Industrial Symbiosis in New Haven Harbor: English Station West 2001

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ABSTRACT
Industrial ecology recognizes the importance of technology in our lives and seeks to reconcile it with the equally important need to minimize our damage to the environment. Its practitioners apply models of efficiency and reuse that can be found in natural ecosystems to the workings of industry. This project represents the application of these principals to the industrial region west of New Haven's English Station, a power plant that is currently closed but under consideration for reopening. The goal of our project was to examine and understand current material and energy flows in this area and to suggest possible material, water, or energy exchanges between existing industries. In addition, we sought to use the principles of industrial ecology to develop new economic plans for New Haven's waterfront area.

INTRODUCTION TO ENGLISH STATION AND AREA
Quinnipiac Energy is in the process of applying for operating permits from Connecticut’s Department of Environmental Protection (DEP) to reopen English Station, a power plant dating to the 19th century that was decommissioned in the early 1990’s. Should the permits be approved, the English Station power plant will begin to burn oil on a limited basis before replacing its current boilers with natural gas-fired combined cycle units after approximately two to three years.

Currently, the City of New Haven’s economic development efforts are centered on expanding the tax base by putting vacant properties into use and on increasing employment opportunities for New Haven residents (Gilvarg 2001). We propose using the capacity for steam sharing in the area west of English Station and creating recycling centers for paper, plastics, metal, and glass, as well as for bulky wastes, to help encourage other small and medium-sized businesses to relocate to the area. English Station and the suggested recycling facilities will help make businesses more viable by providing them with wholesale electricity and access to inexpensive raw materials. These businesses would in turn provide the city with jobs and tax revenue, as well as adding further life to an industrial area with a rich history.

The area of New Haven included in this project, nestled between the Mill River and Interstate 91, is set apart from the neighborhoods on either side of it both by the physical boundaries and by its character (see Figure 1). Though this
little strip is completely industrial and commercial, the neighborhoods across the river and highway are mainly residential. Historically, the area west of English Station was a part of the Wooster Square neighborhood of New Haven, which lies on the other side of Interstate 91. Recently, however, English Station has been of more concern to the residents of the Fair Haven neighborhood of New Haven, to the east, and is often included in plans for the neighborhood. Because the re-lighting of English Station and the status of industries near the Station will effect residents of both Wooster Square and Fair Haven, at least some knowledge of the development of these two neighborhoods is important.

Although the area west of English Station has historically been a center of industry in New Haven, it developed relatively late. Wooster Square Park was built in 1825, and many of New Haven’s wealthier citizens built their homes around it. During the middle of the 19th century, numerous industries developed in the Wooster Square neighborhood. The eastern and southern edges of the neighborhood became home to the carriage-making, garment, and hardware industries, as well as to several other manufacturing outfits. In addition to the wealthier families who lived around the park, Wooster Square became home to Irish, and later Italian, immigrants who came to New Haven to work in the factories and lived in crowded tenements to the east of the park (Harrison 1995).

During the first 50 years of the 20th century, the neighborhood went into decline. Many factories shut down under the economic pressures of the Depression, and suburbanization led many of the middle class residents of the neighborhoods to move out to East Haven and other areas. Many of the industrial and residential buildings began to deteriorate. In 1951, the neighborhood was slated for redevelopment, although no work began until 1955 when Mayor Richard C. Lee secured national redevelopment funds for the area. Around the same time, Interstates 91 and 95 were constructed along the western and southern sides of the neighborhood, cutting the residential area off from the industrial areas bordering it. Around the park, the city carried out a successful revitalization effort that succeeded in turning Wooster Square into one of the city’s nicest neighborhoods (Garvin 1996). Throughout these dramatic changes to the neighborhood, it has remained the center of the Italian community in New Haven. It contains numerous Italian restaurants and bakeries, as well as St. Michael’s Catholic Church and the St. Paul/St. James Episcopal Church. Wooster Square hosts a number of seasonal and religious festivals during the summer.

On the other side of the Mill River, Fair Haven has a quite different history. Most of Fair Haven remained undeveloped farmland until the 1850s. Fishing and oystering were the key economic activities throughout the 19th century in spite of the development of other industries. During the latter half of the 19th century, the area between the Mill and Quinnipiac Rivers was home to several ship-building operations and a red sandstone quarry that supplied building materials for many New Haven construction projects (Townsend 1976).
Figure 1 Aerial map of region with industries outlined.
Residential development began seriously around the same time. Wooster Square was becoming overcrowded and more housing was needed for the city’s growing industrial workforce. In addition, during the second half of the 19th century, several waves of immigration brought Irish, Germans, Poles, Russian Jews, and, finally, Italians to live and work in the area. A railway running between Fair Haven and downtown made the area attractive to both new industry and residential developers (Townsend 1976).

