The Oak Point Eco-Industrial Park: A Sustainable Economic Development Proposal for the South Bronx

report prepared by

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STATEMENT OF PURPOSE

The City of New York is at a critical juncture in deciding how to move forward in making its future more sustainable. While the city is taking steps to address longstanding environmental problems, it has many serious and long-lasting decisions to make. In the course of this decision making certain trade-offs will have to be determined. The city has to balance its long term needs with its desire to reduce its environmental impact. The two, however, are not exclusive.

The following study discusses the concept of an eco-industrial park. It sets forth a feasibility study showing that long-term planning of city industrial uses and processing is economically feasible, and can be developed in such a way that it can directly address inequities and in an equitable and sustainable manner.

During the course of drafting this study, we have held discussions with the community, identified potential tenants, projected revenue generation and job creation, determined the cost of development and identification of potential problems with site development and how to overcome these obstacles. Again, this proposal shows that sustainable solutions can meet the long term needs of the city.

It is the belief of the authors that the City of New York's creation of an Office of Long-Term Planning and Sustainability has created a historic opportunity to integrate, in a comprehensive manner, land use decision making with environmental planning. What is critical now is how the city decides to direct the Office of Long Term Planning and Sustainability, and how it decides to take the information contained within this document, to move forward in implementing sustainable solutions to real city problems.

Definition of Eco-Industrial Park

An eco-industrial park is a community of manufacturing and service businesses seeking enhanced environmental and economic performance through collaboration in the management of waste, energy, water, and raw materials. The goal of an EIP is to improve the economic performance of the participating companies while minimizing their environmental impact. Components of this approach include pollution prevention and energy/water efficiency. Compared to a traditional industrial park, the emphasis of an EIP on material, energy, and water efficiency reduces both pollution and demands for natural resources typically used as raw materials. In short, the waste of one business becomes the resource of another. The proposed Oak Point Eco-Industrial Park (Eco Park) is based on the EIP model.

Sustainable Solutions are Possible

Fortunately, current City policies related to solid waste management, industrial business development, waterfront access and environmental justice, are more supportive of Eco Industrial Parks. The City's draft Solid Waste Management Plan proposes a waste reduction goal of 70% for all residential and commercial waste by the year 2015. The 2004 announcement of the long-term City contract with Sims Hugo Neu Corporation for processing metal, glass and plastic indicates the City's commitment to reducing the amount of waste exported to landfills. However, new infrastructure is required to meet the targeted 70% waste diversion goal. An Eco Park can support this commitment by bringing together businesses that utilize not only DSNY-collected recyclables, but also Construction & Demolition (C&D) debris, for which minimal recycling infrastructure exists in New York City. The development of C&D recycling infrastructure further supports the growing interest among builders in "green buildings", especially in light of Local Law 86 that requires green building on certain large city-funded projects. It also enables contractors to engage in the recycling initiatives called for in the 2003 Construction & Demolition Waste Manual published by the NYC Department of Design & Construction.

Bronx Innovation and Opportunity

The Eco Park study expands upon the principle of the EIP by prioritizing waste reduction, in order to confront the problem of waste export that plagues the South Bronx communities of Hunts Point and Port Morris/Mott Haven. The Eco Park would operate as a community of manufacturing and service businesses that recover waste for remanufacturing, recycling, and reuse. By recovering materials before they become waste, the total amount of waste exported from the Bronx is reduced while simultaneously creating a new source of jobs and reviving the Bronx's manufacturing sector.

Additionally, the Eco Park requires both rail and barge access in order to avoid using trucks as a primary mean of transportation. This site is found in the Hunts Point neighborhood. The Eco Park study determined that a site with multi-modal capabilities to be ideal for recycling and recycling-based industries. Additionally, recycling is an innovative way to address issues such as unemployment and pollution prevention that plague the South Bronx, while concurrently creating opportunities for new green economies and green industrial markets.

The Bronx already hosts several businesses that have ecologically minded focuses. Several Bronx-based manufacturers and building suppliers are providing the city with building products that comply with Green Building Principles, such as those offered through the U.S. Green Building Council. It is the intention of the Eco Park to complement these existing businesses, and to expand the availability of material resources for other green building manufacturers and suppliers throughout the city.

Bronx Solid Waste Solutions

An Eco Park was originally recommended by the Bronx Solid Waste Advisory Board and Bronx Solid Waste Task Force in the 1997 Bronx Solid Waste Management Plan. In 2000 the Bronx Overall Economic Development Corporation (BOEDC) published a feasibility study for a Bronx Recycling Industrial Park.[1] While it did not propose a location, the BOEDC feasibility study concluded that co-locating ten businesses on approximately ten acres of land would generate up to 300 new jobs on-site while retaining and generating an additional 600 jobs throughout the Bronx on account of expansion of existing recyclers, manufacturers and others that would benefit from the location of a recycling industrial park in the Bronx. The study also estimated that Bronx businesses would save $25 million annually on waste disposal by recycling at the park, instead of paying waste carting fees. Despite these benefits the concept of a recycling industrial park at the time was not supported by City policy that would have facilitated development of a site.

In the summer of 2005, the New York Empowerment Zone, along with the Sims Hugo Neu Corporation, funded this feasibility study, specific to the Oak Point Site. This support has provided Sustainable South Bronx and Green Worker Cooperatives the opportunity to work with Sustainable Enterprise and Pratt Center. Since initiating the study in February 2006, the Eco Park partners have worked to fulfill the study's objectives set forth in their agreement with the EZ.

In short, this study has found that the development of an Eco Park is economically viable. Gross revenues of the Eco Park would be close to $90 million per year and provide about 335 jobs. A significant amount of waste would be diverted and utilized, plastics 3-7 would be used (approximately 30 million pounds per year) and approximately 1,900 tons per day of C&D waste would be recycled (about 95% of the tpd). Additionally, the Eco Park as described in the feasibility study would provide materials for the creation of green building products that would help buildings in New York City achieve green building standards, reduce truck miles of C&D operators by 21,000 truck trips per year and alleviate the C&D burden affecting the Hunts Point and Port Morris/Mott Haven neighborhoods.

Sustainable Solutions *Now*

The findings of this Eco Park study support the belief that the twin problems of high unemployment and environmental degradation in the South Bronx can be alleviated through the development of an eco-industrial park in the Hunts Point community of the Bronx. The Eco Park should be seriously considered not only as a solution to these problems, but also as a way for the City of New York to pro-actively step forward in its Long Term Planning and Sustainability objectives. Additionally, the City should seriously consider the benefits, both economic and environmental, that would be provided by the Eco Park. In essence, by looking at the long term needs of the city's management of recyclables, waste and infrastructure, sustainable solutions such as those offered by the Eco Park will allow the City of New York to become more economically sound and equitable while greatly reducing its environmental impact. The City of New York City must innovate for its future in a way that makes it livable for all residents. The Eco Park will provide for this possibility.

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1 Bronx Overall Economic Development Corporation, "*Report on the feasibility of developing a Bronx Recycling Industrial Park"*, 2000.

EXECUTIVE SUMMARY

This study indicates the feasibility of developing a $36 million dollar eco-industrial park on an approximately 28-acre, waterfront brownfield site in Hunts Point after the site has been remediated and made shovel-ready for development by the City. The cost of remediation was not estimated. The capital cost of installing new infrastructure has been estimated at $21.7 million exclusive of the costs of repairing the waterfront bulkhead.

The site can accommodate development of 495,000 square feet (11.4 acres) of leasable space in six parcels. On each, a well-insulated, "Butler-style" building would be constructed with recycled steel, landscaping, water management and energy systems that may qualify the building for federal and state "green building" tax credits. Buildings would have access to rail and water for receiving and shipping via an elevated, computer-operated conveyor system.

Financially, development of the $36 million eco-industrial park would be feasible in a structure like the following:

- a long-term (eg., 99-years') ground lease from the City of New York
- $27 million in tax-exempt bond financing from the Bronx Empowerment Zone and/or the New York City Industrial Development Agency
- $9 million in developer's equity and/or credit-enhancing loans
- ground lease payments to the City equivalent to net operating income after the payment of debt service, operating costs, lenders' reserves, and distributions to investors
- leases to occupants of the park at an average minimum triple-net building rent of between $8 to $10 per square foot

Without having had a commitment for site control, preparers of this study identified several companies with a serious financial interest in establishing an operation in New York City or the metropolitan area some time in the next three to five years – a time frame intended to be reasonably related to the time it might take to determine site control and develop the park. Consequently, during the interim between this writing and the start of construction, some may find other locations and the actual occupants may change. Hence, the companies we describe are realistic and desirable prospects as well as examples of the types of companies the park could attract.

Facilities at the eco-industrial park would include:

- a **construction and demolition (C&D) debris recycling facility** which would operate in a fully-enclosed 160,000 square foot building, provide existing C&D transfer stations with financial incentives to close down 2,000 tons-per-day of outdoor operations, replace some 36,500 outgoing truck trips from the Bronx annually (145 daily) with shipments by barge and rail, and create 80 jobs
- a **plastics product manufacturer** which would produce railroad ties using mixed plastic waste materials from post-industrial and post-consumer sources, provide the city's recycling processors with a convenient market for the 31.5 million pounds of mixed plastics in the city's current recycling stream, enable the recycling program to expand into some of the 245 million more pounds of unrecycled plastics in the city's refuse stream, and create 155 jobs
- a **paper converting operation** which would convert one-ton "parent rolls" of 100% recycled-content paper into individually-wrapped, consumer-sized rolls and packages of tissues and towel products for sale under its supply contracts with the federal government and major commercial and institutional buyers, and which would create 50 jobs, including 15 for the blind and visually-impaired
- a **wood salvage and re-milling operation** which would sort heavy and antique timber, beams, joists, shoring lumber and plywood salvaged from demolished buildings and construction sites by dimensions and species, would wholesale about half to lumber mills and timber framing companies, would retail about one-quarter to highway construction, bridge refurbishing, and other contractors, would re-mill the rest into dimensional lumber and blanks for architectural and fine carpentry applications, and would create 20 jobs
- a **glass powder manufacturing facility** which would process the 77,870 tons of mixed glass cullet and container glass from the city's recycling program into a valuable "green" building material, namely a clean, dry "glass powder" that can replace up to 40% of the Portland cement used in making concrete masonry blocks and ready-mix concrete, and which would create 30 jobs
- a small non-profit facility with **educational exhibition space** about recycling, re-use, and re-manufacturing and **incubator space for craftspeople** designing artworks or products made from recycled materials

Together, the five operating facilities would generate upwards of $90 million in annual revenues, including some $70 million on sales of products made from recycled waste materials that most recyclers and processors consider to have low-end use and value. They would create some 335 living- wage jobs. They would achieve a net reduction of some 20,100 truck trips annually (84 daily) by shipping and receiving on 4,300 barges and railcars a year (17 a day). The eco-industrial park would be in an M-3 industrial zone. Each of the prospective users is allowed as of right.

Facilities would be responsible for securing all applicable city, state, and federal permits. Except for the C&D recycling facility, all of the facilities would likely be exempt from both city and state solid waste regulations and state recyclable handling and recovery regulations because they are "manufacturing facilities." For this reason too, they would be exempt from state regulations prohibiting solid waste management facilities in regulated wetlands.

The new C&D facility would qualify for a solid waste transfer permit from the city's Department of Sanitation. It would comply with the enhanced protections effective in Bronx Community District 2 under City requirements, including the responsibility to secure a corresponding reduction (offset) in the lawful daily permitted throughput capacity at construction and demolition debris or putrescible transfer stations within the community district.

The new C&D facility would also qualify for a Part 360 permit from the NYS Department of Environmental Conservation. It would seek a variance from state regulations prohibiting solid waste management facilities in regulated wetlands based on its unique situation in the park, its positive economic, public health, safety, and environmental benefits for the community, and the absence of any significant adverse impacts on public health or the environment.

The park would be a use consistent with the Significant Maritime and Industrial Area site restrictions under the city's Local Waterfront Revitalization Program (LWRP) as mandated by federal and state Coastal Zone Management Acts.

Considering other possible uses for the site, the study recommends that the City prepare a Generic Environmental Impact Statement including the eco-industrial park, that the City Environmental Quality Review Process be sufficient to comply with the State Environmental Quality Review Act and the National Policy Review Act, and that the State Department of Environmental Conservation, the Army Corps of Engineers, the State Department of State, the State Historic Preservation Office, the City Landmarks Preservation Commission and other appropriate agencies be included in the process so that, if necessary, mitigating measures may be designed and additional permitting processes may be expedited.

The environmental review process would analyze any impacts on the waterfront, tidal wetlands and the Brother Islands from the perspectives of Special Natural Waterfront Areas under the LWRP, state-designated significant coastal fish and wildlife habitats, and permitting requirements for dredging (if any should be required) and uses in tidal wetlands. The park would be carefully designed with the intent of mitigating any such impacts as well as enhancing the community's access to the waterfront through the South Bronx Greenway for which the master plan was released by the NYC Economic Development Corporation (EDC) in the fall of 2006. Leases at the park would require that occupants provide certification from barge operators to operate in a manner compatible with proximity to the island's wildlife preserves. It appears that dredging may be unnecessary as the depth at mean lower low water adjacent to the park's bulkhead was fifteen feet in December, 2005 surveys.

Finally, the study recommends that NYC EDC issue a Request for Proposals (RFP) for the development and management of the eco-industrial park that seeks qualified developers with experience in commercial and industrial development – preferably, including "green" buildings in economically distressed urban areas – done in collaboration with non-profit environmental or community-based development organizations. Limited partnerships and joint ventures between for-profit developers and non-profit environmental or community-based development organizations should receive preference. And, the RFP should specify that it is the intent of the RFP to achieve the objectives and findings of this study and to engage the study's sponsors and other representatives of the local community in the development and management of the park.

I. PRE-DEVELOPMENT

The City of New York has indicated that it intends to acquire the approximately 28-acre property through eminent domain for the public purpose of a constructing and operating a correctional facility on an estimated eight to eleven acres of land.

Making the site "shovel-ready" for any proposed use, be it a correctional facility, an eco-industrial park, open recreational space, or whatever, will require the City to undertake brownfield remediation and install new infrastructure. Because these capital improvements are the *sine qua non* for *any* re-use of the site, their costs should be covered by public funds and not carried by future occupants of the site.

Brownfield remediation

As the property has been used historically as an illegal landfill, it is anticipated that the City will be able to utilize monies from the New York State Environmental Restoration Fund (i.e., 90% contribution from the State) to properly clean up the site. The cost of soil and groundwater remediation has not been estimated by this study. In the case that the City chooses to let the developer of the site perform the brownfield remediation, the developer of the site may apply to the New York State Brownfield Cleanup Program, whereby they would receive up to 10-18%in tax credits for the entire development costs.

Depending on the material composition of the illegal landfill and the presence or absence of hazardous materials, the operators of the new construction and demolition (C&D) debris recycling facility proposed for the eco-industrial park may be able to assist in, and reduce the costs of remediation and debris removal, with an on-site system to process the landfill debris into material for capping the site.

Infrastructure

Restoration of the infrastructure is necessary for any re-use of the site. It will involve construction that is generic to bringing any user to this waterfront location, and it will necessary to design specifically for the particular use at the site. For the proposed eco-industrial park, the infrastructure would include:

- installation of the storm and waste water drainage system in accordance with a plan for storm water pollution prevention, including integration with any capping that may be required as part of the remediation plan
- installation of telephone conduits, gas mains, electrical conduits, and light pole fixtures, running to property line of each parcel identified for development[2]
- installation of water lines and meters, running to property line of each parcel identified for development

2 The possibility of alternative energy systems is considered in the section on building construction in the eco-industrial park.

- installation and paving of a one-mile long access and circulation road with truck scales, curbs and sidewalks
- landscaping and installation of signage, fencing, and site furnishings
- a waterfront Greenway with bike path
- the installation of an elevated, computer-operated conveyor system to provide occupants of the park with access to shipping and receiving via barge and rail
- the repair of the waterfront bulkhead (and, *if necessary*, dredging of the dockage area) to enable shipping and receiving by barge

The Greenway and bike path would advance the South Bronx Greenway Master Plan's goal of creating an east-west connection along Oakpoint Avenue in order to connect the Hunts Point neighborhood to Port Morris. The park's site plan would incorporate the continuation of the Greenway from Oak Point Avenue through the site. The Greenway's design would be integrated with the internal roadway system, and provide pedestrian- and bicycle-friendly access to workers and visitors. It would provide waterfront access and viewing while limiting conflicts with barge loading operations and ensuring safety for path users.

The conveyor system and waterfront bulkhead are transportation systems intended to comply with the city's Solid Waste Management Plan's goal of "facilitating the private commercial waste industry's transition from a network that is heavily reliant on trucks to one that relies primarily on barge and rail."[3] They are critical to achieving substantial reductions in the volume of truck traffic to and from the park. Hence, they are an integral part of the site's transportation infrastructure and provide a significant public benefit.

Accordingly, the capital costs of installing the conveyor system, repairing the bulkhead, and dredging if necessary should be included in the publicly-funded capital improvements. As of this writing, without having taken any soundings, it appears that dredging may be unnecessary. The depth at mean lower low water adjacent to the bulkhead was 15 feet according to the Corps of Engineers' Report of March, 2006 based on surveys to December, 2005 (Figure 1 below). (The costs of maintaining and operating the conveyor system could be supported by user fees allocated among the park's occupants.)

The capital cost of infrastructure is an estimated $21.7 million. Appendix 2 presents the line-item estimates that comprise this cost. Categorically, the estimate includes:

- $ 2,153,000 storm and waste water drainage system
- $ 1,031,000 telephone and electrical conduits, gas mains, & light pole fixtures
- $ 226,000 water lines and meters
- $ 2,086,000 road paving, truck scales, curbs and sidewalks
- $ 2,200,000 landscaping, signage, fencing, and site furnishings
- $ 7,900 bikeway

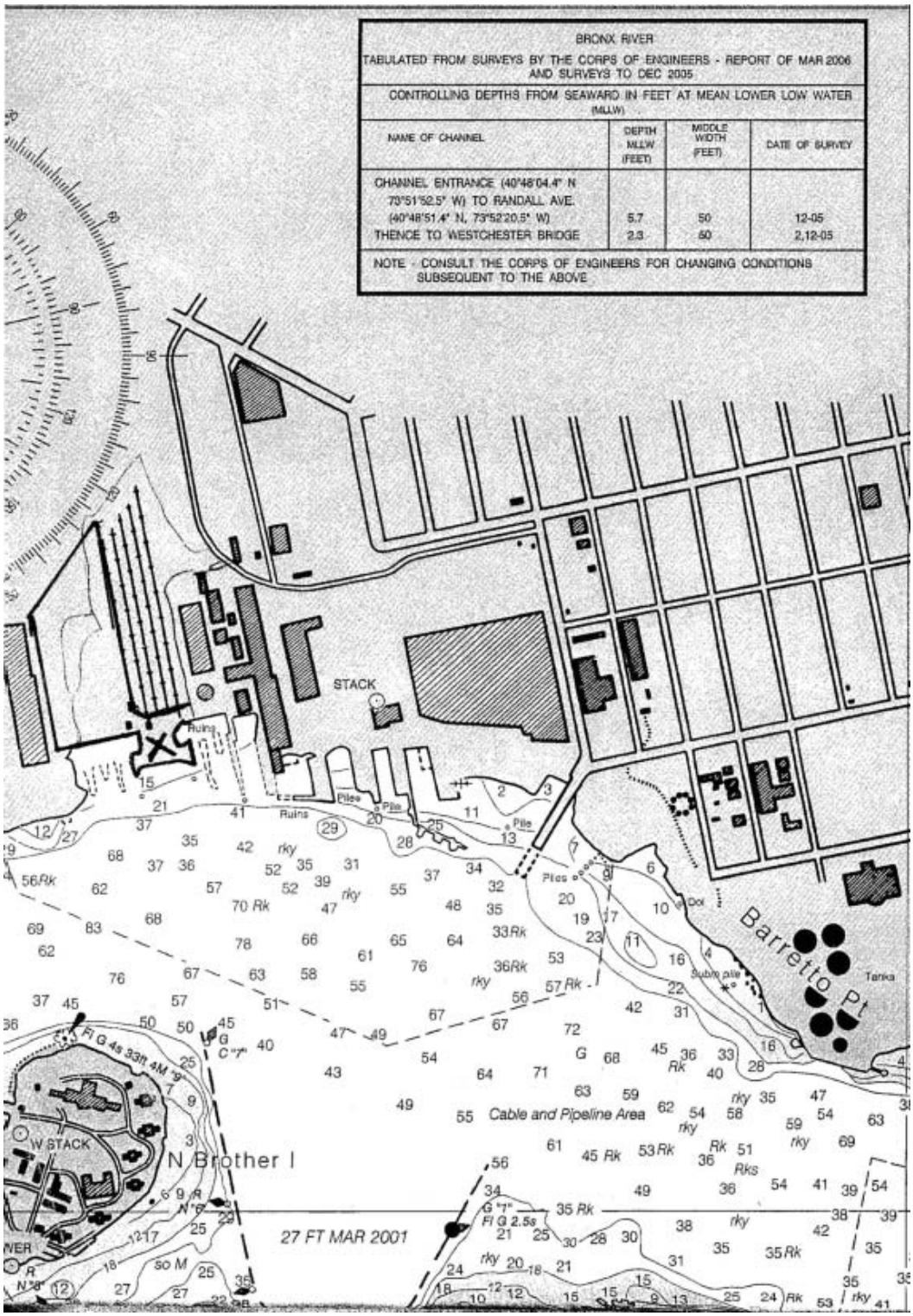
[3] NYC Dept. of Sanitation, Solid Waste Management Plan, Executive Summary, p. ES-9. September, 2006

- $ 4,034,000 site preparation, site work, debris removal, & general conditions
- $10,000,000 conveyor system
- bulkhead repair and dredging – not estimated

The infrastructure costs qualify for federal support *via* the US Economic Development Administration's (EDA) grants for public works and economic development facilities. This qualification is a result of the EDA-sponsored Comprehensive Economic Development Strategy (CEDS). The CEDS was prepared by the Bronx Overall Economic Development Corporation, in order to identify strategic economic objectives in the Bronx. The creation of eco-industries was one of seven economic development strategies for the borough.

