers and disposal companies at lower costs than if done on an individual business basis. Another example of a small-scale networking initiative would be the joint collection of waste paper for local boys and girls club art programs. Because small firms often have few resources, these cooperative arrangements will most likely only be acceptable to small businesses if they show a clear reduction in costs or require very little in transaction costs.

Interest in Waste Exchange Program and Related Services

The survey attempted to gauge the level of interest in a materials exchange program (Table 5). Thirty-nine percent of responding companies indicated that they are interested in participating in a materials exchange program, while 6% responded maybe, 29% no, and 26% did not respond. The high rate of non-response to this question may be attributed to lack of a clear understanding of the scope of service or level of involvement such a program would entail. In addition, some of those responding negatively or equivocally indicated that they did not feel they had a relevant type or quantity of waste to enter into exchange relationships. Fifty-five percent of respondents would be interested in participating in a computer pickup service, while only 19% would be willing to have an energy audit. The relatively low interest in having an energy audit is most likely due to the fact that many businesses already receive this service from the local utility.

Table 5: Interest in Materials Exchange, Computer Pickup Service, and Energy Audit (based on business survey responses)

<i>Response</i>	<i>Materials Exchange (%)</i>	<i>Computer Pickup Service (%)</i>	<i>Energy Audit (%)</i>
Yes	39	55	19
Maybe	6	23	0
No	29	19	39
No response/Not applicable	26	3	42

Though not all respondents indicated an interest in materials exchange, several described a willingness to enter into any relationship that could lower the cost of materials or disposal. At least one manufacturer perceived that appliances require the use of virgin materials, limiting the potential for reusing materials. On the other hand, several companies expressed a general commitment to reducing waste and addressing both environmental and social concerns, principles that are not entirely linked to their business concerns. Some respondents indicated a belief that sound environmental practices can potentially (though not necessarily) reduce the cost of waste disposal and material inputs. An additional benefit can be an enhanced market image as an environmental business. Raising the awareness of business regarding new technologies and process, with an emphasis on benefits such as cost savings and enhanced market image, is essential to the promotion of eco-industrial strategies.

Perceived Risks of Involvement

Although adopting byproduct exchange and other eco-industrial strategies has great potential, it includes recognizing real and perceived financial, regulatory, and other risks. Project participants identified some of these concerns:

1. Most businesses will only participate if there are economic benefits; environmental improvement will not be the primary driver.
2. With respect to redevelopment of the Crane/Chapman Valve site, as with any property, potential tenants will consider the condition of the property and the area's customer base.
3. Traffic is a constraint, particularly in the Indian Orchard neighborhood, where local roads do not have the capacity to handle heavy industry and large trucks.
4. Much of the feasibility of materials recovery and reuse depends on the regulatory environment. Small businesses in particular have concerns about potential regulatory challenges to byproduct exchanges.
5. Businesses and residents alike pay taxes, but only residents have access to city services for hazardous waste pick-up.

Byproduct Exchange Infrastructure

EIAC members strategized about how to facilitate byproduct exchanges between businesses through physical and market infrastructure. These involve mechanisms for transport, storage, sorting, and marketing of byproduct materials.

Used Machinery/Parts Broker. In the past used material brokers operated in the City, locating goods for local and regional companies who wanted specific industrial items. An inventory of used parts would facilitate exchanges. Northeast Utilities used to have a program that accepted and refurbished old refrigerators.

Materials Exchange Clearinghouse. Create a clearinghouse where exchangeable and reusable materials can be collected. If the clearinghouse were a non-profit, these materials would gain value because the contributing companies would get a tax break for the donations. For example, "Crayons to Computers" program in West Springfield collects materials in a warehouse and then opens once a week for local teachers to gather materials to be used in their classrooms. Lawrence, MA is also currently developing a center for materials exchange.

Sorting centers. There is a need for sorting centers in Springfield. One respondent, for example, said that sorting waste after collecting it is prohibitively costly.

Reuse Retail Centers. Reuse retail centers sell remanufactured and recovered products to consumers. CET, for example, has just opened a reuse center. Organizations nationwide, such as the Green Institute in Minneapolis, MN, are developing reuse retail operations for resale of deconstructed building materials.

R&D and Business Incubators

Business incubation provides entrepreneurs with a distinct competitive advantage as they develop their products and operations. Incubator programs offer businesses increased efficiencies related to common facilities management and maintenance, shared infrastructure, and often, common administration of environmental compliance documentation and permitting.

