

Potential Areas of Eco-Industrial Networking

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The late Ed Cohen-Rosenthal created a useful model of potential areas of Eco-Industrial Networking, which appears in his 2003 Eco-industrial Strategies: Unleashing Synergy Between Economic Development and the Environment. (Greenleaf Publishing). This article reviews the results of nine years of programs to embed eco-industrial concepts into the redevelopment of the former Fort Devens in North Central Massachusetts and how these efforts match up against the Cohen-Rosenthal model.

Materials:

By-Product Exchange - The Great Exchange from November 2007 provides ample examples of Devens' success in this category. This initiative, launched in November 2007, enabled long-term partnerships that facilitated the exchange of materials for reuse purposes. It is estimated that in the first six months participants collectively saved approximately \$63,000 in avoided purchasing or disposal costs. In addition, we have

Cains Food in the neighboring community of Ayer exchanging its oily by-products with a soap company in Lowell, MA which regularly sends a vacuum truck to Ayer to pick up its reused feedstock. At Devens we have introduced US Gypsum (USG) to their neighbor, Devens Recycling LLC which can take any spoilage from the transportation process to USG's new Devens facility and recycle it. Devens Recycling LLC is a construction and demolition debris recycling firm with the largest such facility in North America, 90,000 sf. By its very nature it is focused on by-product exchanges.

Common Purchasing – We have tried locking a few purchasing agents in a room and providing them with lunch. Their assigned goal was to come up with common purchasing opportunities for their firms and other EcoStar members. This proved a successful investment in sandwiches. We have a number of firms who share suppliers of safety shoes, hearing protection and other personal protection equipment. Mass Development and the DEC have negotiated a common contract for recycling and solid waste services for Devens firms and residents and are working with the Commonwealth of Massachusetts to assess the deployment of a regular household hazardous waste facility for the region which would be open to businesses defined as very small quantity generators.

Supplier Relationships –

A number of our firms communicate up and down their supply chain about their green commitment through the EcoStar program. This push back to green the supply chain is slowly producing results for firms such as Image Software Services, a digital duplication firm at Devens, continues to work with their suppliers in an effort to share their “green” knowledge and work on solutions for reduced packaging, incorporating more recycled content into products. Image Software receives a large amount of inventory and supplies in cumbersome packaging that often contains plastics and/or non-recyclable materials. Not only has Image Software worked with EcoStar to redirect and reuse these packaging waste streams, they have also spoken with their suppliers to request alternative packaging that contains less material and is recyclable and/or re-usable. Doing so is a win-win-win for both companies – saving money, materials and reducing both the supplier's and their client's environmental footprint through reduced storage space as well as lower material purchasing and disposal costs.

Customer Relationships – Eglomisé Designs, a Devens firm which manufactures high quality university giftware, received a request from Yale University regarding what steps they were taking to green their operations. Eglomisé was able to reply that they were an EcoStar member and had just been recognized for achieving zero waste in their production process. This is the type of communication the EcoStar branding and achievement program was made for. One well-received EcoStar workshop featured strategies for communicating your greening successes to your customers and suppliers.

Creating New Material Markets - Another Devens firm is JP Routhier which is in the tire recycling business. Routhier reuses the rubber, fluff and wire from old tires to provide the materials for a number of ventures, include Animat USA which will take the

rubber and produce animal mats for the dairy industry. The fluff, fiber and nylon is added to recycled pelletized plastic to form plastic deco board.