Like Wooster Square, Fair Haven experienced a decline during the latter half of the 20th century. Many middle class families moved out, leaving their houses to become blighted. Although today Fair Haven is one of New Haven’s poorer neighborhoods, it has several dedicated citizens’ groups working to revitalize the neighborhood. Since its earliest days, Grand Avenue has served as the main street in the Fair Haven neighborhood, and today is a thriving commercial district and the center of Latino life in the city.

The industrial history of Fair Haven is long and varied. One of the largest and most important firms to make its home there was the Sargent Company, which moved to New Haven in 1864 and occupied a huge, castle-like red-brick building on Water Street, between Wallace and Collis streets. Sargent manufactured a wide variety of hardware products, including hooks, door latches, cow bells, hammers, and other small items. By 1902, Sargent employed over 2,500 workers, and was one of the largest companies in New England and one of the nation’s leading hardware manufacturers (Gillette 1982). Sargent moved to Long Wharf during the 1970s and its old building was demolished.

Besides Sargent, Fair Haven had several other large industries. C. Cowles and Company, which specialized in carriage parts, was founded in 1837 on Water Street. During the beginning of the 20th century, Cowles converted to producing hardware for automobiles, and is still in operation today as a hardware manufacturer. Water Street was also home to the (famous) New Haven Clock Company, founded by Hiram Camp in 1850. River Street housed the Bigelow Company, which produced machinery for gold mines, oil wells, and sugar plantations during the industrial expansion of the Gilded Age and, later, boilers. In 1880 the National Pipe Bending Company was established next door to Bigelow. The Connecticut Adamant Plaster Company opened on River Street in 1890 and turned gypsum into wall plaster there until it closed in 1935 (Beal 1951).

Although manufacturing has been in decline in northern U.S. cities for half a century, it should not be counted out as a possible factor in the economic development of New Haven. Today, about 10% of the jobs in New Haven are in manufacturing. More than 5,000 New Haven residents, and 15,000 or more residents of the surrounding area, are employed in manufacturing in New Haven (Connecticut Labor Department 1999). The City’s Office of Business Development offers both loan programs and tax incentives that can be used to help businesses, including manufacturing firms, locate in New Haven (City of New Haven 2001).
EXISTING INDUSTRIES IN THE ENGLISH STATION WEST AREA
For the purposes of our project, the boundaries of the area being discussed are Grand Avenue to the north, the Mill River to the East, Interstate 95 to the south, and Hamilton Street to the west (see Figure 1). Below we have provided a brief overview of the nine companies located in and adjacent to the neighborhood that we consider in our analysis.

Quinnipiac Energy – English Station
English Station was once a United Illuminating power plant, which closed in 1992. It was recently purchased by Quinnipiac Energy and is currently slated for re-start. The proposal to operate units at this facility again has been controversial. Local residents, particularly those in the Fair Haven community, have opposed the re-start of the power plant, citing health concerns related to the potential increase in air pollution because of the plant’s emissions. Currently, Quinnipiac Energy is moving forward in the Connecticut Department of Environmental Protection’s air permitting process. The DEP Commissioner recently issued a tentative determination, and a public hearing on the permitting issue will likely be held within a few months of the time of this writing.

Quinnipiac Energy’s plans for re-powering the site are split into three main phases:

1. Obtain a permit to operate from the CT DEP. If a permit is issued, operate the two existing boilers on 0.05% sulfur fuel. This fuel is much cleaner than the 1.0% sulfur fuel typically burned by large power plants in Connecticut. The draft DEP permit would also impose a fuel consumption limitation that in effect caps the total number of combined hours that the units can operate per year. The limit allows Quinnipiac
Energy to operate the two units for a combined total of roughly 561 hours per year at maximum firing rate (CT DEP 2001b).

2. Install four simple cycle turbine generators. These units would be primarily natural gas-fired, but would also likely be able to use diesel fuel as a backup (Mannis 2001).

3. Replace the two existing boilers with two combined-cycle technology units. Like the simple cycle units, these units would be primarily natural gas-fired, but would likely be able to use diesel fuel as a backup. A diagram describing combined cycle appears in Figure 3 (Mannis 2001, Holzman 2001).

Quinnipiac Energy – Station B
Station B is a large vacant building located on the northern part of the Quinnipiac Energy – English Station property. Quinnipiac Energy is looking for a tenant that would be able to make use of steam and direct electricity
connections. An ideal tenant would also be a light industrial (low polluting) or commercial business that might be able to take advantage of barge transport of goods on the Mill River. Quinnipiac Energy has had discussions with a granite-carving company and has also considered an industrial laundry service and a bakery for the site (Mannis 2001).