The Springfield area is home to the Springfield Enterprise Center (SEC), located in the Springfield Technical Community College Technology Park. STCC established the SEC in 1996 to support, assist, and "incubate" new businesses, with an overall goal of enhancing economic development in the Pioneer Valley. This 37,000 square foot building is home to a number of small technology-based businesses, and the Park will soon reach its full capacity of 20 firms. Sectors of industry that will benefit most from the association with the SEC are technology, service, light manufacturing, and product development. Tenant firms benefit from the cost-effectiveness of shared facilities, infrastructure, equipment, and mentoring and administrative services, such as travel arrangements, reception, and a notary public.

Large businesses can afford to investigate and implement new and better technologies and processes. Lack of resources and time, however, limits the awareness and capacity of smaller companies to implement better practices. Lessons from the larger companies must therefore be accessible to smaller businesses. The City can facilitate such information exchange through an initiative to disseminate information on new and better practices and technologies. This initiative can support smaller businesses in keeping closer to the cutting edge of environmental and economic efficiency.

Springfield's eco-industrial program would benefit from linking with programs that research and develop uses for byproducts. The Chelsea Center could help establish programs and identify existing programs. UMass-Amherst, for example, has a Center for Materials Recycling. Research and development and local business incubator centers, such as those of UMass and STCC's SEC, can be linked. Entrepreneur-researchers looking for a business idea can be matched with available materials.

Training and Workforce Development

Despite Springfield's labor resources, participants in the community meetings identified training and workforce development as priority needs in Springfield. For businesses, workforce supply and quality is a dominant economic development concern, while community members seek good jobs with livable wages and benefits.

The City's blue-collar sector is experiencing a decline, even though skilled labor employment can offer a high quality of life. Businesses complain that their concerted efforts to recruit young people to these jobs are frustrated by low interest or job abandonment by new employees. One company does not have difficulty finding entry-level workers, but cannot find reliable supervisory staff. One respondent indicated

a need to instill in children an appreciation of the value of hard work and raise awareness about the earning potential for skilled crafts professions.

Most businesses conduct training in-house related to both skills development and environmental health and safety practices. Establishing training and workforce recruitment partnerships is an area with high potential for networking among and between businesses and the community. The Chapman Valve site could potentially operate as a local/regional training center for skilled labor, in conjunction with local community colleges, high schools (e.g., Putnam Vocational Technical High School), vocational institutes, and trade union training programs. Businesses, too, can receive training on workplace improvement for employees, for example, adding better lighting and improving safety around their plants.

Business Clustering

Clustering of similar and related businesses is a key eco-industrial strategy. Industrial clustering focuses on locating networks of competing and collaborating industries in a regional network into horizontal and vertical relationships, involving strong common buyer-supplier linkages. Through this structure, companies both compete and cooperate to make most efficient use of human and technological resources to optimize opportunities. Eco-industrial thrives on the diversity of businesses in the area including the existing clusters but seeks a more diverse set of companies therefore creating a more sustainable business environment and increasing the probability of innovative connections.

The Indian Orchard community members expressed concern about the number of auto repair shops in their neighborhoods and the environmental impact of improper disposal, poor storage, and illegal operations. An alternative to this situation could be the creation of auto-repair clusters. In a cluster these businesses could share resources, costs, and training, and work in an environmentally sound building. With 490 registered automotive repair establishments in the City, Springfield has a significant business base for exploring this option. EIAC members discussed how in Springfield the problem is available space for such a cluster.

Redeveloping the Crane/Chapman Valve Site

Eco-industrial parks are an innovative method for local communities to contend with the challenges of environmental remediation and reuse of contaminated land, or brownfields. Brownfields contamination complicates the redevelopment of real estate assets in many communities that also face economic development challenges, such as unemployment and business retention and recruitment. Eco-industrial parks provide a number of benefits which allow communities to redevelop brownfields sites in ways that are more environmentally and socially sustainable than past uses. Eco-parks strive to minimize waste through materials exchange, facilitate sharing of energy and water resources, use the latest green technologies to limit emissions and maximize efficiency, enhance worker and community health and safety, and optimize local community resources and assets. These objectives match the goals the Indian Orchard community has expressed for redevelopment of the Crane/Chapman Valve site.

The City of Springfield and the Indian Orchard community have therefore proposed developing an eco-industrial park on the former site of Crane/Chapman Valve. This proposed project is based on discussions the City has had with residents, the Citizen's Council, and the Main Street Partnership of the Indian Orchard neighborhood. This neighborhood was once one of the most industry-intensive areas of the City. Remnants of the once thriving mills now stand as vacant brownfield sites among an aging housing stock and a partially occupied Main Street. The economy of Indian Orchard is in decline, and some of the properties available for development are contaminated as a result of past industrial activities.