As previously discussed, Devens Recycling is a 90,000 square-foot construction and demolition (C&D) debris recycling facility at Devens, which opened in 2007. Devens Recycling recovers over 80% of the raw material from C&D materials from various construction projects throughout New England. This material is separated and used as feedstock for numerous recycled material markets, including, but not limited to:

- **Wood:** biofuel, wood pellets, landscaping mulch
 - **Aluminum:** reuse for aluminum products including cans, duct and framework
 - **Light iron:** reuse for steel production
 - **Cardboard:** raw material for paper mills, reused for new cardboard products
 - **Concrete:** crushed and used for road bases, soil stabilization, pipe bedding and landscaping
 - **Asphalt shingles:** used in road bases, cold patch, new shingles and fuel sources
 - **Fines:** filler material in landscaping and excavation projects as well as an alternative cover for landfilling and animal bedding
 - **Gypsum:** crushed and used for making new wallboard and cement products
- All of these uses not only re-direct waste streams from landfills and/or incineration, they reduce the demand for virgin materials and also preserve natural resources - saving time, energy and money by taking advantage of the embodied energy that went into the original extraction, production and processing of these materials. All of these reuses and savings also translate into reduced greenhouse gas emissions

Transportation:

Our initial Devens Sustainable Indicators report, (1999) identified access to public transportation as a major issue for the redevelopment team to address. Efforts in this area have been surprisingly successful, with the launching of the Fitchburg Line Working Group - a network of community, legislative, planning and business interests from communities located along the Fitchburg Line Commuter Railway, which provides a direct link to Boston. The Group's successful advocacy with the Massachusetts Bay Transportation Authority, helped secure Federal Small Starts funding for \$150 million in improvements to the line which is in the process of being implemented with a late 2011 completion date. This has the potential to further connect the Devens Region with Boston and attract additional opportunities for improved transportation efficiencies.

Shared Shipping – A roundtable group of logistics managers from firms in the area has been established by the Devens Eco-Efficiency Center (we haven't explained DEEC vs. EcoStar) to begin working on this issue. With many of the firms returning to Devens with empty trucks and local firms in needs of delivery of supplies this is a logistical issue that appears solvable with savings for all involved.

Shared Commuting – The DEC has requirements for firms to be ready to participate in a transportation management association. Mass Development, as the lead redevelopment agency for Devens, has an agreement with Mass Highway to deploy a transportation

management association when traffic from the redevelopment reaches a certain level. All firms with over 250 employees are required to implement a ride sharing program and the DEC has provided assistance to the Federal Corrections Facility at Devens, Sonoco and the Army to establish these required programs.

Additionally, Devens businesses are being encouraged through EcoStar to enroll in a publicly-funded MassRIDES program and promote car pooling activities to their employees. By collaborating on this initiative and doing a community-wide promotion, employees in a small business will have an easier time identifying a ride-share partner in a database that will have potentially 4,000 other local employees listed.

Common Vehicle Maintenance – Mass Development’s Public Works Department (DPW) provides common vehicle maintenance to all Mass Development, Fire Department and State Police vehicles at Devens. They also participate in a barter program with surrounding municipal DPWs, lending their equipment and operators to other towns in return for assistance in other areas. For example, the Devens DPW sent a backhoe and operator to the Town of Groton for a job. In return, the Groton DPW installed a section of sidewalk for Devens.

Alternative Packaging - A number of companies have used other firms’ orphan products or waste as packaging for their own products. Peak Manufacturing and Parker Hannifan deploy 96 gallon totes to collect Parker Hannifan’s bubble wrap and send it to Waiteco where it is used as packaging for their machine tooled products. Both firms save money and nothing goes into the landfill.

Intra-park transportation – Recognizing the importance of a highly connected, multi-modal infrastructure to support eco-industrial development, as part of the Devens Redevelopment efforts, a Rail, Industrial and Trade-Related District was created to accommodate a cluster of business and industry within close proximity to the Pam Am Railways rail line and intermodal facility (formerly GMX and Boston & Maine Railroad). Industries within Devens such as US Gypsum, Devens Recycling, Peak Manufacturing and the military utilize this rail system. As planning for the future development of Devens continues, a multi-purpose trail system is being constructed to provide pedestrian and bicycle connections between business, industry, community services and natural open spaces and parks. The portions of this trail system that are currently in place are used by many employees of businesses for exercise. As development continues at Devens, these trails will facilitate opportunities for alternative modes of transportation to and within Devens, as well as between businesses and organizations. Although Devens has yet to develop an intra-park public transportation system, a Transportation Demand Management (TDM) Program, has been developed to reduce peak traffic flows, single-occupancy vehicle trips and increase options for alternative forms of transportation within Devens. These strategies are aimed at reducing the mental and physical distance between business, industry, organizations and services within Devens and the surrounding region. Once development at Devens reaches a critical mass, the Devens Transportation Management Association (TMA) will provide commuter-related services, assistance and information to all organizations (residents, visitors, businesses, industries,