Simkins Industries
Simkins produces about 250 tons of recycled paperboard per day. Paperboard is used for products such as cereal, tissue and packaging boxes. Of the materials Simkins uses to manufacture its paperboard, about 75% is post-consumer waste (newspapers) and about 25% is pre-consumer waste (for example, fast food bags with logo misprints). The paperboard is made by sandwiching three separate layers (back liner, filler, top liner) together, pressing out the excess moisture and applying corn starch during the drying process to prevent curling. Clay is used to obtain a glossy white finish. The paperboard is sold in rolls or cut into sheets and sent out for printing (CT DEP 2001a; Doucette 2001).

Simkins is able to recycle all scrap paper product from its process back into the manufacturing process. This is accomplished as follows:

- A water-paper sludge mixture passes through an in-house water screening and treatment center to separate the paper sludge from the water.
- The paper sludge is extracted and used to produce the filler layer of the paperboard.
- The treated water (150,000 to 250,000 gallons per day) is discharged to the public sewer system, where it is then carried to the City of New Haven’s treatment center (Doucette 2001).

Simkins must ship off-site approximately 100 to 110 tons of miscellaneous wastes per month. These wastes are contaminants found in the baled recycled
materials brought in for processing and include metal cans, plastics, and Styrofoam (Doucette 2001).

Simkins’ largest source of air pollution is a Bigelow boiler used to generate steam for both the paper process and to power a 3.5 MW generator. This generator provides Simkins with roughly half its electricity needs. The Bigelow boiler can be fired on either natural gas or oil, with the choice of fuel determined primarily by cost.

Figure 5  Simkins Industries (background) and GT Wholesale Yard (foreground)

GT (Gateway Terminal) Wholesale Yard
This company purchases bulk materials and resells them. Gateway unloads, stores, sells, and delivers salt, sand, coal stone, cobblestone, landscaping materials, and sometimes firewood. There is no manufacturing done on-site. The wholesale yard is located on a large tract of land adjacent to the Mill River. Potentially, some of this space could be used as a bulky/construction waste recycling site. Its location along the river would make barge transport of the wastes a possibility (Dubno 2001).

HB Ives
HB Ives plates base metal pieces of architectural hardware, such as bathroom fixtures and cabinet handles, with chrome, copper, and nickel. Ives used to have a foundry on-site to manufacture the various pieces of architectural hardware but this process was recently shut down. Ives now purchases the already formed metal pieces and plates them in one of its metal-plating lines. Some of the pieces are also finished in a clearlacquer line (CT DEP 1998).

When the company periodically empties tanks in its plating lines, the water-based metal plating solutions are handled as follows:
• The water-based solutions pass through an in-house water treatment center to separate the metal components from the water.
• The metal sludge is then shipped as hazardous waste to a metal reclamation facility in Pennsylvania.
• The treated water (about 62,000 gallons per day) is discharged to the public sewer system, where it is then carried to the City of New Haven’s treatment center (Kleinbaum 2001).

Since HB Ives eliminated the foundry portion of its business, it has significantly reduced the amount of waste metal it produces. Still, the company sends about 850,000 pounds per year of scrap metal off site. Ives used to sell its scrap metal to Alderman Dow, but now sells to a dealer based in Bristol, Connecticut for a better price (Kleinbaum 2001).

Space-Craft Manufacturing
Space-Craft Manufacturing machines aerospace components of aircraft engines for companies such as Pratt & Whitney and General Electric. It orders already-forged metal from an out-of-state source and manufactures engine rings from high temperature alloys (composed primarily of nickel). The facility’s primary process is manufacturing parts using a vertical turret lathe that runs on electrical energy. This machining process uses a water-soluble coolant. Process water currently comes from the tap and is reused. When not in use, the water is stored in a holding tank. Leftover oil from the machining process is recycled. No other chemicals come out of Space-Craft’s processes. Metal chip scraps are sent to Alderman Dow (Clark 2001).
Alderman Dow buys and resells scrap metals of all kinds. It has relationships with several hundred businesses, including many local firms. Though it will buy scrap metal in any amount, it usually sells in quantities of 20,000 to 40,000 pounds. Several million tons of metal pass through the scrap yard every year but, because Alderman Dow does not alter it, the company has no significant waste streams (Alderman 2001).
L. Suzio Concrete Company

The L. Suzio Concrete Company is a ready-mix concrete batching plant that produces concrete from natural sand, crushed rock, cement, and various chemicals. It produces about 116,000 cubic yards of concrete per year. Suzio carries its mixed concrete in trucks to construction sites. Leftover concrete from the job site is run through a washout plant to separate out the components. Sand and stone are sold as materials for road base, while the cement putty is sold for use in filling or capping landfills (Suzio 2001).