It is proposed that NYC EDC apply for an EDA grant for infrastructure and that the City cover the balance of the infrastructure cost as the match therefor.[4] However, it is the intention of the authors to continue to identify additional funding sources to supplement the city's share of the infrastructure costs.

FIGURE 1 Depths at Mean Lower Low Water Adjacent to Eco-Industrial Park's Bulkhead [X]



II. THE ECO-INDUSTRIAL PARK

Methodology

A series of community workshop meetings helped to inform the design and components of this feasibility analysis. Sustainable South Bronx and Green Worker Cooperatives conducted over 7 community workshops reaching over 60 participants, some of which took place with members of The Point CDC, St. Lukes Church, and Community Board 2. These workshops collected input and feedback from the community to listen to their concerns and desires for an eco-industrial park. This information was then tabulated and used to inform the authors of this study to ensure that the community's needs were integrated into the park's structure and design. Sustainable South Bronx and Green Worker Cooperatives are conducting more workshops in order to share the results of this study, the findings of the first workshops and to collect additional feedback. The following sections reflect the integration of community desires to the feasibility analysis.

Construction

The eco-industrial park will provide roughly 11.4 acres of occupiable space for five manufacturing and processing operations.

Upon the completion of site preparation and the execution of occupancy agreements with the operating companies, it is anticipated that the park will finance and build well-insulated, "Butler-style" buildings using recycled steel and landscaping, water management and energy systems that may qualify the buildings for federal and state "green building" tax credits. The possibilities of enhancing the park with electricity generated by solar panels and a wind turbine that would be separately financed and installed are discussed in Appendices 3 & 4.[5]

Exterior colors will be selected to minimize summer heat gain and to create a unified and visually appealing look for the site as a whole. Buildings will range in height from 30 to 50 feet to provide headroom required for tenants' operations. The buildings will have unfinished interior space, off-street loading docks, and, if necessary, paved and fenced exterior yard space.

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[5] It is estimated that photovoltaic panels on the rooftops at the eco-industrial park could generate approximately 1.5-2.1 megawatts, or 2.0-2.8 million kWh per year, of solar electricity, making it the largest installation in New York City and one of the larger installations in the Northeast. Assuming grid-based electricity with business incentive rates would cost about $0.121/kWh, it is likely that solar-generated electricity could be competitively priced at approximately $0.11/kWh depending on the regulations, incentives, interest rates, and tax credits affecting solar power at the time of construction. Because of variability in those matters, grid interconnection issues with Con Ed, and the system's estimated $11.8-$16.8 million capital cost, it is possible that the park would lease the rooftops to a third-party, like SunEdison, MMA Renewable Ventures, or GE Energy Financial Services, which specializes in financing, installing and maintaining these systems and selling the electricity to the park's occupants. The lease arrangement would enable the park to provide solar power without incurring any capital costs. Whether or not the park would derive any revenue from the rooftop leases would depend on the price of the "green" power. See Appendix 3.

It is also estimated that a 100-foot high wind turbine, installed at a capital cost of $60,000, could generate 10 kilowatts or 9,000 kWh per year, of solar electricity priced at only $0.02/kWh. Although the turbine could become an iconic symbol of the park, a decision to proceed with its installation would depend on the satisfactory resolution of possible safety risks associated with its location in the park. See Appendix 4.

As illustrated in Figure 2, the five industrial buildings and possible occupants would include:

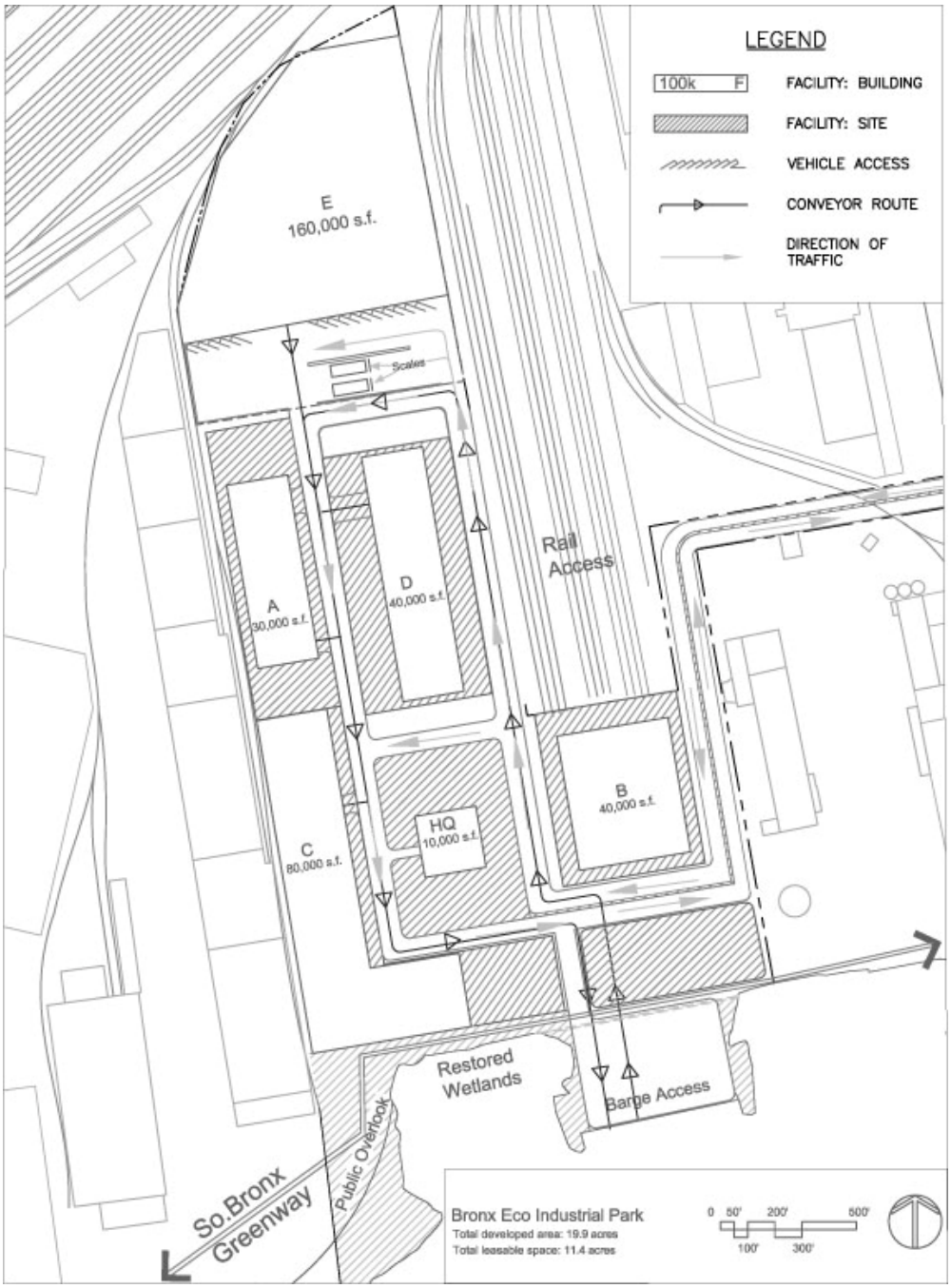
- Building A – 30,000 square feet for a glass powder manufacturer
- Building B – 40,000 square feet for a plastics product manufacturer
- Building C – 80,000 square feet for a paper tissue and towel converter
- Building D – 40,000 square feet for a timber and lumber salvage facility
- Building E – 160,000 square feet for a construction and demolition debris recycling facility

A sixth 10,000 square-foot parcel would be reserved for eventual development for two possible users. One would be an exhibition center for educating school children and the general public about recycling, re-use, and re-manufacturing. The other would be incubator space for craftspeople designing artworks or products made from recycled materials. The facility could also provide a small amount of office space and a maintenance shop for park management.

It is anticipated that the execution of occupancy and financing agreements and the completion of construction could be achieved within thirty-six months after the pre-development site preparation work has been completed.

The total development cost for these buildings is estimated at $35.9 million.

Figure 2. Site Plan Eco-Industrial Park



Occupancy

It is intended that the eco-industrial park would be occupied by manufacturing and processing facilities which can:

- demonstrate the environmental and economic significance of recycling, reuse, and re-manufacturing as means for conserving natural resources and creating jobs, or
- create opportunities for expanding or improving the city's recycling programs, or
- advance the Solid Waste Management Plan's goal of transitioning the private commercial waste industry from a reliance on trucks to barge and rail; and/or,
- alleviate some of the burdens which current solid waste management and recycling facilities impose on communities in the Bronx.

During the time period when this study was being prepared, the availability of the site for use as an eco-industrial park was unknown. Consequently, the preparers had to solicit the interest of prospective occupants on a hypothetical basis.

We approached numerous companies seeking to identify several with a serious financial interest in establishing an operation in New York City or the metropolitan area some time in the next three to five years. This time frame was intended to be reasonable to prospects so that – absent our site control – they would take our inquiries seriously and we could take their interests seriously. Nonetheless, it is possible that, during the interim between this writing and the construction of the park, they may find other sites and the actual occupants will change. Accordingly, the prospective companies we describe are realistic and desirable possibilities, but they should be seen as examples of the types of companies the park could attract rather than as committed occupants.

1. Construction and Demolition Debris Recycling Facility

The eco-industrial park provides an ideal location for the city's first fully-enclosed construction-and-demolition (C&D) debris recycling facility with state-of-the-art processing systems.[6]

Such a facility can offset the open-air handling of 2,000 tons per day at the borough's existing C&D transfer stations. It can reduce the daily volume of trailer trucks exporting C&D waste out of the Bronx by between 100 to 200 trucks per day. It can create 80 jobs. And, it can achieve a recycling rate approaching 95%.

[6] Construction and demolition debris is non-putrescible solid waste as defined in DSNY regulations (Subchapter A of 4RCNY 16), namely solid waste, whether or not contaminated in receptacles, that does not contain organic matter having the tendency to decompose with the formation of malodorous by-products, including but not limited to dirt, earth, plaster, concrete, rock, rubble, slag, ashes, waste timber, lumber, plexiglas, fiberglass, ceramic tiles, asphalt, sheetrock, tar paper, tree stumps, wood, window frames, metal, steel, glass, plastic pipes and tubes, rubber hoses and tubes, electric wires and cables, paper and cardboard. (source: Commercial Solid Waste Management Study Vol. II, DSNY). It is distinguished from "fill material" which includes only clean material consisting of earth, ashes, dirt, concrete, rock, gravel, asphalt millings, stone or sand, provided that such material shall not contain organic matter having the tendency to decompose with the formation of malodorous by-products.

The park can accommodate the new facility in a four-acre, 160,000 square-foot building with one additional exterior acre for employees' and visitors' parking and truck scales for weighing incoming loads. The facility would operate twenty-four hours a day, six days a week.

Based on an incoming truck carrying an average of 27 cubic yards of material weighing some 8.1 tons,[7] The new facility could receive an average of 248 incoming trucks a day at full capacity. The facility could accommodate these 248 incoming truckloads in fourteen hours using three truck scales and assuming ten minutes per truck for the process of weighing in full and weighing out empty. At 75% of capacity (1,500 tons per day), the facility could receive an average of 186 trucks per day over a ten hours' period.[8] At these volumes, the facility could handle 18 incoming trucks per hour; and, if necessary, the park's one-mile long internal access and circulation road could accommodate a queue of 50 trucks and roll-offs away from the public streets.

example of an enclosed C&D facility

After weighing in, the incoming trucks would enter the building, tip their loads, weigh out, and depart. Inside the building, trucks would tip their loads onto an in-ground, steel-plate conveyor from which the materials would begin to move through several processes of sorting, sizing, and cleaning covering an estimated three acres of space. The fourth inside acre would be used for the accumulation of inventories of various outgoing products until optimal shipping quantities were reached.

Wood, steel, and concrete over one foot in length would be screened and moved out for separate accumulation and processing. Materials of less than one foot would be conveyed through trommels to separate smaller from larger pieces. The larger pieces would be conveyed off through magnetic and resin separators and along an extended manual picking line for a positive sorting of plastic and metal recyclables; and, the residue would be conveyed off for down-sizing and mixed processing with the smaller sizes. The smaller pieces of plastic, glass, metal, concrete, brick, rock, rubble, wood, paper, etc. would go through magnetic and other separators to sort out ferrous and non-ferrous metals for processing into the 93%-mixed metallic aggregate known in

[7] The NYC Department of Sanitation reports that an average of 9,461 tons per day was handled by the city's licensed C&D transfer stations in 2005. [source: Omar Freilla, Greenworkers Cooperative, internal communication] INFORM reports that the city's licensed C&D waste haulers operated 1,752 trucks in 2005. [INFORM, "New York City's Commercial Waste Hauling Fleets: An Opportunity for New York City to Ensure Cleaner Quieter Waste Collection Operations," February, 2006] Assuming that one-third of the trucks (578) are used to transport outgoing materials to landfills and that two-thirds (1,174) are used to pick up and haul the C&D waste to the transfer stations, then the average incoming load on the 1,174 incoming trucks would be 8.1 tons per truck. At an average density equivalence of 600 pounds per cubic yard, [cf. DSNY, Commercial Waste Management Study, Vol. II, Commercial Waste Generation and Projections, Appendix E, Attachment 3], each 8-ton truck would contain an average of 27 cubic yards of incoming material. Consequently, hauling 2,000 tons per day to the new C&D facility would require an average of 248 incoming trucks per day.

[8] Although it is unlikely, if all 1,752 trucks were used daily to pick up and haul C&D waste to the transfer stations, then the average incoming load on the 1,752 incoming trucks would be 5.4 tons per truck, the average cubic yards per truck would be 18, and an average of 370 incoming trucks per day would be necessary to bring 2,000 tons per day to the new facility. If the number of incoming trucks reached 370 per day, three scales could accommodate the incoming volume in twenty-one hours. At 75% of capacity (1,500 tons per day), the facility would receive an average of 278 trucks per day over a 15-hours' period.

the trade as ZORBA 93. The other smaller materials would be run through rising current separators to remove stone and ceramic materials from plastic, wood, paper, rubber and other floatables. The stone and ceramic materials would be aggregated with the larger pieces for concrete and other stone materials for processing and cleaning into variously-sized stone, gravel, sand, and dust products. The floatables would be clarified, vacuum-filtered, and processed into a sludge-like cake known in the trade as slime for use as landfill liner.

To reduce demand for municipal water, the sorting, cleaning and processing operations which use water can be designed as recyclable, closed-loop circulation systems that tap the site's storm-water and drainage systems.

example of an enclosed C&D facility

Assuming the facility were operating at its 2,000 tons-per-day capacity, it is estimated that its outgoing tonnage would include primarily:

- 1,550 tons per day (77.5%) of sand, gravel, and other "stone" products which would be transported to northeastern markets by barge (1,000 ton-capacity per barge)
- 100 tons per day (5%) of sand, gravel, and other stone products which would be transported to nearby local markets in 40,000-pound-capacity dump loaders;
- 200 tons per day (10%) of ferrous and non-ferrous metals which would be transported to market by rail (100 tons per car) and road (40,000-pound-capacity dump loaders);
- 50 tons per day (2.5%) of slime which would be transported to landfills by rail (100 tons per car); and,
- 100 tons per day (5%) of residue waste which would be transported to landfills by rail (100 tons per car);

Based on this estimated product mix, the facility's anticipated shipping would involve approximately:

- 3 barges (@1,000 tons) every two days for northeastern "stone" markets
- 1 rail car (100 tons) per day for residue
- 1 rail car (100 tons) every two days for landfill slime
- 2 rail cars (@ 100 tons) per day for ferrous and non-ferrous metals
- 5 dump loaders (@40,000 lbs) per day for nearby sand, gravel, and other stone markets

In sum, the facility's estimated outgoing freight would involve:

- 3 rail cars daily, plus
- 1 additional rail car every other day
- 1 barge daily, plus
- 1 additional barge every other day
- 5 dump loaders daily

The park's conveyor system would move outgoing products directly from the processing facility to barges and rail cars. If the discharge conveyor carrying outgoing sand, gravel, and other stone products were to extend into deep water, it could eliminate the necessity of dredging at the site's marine bulkhead.

By contrast, none of the Bronx's five existing C&D transfer stations have access to rail or barge, and all of their outgoing materials, be they recycled or landfilled, are transported out of the Bronx by road.[9] Assuming all 2,000 tons per day were transported in 20-foot trailers with 20,000 pound capacity, exporting would require 200 trucks a day. Assuming they were all shipped in 48-foot trailers with 40,000 pound capacity, exporting would require 100 trucks per day. Hence, the new C&D facility would eliminate between 100-to-200 heavy trailer-loads from the Bronx on a daily basis.

example of an outdoor C&D facility

According to local observers,[10] the Bronx's five existing C&D transfer stations operate on outdoor lots of less than 15,000 square feet surrounded by opaque, usually corrugated tin, perimeter fences. They have their own pick-up and carting operations, and they also receive loads directly from contractors. Two have no visible equipment for mechanically sorting incoming materials; two operate screening equipment to separate small pieces from large.[11] Workers may handpick easily-identifiable pieces of recyclable material like ferrous and non-ferrous metals for shipment to recyclers, but nearly all the material is transferred by front-end loaders from the outdoor tipping floor onto trailers for export by truck to landfills. Workers with garden hoses spray water on the piles of debris in an effort to suppress dust.[12]

Overall, in the fourth quarter 2005, the Bronx's five existing C&D transfer stations operated at only 54% of their combined 3,735 tons-per-day of permitted capacity and reported recycling only 14% of their incoming materials.[13] Their low rate of recycling reflects the relatively low

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[9] Source: Omar Freilla, Greenworkers Cooperative, internal communication

[10] *Ibid.*

[11] Equipment at the fifth location was not visible to outside observers. *Ibid*.

[12] *Ibid.*

[13] Individually, recycling by the five operators ranged from a low of 4% to a high of 30%. One station operated at 51% of its 750 tons-per-day permitted capacity and reported a 4% recycling rate. A second operated at 69% of its 330 tons-per-day permitted capacity and

proportion of easily identifiable recyclables in the city's C&D waste stream and the absence of state-of-the-art sorting and processing systems at the existing facilities.[14] None of the existing facilities has sufficient space to expand, modernize, and enclose its processing operations on the scale proposed for the eco-industrial park.

The new C&D facility can qualify for a Part 360 permit from the NYS Department of Environmental Conservation and a solid waste transfer permit from the city's Department of Sanitation.