To address these challenges, residents seek to transform their economy by creating jobs, eliminating pollution, and attracting new, non-polluting businesses. The Crane/Chapman Valve site, the preferred site for the eco-industrial park, has stood vacant for over twenty years, during which time a residential community has grown around it. The City has funded a master planning process for the neighborhood, and specifically for the former mill site, with an emphasis on integrating eco-industrial concepts. TerraSphere/BSC Team consultants have recently completed this plan. As implementing this plan for the eco-park moves forward, the neighborhood will continue to participate actively in its development. This Baseline Study supports these planning efforts by identifying opportunities for attracting recycling and

remanufacturing-based companies for locating on the site and partnering with community members to further refine ideas and preferences for how to approach redevelopment. But Indian Orchard must have a particular subset of such industries. The road sizes and locations won't support large scale truck traffic this disrupting residents and altering the character of a proud neighborhood. Microbusinesses, which either use recycled material as part of their fabrication or manufacturing processes or have artistic incorporations of what was someone else's trash, can easily fit in the environment along with remanufacturing of smaller appliances. All would add value to Main Street in Indian Orchard.

One can envision several green buildings using solar energy to help daylight and warm the structures where shop space is leased for small businesses. They could have common areas where technology is shared and for working together on larger jobs. The link to the vocational schools mentioned above should provide an exciting and diverse learning environment. By making craft studios more transparent to the public it can serve as means to appreciate the value of blue collar work—in a blue collar neighborhood. As the local housing stock turns over, these houses will be attractive to a walk to work clientele who have retail and the river as amenities. An initial study played down the opportunity for economic vitality in the area. They are correct business as usual won't work—but new ways of thinking about the area can be an exemplar for other cities with similar neighborhoods.

Currently the numbers show dominant employment in manufacturing but unless skilled trades are maintained this base can easily disappear. By providing a set of service companies with on-site and remote capabilities this trend can be countered and help sustain the local economy.

We did not propose large scale recycling businesses in the Indian Orchard area because they are not as appropriate and would lead to fewer jobs than the approach put forward. That doesn't mean that they can't reuse material, extend product life, repair rather than throw out and other methods that meet the goals of resource aware and efficient businesses and jobs. Service trucks coming through the neighborhood will bring proud jobs back to the area while preserving resources and industrial character

This integration of work, community, education and environment can all occur in one location as a testimony of the resilience of blue-collar communities—when many are languishing without hope. Innovative architecture designed to accent the blue/green coalition of the future can be an asset to residents/employees and businesses.

Meetings with the Indian Orchard residents generated a number of ideas for redeveloping the Crane/Chapman Valve site using eco-industrial principles and local assets. Participants described the community's need for support services, medical services, recreation opportunities, day care, workforce training, local transportation and walk-to-work opportunities. Residents want a family type of development that maintains the character of the neighborhood and reduces large truck traffic.

The underlying theme suggested for the project might be optimizing the blue-collar character of the surrounding neighborhood by showcasing trades, creating an incubator for small- and medium-sized service businesses, and developing training programs. Service businesses, such as machine repair and equipment calibrators with small service trucks are another target possibility for the site. STCC is forming a transition group to help incubating businesses adjust to life outside the incubator after their initial three years at Springfield Enterprise Center, and will be looking for space for these businesses.

To address Indian Orchard's need for quality of life, governmental, and training services, the Crane/Chapman Valve site can link to STCC for a community learning center, job training, senior living, and day care. Training opportunities include video conferencing opportunities, satellite courses in Indian Orchard, and connections to STCC's machinery training facility. Connection to union apprenticeship training programs and welfare-to-work programs can provide additional training resources to local residents. Government agencies could locate satellite service offices on the site.

Residents suggested a number of types of operations that can be recruited to locate on the site. High technology and biotechnology firms, which account for a growing number of companies in the Western Massachusetts area, can benefit from Springfield's close access to major highways and an abundant water

supply appropriate to high-tech industries, such as chip manufacturing. Local big company connections like Post Office Bulk Mailing Facility and Solutia may have supplier needs that can lead to jobs and businesses on the site. Where appropriate, manufacturing firms can link to retail stores on Main Street.

Residents added ideas for the physical plan for the Crane/Chapman redevelopment. Physical and parking connections with Main Street and the river can increase recreation and shopping opportunities. Although the contamination of the site limits the ability to include green recreational spaces, paved athletic facilities, such as skateboarding surfaces or basketball, squash, and handball courts, may be feasible. The design of the site should build in flexibility and space to accommodate the diverse, changing needs of businesses.