Figure 9  L. Suzio Concrete Company

Saint-Gobain Performance Plastics

Saint-Gobain Performance Plastics (formerly Furon, formerly CHR) manufactures pressure-sensitive tapes on six adhesive coating machines and silicone-based sponge and sheet rubber on four presses. A contact at Saint-Gobain stated that very little plastic residue is created at the facility. While this company is located north of Grand Avenue and thus outside our neighborhood, it was still considered in our analysis for reasons to be clarified later in this paper (Oszurak 2001; CT DEP 1997).
Palmieri Food Products
Palmieri Food Products produces and packages food products such as tomato sauces. It temporarily stores sauces in large metal barrels, which it sells used to Alderman Dow (Alderman 2001).
TARGET ISSUES

Our team identified steam sharing, the creation of a paper, plastics, metal, and glass recycling facility, and the creation of a bulky waste recycling facility as our target issues. While each of these topics has a short, intermediate, and long-term development phase, we have integrated the discussion of these phases throughout the text.

Why do our recommendations focus on the creation of new industries as opposed to creating links between those already existing? As noted in our Overview of Existing Industries, several companies in this region are already involved in material exchanges – for example, both Space-Craft Manufacturing and Palmieri Foods send their scrap metal to Alderman Dow. Other industries in this region simply do not have significant waste streams because most of the materials they handle are pre-manufactured elsewhere, such as Space-Craft’s and HB Ives’ metal base pieces and Palmieri’s metal barrels. Some industries already reuse materials and scrap in-house, as is the case with Simkins’ paper pulp and Suzio’s concrete mix.

In some cases, a company has specific requirements for inputs that limit its ability to exchange materials. Suzio, for example, is a large consumer of water. Our team initially proposed the use of brown water in the concrete mixing process. However, Suzio requires water that is fairly pure and of a consistent pH (Suzio 2001a). None of the existing companies currently have waste water pure enough for Suzio to use. However, there are still possibilities for future water-sharing arrangements. Some industrial cleaners discharge large amounts of pH neutral water that might be usable by Suzio or Simkins, and Simkins’ waste water could be processed to make it reusable by Suzio. Overall, though, we did not feel that water-sharing was significant enough to include as a target area.

Our team also faced unexpected feasibility issues when considering bringing in new industries. A particular example involves a tile manufacturer. Our team noticed an unusual number of tile retailers in our area, and we discovered that some tile manufacturers make a product that uses concrete. Given the nearby location of Suzio, we identified a tile manufacturer as a good potential match for the region. We learned from the manager of New Haven’s Standard Tile that, for a variety of reasons, tile is almost never manufactured in the United States (Douglas 2001).

Working within these limitations, our team has made recommendations for new industries that will fit with the kinds of material flows already present in the area.

Steam Sharing

One of the key areas of potential symbiosis in our target area is steam sharing. Incorporation of this practice hinges on Quinnipiac Energy’s replacement of its two current oil-fired boilers with two natural gas-fired combined cycle units. As its name suggests, combined cycle technology generates electricity at two points in its cycle. A diagram of this technology can be found in Figure 3 (Holzman 2001).
The first source of electricity is a generator that is turned by the gas-fired turbine as gas is combusted in the turbine. Hot exhaust gas from the gas turbine then enters a heat recovery steam generator (HRSG). In the HRSG, the hot air is used to convert water to steam. This steam is piped to a steam turbine that uses the steam to turn a shaft connected to a second electricity generator. In a closed-loop system, the degraded steam would then be returned to the HRSG for re-heating.

In a steam-sharing scenario, steam can be piped to a neighboring building or industry. The steam can either be drawn directly from the HRSG or at a point after it has passed through the steam turbine. The neighboring building can use the steam for industrial processes and/or for heating and cooling purposes. Because hot water still contains energy that can be useful (i.e., less energy is needed to bring hot water or low-quality steam back to high-quality steam), the spent steam and condensate might then be piped back to the HRSG.

Again, this potential use of steam sharing depends on the installation of natural gas-fired combined technology at English Station. Such a technology conversion would likely not occur any sooner than two years from the time of this writing. Once Quinnipiac Energy has received approval to operate the new units on a full-time basis, it would likely begin connecting steam pipelines to neighboring buildings and industries. Initial users of the steam would include the tenant of Station B and Simkins Industries. The piping to Simkins from English Station would most likely go out to Grand Avenue, over the bridge and back down along the Mill River to Simkins. Although this requires more piping than would a plan to connect English Station and Simkins through direct piping buried under the Mill River, it would be the less expensive option according to David Damer, a former United Illuminated employee (Damer 2001).

As stated previously, the potential re-start of English Station has inspired opposition, especially from those in the nearby Fair Haven community concerned about increased air pollution levels. Steam sharing could help minimize overall air emissions increases in the area, and significantly decrease the amount of sulfur dioxide (SO₂) emitted. For example, if Simkins were able to connect to English Station’s steam and buy its electricity wholesale from the power plant, it could shut down the Bigelow boiler it is currently using to create steam and electricity. The environmental benefits from such an arrangement are summarized in Table 1.