The new facility can comply with the enhanced protections effective in Bronx Community District 2.[15] It would be located entirely within an M3 zone. It would be located well over 600 feet from a residential district, public park, hospital, school or other non-putrescible solid waste transfer station. Further, its processing operations would be entirely enclosed in a 160,000 square-foot building. Fencing, plantings, and landscaping would provide additional buffers. It would be located at and adjacent to a rail yard, rail spur, industrial track and vessel facility and at least 90 percent of the solid waste received would subsequently be transported by rail or vessel. And, the park would accommodate truck queuing on-site.[16]

Prior to applying for an operating permit from the city, the new C&D recycling facility is also obligated by the Administrative Code of the City[17] to obtain "a corresponding reduction (offset) in the lawful daily permitted throughput capacity at a putrescible or construction and demolition debris transfer station within the same community district at a rate of one ton for every new ton of capacity."

To obtain the reduction or offset,[18] the new C&D facility would become the central processing and recycling facility for several existing transfer stations which contractually agree to terminate

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reported a 7% recycling rate. A third operated at 71% of its 1,200 tons-per-day permitted capacity and reported a 12% recycling rate. A fourth operated at 35% of its 405 tons-per-day permitted capacity and reported an 18% recycling rate. The fifth operated at 40% of its 1,050 tons-per-day permitted capacity and reported an 30% recycling rate. [source: NYC Dept of Sanitation, Capacity Use and Recycling Rates at NYC C&D Transfer Stations, Fourth Quarter 2005 in *Ibid*]

[14] Out of 442,515 tons of C&D debris in a 2003 sample, only 963 tons (0.2%) were bulk metals, only 4,717 tons (1.1%) were wood; only 6,970 tons (1.6%) were concrete and other stone materials; and, the remaining 429,865 tons (97%) were "mixed" C&D. See Table 2.2-1 in the Commercial Waste Management Study Vol. II – Appendix E: Non-putrescible Commercial Waste Quantification and Projections

[15] Rules of the City of New York, Title 16, Chapter 4, Subchapter C, Section 4-32(b)(4)

[16] As indicated above, an estimated 18 trucks per hour could be moved through the facility. The park could accommodate an off-street queue of 50-to-90 trucks and roll-offs (depending on length) if necessary on its internal access and circulation road.

[17] Rules of the City of New York, Title 16, Chapter 4, Subchapter C, Section 4-32(b)(4)(i) The Department shall not authorize the operation of a new transfer station unless: .... (B) the application is for a new putrescible or construction and demolition debris transfer station located at or adjacent to a rail yard, rail spur, industrial track or vessel facility where at least ninety percent of the solid waste received is subsequently transported from the transfer station by rail or vessel, and the applicant obtains a corresponding reduction (offset) in the lawful daily permitted throughput capacity at a putrescible or construction and demolition debris transfer station within the same community district at a rate of one ton for every new ton of capacity.

[18] The code does not define either reduction or offset. It is also silent as to the means and methods by which the applicant can obtain a reduction or an offset. Since the applicant is a private person and not a public authority or agency, the code cannot be construed to obligate the applicant to terminate or reduce the daily permitted throughput capacity of an existing transfer station which had been lawfully bestowed by the department. Rather, it must be construed that the code allows the applicant to use any reasonable means and methods for accomplishing the equivalent of a reduction or an offset. Absent this construction, the applicant would effectively be barred from entering into the construction and demolition transfer station business, and this section of the code could be challenged on constitutional grounds. We presume that the drafters of the code would not have intended to create the possibility of this challenge, and our construction obviates the issue.

their on-site handling, transferring and recycling operations and restrict their activities to hauling and carting C&D debris to the new facility.

In return for out-sourcing and terminating their handling, transferring and recycling operations and as the financial incentive and consideration for such contracts, the new facility could charge the existing operators a tipping fee which would be somewhere between $10-to-$20 per ton below the approximately $66 per ton cost these operators incur for densifying materials at their transfer stations and transporting and tipping them at C&D landfills in New York, New Jersey, Pennsylvania and Connecticut.[19]

In aggregate, on 2,000 tons per day, such contracts could improve the profitability of the existing operations by somewhere between $20,000 to $40,000 a day. And longer term, the existing operators would have the benefit of insulating themselves from possible city or state regulations requiring them to modernize and/or fully enclose their current sites. Hence, the new facility would provide existing C&D operators with substantial financial incentives to execute contracts under which they would reduce and eliminate their handling, transferring, and recycling throughput.

Job Title	C&D Recycling Jobs
Management & Sales	5
Clerical	7
Machine Operators	9
Material Handlers	10
Sorters	16
Truck Drivers	4
Barge loaders	10
Forklift / front end loaders	6
Maintenance	6
Crew Chiefs/Forepersons	5
Quality Control	2
TOTAL	80

At 2,000 tons a day, the new C&D facility would generate $27 million in estimated annual revenues from a combination of tipping fees and material sales. On three shifts a day, it would create an estimated 68 materials handling, equipment operating, and other blue-collar jobs plus some 12 sales and management jobs as necessary.

The prospective operator of the new C&D facility is prepared to invest $5-to-$7 million for equipment and working capital to launch the operation. It is a privately owned corporation headquartered in New York with more than forty years experience in recycling, industrial and commercial real estate development, and warehousing, transportation and other logistics services.

[19] The estimated $66 per ton cost assumes "internal" trucking costs rather than contract trucking. It also does not include tolls, maintenance and insurance costs for trucks nor workers' compensation, fringe benefits, and union benefits for labor. It does assume:

- the $57 per ton median tipping fee for C&D debris at landfills in New York state, rather than the median $80 per ton in New Jersey, $63 in Pennsylvania, $62 in Connecticut, or $40 in Virginia. See Freilla, *op. cit.*, citing "Chartwell Waste Industry Pricing Analysis and Survey," *Solid Waste Digest* report#3-2006;
- $6 per ton for cost of truck driver for a 6 hours round-trip to landfills at the average $18.71 hourly wage for heavy truck operators in New York state according to the US Dept. of Labor, Bureau of Labor Statistics, "Occupational Employment & Labor Statistics," May 2005.
- $2 per ton cost of diesel fuel for a 6 hour round-trip based on $2.60 per gallon (US Energy Information Administration, http://tonto.eia.doe.gov/oog/info/gdu/gasdiesel.asp) at a burn-rate of 2-gallons per hour (INFORM, "New York City's Commercial Waste Hauling Fleets: An Opportunity for New York City to Ensure Cleaner Quieter Waste Collection Operations," February, 2006)
- $1 per ton cost of labor at transfer stations to unload and hand-pick incoming materials, to densify them, and to reload them onto outgoing trailers, assuming 10 hours of handling labor at $10 per hour and 3 hours of heavy equipment operators at $18 per hour.

2. Plastics Product Manufacturer

The second company is a Texas-based manufacturer which uses a unique, proprietary technology and process to make industrial composite plastic products like pallets, marine timbers, and railroad ties out of the mixed post-consumer and post-industrial recycled plastic waste streams that most recyclers and processors generally deem unusable and send to landfills.

Such a facility would provide the city's recycling processors with a convenient market for the plastic residues they currently send to landfills and low-end destinations. It would enable the city to expand its recycling program to include more than 11 million pounds a year of types 3-7 plastics containers (Table 1 below).

Founded in 2004, the company has focused initially on high-volume, cost-efficient manufacturing of composite railroad ties for the 18-million-ties-per-year railroad ties market.[20] Its Texas facility has the capacity to produce 600,000 ties per year. The enormous replacement market for ties among the Northeast's commuter railroads and certain transportation advantages in shipping ties to railroads in North Carolina and Florida are two reasons why the company proposes to establish a second 600,000 ties-per-year manufacturing operation in the eco-industrial park.

The third reason is the enormous volumes of post-consumer and post-industrial plastic wastes that are consistently generated in the New York metropolitan area and are difficult for recyclers, handlers, or producers of plastic waste streams to recycle or sell. There are some 31.5 million pounds of post-consumer mixed plastics in the city's current annual recycling stream, and some 245 million more pounds unrecycled in its annual refuse stream (Table 1).

The company's ability to process mixed plastic wastes that are not usable by others would give it a significant cost advantage over other high-volume plastics and composites manufacturers who are dependent on virgin materials or uncontaminated, single-resin recycled materials for their feedstocks. Hence, the Bronx location is desirable.

The park can accommodate the new operation in a 40,000 square-foot building with 20,000 square-feet of paved yard space. The building would have a clear span with minimum ceiling height of 26 feet, six exterior loading docks, and a small, interior office area with an HVAC system. It would also have 3-phase electrical service.

[20] Plastic railroad tie manufacturers aim to penetrate the replacement market for railroad ties. Current annual demand for ties is estimated to exceed 18 million ties in North America and more than 60 million ties in the rest of the world.

The company's processing and manufacturing systems would be energy-intensive. The company would require 4 megawatts of power, twenty-four hours a day, five days a week, or 25 million kilowatt hours per year. Consequently, the company could be the principal, and perhaps exclusive, consumer of solar-powered electricity if the regulatory conditions, tax incentives, and potential financial advantages extant at the time of construction warrant the installation of rooftop solar panels at the park.

The company would operate on three-shifts, twenty-four hours a day, five days a week. It would receive incoming supplies of its proprietary additives and the plastics waste materials, which had previously been ground into small, flake-like particles, and off-load them immediately into storage silos. These materials would then be conveyed from the silos to mixers for weighing and blending in accordance with proprietary specifications. The blended materials would then be fed into horizontal compression molding equipment to produce the railroad ties. Taken from the molds, the new ties would be cooled in water and by air, inspected for quality control, and then bundled in lots of twenty in preparation for shipping. The finished railroad tie would generally be 7" by 9" by 108" (9 feet) and weighs 280 pounds. A shipping bundle of twenty would weigh 5,600 pounds or nearly 3 tons.

Reaching full production in its third year, the company would ship 600,000 railroad ties annually via flatbed rail cars. The anticipated volume would require 1,400 flatbed rail cars annually, or roughly 6 outgoing cars per day.[21]

At full production, the company's incoming supplies of proprietary additives and plastic wastes would total 168 million pounds, or 84,000 tons. It is expected that 42 million pounds of additives (25%) would arrive via some 263 rail hopper cars annually, or roughly 1 car a day.[22]

Of the 126 million pounds (75%) of incoming mixed plastics, some 35 million pounds would be post-consumer material supplied by barge from the city's curbside recycling processors.[23] At 250 tons per barge, the 35 million pounds would require 70 barges per year, or roughly 4 barges every three weeks.[24] The remaining 91 million pounds would come from post-industrial scrap sources via some 569 rail hopper cars annually, or roughly 7 cars every three days.[25]

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[21] In 2005, the average tonnage per CSX freight car was 63 tons (126,000 pounds). Source: American Association of Railroads, Railroad Profiles. At an average 120,000 pounds per car, a car would haul 420 ties (at 280 pounds per tie), and the annual 600,000-ties output would require 1,400 cars, or 5.6 cars per day shipping 250 days a year.

[22] At a 160,000 pounds per hopper car, the 42 million pounds of additives would require 263 hopper cars per year, or 1.05 cars a day receiving 250 days per year.

[23] There are some 31.5 million pounds of mixed plastics residue in the city's current annual metals-plastics-glass recycling stream which could be available to the company "immediately" (Table 1). The expansion of the city's recycling program to include # 3-7 plastic containers could make up to an additional 11.1 million pounds available annually. There would still be 265.6 million more pounds of waste plastics available in the annual refuse stream. If the city's recycling program were expanded to include these materials, it could reduce the incoming volumes of post-industrial scrap.

[24] At 500,000 per barge, the city's 35 million pounds would require 70 barges a year, or 0.28 barges a day receiving 250 days a year, or 1.35 barges a week receiving 52 weeks a year.

[25] At a 160,000 pounds per hopper car, the 91 million pounds of post-industrial plastics waste would require 569 hopper cars per year, or 2.3 cars a day receiving 250 days per year.

The company's production process would generate minimal waste since all of its production scrap could be recaptured and reprocessed through the system. Hence, the company's waste would be normal commercial trash like office waste paper and employees' lunches.

Because the company is a manufacturing operation not a waste handling facility and because it would be located in an M-3 zone, there would be no special regulatory requirements. The production operation would not generate any external noise, odors, or pollutants that could affect the community. Dust collection equipment and procedures would be installed to capture particulates generated by the handling systems.

Job Title	Plastic Products Jobs
Management & Sales	4
Clerical	1
Machine Operators	100
Material Handlers	12
Truck Drivers	0
Forklift / front end loaders	10
Maintenance	14
Crew Chiefs/Forepersons	4
Quality Control	10
TOTAL	155

At full production of 600,000 ties per year, the company projects annual revenues of $46 million and the creation of up to 155 jobs. The company would commit to paying livable wages with benefits to all hourly and salaried employees, to recruiting locally, and to promoting from within whenever feasible. All production employees would require special training which the company would provide in-house.

The company is prepared to invest and/or borrow $14 million to meet its equipment and working capital needs at the new facility.

Table 1. Supplies of Non-designated Plastics in the City's Refuse and Recycling Streams (not including film and bags)

	% of WASTE Stream	WASTE Stream tons/wk	WASTE Stream tons/yr	WASTE Stream LBS/yr	Refuse Stream tons/wk	Refuse Stream tons/yr	Refuse Stream LBS/yr	% of Recycling MGP Stream	Recycling MGP Stream tons/wk	Recycling MGP Stream tons/yr	Recycling MGP Stream LBS /yr
TOTAL		64,000							4,600		
# 3-7 containers	0.167	106.9	5,557.8	11,115,520	71.9	3,740	7,479,680	0.76	35.0	1,818	3,635,840
expanded polystyrene	0.54	345.6	17,971.2	35,942,400	341.0	17,732	35,464,000	0.1	4.6	239	478,400
other plastics	1.91	1,222.4	63,564.8	127,129,600	1,049.0	54,547	109,093,920	3.77	173.4	9,018	18,035,680
other PVC	0.02	12.8	665.6	1,331,200	11.0	570	1,139,840	0.04	1.8	96	191,360
other rigid plastic containers	0.75	480.0	24,960.0	49,920,000	418.4	21,755	43,509,440	1.34	61.6	3,205	6,410,560
crates & bottle carriers	0.01	6.4	332.8	665,600	3.2	165	330,720	0.07	3.2	167	334,880
rigid polystyrene	0.25	160.0	8,320.0	16,640,000	147.1	7,650	15,300,480	0.28	12.9	670	1,339,520
single use food service	0.51	326.4	16,972.8	33,945,600	316.3	16,447	32,893,120	0.22	10.1	526	1,052,480
TOTAL Excluding plastic bags & film	4.16	2,660.5	138,345.0	276,689,920	2,357.8	122,606	245,211,200	6.58	302.7	15,739	31,478,720

%s of plastics in WASTE stream and MGP streams from Major Findings on Plastics Figure Total Plastics in 22 Categories
2004-05 NYC Residential Waste Characterization Study
http://www.nyc.gov/html/nycwasteless/downloads/pdf/wastecharreports/wcsfinal/highlights/13_plastics.pdf

Total tons in WASTE stream from Major Findings on Waste: The Totality of Materials New Yorkers Throw Out
2004-05 NYC Residential Waste Characterization Study
http://www.nyc.gov/html/nycwasteless/downloads/pdf/wastecharreports/wcsfinal/highlights/03_overall_waste.pdf

Total tons in MGP stream from Results for Metal, Glass, Plastic and Beverage Carton Recycling
2004-05 NYC Residential Waste Characterization Study
http://www.nyc.gov/html/nycwasteless/downloads/pdf/wastecharreports/wcsfinal/highlights/04_mgp.pdf

3. Paper Converting

The third company is a light industrial manufacturing operation that converts one-ton "parent rolls" of 100% recycled-content paper into individually-wrapped, consumer-sized rolls and packages of tissues and towel products for rest rooms in commercial and institutional settings. Converting is the last stage in the production chain before paper products reach the consumer. The company's products are sold in the so-called "away-from-home" market (as distinct from the household consumer market) under its supply contracts with the federal government and major commercial and institutional buyers.

unwinding the parent roll

The company was founded in 1997 in Nebraska where it operates a waste paper collection and recycling business as well as a converting factory similar to the one it would set up in the Bronx. By 2005, it had reached annual revenues of $17.7 million and employed 85 people.

The company would establish a converting facility in the Bronx in order to achieve substantial reductions in freight costs to its major markets in the Northeast, including the General Services Administration's warehouse in New Jersey to which it ships its products under its existing federal supply contract. The Bronx location would also enable the company to initiate an aggressive marketing effort aimed at northeastern hotels, restaurants, hospitals, colleges and universities.

The park can accommodate the new converting operation in an 80,000 square-foot building with about one-half acre of paved yard space. The building would have a clear span with minimum ceiling height of 26 feet, 8-to-12 exterior loading docks, a heating system for the entire building, and a small, interior office area with a complete HVAC system. It would require three-phase electrical service.

winding individual toilet paper rolls

The company would operate on three-shifts, twenty-four hours a day, five days a week. It would receive incoming, one-ton parent rolls from recycled fiber mills in New York, Pennsylvania and North Carolina. Other incoming supplies would include greyboard cores around which the tissue would be wound, glue to adhere the tissue to the cores, wrapping paper and corrugated boxes for packing finished products, and pallets for shipping.

The parent rolls would be mounted on machines for unwinding. The unwound paper would then be cut and fed to rewinding and folding machines of various sizes and purposes to produce a variety of finished products.[26] Then, the various rolls and packages would be fed to machines for individual wrapping and case packing before shipment to customers.

[26] For example, single-roll tissue winder, multi-towel paper folder, jumbo towel winder, c-fold towel maker, and napkin-machine ribbon towel maker.

quality control on finished rolls

At full production in its third year, the company would ship some 15,000 tons of finished paper products annually at a rate of 60 tons a day requiring between 750 to 1,500 trucks a year, or 3 to 6 trucks a day. Assuming outgoing shipments were in less than full trailer-load lots of 20,000 pounds, this volume would require 1,500 trucks a year or 6 trucks per day. Assuming outgoing shipments were in full trailer-load lots of 40,000 pounds this volume would require 750 trucks a year or 3 trucks a day.

At this volume, the company would also generate some 1,050 tons of post-industrial scrap annually or about 4.2 tons a day. The scrap would be shipped back to the paper mills which supply the parent rolls, thereby closing the loop on material production cycle. Assuming outgoing shipments were in full trailer-load lots of 40,000 pounds, this volume would require 53 trucks a year or roughly 1 truck a week.

At full production, the company would receive some 16,050 tons of 100%-recycled content parent rolls. Assuming incoming shipments were in full trailer-load lots of 40,000 pounds, this volume would require 803 trucks a year or roughly 16 trucks every five days at a rate of 3.2 trucks a day.

wrapping cases for shipment

The company's production process would generate minimal waste. All of its post-production paper scrap, and even its office waste paper, could be returned to the paper mills for reprocessing. Scrap shipping pallets could be brought to the C&D facility. Hence, the company's waste would be normal commercial trash like employees' lunches plus film plastic pallet wrap.

Because the company is a manufacturing operation not a waste handling facility and because it would be located in an M-3 zone, there would be no special regulatory requirements.

The production operation would not generate any external noise, odors, or pollutants that could affect the community.

At full production equivalent to 15,000 tons of finished paper products per year, the company would anticipate annual revenues of $11 million and the creation of up to 50 jobs, including about 40 involved in production and shipping. The company would commit to paying livable wages with benefits to all employees, to recruiting locally, and to promoting from within whenever feasible. Entry-level employees do not require any special skills and would receive training in-house.

Distinctively, the company expects that, following its experience in Nebraska, all of its Bronx case packer jobs would be offered to the blind and visually-impaired. In 1998 it formed a non-profit organization to assist the blind and visually impaired and empower them to lead more productive and independent lives. Approximately 20% of the company's staff comes from this program.

Job Title	Paper Converter Jobs
Management & Sales	5
Clerical	3
Machine Operators	9
Material Handlers	6
Case Packers	15
Forklift / front end loaders	3
Maintenance	3
Crew Chiefs / Forepersons	3
Quality Control	3
TOTAL	50

The company is prepared to invest and/or borrow $5.5 million to meet its equipment and working capital needs at the new facility.

4. Wood Salvage & Re-milling

The fourth facility would be the salvaged timber and lumber sales and re-milling operations of a full service lumber company which was established in Brooklyn more than seventy years ago. The company is recognized globally for its specialization in brokering and re-milling salvaged and antique timber, beams, joists and other lumber from demolished buildings. The Bronx location would enable it to relocate and expand these operations at a large new facility while diversifying its other lumber operations at its Brooklyn home.