RECOMMENDATIONS

1. Research and Development: Identify Further Eco-Industrial Opportunities

This project has identified a number of opportunities for the attraction and development of recycling-based business opportunities in the Springfield area. Further investigation of alternative re-uses of specific byproduct materials within Springfield's waste stream will inform recruitment of recycling- and remanufacturing-based industries to the area. Linked to this recruitment will be the further development of business incubator spaces, possibly at the Crane/Chapman Valve site in Indian Orchard. Investigate the R&D activities of local universities and colleges and their potential connections to business incubator centers.

2. Locate Recycling-Based and Remanufacturing Companies

Springfield's eco-industrial program can locate recycling-based and remanufacturing companies. Some of these are listed in Appendix 9. The Chelsea Center in particular provides the MA Recycled Products Manufacturers listing (www.chelseacenter.org/MassManufactures0.asp). Through this list, Springfield's eco-industrial program can identify potential end users for existing waste streams already located within the state. The program can identify additional national and international manufacturers for recruitment purposes from industry associations and web searches.

3. Facilitate Business-to-Business Exchanges

An effective byproduct exchange program requires the facilitation of networking among businesses and with the community. We recommend convening workshops with industry cluster representatives to discuss potential partnerships, and follow up with individual businesses when potential exchanges are identified. A continued program should contact and survey a broader range of businesses (including public and private utilities and wastewater treatment plants) to identify additional eco-industrial opportunities. We recommend accomplishing this by implementing a pilot project focusing on a particular material that is a "low-hanging fruit", or common byproduct, such as pallets.

4. Promotion and Awareness: Market Environmental Practices and Springfield's "Eco-Industrial Valley"

A significant finding of this baseline study was that a number of businesses are already involved in waste exchange and more intensive recycling activities. These successes can provide models for other companies to follow, particularly if cost-savings and other benefits are well documented. The program can identify and publicize existing byproduct exchanges and green business practices to demonstrate that area businesses are already achieving success. The results of the survey should be disseminated to participants through public presentations, newsletters (e.g., the Chamber of Commerce newsletter), newspapers, and/or mail-outs, requesting any additional comments or questions. Consider a green business award for the area businesses demonstrating best practices or significant improvements in environmental performance.

Beyond promoting eco-industrial activity among existing businesses, the City has an opportunity to promote and market the greater Springfield area as one of the nation's first eco-industrial regions to

prospective firms. As Springfield's eco-industrial activities are developed further, the City can raise its profile through the national print and web media, building its image as an area with a strong commitment to supporting businesses' economic and environmental improvement. As expressed by many of this study's respondents, such a campaign should emphasize the economic benefits (i.e., reduced costs of disposal and materials) of eco-industrial development. Though a growing number of firms ascribe higher value to environmental improvement, the economic benefits are in generally of greater appeal to companies seeking to reduce costs and often a desirable bonus.

5. Catalyze Information Exchange

The success of byproduct exchange linkages requires that Springfield's businesses are aware of available resources and opportunities. Springfield's eco-industrial development program can play a central role in gathering information and raising business awareness. A continued program requires the development of a physical and information exchange infrastructure plan, including a web site or other directory, warehousing, a byproducts transport service, a facilitator, and funding. This can be managed by a public, private, or non-profit entity. A facilitator is perhaps the most important element, because without one, companies will not be as likely to identify or pursue partnership opportunities.

The program should continue developing the GIS database of inputs and outputs. This site should be linked to existing web-based database such as that of the Center for Ecological Technology's Massachusetts Materials Exchange network. The database site can include this searchable database, but also provide examples of possible uses of and customers for specific byproducts. It may also feature GIS maps and geographic profiles, organizational case studies, discussion forums, and worksheets for calculating potential savings in transportation and landfill tip fee avoidance.

An information infrastructure should include linkages to the Chelsea Center's recycling manufacturer network (ReMade in Massachusetts) and WasteCap.org's list of MA recyclers. In addition, the program should create a recycling/materials exchange marketing plan (e.g., a recycling/reuse guide, web site, advertisements, etc.).

Springfield can be a springboard to a new type of development that helps sustain a regional economy and raise a neighborhood like a Phoenix literally from its ashes. This development will make many Americans proud because its products will be worthwhile sensitive to the environment, to business and to the community. High tech developments in the area are to be applauded, but not every place or every person needs or wants such an economy. Springfield can sprout a 21st century version that reflects the broad aspirations of its citizenry and neighborhoods.