Many industrial cleaners also burn their own fuel to create steam for drying clothes and linens. Quinnipiac Energy has been considering an industrial cleaner as a potential occupant of Station B. Pipes could easily be installed from English Station to Station B, allowing a cleaner to replace its own boiler with electricity and steam from the power plant. Industrial cleaners can be relatively clean commercial businesses. Because they use high-temperature water, they require fewer cleaning chemicals per gallon of water than individual users or small laundry services. The water they discharge can also be pH neutral.
A good-sized industrial cleaner that handles around 1,500 pounds of clothes and linens a day would employ 30 to 40 people (Johnston 2001).

After the initial steam connections to Station B and Simkins Industries are completed, further connections to additional industries in the area should be considered. Contacts at both HB Ives and St. Gobain Performance Plastics indicated that their companies would be interested in a steam-sharing relationship with English Station (Kleinbaum 2001; Oszurak 2001). Longer-term plans could include using the steam to heat and cool nearby housing complexes. While replacing infrastructure in existing complexes might prove to be too costly, any new developments in the area should definitely be planned with the steam connection in mind.

Interestingly, this is not the first time that English Station has been considered as part of a steam-sharing arrangement. In the late 1970s, an arrangement with Simkins was considered. Around this same time, the usage pattern of English Station changed from base-loaded units (operating most of the time) to peaking units (operating only during peak demand days during the summer and winter). Peaking units would not have operated enough to provide Simkins with its steam demand, and thus the plans were shelved (Damer 2001).

In the early 1990s, the steam sharing idea was considered again, this time involving the Yale University steam system. To accomplish this, English Station would have had to convert its units to combined cycle units at that time. Due to various reasons outside the scope of this study, that plan was never implemented and the steam-sharing concept was put on hold again (Damer 2001).

Creation of a Plastics, Paper, Metal and Glass (PPMG) Recycling Facility
Recycling is one of the key points of industrial ecology. There are all kinds of recyclable materials in an industrial community, including everything from glass jars to batteries. A recycling center is a beneficial facility for any eco-industrial park. One of the goals of this project is to bring a facility capable of
sorting, baling, and re-selling recyclable materials to the area. Currently, the City of New Haven’s Department of Public Works operates a waste transfer center on Middletown Avenue that collects glass, plastic, paper, and metal cans from New Haven, Yale, and several neighboring towns. At the moment, the transfer station serves only as a collection point, and the recyclables are sold to Willimantic Waste, a facility in Stratford, Connecticut that sorts the materials and sells them to end users (Mason 2001). The recycling coordinators for both Yale and the City of New Haven agree that it would be beneficial for the city to have a business in New Haven that can sort and sell the plastic, paper, glass, and metal collected by the city and by Yale (May 2001; Mason 2001). Depending on its capacity, the facility might be able to handle materials from other municipalities as well.

Such a facility would require approximately 50,000 square feet, or four acres, of space. During the 1980s, Hershman Recycling, which is now located in Stratford, operated this kind of facility on Chapel and East Streets (Anderson 2001). It would be possible to establish a recycling center within the English Station West area, but it would involve either tearing down existing vacant buildings or purchasing land from the GT Wholesale Yard on East and Chapel. This area is heavily built up and though there are currently many vacant buildings, there is little clear space.

The facility would require both outdoor and indoor space. Recycling trucks would dump mixed glass, plastic, paper, and metal onto a tipping floor. From there, papers would be taken out, sorted, baled, and sent directly to market. Machines would load the remaining materials onto a conveyor belt to take them past a processing line, where employees would sort metal, glass, and plastic into separate containers. Once sorted, plastic and metal would be flattened and baled and glass is crushed and piled. A large recycling center could process 100 tons of materials per shift and employ around 30 people (Montgomery County 2001). In other cities, recycling centers have successfully taken part in welfare-to-work programs, and we recommend that any facility here be tied to an employment program. However it should be noted that having a recycling facility may create noise and safety concerns for the residential neighborhoods since recycling trucks will pass through on their way to and from the facility. The authors recommend that the City of New Haven look into these land and transportation issues in more detail if it decides to pursue this idea further.

Having a recycling center in New Haven would facilitate the development of industries that utilize recycled materials. A mid-term goal of this project is to encourage a relationship between the recycling center and Simkins, a boxboard manufacturer. In addition, it might be possible for Alderman Dow to purchase crushed steel or aluminum cans from the center if they were sorted correctly. In the longer term, we would suggest that the recycling facility be used to encourage a glassworks and a plastics company, both “clean” businesses, to locate in the area and take advantage of the raw materials that the recycling company can provide.
Recycling Paper

Simkins currently recycles paper that it purchases in bulk from publishing firms or other large paper users. Simkins could potentially use post-consumer paper collected locally if it were assured that the paper would be sorted correctly. In the past, Simkins has considered adding a paper sorting operation of its own to its factory, but never came to a satisfactory agreement with the city. A recycling facility located near Simkins could work with the boxboard manufacturer to supply it with locally collected paper in a usable form. Establishing such a relationship is a goal for the next three to five years.