Incoming timbers and lumber would generally be purchased by the company from those who de-construct or demolish old buildings. Purchase price is based on the wood's prospective re-sale or re-use value.[27]

[27] For example, the company paid $150 each to purchase 350 eastern white pine ceiling beams, which measured 4 inches thick, by 14 inches wide, by 24 feet long, from a Manhattan building-in-demolition which was built in the early 1830s. Source: Downtown Express, October 7-13, 2003.

At the Bronx facility, the incoming salvaged lumber and timbers would be sorted and stacked manually by dimensions and species of wood.[28] They would be counted, strapped, labeled and placed into inventory.

Approximately 50% of the inventory would be sold wholesale, by dimensions and species, "as-is" or "in the rough," to lumber mills and timber framing companies in the United States and overseas. Consequently, no additional processing and re-milling would be required.

About 25% of the inventory – heavy timbers, shoring lumber and plywood – would be sold to highway construction, bridge refurbishing, and other contractors throughout the eastern seaboard for shoring, lagging, sewer sheeting, road barricades, concrete framing and other uses. Generally, only minimal processing of timbers and lumber would be required involving, for example, removing surface nails and sawing and squaring-off ends. Custom cut-to-order services would be available for specific construction projects.[29]

About 25% of the inventory would be re-sawn and re-milled into dimensional lumber and blanks for architectural and fine carpentry applications like flooring, stair treads, millwork, cabinetry, furniture, stage sets, sculpture, etc.[30]

The facility would operate a single 9-hour shift, 5 and a half days a week.

The park can accommodate the new facility in a 40,000 square-foot building with an acre of paved and fenced yard space. Rather than loading docks, the building would need two drive-through, entry-exit doors which are at least 32 feet wide and 20 feet high. The building's HVAC and energy requirements could not be determined as of this writing.

Reaching full production in year three, the facility would expect to ship nearly 43,000 board feet of reclaimed timber and re-milled lumber products daily, or about 10.7 million board feet annually. The anticipated outgoing volume could require upwards of 13 flatbed trucks a day, or 3,300 outgoing trucks a year.[31] Rail shipments on larger orders could reduce this somewhat.

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[28] For example, red oak, white oak, douglas fir, antique eastern white pine, antique southern yellow pine, cherry, poplar, spruce, cedar, yellow birch and white birch.

[29] Stock timber dimensions and species include, for example: douglas fir 6" x 6" through 16" x 16" in lengths up to 44 feet; southern yellow pine 6" x 6" through 16" x 16" up to 28 feet; and, hardwoods 6" x 6" through 14" x 14" up to 28 feet. Other stock dimensions for used douglas fir include: 2" x 10" and 2" x 12" in lengths up to 20 feet; 3" x 8" and 3" x 10" and 3" x 12" up to 30 feet; and, 4" x 8", 4" x 10", and 4" x 12" up to 20 feet.

[30] Stock dimensions and species include, for example: antique heart pine planking, 3" x 8", 3" x 10", 3" x 12", 3' x 14", 4" x 8", 4" x 10", 4" x 12", 4' x 14", in lengths up to 26 feet; antique heart pine timber 6" x 6" through 16" x 16" up to 26 feet; antique heart pine flooring surfaced four sides (S4S) and 3/4" thick; furniture-grade hardwoods (oak, cherry, poplar, birch, spruce and cedar) ranging from 1" to 3" in thickness.

[31] With a 40-foot flatbed truck carrying an average load of 3,250 board feet weighing 9,600 pounds, the annual volume of 10.7 million board feet would require 3,292 trucks per year, and the daily volume of 42,800 board feet, 13 trucks per day.

At full production, the facility would expect to receive about 49,000 board feet of salvaged timber and lumber each day, or about 12.4 million board feet annually. Incoming supplies would generally arrive in 30 cubic-yard roll-off containers or on 40-foot flatbed trucks. The anticipated incoming volume could require upwards of 33 trucks a day, or 8,200 incoming trucks a year.[32]

Some 75% of the incoming supply would be expected to come from sources in the New York metropolitan area. The remainder would likely be from salvaged buildings as far south as Washington, D.C., as far north as Maine, and as far west as Ohio.

New York State Department of Environmental Conservation recognizes the facility's Brooklyn parent operation as a "zero-waste business."[33] At full production, the facility's sawing and re-milling operations would generate two 30 cubic-yard containers of wood scraps and shavings daily. These materials could be recycled through the park's C&D processing facility or sent to other users. The facility would be equipped with a system to collect sawdust for distribution to local sawdust users.

Because the facility is a manufacturing operation not a waste handling facility and because it would be located in an M-3 zone, there would be no special regulatory requirements. The milling operations would produce noise and dust which would be contained within the building.

At full production of 10.7 million board feet annually, the facility would produce annual revenues of $4.5 million and create 20 jobs.

The company would recruit employees through local agencies. Previous experience would be required for mill workers, forklift operators, and clerical staff. In-house training for job advancement would be available to employees with favorable job performance evaluations. Starting wages would be about $25,000 a year, or $12 an hour, with health benefits provided after a probationary period. Additional benefits would be available with the accrual of seniority at the facility.

Job Title	Wood Salvage Jobs
Management & Sales	6
Machine Operators	3
Material Handlers	5
Truck Drivers	3
Maintenance	1
Crew Chiefs/Forepersons	2
TOTAL	20

The company is prepared to invest and/or borrow $750,000 to meet the new facility's needs for equipment and working capital.

[32] With the average truck carrying 1,500 board feet weighing 4,400 pounds, the 12.4 million annual volume would require 8,231 trucks, and the daily volume of 49,400 would require 33.

[33] Environment DEC Newsletter, November 2005.

5. Glass Powder for Concrete & Masonry Blocks

This facility would use a proprietary technology and operating system to process the mixed glass cullet and container glass which New York City's and most other curbside recycling programs generally deem to be valueless and unmarketable into a valuable "green" building material. The facility would produce clean, dry "glass powder" that can replace up to 40% of the Portland cement used in making concrete masonry blocks and ready-mix concrete. At least 60% of the glass powder would be 325 mesh size or finer, and the powder would have no more than 2% moisture-content.[34]

The average annual U.S. mill price of Portland cement ranged from $76-to-$98 per ton from 2002 through 2006. Total annual production ranged from 89.7 million tons in 2002 to 99.8 million tons in 2006.[35] The value of the facility's dry glass powder could approach these levels.[36]

Market demand for the facility's glass powder product will have five powerful drivers: (1) common shortages in supplies of Portland cement;[37] (2) the increasingly prohibitive costs of transporting glass powder from the limited number of places where it is produced from virgin material and post-industrial waste; (3) the mountains of locally-available post-consumer glass waste that are potentially reliable and cost-effective sources of glass powder; (4) generally, the demand of the "green" building industry for construction materials with ingredients that can earn points on the US Green Building Council's LEED scale for certifying green buildings;[38] and, (5)

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[34] U.S. Patent Application Number 20060130707 for "Production of glass powder from waste glass, and products made using the same, especially concrete," by Grasso, Andela, *et als*., filed 2004-12-16, www.freepatentsonline.com/20060130707 [hereafter Grasso, Andela] Other techincal and processing references are from this source.

[35] U.S. Geological Survey, *Mineral Commodity Summaries 2007* (U.S. GPO, Washington, DC, 2007) p.40

[36] Cf., Meyer, Christian, "Concrete for the New Century," Concretus (Association of New York City Concrete Producers) Spring-Summer, 2002: "Silica fume, for example, started out as a waste product that would need to be disposed of at great cost. But once it was understood that if used to replace a certain fraction of the cement it would greatly improve the properties of the mix, its cost turned from a negative value to a multiple of that of cement. Likewise, fly ash needed to be landfilled or otherwise disposed of ... Yet, once the ash was recognized as a valuable cement substitute, its cost reached a value close to that of Portland cement. Similar developments can be expected as ways are found to beneficiate other solid waste components and to use them with advantage in concrete applications. New York City, for example, spends millions of dollars annually to discard of its waste glass ... There exist no viable secondary markets for this material, because it is typically of mixed color and highly contaminated ... A research program at Columbia University has demonstrated that crushed recycled glass can be used as an aggregate in concrete, if the expected alkali-silica reaction is properly suppressed. By developing a new market for such recycled glass, we can be assured that the economics of the recycling market will be fundamentally affected, and the value of the glass will turn from a negative amount ... to one comparable to that of the aggregate it replaces."

[37] Cf. Murray, Robert, "Hurricane Katrina: Implications for the Construction Industry," McGraw-Hill Construction, September 20, 2005: "According to the Portland Cement Association (PCA), cement remained in short supply in 32 states and the District of Columbia - even before the advent of Katrina. The disruption to transportation systems and loss of power to cement plants in the Gulf region further cut into supplies, while the need to rebuild roads, buildings, and other infrastructure will increase demand. That adds up to continued increases in cement prices during 2005 and 2006 - unless, as urged by the AGC, the Commerce Department and the Southern Tier Cement Committee reach an agreement to allow Mexican cement into the Gulf states without the 55% duty now in place;" see also, Engquist, Erik, "Saving Concrete Jungle," Crain's New York Business, October 29, 2006; Jones, David, "NYC Construction to hit record $20.8B in 2006," Crain's New York Business, October 3, 2006.

[38] The United States Green Building Council, the nation's foremost coalition of real estate and environmental organizations promoting green buildings, has developed a green building rating system known as LEED for Leadership in Energy and Environmental Design. Buildings receive LEED certification based on the number of points scored in the five general design areas of the rating system: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, and Indoor Air Quality. There are four levels of LEED certification depending on the number of points scored by the design: Certified (26-32 points), Silver (33-38 points), Gold (39-51 points), and Platinum (52-69 points). The rating system with measurable standards for "how green" a building is has been a major influence on the growth of the green building market. Nearly 2,000 building projects have sought LEED certification, and 215 have completed certification.

specifically, the “green building requirements” of New York City’s capital building program under Local Law 86.

Local Law 86 requires LEED certification for all municipal capital projects costing over $2 million. The law is expected to apply to approximately $12 billion in construction during the city’s ten-year capital plan.

The ability of the facility’s glass powder to substitute for Portland cement in making concrete and concrete masonry blocks would make it particularly attractive to architects, builders, contractors, and concrete and masonry block suppliers who are looking for a competitive edge in bidding to design, build, and/or supply building materials for projects that are part of the city’s capital program. And, the city’s Department of Design and Construction could drive the market even more – and, “close the loop” on the city’s recycled glass – by specifying design and purchasing preferences for the use of concrete and masonry block made with up-to-40%- New York City recycled glass powder.

Mixed color cullet and container glass in the city’s recycling stream total some 77,870 tons, or 155.7 million pounds, annually (Table 2). These materials are now processed into 2" commingled fragments and generally barged to New Jersey for further processing into low-end uses such as aggregate and alternative daily cover. By contrast, the new facility would provide a dramatic, value-adding alternative for processing the city’s recycled glass.

Clean, dry glass powder can replace a portion of Portland cement in making concrete because the powder acts as a cementing material, or pozzolana, when moistened.[39] And, because it is powder rather than glass fragments, it does not require the addition of substances like chromium or lithium to suppress the alkali-silica reaction between the silica in glass and the alkali in concrete’s other elements which would weaken the concrete.

The requirement of producing high-quality, clean, dry glass powder dictates the facility’s system for processing post-consumer waste glass. Glass must have been separated from, and cleansed of, foodstuffs, sugar, and chemical residues as well paper, labels, ceramics, plastics, and metals. Sugar residues, for example, could affect the setting and binding of concrete.[40] (Organic residue from an unwashed mayonnaise jar could bacterially contaminate gallons of paint and other coating applications which can use glass powder.[41]) Large glass particles would not work in concrete because the alkali-silicate reaction between the silica in glass and the alkali in concrete’s other elements weakens the concrete.

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[39] See, Meyer & Baxter., “Use of Recycled Glass for Concrete Masonry Blocks,” NYSERDA Report 97-15 (1997); Shayan, “Value-Added Utilisation of Waste Glass in Concrete,” IABSE Symposium Melbourne 2002. Merriam-Webster’s Dictionary defines pozzolana as “finely divided siliceous material that reacts chemically with slaked lime at ordinary temperature and in the presence of moisture to form a strong slow-hardening cement.”

[40] Jin, U.S. Pat. No. 6,296,699 for "Inorganic binders employing waste glass"

[41] Clean Washington Center, "Recycling of Crushed Glass into Coating Products", CWC Report No. GL-96-1 (1998)

At the new facility, it is anticipated that incoming 2" glass fragments would be shipped in by barge. Inside the building, they would be moved through four steps in sorting, cleaning, drying and sizing.[42]

First, the glass would be fed into surge hoppers and conveyed through magnetic separators to remove ferrous materials and then through glass pulverizers to remove paper and plastics and produce nearly uniform-sized glass particles of 1/8" or less. It expected that up to 30% of the incoming materials (by weight) could be removed from the glass stream by this process.[43] Then, the glass fragments would be conveyed through trommels to separate those up to 1/8" from larger pieces which would be returned to the pulverizer for further reduction.

Second, the 1/8" glass particles would be fed into screw or auger washing equipment which would separate and remove any remaining paper and plastic and dissolve any sugars or organic residues. Glass particles would settle to the bottom of the washing tank from which they would be removed, de-watered, and screened for either drying or further size reduction. (To reduce demand for municipal water, the washing operations can be designed as recyclable, closed-loop circulation systems that also tap the site's storm-water and drainage systems.)

Third, the clean 1/8" glass particles would be conveyed for drying using fluidized bed, rotary kiln, or other equipment.

And, fourth, the dry fragments would be conveyed to ball mills for grinding into a powder that is 325 mesh or less in size. After milling, the powder would be conveyed through an air classifier to separate "fine" and "coarse" particles. The "coarse" would be returned for additional milling or marketed for other purposes. The "fine" would be conveyed to storage bins as finished inventory ready for bagging or shipping in bulk.

The facility would operate on three-shifts, twenty-four hours a day, six days a week. It would have the capacity to process between 25-to-30 tons of incoming cullet an hour.[44]

Receiving 77,870 tons of 2" glass cullet from the city's curbside recycling processor would require some 111 incoming barges annually at 700 tons per barge, or roughly 1 barge every two days.[45]

Processing the 77,870 tons a year, the facility would produce an estimated 54,509 tons of glass powder annually. If shipped by rail, this volume would require 681 covered hopper cars

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[42] Grasso, Andela, *et als., supra*.

[43] *Ibid*. A typical stream of post-consumer waste glass from a municipal recycling facility contains up to 30% by weight of various metals, paper, and plastic, foodstuffs, and dirt picked up in handling the waste stream.

[44] Processing the city's current 77,870 tons of recycled glass would require 15 tons per hour of processing capacity running three-shifts 250 days a year. The additional capacity would allow for both redundancy and up to an 80% expansion of the city's volume of recycled glass to 140,000 tons per year..

[45] At 700 tons per barge, the incoming 77,870 tons would require some 111 barges a year, or 0.44 barges per day receiving 250 days a year.

annually, or nearly 3 cars a day.[46] If shipped to local ready-mix concrete makers, this volume could require 2,725 trailer-loads annually, or some 11 trucks a day.[47]

The facility would also dispose of approximately 23,361 tons a year of mixed plastic, paper and metal residual waste. The anticipated volume would require about 292 rail hopper cars annually, or nearly 6 cars a week.[48]

Because the company is a manufacturing operation processing a segregated recycled feedstock and not a waste handling facility, and because it would be located in an M-3 zone, there would be no special regulatory requirements. The production operation would not generate any external noise or pollutants that could affect the community. Dust collection equipment and procedures would be installed to capture particulates generated by the processing systems. Workers would likely wear high-end face masks for fine particulates, eye and ear protection, and gloves. Odors would be minimal because most of the organic residues would be washed away, and the small fraction of particles, if any, would be shipped out daily.

Shipping an estimated 54,509 tons of glass powder annually, the facility would generate some $4.4 million in annual revenues at an estimated market price of $80 per ton.[49]

Job Title	Glass Powder Jobs
Management & Sales	3
Clerical	1
Machine Operators	8
Material Handlers	6
Forklift / front end loaders	3
Maintenance	3
Crew Chiefs/Forepersons	3
Quality Control	3
TOTAL	30

And, it would create some 30 jobs. The company would commit to paying livable wages with benefits to all hourly and salaried employees, to recruiting locally, and to promoting from within whenever feasible. All production employees would require special training which the company would provide in-house.

The park can accommodate the new operation in a 30,000 square-foot building with 10,000 square-feet of paved yard space. The building would have a clear span with minimum ceiling height of 26 feet and a small, interior office area with an HVAC system. It would have 3-phase electrical service. The company's processing systems are energy-intensive.

The park can accommodate the new operation in a 30,000 square-foot building with 10,000 square-feet of paved yard space. The building would have a clear span with minimum ceiling height of 26 feet and a small, interior office area with an HVAC system. It would have 3-phase electrical service. The company's processing systems are energy-intensive.

[46] At 160,000 pounds per covered hopper car, the 54,509 tons of glass powder would require 681 cars a year or 2.7 cars a day shipping 250 days a year.

[47] At 40,000 pounds a load, the 54,509 tons of glass powder would require 2,725 truckloads annually, or 10.9 trucks a day shipping 250 days a year.

[48] At 160,000 pounds per rail hopper car, the 23,361 tons would require 292 cars annually, or 1.2 cars per day shipping 250 days a year.

[49] The estimated $80 per ton price is 18% less than the $98 a ton average annual mill price of Portland cement in 2006.

The prospective operator of the new facility would be a start-up joint venture between a glass recycling equipment manufacturer and a building materials distributor. Upwards of $5-to-$7 million in equity and financing for equipment and working capital would be necessary to launch the operation.

6. Exhibition, Incubator, Café and Child Care Facility

A sixth 10,000 square-foot parcel would be reserved for eventual development for four possible uses. One would be an exhibition center for educating school children and the general public about recycling, re-use, and re-manufacturing. The other would be incubator space for craftspeople designing artworks or products made from recycled materials. The third possible use would be for a small cafe or food vendor. Another identified use would be a child care facility for workers to leave their children. This facility could also provide a small amount of office space and a maintenance shop for park management if necessary. It is anticipated that this facility would be operated by a non-profit environmental or community-based organization and funded by philanthropic and public sources.

Table 2. Supplies of Glass Containers & Cullet in the City's Refuse and Recycling Streams

TOTAL	Refuse Stream tons/week	Refuse Stream tons/yr	Refuse Stream LBS/yr	% of Recycling MGP Stream	Recycling MGP Stream tons/week **4,600.0**	Recycling MGP Stream tons/yr	Recycling MGP Stream LBS/yr	TOTAL Refuse & MGP Recycling tons/yr	TOTAL Refuse & MGP Recycling LBS /yr
brown glass	152.50	7,930	15,860,000	1.98	91.10	4,737	9,474,400	12,667	25,334,400
clear glass	636.90	33,119	66,237,600	8.13	375.50	19,526	39,052,000	52,645	105,289,600
green glass	160.60	8,351	16,702,400	4.13	190.40	9,901	19,801,600	18,252	36,504,000
mixed cullet	316.60	16,463	32,926,400	18.05	832.10	43,269	86,538,400	59,732	119,464,800
other container glass	10.80	562	1,123,200	0.18	8.40	437	873,600	998	1,996,800
TOTAL	1,277.40	66,425	132,849,600	32.47	1,497.50	77,870	155,740,000	144,295	288,589,600

Source: 2004-05 NYC Residential Waste Characterization Study
Results for Metal, Glass, Plastic and Beverage Carton Recycling
Figure: Capture Rate
http://www.nyc.gov/html/nycwasteless/downloads/pdf/wastecharreports/wcsfinal/highlights/04_mgp.pdf

Job Creation, Local Hiring and Utilization Plan

Construction work at the eco-industrial park would provide significant business and employment opportunities for local women-owned and minority-owned businesses and the local workforce. The construction manager would compile lists of local women-owned and minority-owned general contractors and trade subcontractors, would assist the architects in sizing bid packages to elicit responses from small firms, and would identify contractors with good reputations and track records in recruiting local and minority workers.

To maximize local hiring after construction, the park's management would educate occupant companies about the employee tax credits available to them by hiring residents of the Bronx Empowerment Zone. It would also introduce them to community-based organizations, local development corporations, and local employment and training programs as sources for referrals of local residents. And, the occupancy agreement's terms and conditions would require that companies recruit locally through such organizations and complete an annual census of employees listing their zip code of residence.