non-profits, etc.) currently located or locating at Devens. One such service will be a Devens Shuttle Bus Circulator to provide access to Devens business, industries, services, organizations and residents.

Integrated Logistics – The transportation roundtable offers an opportunity to advance the discussion of exploring applying integrated logistics for our firms. Intermodal opportunities abound, as GMX hosts rail container transfer and storage stations at their Barnum Road facility. A number of other firms use rail as well, Rock Tenn, USG, and Devens Recycling LLC.

Environmental Health and Safety

Through EcoStar, an Environmental Health and Safety roundtable has been created. During its first months of operation EH&S personnel from over a dozen firms established a year long agenda of program which cover many of the issues found under this heading in the matrix.

Accident Prevention

EH&S Roundtable on new OSHA requirements for electrical safety training and Chapter 70E regulations as well as shared training for fork lift operators have all focused on accident prevention.

Emergency Response

Mass Development and Devens firms have held joint emergency response training events simulating responses to events such as a toxic plume emanating from a rail siding at Devens moving towards our federal prison facility; a training involving the army and surrounding communities responding to a spill with injuries within the military compound and providing refresher courses on spill response requirements as part of our compliance university series of roundtables. These joint training events keep the Devens Community on top of emergency response procedures. These training events, coupled with the accident prevention and operations programs, help to maximize public health and safety at Devens.

Waste Minimization

The Great Exchange and other efforts to find new homes for orphan products have resulted in a significant reduction in the amount of waste being produced by Devens firms. Our emphasis on examining the opportunities to reuse orphan products and locate potential reuse opportunities, as well as an emphasis on designing the product right from the start, come into play here. The state of Massachusetts Office of Technical Assistance has a program which provides facility design services and examination of the production process as part of this service. EcoStar teamed with the Massachusetts Extension Partnership and EPA to provide a Lean and Green Manufacturing workshop to address these issues as well.

Design for Environment

No information at this time.

Shared EIS

Devens was developed under a shared Environmental Impact Statement. The entire 4400 acre area is permitted under a Massachusetts Environmental Permit Agency (MEPA) Environmental Impact Report which identified performance standards which cannot be exceeded by the overall redevelopment process.

Joint Regulatory Permitting – Devens is an excellent example of both pre-permitting on a park wide basis and the deployment of a one stop fast track permitting program. The Devens Enterprise Commission was established by MGL Chapter 498 of the Acts of 1993 to serve as a one stop permitting authority. It serves as the local conservation commission, board of health, historic district commission, zoning board of appeals, planning board and issues liquor licenses for projects within the Devens Regional Enterprise Zone. The Devens Unified Permitting system is often cited as one of the main reasons for Devens’ successful redevelopment. The umbrella state permit under the Massachusetts Environmental Policy Act coupled with the expedited local permitting process administered by the Devens Enterprise Commission (DEC) resulted in record permitting times of 49 days for Bristol-Myers Squibb, a \$750,000,000 bio-pharmaceutical complex, and less than 40 days for Evergreen Solar, a 450,000 square-foot photovoltaic solar panel manufacturing facility. Recognizing the DEC’s Unified Permit Process as a model for state and local governments, the DEC received the Pioneer Institute’s 2007 Award for Innovation in Government.

Marketing

Co-Product Development – not at this time.

Joint Promotions –At the annual Every Day is Earth Day event, local businesses host tables at the Devens Community Center to share information with each other regarding their sustainability programs and efforts to be a responsible corporate citizen. This celebration facilitates learning among peers in the local business community and enables partnerships between businesses with shared values.