Recycling Glass

One strong possibility for utilizing recycled glass is to bring in a glassworks facility or set up studios for independent glass artisans. There is currently a glut of recycled glass in the market, mostly of green and other colored glasses. Glassblowers that use colored glass could buy it very cheaply from the recycling facility, which could assure it a steady supply of materials (May 2001). Glassblowing is also a relatively clean industry, since glassworks usually use natural gas-fired furnaces and produce no significant waste materials besides glass (Bittersweet Glass 2001).
Many commercial glassworks buy a mixture of sand and silica, which they melt down for use in their products. They often also have the capacity to re-melt their own leftover glass for reuse (Bittersweet Glass 2001). It should be fairly easy for a glassworks to increase the amount of recycling they do if a supply of inexpensive glass is readily available from a nearby recycling plant. In addition, there will already be natural gas pipelines in the area, which the glassworks can use to fuel their furnaces.

Either a small-to-medium sized glassworks or glass artisan studios would be a positive addition to Fair Haven. Showrooms facing the street would enhance the physical charm of the neighborhood and tours of the glassworks could be arranged for children from area schools, making the facilities a cultural asset as well. There are several empty buildings in the English Station West area that could easily be rehabilitated to house a small to moderately sized glassworks or colony of artist studios. The Halprin Building on East Street currently has 6,000 square feet of space and a dock for lease. It is a mixed-use building with several service and retail businesses already on the ground floor. There is a plumbing supply showroom and a screen printing business on either side, forming a buffer between the building and the heavier industries in the area.

Another possibility for recycled glass is for the recycling facility to work with a construction materials company to supply crushed glass for use in road construction. Connecticut’s Proposed Solid Waste Management Plan specifically encourages the use of glass aggregate in highway construction.

Recycling Plastics
Bringing in a small plastics manufacturer to use recycled plastics collected locally is another long-term goal. The Obex plastic company has expressed interest in relocating to New Haven in the past. Obex produces a product called Novawood© out of 100% recycled plastic. It grinds recycled plastics and reforms them into a lumber-like product. This process does not change the molecular structure of the plastics, resulting in zero emissions, zero effluents, no chemical leachate, and a product that is non-toxic and inert. Obex makes Novawood© into outdoor tiles and other yard implements such as compost bins.

Though Obex currently purchases some post-consumer plastics, it relies mainly on large companies, such as Pitney-Bowes, to supply its plastic. Plastic collected from consumers is usually not clean or well-sorted enough to be usable for processing Novawood© (May 2001). By working with the recycling facility to clean and sort local plastics to the necessary degree, Obex might be able to use more post-consumer plastics.

Though the authors were unable to determine Obex’s specific space needs, we believe there are facilities within the English Station West area that would be suitable for it, or a similar company. The Hamilton Industrial Center on Hamilton Street has a large amount of vacant space. Since a plastics company would probably operate during the daytime, and the club at night, the two would be unlikely to bother one another.
Creation of a Bulky Waste Recycling Facility

Based both on the State of Connecticut’s recycling needs and the local availability of materials, we recommend the establishment of a bulky waste recycling facility in New Haven. Connecticut’s Department of Environmental Protection (DEP) estimates that the state generates approximately 2 million tons/year of bulky and related wastes and that over 740,000 tons of this is construction and demolition waste from buildings. The state currently has only four permitted landfills that have enough capacity to accept bulky waste, and if all of the construction and demolition waste generated statewide is sent to these landfills their remaining capacity could be exhausted within one to two years. As the current Commissioner of DEP has stated, Connecticut will be facing “a crisis in bulky waste management” in just a few years. The DEP has identified the development of an infrastructure for recycling bulky wastes as one of the three most critical issues facing the state over the next five to ten years (State of Connecticut 1999). DEP is encouraging private entities to develop bulky waste processing and recycling capacity. It would also like to see the development of markets for the reuse of salvaged material (State of Connecticut 1999).

This is powerful evidence for the need to develop new bulky waste recycling facilities in Connecticut. But why locate one near the area west of English Station? The primary reason is that this area will be the site of a number of major construction projects in the upcoming years, particularly because of its location near the junction of Interstate 95 and Interstate 91. This junction is scheduled to be reconfigured in 2006 (Connecticut Department of Transportation 2001). In addition, a major project to tear down and replace the Quinnipiac River Bridge is planned for 2003. These construction projects will create an enormous amount of local bulky wastes that the state simply does not have room to landfill. A bulky waste recycling facility would be able to process and recycle materials from construction and demolition projects. Our group proposes to establish a facility that would reduce volumes of waste, allow for the reuse of salvaged building materials, and process concrete and asphalt for reuse in road construction. These services are in line with DEP’s own waste management plans (State of Connecticut 1999).