The number, type, and wage level of post-construction jobs anticipated at the park are summarized in the following table. It is possible that these jobs may be union. It was beyond the scope of this study to identify which unions would be involved with the respective trades. However we do know that nine out of ten would be blue-collar. Most would meet the New York City's living wage and health benefits standards ("living wage jobs") of $10 per hour with health benefits or $11.50 per hour without health benefits.[50]

[50] The living wage is defined by Local Law 38 of 2002 as $10.00 per hour as of July 1, 2006. In addition, living wage jobs require the employer either to provide health benefits, as defined in the Local Law, or in the alternative, to provide a supplement to the hourly wage of a value equal to or greater than $1.50 per hour as of July 1, 2003.

Job Title	Approximate Starting Wage	Paper Converter Jobs	Plastic Products Jobs	Wood Salvage Jobs	C&D Recycling Jobs	Glass Powder Jobs	Total Jobs	Total %
Management & Sales	$75-120,000 /yr	5	4	6	5	3	23	7%
Clerical	$25-40,000 /yr	3	1		7	1	12	4%
Machine Operators	$18 /hr	9	100	3	9	8	129	39%
Material Handlers	$15 /hr	6	12	5	10	6	39	12%
Sorters	$15 /hr				16		16	5%
Case Packers	$10 /hr	15					15	4%
Truck Drivers	$18 /hr		0	3	4		7	2%
Barge loaders	$18 /hr				10		10	3%
Forklift / front end loaders	$18 /hr	3	10		6	3	22	7%
Maintenance	$22 /hr	3	14	1	6	3	27	8%
Crew Chiefs / Forepersons	$20 /hr	3	4	2	5	3	17	5%
Quality Control	$15 /hr	3	10		2	3	18	5%
TOTAL		50	155	20	80	30	335	100%

Material Flows, Logistics and Transportation

Material and product flows

As a whole, materials coming into the eco-industrial park would total an estimated 696,000 tons annually, or about 2,784 tons a day receiving 250 days a year (Table 3). Excluding 21,000 tons annually (84 daily) of additives for manufacturing plastic railroad ties, these materials would include 500,000 tons annually (2,000 daily) of C&D debris and 175,000 tons annually (700 daily) of recycled waste materials and parent paper rolls made with 100% recycled content.

The aggregate weight of outgoing shipments from the park would be comparable, but the composition would be radically different. Only an estimated 50,776 tons annually (203 daily) would go out as residual waste from the C&D recycling, wood salvage, and glass powder facilities (Table 3). The remainder – including some 475,000 tons of C&D debris annually (1,900 daily), 54,509 tons of glass annually (218 daily), and 63,000 tons annually (252 daily) of plastics – would have been processed and/or re-manufactured into marketable products (Table 3).

In total, the estimated aggregate market value of products produced at the park would be some $70 million annually. As detailed in the facility profiles above, this estimate would include: $4.75 million from recycled C&D products; $46 million from plastic railroad ties; $11 million from 100%-recycled content toilet paper and towel products; $4.5 million from salvaged timbers and lumber; and, $4.4 million from recycled glass powder.

Table 3. MATERIAL & PRODUCT FLOWS by facility

INCOMING

	annual pounds	annual tonnage	tons per day 250days/yr	% of capacity
C&D				
debris	1,000,000,000	500,000	2,000	100%
Plastics Products				
post-consumer plastic	35,000,000	17,500	70	100%
post-industrial plastic	91,000,000	45,500	182	100%
additives	42,000,000	21,000	84	100%
subtotal	168,000,000	84,000	336	
Paper Converter				
parent rolls	32,100,000	16,050	64	100%
Wood Salvage				
timber bd ft	12,346154 bf		49,385 bf	
timber (wt)	36,312,000.00	18,156	73	100%
Glass Powder				
cullet	155,740,000	77,870	311	55%
TOTAL INCOMING	1,392,152,000	696,076	2,784	

OUTGOING

	annual pounds	annual tonnage	tons per day 250days/yr	% of capacity
C&D				
NE sand, gravel, stone	775,000,000	387,500	1,550	
local sand, gravel,stone	50,000,000	25,000	100	
metals	100,000,000	50,000	200	
slime	25,000,000	12,500	50	
residue waste	50,000,000	25,000	100	
subtotal - wt	1,000,000,000	500,000	2,000	100%
Plastics Products				
railroad ties – units	600,000		2,400	
railroad ties – wt	168,000,000	84,000	336	100%
Paper Converter				
tissues & towels - wt	30,000,000	15,000	60	
recyclable plant scrap	2,100,000	1,050	4	
subtotal - wt	32,100,000	16,050	64	100%
Wood Salvage				
timber bd ft	10,700,000		42,800	
timber (wt)	31,400,000	15,700	63	
residue waste bd ft	1,646,154		6,585	
residue waste (wt)	4,830,000	2,415	10	
subtotal - wt	36,230,000	18,115	72	100%
Glass Powder				
glass powder – 50% rail	54,509,000	27,255	109	
glass powder – 50% local	54,509,000	27,255	109	
residue waste (wt)	46,722,000	23,361	93	
subtotal	155,740,000	77,870	311	55%
TOTAL OUTGOING	1,392,070,000	696,035	2,784	

Table 3. MATERIAL & PRODUCT FLOWS by facility

INCOMING

	annual pounds	annual tonnage	tons per day 250days/yr	% of capacity
C&D				
debris	1,000,000,000	500,000	2,000	100%
Plastics Products				
post-consumer plastic	35,000,000	17,500	70	100%
post-industrial plastic	91,000,000	45,500	182	100%
additives	42,000,000	21,000	84	100%
subtotal	168,000,000	84,000	336	
Paper Converter				
parent rolls	32,100,000	16,050	64	100%
Wood Salvage				
timber bd ft	12,346154 bf		49,385 bf	
timber (wt)	36,312,000.00	18,156	73	100%
Glass Powder				
cullet	155,740,000	77,870	311	55%
TOTAL INCOMING	1,392,152,000	696,076	2,784	

OUTGOING

	annual pounds	annual tonnage	tons per day 250days/yr	% of capacity
C&D				
NE sand, gravel, stone	775,000,000	387,500	1,550	
local sand, gravel,stone	50,000,000	25,000	100	
metals	100,000,000	50,000	200	
slime	25,000,000	12,500	50	
residue waste	50,000,000	25,000	100	
subtotal - wt	1,000,000,000	500,000	2,000	100%
Plastics Products				
railroad ties – units	600,000		2,400	
railroad ties – wt	168,000,000	84,000	336	100%
Paper Converter				
tissues & towels - wt	30,000,000	15,000	60	
recyclable plant scrap	2,100,000	1,050	4	
subtotal - wt	32,100,000	16,050	64	100%
Wood Salvage				
timber bd ft	10,700,000		42,800	
timber (wt)	31,400,000	15,700	63	
residue waste bd ft	1,646,154		6,585	
residue waste (wt)	4,830,000	2,415	10	
subtotal - wt	36,230,000	18,115	72	100%
Glass Powder				
glass powder – 50% rail	54,509,000	27,255	109	
glass powder – 50% local	54,509,000	27,255	109	
residue waste (wt)	46,722,000	23,361	93	
subtotal	155,740,000	77,870	311	55%
TOTAL OUTGOING	1,392,070,000	696,035	2,784	

Logistics and transportation

The 696,000 annual tons (2,784 daily) of incoming materials would necessitate deliveries by an estimated 181 barges annually (0.7 daily), 831 rail cars annually (3.3 daily), and 71,034 trucks annually (284 daily) (Tables 4 & 5). Because the estimated 62,000 trucks delivering annually to the C&D recycling facility (248 daily) would be diverted from the borough's existing C&D transfer stations (Tables 4 & 5), there would be no net increase in truck deliveries as a result of the new facility (Tables 4-7).

The 696,000 annual tons (2,784 daily) of out going products and residual waste shipment would necessitate deliveries by an estimated 388 barges annually (1.6 daily), 2,908 rail cars annually (11.6 daily), and 7,457 trucks annually (29.8 daily) (Tables 4 & 5). Because the estimated 500,000 annual tons (2,000 daily) of C&D products and residual waste would be shipped out almost entirely on 388 barges annually (daily) and 875 rail cars annually (3.5 daily), the new C&D facility would eliminate the estimated 37,500 annual truck shipments (150 daily) that would otherwise be coming out of the borough's existing C&D transfer stations (Tables 4-7). Hence, the new C& D recycling facility would significantly advance the Solid Waste Management Plan's goal of transitioning the commercial waste handling sector from road to rail and barge.

Tables 4-7 present detailed logistics estimates for each facility and the park. Tables 8 & 9 summarize the incoming and outgoing logistics for the park as a whole.

In the aggregate coming into and going out of the Bronx, there would be estimated increases of 569 barges annually (2.3 daily) and 3,739 rail cars annually (15 daily) (Tables 8 & 9). There would also be an estimated net annual decrease of 21,009 truck trips (84 daily) as the overall decrease in outgoing trucks from existing C&D transfer stations (Tables 6 & 7) would be partially off-set by trucks serving the other facilities (Tables 8 & 9).

Table 4. ANNUAL LOGISTICS by facility

INCOMING

	Barges annual	Rail Cars annual	Trucks annual	Bronx Offsets Trucks annual
C&D				
debris			62,000	(62,000)
Plastics Products				
post-consumer plastic	70			
post-industrial plastic		569		
additives		263		
subtotal	70	831		
Paper Converter				
parent rolls			803	
Wood Salvage				
timber			8,231	
Glass Powder				
cullet	111			
TOTAL INCOMING	181	831	71,034	(62,000)

OUTGOING

	Barges annual	Rail Cars annual	Trucks annual	Bronx Offsets Trucks annual
C&D				
NE sand, gravel, stone	388			
local sand, gravel,stone			1,250	
metals		500		
slime		125		
residue waste		250		(37,500)
subtotal	388	875	1,250	(37,500)
Plastics Products				
railroad ties		1,400		
Paper Converter				
tissues & towels			1,000	
recyclable plant scrap			53	
subtotal			1,053	
Wood Salvage				
timber			3,292	
residue waste			500	
subtotal			3,792	
Glass Powder				
glass powder – 50% rail		341		
glass powder – 50% local			1,363	
residue waste		292		
subtotal		633	1,363	
TOTAL OUTGOING	388	2,908	7,457	(37,500)

Table 5. DAILY LOGISTICS by facility

INCOMING

	Barges daily	Rail Cars daily	Trucks daily	Bronx Offsets Trucks daily
C&D				
debris			248.0	(248)
Plastics Products				
post-consumer plastic	0.3			
post-industrial plastic		2.3		
additives		1.1		
subtotal	0.3	3.3		
Paper Converter				
parent rolls			3.2	
Wood Salvage				
timber			32.9	
Glass Powder				
cullet	0.4			
TOTAL INCOMING	0.7	3.3	284.1	(248)

OUTGOING

	Barges daily	Rail Cars daily	Trucks daily	Bronx Offsets Trucks daily
C&D				
NE sand, gravel, stone	1.6			
local sand, gravel,stone			5.0	
metals		2.0		
slime		0.5		
residue waste		1.0		(150)
subtotal	1.6	3.5	5.0	(150)
Plastics Products				
railroad ties		5.6		
Paper Converter				
tissues & towels			4.0	
recyclable plant scrap			0.2	
subtotal - wt			4.2	
Wood Salvage				
timber			13.2	
residue waste			2.0	
subtotal			15.2	
Glass Powder				
glass powder – 50% rail		1.4		
glass powder – 50% local			5.5	
residue waste		1.2		
subtotal		2.5	5.5	
TOTAL OUTGOING	1.6	11.6	29.8	(150)

Table 6. NET ANNUAL DIFFERENCES IN BOROUGH LOGISTICS by facility

INCOMING

	Net Increase (Decrease) Barges annual	Net Increase (Decrease) Rail Cars annual	Net Increase (Decrease) Trucks annual
C&D			
debris	0	0	0
Plastics Products			
post-consumer plastic	70	0	0
post-industrial plastic	0	569	0
additives	0	263	0
subtotal	70	831	0
Paper Converter			
parent rolls	0	0	803
Wood Salvage			
timber	0	0	8,231
Glass Powder			
cullet	111	0	0
TOTAL INCOMING	181	831	9,034

OUTGOING

	Net Increase (Decrease) Barges annual	Net Increase (Decrease) Rail Cars annual	Net Increase (Decrease) Trucks annual
C&D			
NE sand, gravel, stone	388	0	0
local sand, gravel,stone	0	0	1,250
metals	0	500	0
slime	0	125	0
residue waste	0	250	(37,500)
subtotal	388	875	(36,250)
Plastics Products			
railroad ties	0	1,400	0
Paper Converter			
tissues & towels	0	0	1,000
recyclable plant scrap	0	0	53
subtotal	0	0	1,053
Wood Salvage			
timber	0	0	3,292
residue waste	0	0	500
subtotal	0	0	3,792
Glass Powder			
glass powder – 50% rail	0	341	0
glass powder – 50% local	0	0	1,363
residue waste	0	292	0
subtotal	0	633	1,363
TOTAL OUTGOING	388	2,908	(30,043)

Table 7. NET DAILY DIFFERENCES IN BOROUGH LOGISTICS by facility
INCOMING

	Net Increase (Decrease) Barges daily	Net Increase (Decrease) Rail Cars daily	Net Increase (Decrease) Trucks daily
C&D			
debris	0.0	0.0	0.0
Plastics Products			
post-consumer plastic	0.3	0.0	0.0
post-industrial plastic	0.0	2.3	0.0
additives	0.0	1.1	0.0
subtotal	0.3	3.3	0.0
Paper Converter			
parent rolls	0	0	3.2
Wood Salvage			
timber	0	0	33
Glass Powder			
cullet	0.4	0	0.0
TOTAL INCOMING	0.7	3.3	36

	Net Increase (Decrease) Barges daily	Net Increase (Decrease) Rail Cars daily	Net Increase (Decrease) Trucks daily
C&D			
NE sand, gravel, stone	1.6	0.0	0.0
local sand, gravel,stone	0.0	0.0	5.0
metals	0.0	2.0	0.0
slime	0.0	0.5	0.0
residue waste	0.0	1.0	(150)
subtotal	1.6	3.5	(145)
Plastics Products			
railroad ties	0.0	5.6	0.0
Paper Converter			
tissues & towels	0.0	0.0	4.0
recyclable plant scrap	0.0	0.0	0.2
subtotal	0.0	0.0	4.2
Wood Salvage	0.0	0.0	13.2
timber	0.0	0.0	2.0
residue waste	0.0	0.0	15.2
subtotal			
Glass Powder	0.0	1.4	0.0
glass powder – 50% rail	0.0	0.0	5.5
glass powder – 50% local	0.0	1.2	0.0
residue waste	0.0	2.5	5.5
subtotal			
TOTAL OUTGOING	1.6	11.6	(120.2)

Table 8. AGGREGATE ANNUAL LOGISTICS & BRONX IMPACTS

	Barges annual	Rail Cars annual	Trucks annual	Bronx Offsets Trucks annual	Net Increase (Decrease) Barges annual	Net Increase (Decrease) Rail Cars annual	Net Increase (Decrease) Trucks annual
C&D							
incoming	0	0	62,000	(62,000)	0	0	0
outgoing	388	875	1,250	(37,500)	388	875	(36,250)
subtotal in & out	388	875	63,250	(99,500)	388	875	(36,250)
Plastics Products							
incoming	70	831	0	0	70	831	0
outgoing	0	1,400	0	0	0	1,400	0
subtotal in & out	70	2,231	0	0	70	2,231	0
Paper Converter							
incoming	0	0	803	0	0	0	803
outgoing	0	0	1,053	0	0	0	1,053
subtotal in & out	0	0	1,856	0	0	0	1,856
Wood Salvage							
incoming	0	0	8,231	0	0	0	8,231
outgoing	0	0	3,792	0	0	0	3,792
subtotal in & out	0	0	12,023	0	0	0	12,023
Glass Powder							
incoming	111	0	0	0	111	0	0
outgoing	0	633	1,363	0	0	633	1,363
subtotal in & out	111	633	1,363	0	111	633	1,363
All Facilities							
incoming	181	831	71,034	(62,000)	181	831	9,034
outgoing	388	2,908	7,457	(37,500)	388	2,908	(30,043)
total in & out	569	3,739	78,491	(99,500)	569	3,739	(21,009)

Note: numbers may not add due to rounding.

Table 9. AGGREGATE DAILY LOGISTICS & BRONX IMPACTS

	Barges daily	Rail Cars daily	Trucks daily	Bronx Offsets Trucks daily	Net Increase (Decrease) Barges daily	Net Increase (Decrease) Rail Cars daily	Net Increase (Decrease) Trucks daily
C&D							
incoming	0.0	0.0	248.0	(248)	0.0	0.0	0.0
outgoing	1.6	3.5	5.0	(150)	1.6	3.5	(145.0)
subtotal in & out	1.6	3.5	253.0	(398)	1.6	3.5	(145)
Plastics Products							
incoming	0.3	3.3	0.0	0	0.3	3.3	0.0
outgoing	0.0	5.6	0.0	0	0.0	5.6	0.0
subtotal in & out	0.3	8.9	0.0	0	0.3	8.9	0
Paper Converter							
incoming	0.0	0.0	3.2	0	0.0	0.0	3.2
outgoing	0.0	0.0	4.2	0	0.0	0.0	4.2
subtotal in & out	0.0	0.0	7.4	0	0.0	0.0	7
Wood Salvage							
incoming	0.0	0.0	32.9	0	0.0	0.0	32.9
outgoing	0.0	0.0	15.2	0	0.0	0.0	15.2
subtotal in & out	0.0	0.0	48.1	0	0.0	0.0	48
Glass Powder							
incoming	0.4	0.0	0.0	0	0.4	0.0	0.0
outgoing	0.0	2.5	5.5	0	0.0	2.5	5.5
subtotal in & out	0.4	2.5	5.5	0	0.4	2.5	5
All Facilities							
incoming	0.7	3.3	284.1	(248)	0.7	3.3	36.1
outgoing	1.6	11.6	29.8	(150)	1.6	11.6	(120.2)
total in & out	2.3	15.0	314.0	(398)	2.3	15.0	(84.0)

Note: numbers may not add due to rounding.

Vehicular Access and Circulation

The eco-industrial park will provide up to 200 parking spaces for an anticipated 335 employees over three shifts plus visitors. Parking will be sufficient. Most of the workforce will be local and can be expected to arrive on foot via bus and subway. The park is located approximately 10 minutes' walk from the number 6 subway stations at East 149th Street and Longwood Avenue as well as from the numbers 6, 17, and 19 bus lines.

Passenger vehicles and freight vehicles will enter and leave the park through a two-lane access road that is reached from the western end of Oakpoint Avenue. The entry-exit point will be gated. Access will be gained by intercom to tenants, and tokens will be used to operate the gate for egress.[51] The entry point may also be attended at times of heavy traffic depending on operating revenues available to the park's management.

The access road becomes a circular drive which reaches the entry- and exit-ways of every company. No parking or standing will be permitted on the access and interior roadway at any time, except for truck queuing in designated areas. The total length of the interior roadway is approximately one mile. It can accommodate an internal queue of 50 packer trucks and roll-offs waiting for the truck scales and entry into the C&D facility.

All the buildings will have drive-through doors for interior loading and unloading and/or exterior loading docks opening to their own paved yard-space. Consequently, there will be no on-street loading or unloading of trucks.

Multiple truck scales will be located at the entrance to the C&D facility. They will be used by that facility on a continuous basis. They will be available to other park occupants on request since they are expected to need them infrequently. After weighing in and unloading, the trucks will drive around the circular roadway and return to the scale to record their empty weight, the difference between incoming and outgoing weights equaling the weight of their incoming load. (If necessary for a company to weigh its outgoing shipments, the sequence would be reversed for trucks picking up loads from the facility.)

The enclosed and computerized conveyor system will be erected above and adjacent to the circular drive, and feeder conveyors will provide every company with direct access to the conveyor from their loading docks. Feeder conveyors will also lead to the railyard and the barge dock. All outdoor sections of the conveyor system will be enclosed for safety, security and protection of the materials from weather. The design of the structure and enclosure will be a signature element of the site, a landmark for greenway users traveling through the area, and a symbol of the city's intent to reduce its waste management system's dependency on highway trucking.

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[51] The entry point may also be attended at times of heavy traffic depending on operating revenues available to the park's management.