Green Labeling

The EcoStar program in of itself is a green labeling program. EcoStar was the result of a feasibility study in which we asked businesses what it would take for them to participate in an environmental program. Their response was recognition. Therefore we designed EcoStar - an environmental branding and recognition program, with 25 environmental standards and if a firm achieves 15 of these, then they can use our EcoStar Achiever logo to market their products and services and raise awareness of their efforts to integrate sustainability into their day-to-day business practices.

Accessing Green Markets

Eglomisé received an inquiry from one its clients asking what steps it was taking to be a green company, if any. They were able to report back on their participation in EcoStar, including an article featuring them as our member of the quarter which recounted their efforts to become a zero waste firm. They now include information on their participation

in EcoStar in all their communications with clients. Similarly, the SpringHill Suites Hotel has decided to pursue the EcoStar Achiever designation because of the increase in the number of companies that are choosing overnight and conference hotels by the hotel's commitment to being a green facility.

Recruiting New Value Added Companies

JP Routhier was able to attract Animat to the area because of his tire recycling operation which produces the raw material, recycled rubber, for the Animat product. The DEC is currently working with JP Routhier to locate a plastic pelletizing operation in the area using recycled plastics as its raw material source which would produce plastic lumber. Devens Recycling LLC, a construction and demolition debris recycling firm was also attracted by Devens' eco-industrial synergy opportunities. This type of scavenger, decomposer industry plays an important role in facilitating end of useful product life synergies.

Energy

Distributed Generation

The DEC is currently preparing for the development of an additional amount of housing, between 176 to 576 additional dwell units are under consideration and distributed generation will be encouraged and incentivized through a project to green the DEC's Rules and Regulations.

Cogeneration or Energy Cascading

Mass Development and the DEC are currently working with a firm which reprocesses used automotive oils to create lube oils. This re-refining operation is a classic case of cascading of energy resources, taking a higher quality oil and reprocessing it into another product essentially removing contaminants from used lube oil to recover base lube oil stock. Because of the economic downturn the firm pulled out of its plan to relocate to Devens.

Energy Auditing

Mass Development operates as a municipal utility department and has budgeted funds to provide energy audits for the existing residents of Devens. The DEC, through our EcoStar Coordinator, engaged a team of Tufts graduate students to develop a proposal to operate a revolving loan fund to finance energy conservation efforts for both residents and businesses. Energy Audits would form the basis of investment decisions and could be rebated to businesses which implement cost effective recommendations. The DEC has set aside \$50,000 to fund the revolving loan fund with the intent that the money be recycled for solar and renewable initiatives after the initial energy conservation efforts have borne fruit.

Spin-off Energy Firms

Devens has been successful in attracting alternative energy firms to the DREZ. Evergreen Solar, a photovoltaic manufacturer is constructing a 500,000 sf facility at Devens that will employ over 450 people. Another Devens firm, IPT (Integrated Process

Technologies) makes process skids for firms creating ethanol and biodiesel. A third company, American Super Conductor (ASC) makes components for wind turbines.

Alternative Fuels

EcoStar and the Devens Eco-Efficiency Center are currently working with Bay State Bio-Fuels, a firm which uses seed oils (sunflower, safflower, etc) to create biofuels, to market their product to area firms.

Green Design

Mass Development has funded a design build competition to create six to eighteen dwelling units of zero net- energy housing to illustrate the combination of energy efficient design and the use of renewable energy sources,. The DEC offers a feebate program which refunds 15% of a unified permit fee up to \$10,000 to projects that achieve green building certification through the US Green Building Council's Leadership in Energy and Environmental Design (LEED) certified for their green building efforts. Currently Bristol-Myers Squibb has two buildings in the LEED certification process. The Army is also pursuing LEED certification for their new training and maintenance facility , and Transitions, our woman's shelter, will be certified under the LEED for Homes program. Additionally, the DEC is writing its regulations to authorize higher density development if a project is pre-certified under the LEED for Neighborhood Development Pilot program.