In the course of our research, our team became interested in a particular model provided by a California bulky waste recycling company. Raisch Products, a California-based recycling company, has developed an extensive recycling program that includes a Reuse/Recycling Ecological Park (Raisch Products 2001). The Ecological Park concept is a means of promoting recycling and reuse from cradle to grave by establishing links with waste producers all the way through to waste reusers. Company representatives work with the generators of waste as well as government agencies to reduce waste at the source. Waste that is produced is sorted by the Raisch facility, which is capable of handling up to 5,000 tons of material a day (Berry 2001). This sorting process includes commingled materials, such as rebar embedded in concrete. Materials that can be reused (such as brick, lumber, and tile) are then sent to a used-building stockyard.
materials warehouse to be sold to local residents and contractors (Raisch Products 2001). Materials that cannot be reused are directed to the appropriate recycler.

Raisch recycles all of its asphalt and concrete internally to create a new product (Berry 2001). The asphalt and concrete is processed into a base rock that meets the local transportation department’s requirements for road construction. Thus a similar bulky waste recycling facility in New Haven might not only recycle demolition waste from the upcoming New Haven transportation project, but also provide the raw materials for new construction projects.

The Raisch Company is only one model, and there are other bulky waste recycling models here in Connecticut that are worth examining, such as Recycled Concrete Products in Hartford run by Don Mucci (Mucci 2001). Our preliminary research indicated, however, that Raisch exhibits unusually forward environmental thinking with its Ecological Park concept.

If a bulky waste recycling facility is to be brought to New Haven, several potentially limiting factors must be addressed. The first is a question of where to locate such a facility. A Raisch facility requires from three to five acres though a smaller operation could require less space (Berry 2001). In any case, the area west...
of English Station does not have sufficient unused land. As an alternative location, our team suggests potentially locating such a facility in the Long Wharf area. According to the student group researching Long Wharf, it has an excess of unused space including a number of unused parking lots (McEneaney 2001). Moreover, the Long Wharf group has proposed to tear up the asphalt in these parking lots. This would create an immediate source of material for the facility.

The safety concerns of local residents also need to be addressed if a bulky waste recycling facility is to come to New Haven. Residents may be concerned about particulate matter being released in the air. As co-chair of the Fair Haven Community Management Team, Lee Cruz has identified this issue as of utmost importance to Fair Haven residents, who suffer from unusually high rates of asthma (Cruz 2001). If the facility is located in the non-residential Long Wharf area, this may not prove to be a problem. In addition, a company may take measures to adequately reduce particulate. For instance, Raisch uses a “water blanket dust control system” to do just that (Berry 2001).

Cruz and members of the city’s Department of Economic Development have indicated that creating employment opportunities in New Haven is a priority. Our team believes that a bulky waste recycling facility and a PPMG recycling facility would offer significant employment opportunities, particularly for those who have few job skills. Raisch, for example, offers both job training and placement and is committed to working with youths, troubled teens, drug and criminal rehabilitation programs, and welfare relief efforts where appropriate (Raisch Products 2001). Our team recommends the establishment of recycling facilities with a similar commitment to the surrounding community. The development of community employment programs is a long-term goal of this project, and the Recycling Task Force could greatly assist in this effort. Both of the recycling facilities, as well as any new glassworks, cleaners, or plastics companies that locate in New Haven, could be tied into existing Empowerment Zone initiatives, such as the customized job training program, the Construction Workforce Initiative, and the Summer Youth Employment Program (Empower New Haven 2000).

Creation of a Recycling Task Force
Before either a PPMG recycling facility or a bulky waste recycling facility can be brought to New Haven, a Recycling Task Force must be established. This should occur in the short-term development phase and its members should continue to meet through the intermediate and long-term phases. Such a task force would consist of city officials from DEP, the Department of Public Works, and the Department of Economic Development, executives of existing New Haven industries (particularly those with a capacity to use recycled materials), and local residents. The Recycling Task Force would investigate the possibility of increasing New Haven’s capacity to recycle materials through existing means and through the introduction of new industries. The Task Force would address issues of feasibility, recruitment of new industries, and concerns of local
citizens. It could also identify potential areas for industrial symbiosis between existing and incoming industries.

Such a Task Force is essential to New Haven if principles of Industrial Ecology are to begin to be applied to the city’s industry. While the exchange of energy, waste, and water may be the long-term goal of any eco-industrial park, the sharing of information is an equally important goal if not the prerequisite for these other kinds of exchanges. A New Haven Recycling Task Force would represent the beginning of a commitment to industrial symbiotic relationships.