Zoning

The eco-industrial park is located in an M-3 industrial zone per NYC Zoning Map Section 6c. Each of the park's prospective users is allowed as of right in this zone.

The maximum Floor Area Ratio in M-3 districts is 2.0 (ZR 43-12). The total lot area is 2,339,492 square feet, and the total building floor area proposed for the park is 400,000 square feet, resulting in a proposed FAR of 0.17, well within the allowable FAR.

The park will provide up to 200 parking spaces. Although M-3 zoning normally requires one parking space per 1,000 square feet of interior building area, a partial waiver will be sought since some of the largest users of indoor space will be operations like the C & D recycling facility. The operations that will be carried out under roof there and elsewhere in the park are ones that are normally conducted in open yards so the actual numbers of employees per square foot of interior building area will be much lower than in other uses classified in this parking category (ZR 44-20.)

As detailed above, the park will also comply with all requirements for off-street loading per ZR 44-50.

Land Use, Environmental Review & Regulatory Requirements

1. Coastal Zone Management Waterfront Revitalization Program

The City must comply with the New York City Local Waterfront Revitalization Program (LWRP) mandated under Federal and State Coastal Zone Management Acts.[52] The LWRP was approved by the City Council in 1999 and has since been approved on the state and federal levels. Any activity that is part of the eco-industrial park must be found consistent with the WRP. A formal consistency review must be conducted by the Department of State in writing.

The area in which the eco-industrial park would be located has been designated a Significant Maritime and Industrial Area (SMIA) under the LWRP. SMIAs are designated as priority areas for water-dependent and industrial activities. Accordingly, the park is a use consistent with the SMIA site restrictions.

In it important to note that the LWRP also designates Special Natural Waterfront Areas and recognizes the need to protect tidal and freshwater wetlands habitats and significant coastal fish and wildlife habitats. As discussed further below, the site it bordered by tidal wetlands and the Brother Islands (North and South) which have been designated by the State as significant coastal fish and wildlife habitats. Any impacts on the wetlands and the islands will have to be analyzed as part of the environmental review process.

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52 The Federal Coastal Zone Management Act and regulations promulgated thereunder are found at 16 U.S.C. §§1451 to 1465 and 15 CFR Part 930, respectively. The State legislation and regulations are found at Article 42 of the State Executive Law and 19 NYCRR Part 60, respectively.

2. Generic Environmental Impact Statement under ULURP & CEQR

The City of New York has indicated that it intends to acquire the approximately 28-acre property through eminent domain for the public purpose of a constructing and operating a correctional facility on an estimated eight to eleven acres of land. As the property has been used historically as an illegal landfill, it is anticipated that the City will be able to utilize monies from the state Environmental Restoration Fund (i.e., 90% contribution from the State) to properly clean up the site.

As part of the condemnation proceeding, the City must undertake land use and environmental review processes in compliance with the Uniform Land Use Review Procedure (ULURP) and the City Environmental Quality Review (CEQR). The CEQR review must support not only the "taking" itself but also the proposed use of the property. In situations like this, the Department of City Planning will be designated lead agency for the environmental reviews and will begin the process with a public scoping process. The ULURP and CEQR processes can run in parallel and there will be opportunities for public participation throughout.

Considering the size of the property and the proposed jail's limited use thereof, the preparers of this feasibility study recommend that the City prepare a Generic Environmental Impact Statement (GEIS) which would look at all potential uses of the site including the eco-industrial park. It is also recommended that the CEQR process be sufficient to comply with the State Environmental Quality Review Act (SEQRA) and the National Policy Review Act (NEPA) and that the appropriate agencies (e.g., State Department of Environmental Conservation (DEC) and Army Corps of Engineers (Army Corps)) be included in the CEQR review as either "involved" or "co-lead" agencies. Army Corps permitting may be necessary for dredging, maritime use and operations at the eco-industrial park. Therefore, the potential impacts of construction and operation of the industrial park should be studied, thereby facilitating the later permitting process and potentially requiring only a supplemental review.

3. Historic Preservation

There have been assertions that there are historical areas off-shore of the site of the eco-industrial park. As part of CEQR and SEQRA, there will be a review of New York's historic cultural resources. Under Section 106 of the Federal National Historic Preservation Act and Section 14.09 of the New York State Historic Preservation Act, the State Historic Preservation Office (SHPO) is involved in the environmental review process to ensure that effects or impacts on historic places and archeological and culturally significant resources are considered and avoided or mitigated during the project. Additionally, there will be review by the City Landmarks Preservation Commission under the City's Landmarks Law of 1965. If New York City landmarks, potential landmarks or archaeologically sensitive resources are identified within the project or project study area (an area comprising a 400' radius around the project site), then potential impacts of the proposed project must be analyzed and mitigation options determined.

4. Wetlands

Because of the anticipated barge use and possible bulk head work and dredging, there may also be significant wetlands issues that must be addressed from a state and federal permitting perspective. The waterfront consists of tidal wetlands, a portion of which may be classified as a littoral zone, defined as all land under tidal waters not deeper than six feet at mean low water.[53] Dredging or any activity in a littoral zone is a presumptively incompatible use and requires a permit from DEC.[54]

As of March, 2006 and surveys to December, 2005, the depth at mean lower low water adjacent to the park's bulkhead was 15 feet (Figure 1 above).

The State Tidal Wetlands Act was designed to "preserve and protect tidal wetlands, and to prevent their despoliation and destruction, giving due consideration to the reasonable economic and social development of the State."[55] To obtain a permit for a presumptively incompatible use, an applicant must overcome the presumption by demonstrating that the project is compatible with the policy of protecting wetlands and is reasonable and necessary, taking into account, among other things, the degree to which the activity is water dependent. The applicant must also look at feasible alternatives to the site or approaches that would not affect the wetland, or propose mitigation.[56] While not defined, mitigation could mean wetlands restoration on another portion of the site. In the administrative case, *In the Matter of American Marine Rail*, DEC No. 2-6007-00251/0001, project proponents wanted to build a 5200 ton/day marine-to-rail transfer station. The AMR project would have been to the east of the herein proposed eco-industrial park. DEC issued a negative declaration under SEQRA and claimed that the littoral zone was so degraded, no evaluation or permit or mitigation was necessary. The community fought that decision and won before the Administrative Law Judge who ordered a full Environmental Impact Statement on the wetlands issues.[57] We understand that the permitting hurdle is significant and therefore the wetlands issues must be carefully evaluated and the eco-industrial park designed with mitigation in mind.[58] However, the need for and careful design of this project will enhance the overall economic profile of the community. Also, with the strategic and careful design the environmental impacts to the waterfront could be mitigated and significantly reduced. There is the possibility of enhancing the access to the waterfront through a Bronx Greenway connection. In addition, as discussed above, potential impacts on North and South Brother Islands must be considered in the environmental review and the waterfront revitalization consistency review. The terms and conditions in the park's occupancy agreement will require that occupants provide a certification from the barge operator serving the company that its barges will be operated in a

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53 6 NYCRR §661.4(hh)(4).

54 6 NYCRR §661.5.

55 Environmental Conservation Law §25-0102

56 6 NYCRR §§661.9, 661.12

57 Ruling, *In the Matter of American Marine Rail*, DEC No. 2-6007-00251/0001 (August 25, 2000).

58 This project may also require a variance from the minimum setback in New York City of 30 feet from the landward edge of the tidal wetland for all structures. Structures are all principal buildings and all other structures in excess of 100 feet square, not including boardwalks, shoreline promenades, docks, bulkheads, piers, wharves, pilings, dolphins or boathouses, and structures typically located on docks, piers or wharves. 6 NYCRR §§661.6(a)(1), 661.11(a)(1).

manner that is compatible with the proximity of the wildlife preserves on North and South Brother Islands.

With respect to any C&D facility planned for the eco-industrial park, State regulations state that "new solid waste management facilities must not be constructed or operated within the boundary of the regulated wetland." [59] A variance of this restriction is possible. The DEC may grant a variance if the applicant demonstrates that the restriction, on the basis of conditions unique to the particular situation, would impose unreasonable economic, technological or safety burden on the applicant or the public, and that the proposed activity will have no significant adverse impact on public health or the environment.[60] As described above, the C&D facility, as an integral part of the eco-industrial park, will in fact provide economic and environmental benefits for the community.

Most of the park's operations are not waste management facilities and therefore are not subject to the prohibition on solid waste management facilities. Furthermore, the C&D facility will be properly set back and the use of barging will be along side uses by other members of the industrial park so the aforementioned restriction might not apply in the first instance.

Waste Management Permits

Companies operating in the park will be responsible for securing all the permits they require under applicable city, state, and federal laws and regulations.

With the exception of the proposed C&D recycling facility, it is anticipated that all of the current prospects for occupancy in the park will be exempt from both city and state solid waste regulations and state recyclable handling and recovery regulations because they are classifiable as "manufacturing facilities." Under DEC rules, a manufacturing facility is one that accepts a single general type of source-separated, non-putrescible recyclable and produces, through physical or chemical transformation of the material, a marketable product. If the process utilizes more than one type of recyclable, the facility may also be exempt if the DEC approves in writing.

As discussed in the earlier profile of the operation, the new C&D facility may qualify for a Part 360 permit from the NYS Department of Environmental Conservation and a solid waste transfer permit from the City Department of Sanitation. The new facility can comply with the enhanced protections effective in Bronx Community District 2.[18] It would be located entirely within an M3 zone. It would be located well over 600 feet from a residential district, public park, hospital, school or other non-putrescible solid waste transfer station. Further, its processing operations would be entirely enclosed in a 160,000 square-foot building. Fencing, plantings, and landscaping would provide additional buffers. It would be located at and adjacent to a rail yard, rail spur, industrial track and vessel facility and at least 90 percent of the solid waste received

59 6 NYCRR §360-1.7(a)(2)(iv).

60 6 NYCRR §360-1.7(c)(2)

18 Rules of the City of New York, Title 16, Chapter 4, Subchapter C, Section 4-32(b)(4)

would subsequently be transported by rail or vessel. And as indicated above, the park would accommodate truck queuing on-site.

Prior to applying for an operating permit from the city, the new C&D recycling facility is also obligated by the Administrative Code of the City[19] to obtain "a corresponding reduction (offset) in the lawful daily permitted throughput capacity at a putrescible or construction and demolition debris transfer station within the same community district at a rate of one ton for every new ton of capacity."

As detailed in the description of the C&D facility above, to obtain the reduction or offset,[20] the new facility would become the central processing and recycling facility for several existing transfer stations which contractually agree to terminate their on-site handling, transferring and recycling operations and restrict their activities to hauling and carting C&D debris to the new facility. In return for out-sourcing and terminating their handling, transferring and recycling operations and as the financial incentive and consideration for such contracts, the new facility could provide existing C&D operators with substantial financial incentives to execute contracts under which they would reduce and eliminate their handling, transferring, and recycling throughput.

Project Management Plan

The unique nature of this project requires a management structure that provides meaningful avenues for the sponsors of this study and other representatives of the local community to participate in the development and management of the eco-industrial park.

Therefore, the request for proposals (RFP) to be issued by NYC EDC for the development and management of the eco-industrial park should encourage collaboration between the respondents and the sponsors of this study and other local stakeholders. Based upon feedback collected at the community workshops it is recommended that a Community Advisory Board be created to serve as a means for ongoing collaboration once the eco-park opens.

The RFP should seek qualified developers with experience in commercial and industrial development – preferably, including "green" buildings in economically distressed urban areas – done in collaboration with non-profit environmental or community-based development

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19 Rules of the City of New York, Title 16, Chapter 4, Subchapter C, Section 4-32(b)(4)(i) The Department shall not authorize the operation of a new transfer station unless: .... (B) the application is for a new putrescible or construction and demolition debris transfer station located at or adjacent to a rail yard, rail spur, industrial track or vessel facility where at least ninety percent of the solid waste received is subsequently transported from the transfer station by rail or vessel, and the applicant obtains a corresponding reduction (offset) in the lawful daily permitted throughput capacity at a putrescible or construction and demolition debris transfer station within the same community district at a rate of one ton for every new ton of capacity.

20 The code does not define either reduction or offset. It is also silent as to the means and methods by which the applicant can obtain a reduction or an offset. Since the applicant is a private person and not a public authority or agency, the code cannot be construed to obligate the applicant to terminate or reduce the daily permitted throughput capacity of an existing transfer station which had been lawfully bestowed by the department. Rather, it must be construed that the code allows the applicant to use any reasonable means and methods for accomplishing the equivalent of a reduction or an offset. Absent this construction, the applicant would effectively be barred from entering into the construction and demolition transfer station business, and this section of the code could be challenged on constitutional grounds. We presume that the drafters of the code would not have intended to create the possibility of this challenge, and our construction obviates the issue.

organizations. Limited partnerships and joint ventures between for-profit developers and non-profit environmental or community-based development organizations should receive preference. The RFP should specify that it is the intent of the RFP to achieve the objectives and findings of this study and to engage the study's sponsors and other representatives of the local community in the development and management of the park.

Accordingly, the RFP's criteria for the selection of the developer (or, development entity) should include experience in:

- industrial and/or commercial development, including a preference for "green" buildings in distressed urban areas
- obtaining private sources of equity and development financing
- obtaining New Markets Tax Credits, Green Building Tax Credits, and/or other equivalent financing incentives and sources
- financing developments with taxable or tax-exempt IDA bonds or the equivalent
- managing industrial and/or commercial real property, including a preference for multi-tenant, multi-building properties
- assisting private businesses in accessing loans, grants, and tax credits from public authorities and government agencies for equipment, working capital or other purposes
- assisting private businesses in working with organizations and programs engaged in employment and training, welfare-to-work transitions, and placement of economically-disadvantaged or unemployed persons
- administering, and reporting on, government contracts and grants
- working in partnership and/or joint ventures with non-profit environmental or community-based organizations
- working with organizations or businesses committed to social responsibility and/or sustainable development (including, without limitation and as examples only, the Social Venture Network and Business for Social Responsibility)
- establishing or working with Business Improvement Districts (BID) or BID-style organizations

The winning developer (or, development entity) would be given a 99-years' ground lease by the City of New York to develop and manage the site in a manner that is consistent with the intent of achieving the objectives and findings of this study, including engaging the study's sponsors and other representatives of the local community in the development and management of the park. This intent would be incorporated in the terms and conditions of the ground lease. The annual lease payment to the City would be a percentage of the Net Operating Income (NOI) remaining after the payment of an agreed-upon schedule of debt service, maintenance and management expenses, lender's reserve requirements, and distributions to equity investors.

Financial Plan & Feasibility

A financial plan with elements similar or equivalent to the following five features illustrates the financial feasibility of the eco-industrial park.

1. The City would give the developer a 99-years' ground lease to the entire site for development and management of the park. The annual lease payment to the City would be a percentage of the Net Operating Income (NOI) remaining after the payment of an agreed-upon schedule of debt service, maintenance and management expenses, lender's reserve requirements, and distributions to equity investors.

2. The developer would put together a single financing package for all six buildings in the park *after* leases or binding letters of intent have been executed with operators of the five recycling and manufacturing facilities. This would take advantage of economies of scale on Empowerment Zone - IDA (EZ-IDA) soft costs.

- Including the sixth (exhibition and incubator) building in the original financing without a signed tenant would create the equivalent of only a 2.8% vacancy loss in the original rent roll projections. Alternatively, the amount of the original financing could be reduced by $1.4 million (-3.9%) by excluding construction of the sixth building. Either of these variables would not materially affect the numbers presented in the following analyses.

- Alternatively too, as illustrated in Appendix 1, the facilities could be financed separately or in smaller groupings if waiting for all five leases to be executed would significantly delay development or if lenders or underwriters would prefer to spread the risk across multiple financings.

3. The total development cost would be an estimated $35.9 million for 495,000 square feet of leasable space (Exhibit A-1).[21] Space would include 360,000 square feet in six new Butler-style buildings at an average of $77 per square foot plus 135,000 square feet of paved yard space. Combined, this averages out to $72.45 per square foot of leasable space.

- Exhibit A-1 presents detailed development cost estimates for doing the park in a single financing package. Appendix 1 presents these details for each building done separately.

- If the sixth (exhibition and incubator) building were excluded from the original financing, the initial development cost would be reduced to $34.5 million (-3.9%) and the total leasable space would be reduced by 15,000 square feet (10,000 building and 5,000 yard). These reductions would not materially affect the numbers presented in the following analyses.

[21] This total does not include the pre-development costs for brownfield remediation or infrastructure identified in Part I.

- For comparison, Fantini & Gorga estimate the typical, national development cost for new, "good quality, well-located, highly-functional warehouse and distribution space" at $80 per square foot, with the probable rent being $8.00 per square foot or 10% of development cost.[22]

- Hard costs for buildings range from $70 to $80 per square foot. Recent construction cost experiences of local contractors ranged between $55 to $75 per square foot for steel buildings. We have assumed the higher number. Appendices 1 and 2 provide building-by-building cost estimates.

- Hard costs for paving exterior yard space were included in the costs of the park's infrastructure and excluded from building development.

- The development budget allows a 4% developer's fee ($1.29 million on the total budget)

- Construction financing is conservatively estimated at 9.25% interest for 12 months. (By comparison, Fantini & Gorga quote 4Q2006 rates for construction financing without takeout as ranging between 1.25% to 2.25% above LIBOR and rates for construction financing with takeout between 0.5% to 1.5% above LIBOR. With LIBOR at 5.36% in December, 2006, the former would range between 5.9% to 6.9%, and the latter from 6.6% to 7.6%.)[23]

- The total development cost includes $412,000 in estimated additional soft costs for EZ-IDA financing based on estimates supplied by EDC. (The sum of the EZ-IDA additional soft costs for each building does not add to the additional cost for the park in a single financing because of economies of scale.)

4. The original financing would include 75% ($26.9 million) in EZ-IDA debt and 25% ($8.97 million) in equity and credit enhancements from private investors and organizations like LISC, Enterprise, and SJF Ventures presumably, but not necessarily, using New Markets Tax Credits.

- The EZ-IDA loan at 6% would require annual debt service of $26,896,361, or $3.91 per square foot of leasable space. Compared to 75% debt from conventional lenders at 8%, the EZ-IDA loan would reduce annual debt service by $527,363, or $1.06 per square foot. See Option 1 vs. Option 2 in Exhibit A-2.

- The EZ-IDA loan rate is estimated at 75% of the conventional rate based on private communications with NYC EDC. Estimates of both rates are conservative. Fantini & Gorga quote 4Q2006 fixed rates from conventional lenders for industrial properties as ranging between 0.85% (best) to 1.10% (middle for a full loan on a good asset) to 1.40% ("hairy") above 10-year Treasuries which were 4.625% in December, 2006.[24] Accordingly, industrial loans from conventional lenders would currently range between 5.475% (best) to 5.725%

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[22] Fantini & Gorga, Master Money Matrix - Feasibility Edition, December, 2006 www.fantinigorga.com

[23] Fantini & Gorga, Master Money Matrix - Overview Edition, October, 2006 www.fantinigorga.com

[24] Fantini & Gorga, Pocket Guide Fourth Quarter 2006 www.fantinigorga.com

(middle) to 6.025% ("hairy"). At 75% thereof, the EZ-IDA rate would be approximately 4.25%.

- Each 1% reduction in debt service could translate into a $0.41 per square foot reduction in carrying costs and a comparable increase in net operating income.

- On an equity investment or credit-enhancing loan of $8.97 million, each 1% of capitalization rate would require $89,650 or $0.18 per square foot in net operating income. Credit-enhancing loans between 1% to 3% would obligate between $0.18 to $0.54 per square foot of NOI. Equity investors expecting a cap rate of between 4% to 5% would obligate between $0.72 to $0.90 per square foot of NOI. Either alternative can be accommodated by an average minimum triple-net building rent ranging between $8 to $10 per square foot. See Option 2 in Exhibit A-2.

- The fact that the buildings being developed would be multi-purpose industrial (manufacturing, warehouse, and distribution) structures alleviates, to some extent, the investors' and lenders' risk should it be necessary for the developers to broaden the rental market beyond the intended types of targets.

5. With this original financing, the park would be financially viable on an average minimum triple-net building rent of between $8-to-$10 per square foot. Estimated debt service coverage would be 1.1 at $8 per square foot, 1.3 at $9 per square foot, 1.5 at $10 per square foot and 1.7 at $11 per square foot. (See Exhibit A-3 and discussion below).