Co-located Facilities

Proctor and Gamble's Gillette facility is co-located with its packaging partner, Sonoco. The two buildings are connected by a corridor. An in store marketing contractor (they build in-store displays for Gillette products) is also located in the Gillette facility. Mount Wachusett Community College recently chose to locate their bio-technology/bio-manufacturing degree program right across the street from the new Bristol-Myers Squibb (BMS) facility, providing education and job training for potential BMS employees.

Brownfields Redevelopment

Devens is a former Superfund site which has benefited from over \$145million in federal funding to clean up the former army base. Most of the superfund issues have been closed out at this point in time and the redevelopment of these former brownfield sites continues today.

Building Reuse

The DEC Regulations recognize that the most sustainable type of development is to reuse existing buildings. As a former military base, Devens provides a vast inventory existing buildings that offer excellent re-use opportunities. A faster turnaround time is built into the permitting process as an incentive for developers to reuse existing buildings (21 days versus 75 days). The Parker Charter School actually purchased a used modular high school from the Wachusett School District in Holden, Massachusetts, had it disassembled and moved to their site within Devens and reassembled. It is a wonderful story of building reuse. About one quarter of Devens redevelopment efforts (1 Million SF out of 4.25 Million Square feet) involve building reuse and redevelopment.

Sustainable Architecture

Mass Development, the state's economic development agency and the DEC's partner in the redevelopment process has committed to Governor Patrick's goal LEED plus for all state building projects. Proposed changes to the DEC's Development Rules and Regulations will continue to emphasize energy and water efficiency, green building (LEED) certification, while addressing the emerging concepts of passive survivability and requiring vegetated green roofs and walls on buildings located on the edges of the Viewshed Overlay district.

Energy Efficiency & Renewables

The DEC has set aside \$50,000-\$100,000 to fund a revolving energy conservation and renewable energy loan fund with the intent that the money be recycled for solar and renewable initiatives after the initial energy conservation efforts have borne fruit. Proposed changes to the DEC's regulations will also look at requiring improved energy efficiency for developments. Modeled after the Commonwealth of Massachusetts current draft "Stretch Building Code", the energy efficiency regulation amendments will require development to meet energy efficiency standards beyond the 2006 International Energy Conservation Code by 15-40%.

Native Landscaping

The DEC's Regulations require the use of native plant species and prohibit the use of invasive species. The DEC Development Rules and Regulations include a list of invasive plant species that are prohibited. In addition, proposed development on sites with existing invasive species colonization are required to implement a long-term invasive species control and monitoring plan as part of their long term operations and maintenance plan. EcoStar has also developed a model contract for members to use to assure that ecological landscaping practices are implemented as part of the ongoing maintenance of grounds for Devens facilities.

Production Processes

Pollution Prevention

EcoStar hosts educational workshops that enable local businesses to implement more sustainable business practices, such as eliminating waste and preventing pollution in their manufacturing process. Eglomisé Designs eliminated the use of toxic lead in their mantle clocks by replacing the weight needed for balancing with pieces of scrap glass generated from their decorative mirror production.

Scrap Reduction and Reuse

Several businesses within Devens are separating scraps for collection and reuse by local art organizations. For example, a digital printing company, Image Software Services, saves trimmings of paper and spirals (used for binding) for the local organization For Arts Sake. Several EcoStar members set scraps aside for a monthly pickup by Extras for Creative Learning. This non-profit collects "waste" from businesses throughout the state and makes them available to art teachers for reuse in their classrooms. Materials obtained

locally include fabric pieces and plastic jars and covers that do not meet quality standards.

Production Design

Nothing at this time.