SUMMARY OF RECOMMENDATIONS

In order to create a useful set of recommendations, our team relied on the assistance and information provided by several existing New Haven industries. These include Quinnipiac Energy, Simkins Industries, HB Ives, L. Suzio Concrete Company, Alderman Dow Scrap Metal, Space-Craft Manufacturing, GT Wholesale Yard, Palmieri Food Products, and Saint-Gobain Performance Plastics. Much of the information in this paper comes from telephone interviews with company representatives. Some – such as our most up-to-date information from Quinnipiac Energy – comes from a site visit. Our team also contacted several companies in other cities and states in order to base our recommendations on ideas that have already proved feasible.

While a number of opportunities exist in our region for the application of industrial ecology, we have concentrated our efforts on three particularly promising issues:

• Steam usage/sharing;
• Creation of a glass, paper, aluminum, and plastics recycling facility;
• Creation of a bulky waste recycling facility.

Steam usage and sharing

Combined cycle technology could be configured at English Station to produce excess steam as a byproduct. Our team encourages local industries to view this steam as a primary or secondary source of energy as well as a way of reducing harmful air emissions.

Creation of a Recycling Facility

New Haven currently does not have a recycling facility that is capable of sorting and baling glass, paper, aluminum, and plastics. As a result, the City must send out such materials to a neighboring municipality. Our team recommends that these materials be viewed as a potentially valuable stream of raw materials. We propose that such materials be recycled within New Haven in order to be used by existing manufacturers and to attract new industries to the city.
Creation of a Bulky Waste Recycling Facility
The state of Connecticut is currently unprepared to manage the amount of bulky waste produced by ongoing construction and demolition projects. Our team recommends the creation of a bulky waste recycling facility in order to create a new product from used concrete and asphalt and to return used building materials to New Haven residents and businesses.

In addition, we recommend the establishment of a Recycling Task Force to facilitate communication among existing area businesses, city officials, and community members and to work towards making progress in the above-mentioned areas. Our recommendations are based on short-term (1-2 years), intermediate-term (3-5 years), and long-term (6-10 year) time frames. The following is a summary of our recommendations:

Short-term
- Start English Station power plant on low sulfur oil according to a plan that restricts the number of hours of operation per year.
- Transfer scrap metal from Ives to Alderman Dow.
- Create a Recycling Task Force.
- Convert English Station to natural gas-fired combined cycle units within a two to three year time frame.
- Lay steam pipeline from English Station to Simkins and Station B (the building adjacent to English Station) once conversion to natural gas-fired units commences.

Intermediate-Term
- Bring a tenant into Station B. Possible tenants include a granite cutter or industrial cleaner.
- Expand steam pipeline infrastructure to other local businesses.
- Establish a recycling center.
- Begin operation of the recycling center’s paper unit.
- Locate a bulky waste recycling facility in the Long Wharf area.
- Develop artist studios in existing tenant buildings.

Long-term
- Expand steam pipeline to residential housing complexes.
- Begin operation of glass, plastics, and metal recycling at the recycling center.
- Create a retail warehouse for used-building materials.
- Bring glassblowers into artist studios.
- Bring in a recycled plastics manufacturer.
- Develop a community outreach and employment program through both recycling facilities.
Communication between existing and proposed industries and city officials will be essential to the future of this region. While our team has attempted to make feasible recommendations, all incoming industries will have to address a number of potentially limiting factors. The amount of available space may restrict the size and type of industries looking to locate in this area. New industries also must be assured of a significant source of raw materials and a market share large enough to keep their business sustainable. In addition, this geographical region borders on the mostly residential Fair Haven and Wooster Square communities. Residents of these communities rightfully have an interest in protecting their health and safety and the character of their neighborhoods. Any plans for economic development must be shared with the public.

In spite of these concerns, the region west of English Station holds great potential for the future of New Haven’s economic and environmental success. Already, the region contains a number of manufacturers with significant material inputs and outputs. Moreover, our team found that many of these companies were already engaged in or exploring material exchanges where possible. Even where none were possible, many industry executives were still familiar with co-located businesses. Establishing communication between companies is perhaps the most difficult and important step toward creating opportunities for industrial symbiosis. With this in mind, the industrial region west of English Station can already be said to be moving in a positive direction.

ACKNOWLEDGEMENTS
Our team would like to acknowledge the following individuals for their giving us their time, assistance and ideas, without which this project would not have been possible: Jason Alderman, Steve Anderson, Chuck Berry, Marian Chertow, Dan Clark, Lee Cruz, Bill Doucette, Mark Douglas, Dave Damer, Tom Dubno, Karen Gilvarg, Michael Holzman, Celeste Johnson, Bruce Johnston, Robert Klee, Aaron Kleinbaum, Jeff Mannis, Simone Mason, C.J. May, Don Mucci, Paul Oszurak, Mike Piscatelli and Len Suzio.

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FURTHER INFORMATION