- The going rents for existing industrial space in the Bronx range from $8-to-$10 per square foot.[25] Hence, the park's asking rent would be considered below-market for prime new industrial buildings with rail and barge access. Nonetheless, they are likely to be the maximum that the park's target companies can be expected to pay during the initial term of their leases. Regionally in 3Q2006, the average triple-net rent being asked for warehouse-distribution facilities on Long Island was $8.19 per square foot. In New Jersey's Meadowlands submarket, the average triple-net rent being asked for standard industrial space was $7.17 and in its Hudson Waterfront submarket, it was $5.41.[26] Furthermore, the target companies which would be recruited to New York from other locations have been paying between $3 and $4 dollars a square foot. Marketing efforts would have to stress the off-setting cost savings on transportation via propinquity and access to markets as well as use of rail and barge.[27]

- At $8 per square foot, the park would generate $3.08 million in rent annually which covers the $1.93 million in EZ-IDA debt service ($3.91 per SF) leaving $1.15 million or $2.32 per square

[25] Wendy Davis, "Bronx Offers Refuge for Manufacturers," January 14, 2007, Crain's New York Business.com: "While the Bronx has also seen a decline in industrial space due largely to zoning changes affecting 1.6 million square feet, the borough still has a lot of available inventory. In addition, the price pressure on industrial leases has been far less severe than in other boroughs. Rents for industrial space now hover between $10 and $12 a square foot in Queens, compared with a range of just $8 to $10 in the Bronx, says Sholom & Zuckerbrot's Mr. Ritter." [underlining added]

[26] Grubb & Ellis, "Industrial Market Snapshot: North Central New Jersey Third Quarter 2006," p. 6.

[27] If these and other cost adjustments were not sufficiently persuasive reasons, occupants would presumably seek to reduce other operating costs and community residents might have to tolerate adjustments in expected wage and salary levels. A $1 per square foot in average rent for 495,000 square feet would be the annual equivalent of $1 per hour in wages for 238 full-time employees.

foot in net operating income for all other purposes. At a 3% cap rate or credit-enhancing loan rate, $0.54 would required for obligations to investors or lenders, leaving $1.78 per square foot available for operating costs, lender's reserves, and payments to the city. (see Option 2 in Exhibit A-2).

- At $9 per square foot, the park would generate $3.44 million in rent annually which covers the $1.93 million in EZ-IDA debt service ($3.91 per SF) leaving $1.5 million or $3.05 per square foot in net operating income for all other purposes. At a 3% cap rate or credit-enhancing loan rate, $0.54 would required for obligations to investors or lenders, leaving $2.51 per square foot available for operating costs, lender's reserves, and payments to the city. (see Option 2 in Exhibit A-2).

- At $10 per square foot, the park would generate $3.8 million in rent annually which covers the $1.9 million in EZ-IDA debt service ($3.91 per SF) leaving $1.87 million or $3.77 per square foot in net operating income for all other purposes. At a 3% cap rate or credit-enhancing loan rate, $0.54 would required for obligations to investors or lenders, leaving $3.23 per square foot available for operating costs, lender's reserves, and payments to the city. (see Option 2 in Exhibit A-2).

- The National Association of Industrial and Office Properties's survey of the northeast regional market's 2001-2002 operating costs for industrial properties to be, at the high end, about $1.42 per square foot, and at the median about $0.75 per square foot, for common area maintenance, repairs and maintenance, property management and insurance.[28] Assuming conservatively an additional 20% upward adjustment in expenses for a New York City location five years in the future would bring the estimated operating costs for the park to be, at the high end, about $1.70 per square foot for common area maintenance, repairs and maintenance, property management and insurance. Assuming lender's reserve requirements of $0.25 per square foot would bring the park's estimated carrying costs before debt service, distributions to investors and payments to the City at $1.95 per square foot. Based on these assumptions, Exhibit A-3 presents the estimated debt service coverage ratios between net operating income and debt service at different rent levels.

- At $8 per square foot of building space, the park's total annual rent would average $6.23 per square foot for combined 495,000 square feet of building and exterior space. Subtracting $1.95 per square foot for operating costs and lender's reserves would leave net operating income of $4.28 per square foot, or 1.1 times the $3.91 per square foot debt service on the EZ-IDA loan. After the payment of debt service, there would be only $0.37 per square foot available, first, for credit enhancement loan payments and distributions to investors and, second, for lease payments to the city. Exhibit A-3, Option 2.

- At $9 per square foot of building space, the park's total annual rent would average $6.95 per square foot for combined building and exterior space. Subtracting $1.95 per square foot for

[28] NAIOP, *Industrial Income and Expense Report: 2001-2002*, p.19

operating costs and lender's reserves would leave net operating income of $5.00 per square foot, or 1.3 times the $3.91 debt service on the EZ-IDA loan. After the payment of debt service, there would be $1.10 per square foot available, first, for credit enhancement loan payments and distributions to investors and, second, for lease payments to the city. At a 3% cap rate or interest rate, the former would receive $0.54 per square foot and the city, $0.55 per square foot. At 6%, the former would receive $1.09 per square foot and the city, $0.01 per square foot. Exhibit A-3, Option 2.

- At $10 per square foot of building space, the park's total annual rent would average $7.68 per square foot for combined building and exterior space. Subtracting $1.95 per square foot for operating costs and lender's reserves would leave net operating income of $5.73 per square foot, or 1.5 times the $3.91 debt service on the EZ-IDA loan. After the payment of debt service, there would be $1.82 per square foot available, first, for credit enhancement loan payments and distributions to investors and, second, for lease payments to the city. At a 3% cap rate or interest rate, the former would receive $0.54 per square foot and the city, $1.28 per square foot. At 6%, the former would receive $1.09 per square foot and the city, $0.74 per square foot. Exhibit A-3, Option 2.

- At $11 per square foot of building space, the park's total annual rent would average $8.41 per square foot for combined building and exterior space. Subtracting $1.95 per square foot for operating costs and lender's reserves would leave net operating income of $6.46 per square foot, or 1.7 times the $3.91 debt service on the EZ-IDA loan. After the payment of debt service, there would be $2.55 per square foot available, first, for credit enhancement loan payments and distributions to investors and, second, for lease payments to the city. At a 3% cap rate or interest rate, the former would receive $0.54 per square foot and the city, $2.01 per square foot. At 6%, the former would receive $1.09 per square foot and the city, $1.46 per square foot. Exhibit A-3, Option 2.

EXHIBIT A - 1

COMPLETE PARK FINANCED AS A SINGLE PACKAGE – DEVELOPMENT BUDGET

Bronx Eco-Industrial Park **Simplified I & E Pro Forma** **Sustainable Enterprise** 29-Dec-06	**DEVELOPMENT COST** TOTAL COST	Occupied Sq Feet	Cost per SF
Total Buildings	$27,700,000	360,000	$77
Total Yards	$0	135,000	infrastrux
Total Roof Rails - LF	$1,400,000	6,000	$233 /LF
Total Hard Costs	$29,100,000	495,000	$59
Total Soft Costs	$6,349,567		
Total Development - conventional finance	**$35,449,567**	495,000	$71.62
Total Development- EZ/IDA added soft costs	$412,248		
Total Development w/ EZ-IDA bonds	**$35,861,815**	495,000	$72.45

TOTAL PARK DEVELOPMENT			
SOFT COSTS			
Legal	60,000		
Construction Consultant	30,000		
Bank's Engineer	30,000		
Accounting	20,000		
Environmental Report	na		remediated
Appraisal			land held by city
Bank's Legal	60,000		
Title Insurance			land held by city
Developer Fee	1,290,180	4.00%	of total cost
Insurance	1,164,000	4.00%	of hard cost
Soft Cost Contingency	265,418	10.00%	of soft cost
Subtotal	2,919,598		
Construction Interest for 12 months	2,978,127	9.25%	of total cost
Interest on construction interest	275,477	9.25%	of capitalizd intst
Bank's Commitment Fee	176,366	0.50%	of total cost
TOTAL SOFT COSTS	6,349,567		
		21.82%	

E/Z & IDA Added Soft Costs

Closing fee up to $5 million bond	1.00%
Closing fee amount > $5 million	
1% on first $5 million plus	1.00%
0.5% on amount > $5million	0.50%
Average bond counsel fee	$130,000
Other	$10,000

Source: NYC EDC private communication

EXHIBIT A - 2

COMPLETE PARK FINANCED AS A SINGLE PACKAGE -- FINANCING OPTIONS & SIMPLE I & E PRO FORMA

Bronx Eco-Industrial Park	Occupied
Simplified I & E Pro Forma	Sq Feet
Total Buildings	360,000
Total Yards	135,000
Total Occupied Space	495,000

OPTION 1 - 75% Conventional financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X Building	Annual Rent Net 3X Buildings	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% Conventional Loan @ 8% 30 years**	Annual Debt Service Conventional Loan	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$2,520,000	$202,500	$2,722,500	$8,862,392	$26,587,175	$2,462,450	$4.97	$260,050	$0.53	$0.18
$8.00	$2,880,000	$202,500	$3,082,500	$8,862,392	$26,587,175	$2,462,450	$4.97	$620,050	$1.25	$0.18
$9.00	$3,240,000	$202,500	$3,442,500	$8,862,392	$26,587,175	$2,462,450	$4.97	$980,050	$1.98	$0.18
$10.00	$3,600,000	$202,500	$3,802,500	$8,862,392	$26,587,175	$2,462,450	$4.97	$1,340,050	$2.71	$0.18
$11.00	$3,960,000	$202,500	$4,162,500	$8,862,392	$26,587,175	$2,462,450	$4.97	$1,700,050	$3.43	$0.18

OPTION 2 - 75% Empowerment Zone / IDA bond financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X Building	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% EZ - IDA Loan @ 6% 30 years**	Annual Debt Service **EZ - IDA Loan**	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$2,520,000	$202,500	$2,722,500	$8,965,454	$26,896,361	$1,935,087	$3.91	$787,413	$1.59	$0.18
$8.00	$2,880,000	$202,500	$3,082,500	$8,965,454	$26,896,361	$1,935,087	$3.91	$1,147,413	$2.32	$0.18
$9.00	$3,240,000	$202,500	$3,442,500	$8,965,454	$26,896,361	$1,935,087	$3.91	$1,507,413	$3.05	$0.18
$10.00	$3,600,000	$202,500	$3,802,500	$8,965,454	$26,896,361	$1,935,087	$3.91	$1,867,413	$3.77	$0.18
$11.00	$3,960,000	$202,500	$4,162,500	$8,965,454	$26,896,361	$1,935,087	$3.91	$2,227,413	$4.50	$0.18

EXHIBIT A - 3

COMPLETE PARK FINANCED AS A SINGLE PACKAGE -- DEBT SERVICE COVERAGE & LEASE PAYMENTS

OPTION 1 - 75% Conventional financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Building	Total Annual Rent	Combined Annual Rent / SF Bldg plus Yard @ $1.50	Estimated Operating Costs per SF	Estimated Lenders Reserves per SF	Estimated Net Operating Income per SF	Conventional Debt Service per SF	Estimated NOI Debt Service Coverage Ratio	Estimated Balance after Debt Service per SF	Estimated Payment Equity or Credit Enhance per SF @ 3%	Estimated Lease Payment to City per SF	Estimated Payment/SF Equity or Credit Enhance per SF @ 6%	Estimated Lease Payment to City per SF
$7.00	$2,722,500	$5.50	$1.70	$0.25	$3.55	$4.97	0.7	($1.42)	$0.54	($1.96)	$1.07	($2.50)
$8.00	$3,082,500	$6.23	$1.70	$0.25	$4.28	$4.97	0.9	($0.70)	$0.54	($1.23)	$1.07	($1.77)
$9.00	$3,442,500	$6.95	$1.70	$0.25	$5.00	$4.97	1.0	$0.03	$0.54	($0.51)	$1.07	($1.04)
$10.00	$3,802,500	$7.68	$1.70	$0.25	$5.73	$4.97	1.2	$0.76	$0.54	$0.22	$1.07	($0.32)
$11.00	$4,162,500	$8.41	$1.70	$0.25	$6.46	$4.97	1.3	$1.48	$0.54	$0.95	$1.07	$0.41

OPTION 2 - 75% Empowerment Zone / IDA bond financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Building	Total Annual Rent	Combined Annual Rent / SF Bldg @ plus Yard @ $1.50	Estimated Operating Costs per SF	Estimated Lenders Reserves per SF	Estimated Net Operating Income per SF	EZ-IDA Debt Service per SF	Estimated NOI Debt Service Coverage Ratio	Estimated Balance after Debt Service per SF	Estimated Payment Equity or Credit Enhance per SF @ 3%	Estimated Lease Payment to City per SF	Estimated Payment Equity or Credit Enhance per SF @ 6%	Estimated Lease Payment to City per SF
$7.00	$2,722,500	$5.50	$1.70	$0.25	$3.55	$3.91	0.9	($0.36)	$0.54	($0.90)	$1.09	($1.45)
$8.00	$3,082,500	$6.23	$1.70	$0.25	$4.28	$3.91	1.1	$0.37	$0.54	($0.18)	$1.09	($0.72)
$9.00	$3,442,500	$6.95	$1.70	$0.25	$5.00	$3.91	1.3	$1.10	$0.54	$0.55	$1.09	$0.01
$10.00	$3,802,500	$7.68	$1.70	$0.25	$5.73	$3.91	1.5	$1.82	$0.54	$1.28	$1.09	$0.74
$11.00	$4,162,500	$8.41	$1.70	$0.25	$6.46	$3.91	1.7	$2.55	$0.54	$2.01	$1.09	$1.46

APPENDIX 1

BUILDING-BY-BUILDING
DEVELOPMENT BUDGETS
FINANCING OPTIONS
PRO FORMA

BUILDING BY BUILDING DEVELOPMENT COST – BUILDING A

Bx Eco-Industrial Park **Simplified I & E Pro Forma** **Sustainable Enterprise** 29-Dec-06	**DEVELOPMENT COST** TOTAL COST	Occupied Sq Feet	Cost per SF
GLASS			
Building A - structure	$2,100,000	30,000	$70
Building A - yard	$0	10,000	infrastrux
Building A - roof rail LF	$160,000	800	$200 /LF
Building A - subtotal hard costs	$2,260,000	40,000	$57
Building A- soft costs	$624,888		
Building A- TOTAL conventional	$2,884,888	40,000	$72.12
Building A- EZ - IDA added soft costs	$168,849		
Building A - TOTAL w/ EZ - IDA bonds	$3,053,737	40,000	$76.34

BUILDING A
SOFT COSTS

Legal	40,000		
Construction Consultant	10,000		
Bank's Engineer	15,000		
Accounting	5,000		
Environmental Report	na		remediated
Appraisal			land held by city
Bank's Legal	40,000		
Title Insurance			land held by city
Developer Fee	113,925	4.00%	of total cost
Insurance	90,400	4.00%	of hard cost
Soft Cost Contingency	31,432	10.00%	of soft cost
Subtotal	345,757		
Construction Interest @ 9% for 12 months	242,360	9.25%	of total cost
Interest on construction interest	22,418	9.25%	of capitalizd intst
Bank's Commitment Fee	14,353	0.50%	of total cost
TOTAL SOFT COSTS	624,888		
		27.65%	

E/Z & IDA Added Soft Costs

Closing fee up to $5 million bond	1.00%
Closing fee amount > $5 million	
1% on first $5 million plus	1.00%
0.5% on amount > $5million	0.50%
Average bond counsel fee	$130,000
Other	$10,000

BUILDING BY BUILDING DEVELOPMENT COST – BUILDING A

Bx Eco-Industrial Park	Occupied
Simplified I & E Pro Forma	Sq Feet
GLASS	
Building A - structure	30,000
Building A - yard	10,000
Building A - total occupied space	40,000

OPTION 1 - Conventional financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X Building	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% Conventional Loan @ 8% 30 years**	Annual Debt Service Conventional Loan	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$210,000	$15,000	$225,000	$721,222	$2,163,666	$190,515	$4.76	$34,485	$0.86	$0.18
$8.00	$240,000	$15,000	$255,000	$721,222	$2,163,666	$190,515	$4.76	$64,485	$1.61	$0.18
$9.00	$270,000	$15,000	$285,000	$721,222	$2,163,666	$190,515	$4.76	$94,485	$2.36	$0.18
$10.00	$300,000	$15,000	$315,000	$721,222	$2,163,666	$190,515	$4.76	$124,485	$3.11	$0.18
$11.00	$330,000	$15,000	$345,000	$721,222	$2,163,666	$190,515	$4.76	$154,485	$3.86	$0.18

OPTION 2 - 75% Empowerment Zone / IDA bond financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X **Building**	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% EZ - IDA Loan @ 6% 30 years**	Annual Debt Service **EZ - IDA Loan**	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$210,000	$15,000	$225,000	$763,434	$2,290,303	$164,778	$4.12	$60,222	$1.51	$0.19
$8.00	$240,000	$15,000	$255,000	$763,434	$2,290,303	$164,778	$4.12	$90,222	$2.26	$0.19
$9.00	$270,000	$15,000	$285,000	$763,434	$2,290,303	$164,778	$4.12	$120,222	$3.01	$0.19
$10.00	$300,000	$15,000	$315,000	$763,434	$2,290,303	$164,778	$4.12	$150,222	$3.76	$0.19
$11.00	$330,000	$15,000	$345,000	$763,434	$2,290,303	$164,778	$4.12	$180,222	$4.51	$0.19

BUILDING BY BUILDING DEVELOPMENT COST – BUILDING B

Bx Eco-Industrial Park **Simplified I & E Pro Forma** **Sustainable Enterprise** 29-Dec-06	**DEVELOPMENT COST** TOTAL COST	Occupied Sq Feet	Cost per SF
PLASTICS			
Building B - structure	$2,800,000	40,000	$70
Building B - yard	$0	20,000	infrastrux
Building B - roof rail LF	$160,000	800	$200 /LF
Building B - subtotal hard costs	$2,960,000	60,000	$49
Building B- soft costs	$755,528		
Building B - TOTAL conventional	$3,715,528	60,000	$61.93
Building B- EZ/IDA added soft costs	$177,155		
Building B - TOTAL w/ EZ-IDA bonds	$3,892,684	60,000	$64.88

BUILDING B
SOFT COSTS

Legal	40,000		
Construction Consultant	10,000		
Bank's Engineer	15,000		
Accounting	5,000		
Environmental Report	na		remediated
Appraisal			land held by city
Bank's Legal	40,000		
Title Insurance			land held by city
Developer Fee	131,625	4.00%	of total cost
Insurance	118,400	4.00%	of hard cost
Soft Cost Contingency	36,003	10.00%	of soft cost
Subtotal	396,028		
Construction Interest @ 9% for 12 months	312,142	9.25%	of total cost
Interest on construction interest	28,873	9.25%	of capitalizd intst
Bank's Commitment Fee	18,485	0.50%	of total cost
TOTAL SOFT COSTS	755,528		
		25.52%	

E/Z & IDA Added Soft Costs

Closing fee up to $5 million bond	1.00%
Closing fee amount > $5 million	
1% on first $5 million plus	1.00%
0.5% on amount > $5million	0.50%
Average bond counsel fee	$130,000
Other	$10,000

BUILDING BY BUILDING DEVELOPMENT COST – BUILDING B

Bx Eco-Industrial Park	Occupied
Simplified I & E Pro Forma	Sq Feet
PLASTICS	
Building B - structure	40,000
Building B - yard	20,000
Building B - total occupied space	60,000

OPTION 1 - Conventional financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X Building	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% Conventional Loan @ 8% 30 years**	Annual Debt Service Conventional Loan	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$280,000	$30,000	$310,000	$928,882	$2,786,646	$245,369	$4.09	$64,631	$1.08	$0.15
$8.00	$320,000	$30,000	$350,000	$928,882	$2,786,646	$245,369	$4.09	$104,631	$1.74	$0.15
$9.00	$360,000	$30,000	$390,000	$928,882	$2,786,646	$245,369	$4.09	$144,631	$2.41	$0.15
$10.00	$400,000	$30,000	$430,000	$928,882	$2,786,646	$245,369	$4.09	$184,631	$3.08	$0.15
$11.00	$440,000	$30,000	$470,000	$928,882	$2,786,646	$245,369	$4.09	$224,631	$3.74	$0.15