Common Subcontractors – The DEC and Mass Development researched existing waste management and recycling contracts of firms at Devens; then negotiated a common contract to provide these services for all Devens businesses and residents. The project is on-going has been generally successful, with competitor firms lowering their rates to retain customers and an increase in recycling rates within the Devens regional enterprise zone. Many businesses, industries and organizations in Devens have benefited from the recent opening of the Devens Recycling Facility. As previously discussed, US Gypsum recently located a warehousing and distribution facility within an existing building on an adjacent property. US Gypsum took advantage of its location and contracted with Devens Recycling to recycle damaged inventory. In addition, the US Army and National Guard are in the process of redeveloping a large parcel at Devens and have contracted with Devens Recycling and its owner to handle and process all construction and demolition debris. As part of this project, Devens Recycling will be processing demolition material on-site for reuse in road sub-bases. All excess construction and demolition debris will be transported to the Devens Recycling facility for further processing and re-distribution as raw materials. This relationship will also aid the Army in their pursuit of LEED certification for their new facility.

Common Equipment – The Devens Department of Public Works (DPW) provides excellent illustrations of this concept. They range from deploying a recycling container and compactor in front of their facility which is free and open to all businesses and the general public, to the sharing of graders, loaders and other heavy equipment with Devens operators to surrounding municipalities in return for the use of their personnel and equipment for projects within Devens. In tight economic times this approach has proven to be effective and economical for communities in the region. In one instance, Devens DPW lent a grader to an adjacent town and in exchange, the town assisted with a sidewalk construction project in Devens. These exchanges not only save money in purchasing, maintenance, storage and contracting expenses, they also connect town departments and promote regional efficiencies beyond Devens. Devens Public Works facility also has a recycling drop off center where Devens residents, businesses, industries and organizations, as well as surrounding communities can dispose of glass, paper, cardboard, cans and clothing at no charge. Metal, Electronic and Appliance Recycling are also available at the Devens DPW for Devens residents and businesses. Household hazardous waste and very small quantity generator (VSQG) collection days are periodically hosted at Devens and in the surrounding region as well. These collection days are open to all residents and qualifying small businesses with Massachusetts.

Technology Sharing and Integration – not at this time.

Human Resources

HR Recruiting –As previously mentioned, Bristol-Myers Squibb (BMS), a \$750 million dollar biological pharmaceutical manufacturing facility currently under construction at Devens and Mount Wachusett Community College have taken advantage of co-location opportunities by locating their new Biotechnology/Biomanufacturing degree program on the property across the street from BMS. Apex Properties, a property management company within Devens, facilitated this opportunity by renovating a former military intelligence building to allow the College to move in and commence its program while the BMS facility is still under construction.

Joint Benefits Packages – not at this time.

Wellness Programs – not at this time.

Common Needs - not at this time.

Employee Training Because Devens is a former military base, it is possible that unexploded ordinance (UXO) from past military exercises and activities could be found during construction. As a result, Devens Fire Department provides UXO and safety training to all persons working on any construction project at Devens. Due to the size and duration of the Bristol-Myers Squibb project (94 acres being developed over 3 years), UXO training sessions were held on-site at BMS on a regular basis. As new projects have come to Devens, BMS has allowed other developments to utilize their facilities for joint UXO and safety training.

In addition to UXO training, the EcoStar (or define the DEEC) provides monthly workshops and quarterly roundtables on specific sustainability topics to all Devens and surrounding area businesses, industries and organizations and their employees to aid in educating and providing technical assistance to further support eco-industrial development opportunities. Roundtables focus on four specific areas: Environmental Health and Safety, Green Building, Transportation and Environmental Compliance, and have been a great success at educating and engaging the local community and promoting more sustainable approaches to day to day business practices. EcoStar has created a network that has provided another mechanism for the businesses within Devens to train their employees in an efficient manner. Through the monthly Roundtable meetings, environmental, health, and safety professionals have organized to secure the training and knowledge they need to be more effective in their roles. EcoStar also hosts a Compliance University session twice per year. This forum enables small businesses that do not have internal experts to gain a strong understanding of the environmental performance practices that are expected of them by the federal, state, and local government. These trainings would not be possible without collaboration.