OPTION 2 - 75% Empowerment Zone / IDA bond financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X **Building**	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% EZ - IDA Loan @ 6% 30 years**	Annual Debt Service **EZ - IDA Loan**	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$280,000	$30,000	$310,000	$973,171	$2,919,513	$210,047	$3.50	$99,953	$1.67	$0.16
$8.00	$320,000	$30,000	$350,000	$973,171	$2,919,513	$210,047	$3.50	$139,953	$2.33	$0.16
$9.00	$360,000	$30,000	$390,000	$973,171	$2,919,513	$210,047	$3.50	$179,953	$3.00	$0.16
$10.00	$400,000	$30,000	$430,000	$973,171	$2,919,513	$210,047	$3.50	$219,953	$3.67	$0.16
$11.00	$440,000	$30,000	$470,000	$973,171	$2,919,513	$210,047	$3.50	$259,953	$4.33	$0.16

BUILDING BY BUILDING DEVELOPMENT COST – BUILDING C

Bx Eco-Industrial Park **Simplified I & E Pro Forma** **Sustainable Enterprise** 29-Dec-06	**DEVELOPMENT COST** TOTAL COST	Occupied Sq Feet	Cost per SF
PAPER			
Building C - structure	$6,400,000	80,000	$80
Building C - yard	$0	20,000	infrastrux
Building C - roof rail LF	$320,000	1,600	$200 /LF
Building C - subtotal hard costs	$6,720,000	100,000	$67
Building C- soft costs	$1,544,345		
Building C - TOTAL conventional	$8,264,345	100,000	$82.64
Building C- EZ/IDA added soft costs	$214,922		
Building C- TOTAL w/ EZ-IDA bonds	$8,479,267	100,000	$84.79

BUILDING C
SOFT COSTS

Legal	40,000		
Construction Consultant	10,000		
Bank's Engineer	15,000		
Accounting	5,000		
Environmental Report	na		remediated
Appraisal			land held by city
Bank's Legal	40,000		
Title Insurance			land held by city
Developer Fee	298,216	4.00%	of total cost
Insurance	268,800	4.00%	of hard cost
Soft Cost Contingency	67,702	10.00%	of soft cost
Subtotal	744,718		
Construction Interest for 12 months	694,290	9.25%	of total cost
Interest on construction interest	64,222	9.25%	of capitalizd intst
Bank's Commitment Fee	41,116	0.50%	of total cost
TOTAL SOFT COSTS	1,544,345		
		22.98%	

E/Z & IDA Added Soft Costs

Closing fee up to $5 million bond	1.00%
Closing fee amount > $5 million	
1% on first $5 million plus	1.00%
0.5% on amount > $5million	0.50%
Average bond counsel fee	$130,000
Other	$10,000

BUILDING BY BUILDING DEVELOPMENT COST – BUILDING C

Bx Eco-Industrial Park	Occupied
Simplified I & E Pro Forma	Sq Feet
PAPER	
Building C - structure	80,000
Building C - yard	20,000
Building C - total occupied space	100,000

OPTION 1 - Conventional financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X Building	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% Conventional Loan @ 8% 30 years**	Annual Debt Service Conventional Loan	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$560,000	$30,000	$590,000	$2,066,086	$6,198,259	$545,768	$5.46	$44,232	$0.44	$0.21
$8.00	$640,000	$30,000	$670,000	$2,066,086	$6,198,259	$545,768	$5.46	$124,232	$1.24	$0.21
$9.00	$720,000	$30,000	$750,000	$2,066,086	$6,198,259	$545,768	$5.46	$204,232	$2.04	$0.21
$10.00	$800,000	$30,000	$830,000	$2,066,086	$6,198,259	$545,768	$5.46	$284,232	$2.84	$0.21
$11.00	$880,000	$30,000	$910,000	$2,066,086	$6,198,259	$545,768	$5.46	$364,232	$3.64	$0.21

OPTION 2 - 75% Empowerment Zone / IDA bond financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X **Building**	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% EZ - IDA Loan @ 6% 30 years**	Annual Debt Service **EZ - IDA Loan**	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$560,000	$30,000	$590,000	$2,119,817	$6,359,450	$457,537	$4.58	$132,463	$1.32	$0.21
$8.00	$640,000	$30,000	$670,000	$2,119,817	$6,359,450	$457,537	$4.58	$212,463	$2.12	$0.21
$9.00	$720,000	$30,000	$750,000	$2,119,817	$6,359,450	$457,537	$4.58	$292,463	$2.92	$0.21
$10.00	$800,000	$30,000	$830,000	$2,119,817	$6,359,450	$457,537	$4.58	$372,463	$3.72	$0.21
$11.00	$880,000	$30,000	$910,000	$2,119,817	$6,359,450	$457,537	$4.58	$452,463	$4.52	$0.21

BUILDING BY BUILDING DEVELOPMENT COST – BUILDING D

Bx Eco-Industrial Park **Simplified I & E Pro Forma** **Sustainable Enterprise** 29-Dec-06	**DEVELOPMENT COST** TOTAL COST	Occupied Sq Feet	Cost per SF
LUMBER			
Building D - structure	$2,800,000	40,000	$70
Building D - yard	$0	40,000	infrastrux
Building D - roof rail LF	$200,000	1,000	$200 /LF
Building D - subtotal hard costs	$3,000,000	80,000	$38
Building D- soft costs	$763,920		
Building D - TOTAL conventional	$3,763,920	80,000	$47.05
Building D- EZ/IDA added soft costs	$177,639		
Building D - TOTAL w/ EZ-IDA bonds	$3,941,559	80,000	$49.27

BUILDING D
SOFT COSTS

Legal	40,000		
Construction Consultant	10,000		
Bank's Engineer	15,000		
Accounting	5,000		
Environmental Report	na		remediated
Appraisal			land held by city
Bank's Legal	40,000		
Title Insurance			land held by city
Developer Fee	133,397	4.00%	of total cost
Insurance	120,000	4.00%	of hard cost
Soft Cost Contingency	36,340	10.00%	of soft cost
Subtotal	399,737		
Construction Interest for 12 months	316,208	9.25%	of total cost
Interest on construction interest	29,249	9.25%	of capitalizd intst
Bank's Commitment Fee	18,726	0.50%	of total cost
TOTAL SOFT COSTS	763,920		
		25.46%	

E/Z & IDA Added Soft Costs

Closing fee up to $5 million bond	1.00%
Closing fee amount > $5 million	
1% on first $5 million plus	1.00%
0.5% on amount > $5million	0.50%
Average bond counsel fee	$130,000
Other	$10,000

BUILDING BY BUILDING DEVELOPMENT COST – BUILDING D

Bx Eco-Industrial Park	Occupied
Simplified I & E Pro Forma	Sq Feet
LUMBER	
Building D - structure	40,000
Building D - yard	40,000
Building D - total occupied space	80,000

OPTION 1 - Conventional financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X Building	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% Conventional Loan @ 8% 30 years**	Annual Debt Service Conventional Loan	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$280,000	$60,000	$340,000	$940,980	$2,822,940	$248,565	$3.11	$91,435	$1.14	$0.12
$8.00	$320,000	$60,000	$380,000	$940,980	$2,822,940	$248,565	$3.11	$131,435	$1.64	$0.12
$9.00	$360,000	$60,000	$420,000	$940,980	$2,822,940	$248,565	$3.11	$171,435	$2.14	$0.12
$10.00	$400,000	$60,000	$460,000	$940,980	$2,822,940	$248,565	$3.11	$211,435	$2.64	$0.12
$11.00	$440,000	$60,000	$500,000	$940,980	$2,822,940	$248,565	$3.11	$251,435	$3.14	$0.12

OPTION 2 - 75% Empowerment Zone / IDA bond financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X **Building**	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% EZ - IDA Loan @ 6% 30 years**	Annual Debt Service **EZ - IDA Loan**	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$280,000	$60,000	$340,000	$985,390	$2,956,169	$212,685	$2.66	$127,315	$1.59	$0.12
$8.00	$320,000	$60,000	$380,000	$985,390	$2,956,169	$212,685	$2.66	$167,315	$2.09	$0.12
$9.00	$360,000	$60,000	$420,000	$985,390	$2,956,169	$212,685	$2.66	$207,315	$2.59	$0.12
$10.00	$400,000	$60,000	$460,000	$985,390	$2,956,169	$212,685	$2.66	$247,315	$3.09	$0.12
$11.00	$440,000	$60,000	$500,000	$985,390	$2,956,169	$212,685	$2.66	$287,315	$3.59	$0.12

BUILDING BY BUILDING DEVELOPMENT COST – BUILDING E

Bx Eco-Industrial Park **Simplified I & E Pro Forma** **Sustainable Enterprise** 29-Dec-06	**DEVELOPMENT COST** TOTAL COST	Occupied Sq Feet	Cost per SF
C & D RECYCLING			
Building E - structure	$12,800,000	160,000	$80
Building E - yard	$0	40,000	infrastrux
Building E - roof rail LF	$360,000	1,800	$200 /LF
Building E - subtotal hard costs	$13,160,000	200,000	$66
Building E- soft costs	$2,895,404		
Building E - TOTAL conventional	$16,055,404	200,000	$80.28
Building E- EZ/IDA added soft costs	$245,277		
Building E - TOTAL w/ EZ-IDA bonds	$16,300,681	200,000	$81.50

BUILDING E
SOFT COSTS

Legal	40,000		
Construction Consultant	10,000		
Bank's Engineer	15,000		
Accounting	5,000		
Environmental Report	na		remediated
Appraisal			land held by city
Bank's Legal	40,000		
Title Insurance			land held by city
Developer Fee	583,533	4.00%	of total cost
Insurance	526,400	4.00%	of hard cost
Soft Cost Contingency	121,993	10.00%	of soft cost
Subtotal	1,341,926		
Construction Interest for 12 months	1,348,459	9.25%	of total cost
Interest on construction interest	124,732	9.25%	of capitalizd intst
Bank's Commitment Fee	79,857	0.50%	of total cost
TOTAL SOFT COSTS	2,894,974		
		22.00%	

E/Z & IDA Added Soft Costs

Closing fee up to $5 million bond	1.00%
Closing fee amount > $5 million	
1% on first $5 million plus	1.00%
0.5% on amount > $5million	0.50%
Average bond counsel fee	$130,000
Other	$10,000

BUILDING BY BUILDING DEVELOPMENT COST – BUILDING E

Bx Eco-Industrial Park	Occupied
Simplified I & E Pro Forma	Sq Feet
C & D RECYCLING	
Building E - structure	160,000
Building E - yard	40,000
Building E - total occupied space	200,000

OPTION 1 - Conventional financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X Building	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% Conventional Loan @ 8% 30 years**	Annual Debt Service Conventional Loan	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$1,120,000	$60,000	$1,180,000	$4,013,851	$12,041,553	$1,060,280	$5.30	$119,720	$0.60	$0.20
$8.00	$1,280,000	$60,000	$1,340,000	$4,013,851	$12,041,553	$1,060,280	$5.30	$279,720	$1.40	$0.20
$9.00	$1,440,000	$60,000	$1,500,000	$4,013,851	$12,041,553	$1,060,280	$5.30	$439,720	$2.20	$0.20
$10.00	$1,600,000	$60,000	$1,660,000	$4,013,851	$12,041,553	$1,060,280	$5.30	$599,720	$3.00	$0.20
$11.00	$1,760,000	$60,000	$1,820,000	$4,013,851	$12,041,553	$1,060,280	$5.30	$759,720	$3.80	$0.20

OPTION 2 - 75% Empowerment Zone / IDA bond financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X **Building**	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% EZ - IDA Loan @ 6% 30 years**	Annual Debt Service **EZ - IDA Loan**	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$1,120,000	$60,000	$1,180,000	$4,075,170	$12,225,511	$879,577	$4.40	$300,423	$1.50	$0.20
$8.00	$1,280,000	$60,000	$1,340,000	$4,075,170	$12,225,511	$879,577	$4.40	$460,423	$2.30	$0.20
$9.00	$1,440,000	$60,000	$1,500,000	$4,075,170	$12,225,511	$879,577	$4.40	$620,423	$3.10	$0.20
$10.00	$1,600,000	$60,000	$1,660,000	$4,075,170	$12,225,511	$879,577	$4.40	$780,423	$3.90	$0.20
$11.00	$1,760,000	$60,000	$1,820,000	$4,075,170	$12,225,511	$879,577	$4.40	$940,423	$4.70	$0.20

BUILDING BY BUILDING DEVELOPMENT COST – BUILDING F

Bx Eco-Industrial Park **Simplified I & E Pro Forma** **Sustainable Enterprise** 29-Dec-06	**DEVELOPMENT COST** TOTAL COST	Occupied Sq Feet	Cost per SF
EXHIBITION & INCUBATOR			
Building F - structure	$800,000	10,000	$80
Building F - yard	$0	5,000	infrastrux
Building F - roof rail	$200,000	1,000	$200 /LF
Building F - subtotal hard costs	$1,000,000	15,000	$67
Building F- soft costs	$344,337		
Building F - TOTAL conventional	$1,344,337	15,000	$89.62
Building HQ- EZ/IDA added soft costs	$153,443		
Building HQ - TOTAL w/ EZ-IDA bonds	$1,497,780	15,000	$99.85

BLDG EXHIBITION & INCUBATOR

SOFT COSTS

Legal	40,000		
Construction Consultant	10,000		
Bank's Engineer	15,000		
Accounting	5,000		
Environmental Report	na		remediated
Appraisal			land held by city
Bank's Legal	40,000		
Title Insurance			land held by city
Developer Fee	44,785	4.00%	of total cost
Insurance	40,000	4.00%	of hard cost
Soft Cost Contingency	19,479	10.00%	of soft cost
Subtotal	214,264		
Construction Interest for 12 months	112,938	9.25%	of total cost
Interest on construction interest	10,447	9.25%	of capitalizd intst
Bank's Commitment Fee	6,688	0.50%	of total cost
TOTAL SOFT COSTS	344,337		
		34.43%	

E/Z & IDA Added Soft Costs

Closing fee up to $5 million bond	1.00%
Closing fee amount > $5 million	
1% on first $5 million plus	1.00%
0.5% on amount > $5million	0.50%
Average bond counsel fee	$130,000
Other	$10,000

BUILDING BY BUILDING DEVELOPMENT COST – BUILDING F

Bx Eco-Industrial Park Occupied
Simplified I & E Pro Forma Sq Feet

EXHIBITION & INCUBATOR

Building F - structure	10,000
Building F - yard	5,000
Building F - total occupied space	15,000

OPTION 1 - Conventional financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X Building	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% Conventional Loan @ 8% 30 years**	Annual Debt Service Conventional Loan	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$70,000	$7,500	$77,500	$336,084	$1,008,252	$88,778	$5.92	($11,278)	($0.75)	$0.22
$8.00	$80,000	$7,500	$87,500	$336,084	$1,008,252	$88,778	$5.92	($1,278)	($0.09)	$0.22
$9.00	$90,000	$7,500	$97,500	$336,084	$1,008,252	$88,778	$5.92	$8,722	$0.58	$0.22
$10.00	$100,000	$7,500	$107,500	$336,084	$1,008,252	$88,778	$5.92	$18,722	$1.25	$0.22
$11.00	$110,000	$7,500	$117,500	$336,084	$1,008,252	$88,778	$5.92	$28,722	$1.91	$0.22

OPTION 2 - 75% Empowerment Zone / IDA bond financing with 25% equity or credit enhancement

Minimum Average Rent/Sf Net 3X **Building**	Annual Rent Net 3X Building	Annual Rent Yard /SF @ $1.50	Total Annual Rent Net 3X	**25% Equity or Credit Enhancement @ 0%**	**75% EZ - IDA Loan @ 6% 30 years**	Annual Debt Service EZ - IDA Loan	D S per SF	Net Operating Income after DS	N O I per SF after DS	1% Cap Rate for Equity or Crdt Enhanc @ NOI / SF = to
$7.00	$70,000	$7,500	$77,500	$374,445	$1,123,335	$80,820	$5.39	($3,320)	($0.22)	$0.25
$8.00	$80,000	$7,500	$87,500	$374,445	$1,123,335	$80,820	$5.39	$6,680	$0.45	$0.25
$9.00	$90,000	$7,500	$97,500	$374,445	$1,123,335	$80,820	$5.39	$16,680	$1.11	$0.25
$10.00	$100,000	$7,500	$107,500	$374,445	$1,123,335	$80,820	$5.39	$26,680	$1.78	$0.25
$11.00	$110,000	$7,500	$117,500	$374,445	$1,123,335	$80,820	$5.39	$36,680	$2.45	$0.25

APPENDIX 2

HARD CONSTRUCTION COST ESTIMATES

PRE-DEVELOPMENT
&
ECO-INDUSTRIAL PARK

ITEM NO.	ITEM DESCRIPTION	UNIT	PRICE	QTY	AMOUNT
.	**Site Preparation**				
1	MOBILIZATION (6% OF TOTAL OF OTHER ITEMS)	LS	$ 2,877,651.32	1	$ 2,877,651.32
2	CONSTRUCTION SIGN ON FRAME	EA	$ 1,650.00	1	$ 1,650.00
3	CONSTRUCTION FENCE 8'-0" HT.	LF	$ 19.00	6350	$ 120,650.00
	Subtotal				**$ 2,999,951.32**
.	**Removals**				
4	REMOVALS	LS	$ 50,000.00	1	$ 50,000.00
	Subtotal				**$ 50,000.00**
.	**Site Work**				
5	CLEAR & GRUB	LS	$ 20,000.00	1	$ 20,000.00
6	ROCK EXCAVATION	CY	$ 325.00	20	$ 6,500.00
7	HAND AND/OR PNEUMATIC EXCAVATION	CY	$ 100.00	50	$ 5,000.00
8	UNCLASSIFIED EXCAVATION	CY	$ 40.00	22400	$ 896,000.00
9	TEMPORARY SHEETING	SF	$ 7.00	3500	$ 24,500.00
10	BORROWED FILL (TRUCK MEASURED)	CY	$ 31.00	200	$ 6,200.00
11	EARTH MOVING OPERATIONS	CY	$ 19.00	100	$ 1,900.00
12	GEOTEXTILE - DRAINAGE	SY	$ 4.75	5000	$ 23,750.00
	Subtotal				**$ 983,850.00**
.	**Utilities-Drainage**				
13	EXTRA STRENGTH SEWER PIPE - 36" DIA.	LF	$ 50.00	3750	$ 187,500.00
14	BROKEN STONE - LOOSE MEASURE	CY	$ 52.50	825	$ 43,312.50
15	BRICK MASONRY/PRECAST CONCRETE FOR D.S.	CY	$ 680.00	1500	$ 1,020,000.00
16	CATCH BASIN - D.E.P. TYPE 2	EA	$ 3,280.00	30	$ 98,400.00
17	MANHOLE - D.E.P. TYPE A-1	EA	$ 3,480.00	12	$ 41,760.00
18	MISCELLANEOUS IRON & STEEL	LB	$ 3.10	2000	$ 6,200.00
19	PRECAST DETENTION TANK	EA	$ 3,075.50	2	$ 6,151.00
20	STORMWATER POLLUTION PREVENTION PLAN	LS	$ 750,000.00	1	$ 750,000.00
	Subtotal				**$ 2,153,323.50**

ITEM NO.	ITEM DESCRIPTION	UNIT	PRICE	QTY	AMOUNT
.	**Utilities-Gas, Electric & Telephone**				
21	TELEPHONE CONDUIT - 4" DIA.	LF	$ 20.00	2800	$ 56,000.00
22	GAS SERVICE MAIN - 4" DIA.	LF	$ 48.00	2350	$ 112,800.00
23	GAS SERVICE MAIN - 8" DIA.	LF	$ 70.00	3750	$ 262,500.00
24	ALLOWANCE FOR UTILITY COMPANY FEES	AL	$ 75,000.00	1	$ 75,000.00
25	LIGHT POLE FIXTURES W/PEC	EA	$ 5,000.00	30	$ 150,000.00
26	CONDUIT AND WIRE	LF	$ 100.00	3750	$ 375,000.00
	Subtotal				**$ 1,031,300.00**
.	**Utilities - Water**				
27	WATER TAP - 2" DIA. (HQ)	EA	$ 2,840.00	1	$ 2,840.00
28	WATER TAP - 4" DIA. (All other buildings)	EA	$ 4,000.00	5	$ 20,000.00
29	RPZ & WATER METER & BOOSTER FOR BLDG. 2" DIA. (HQ)	EA	$ 16,200.00	1	$ 16,200.00
30	RPZ & WATER METER & BOOSTER FOR BLDG. 4" DIA. (All other buildings)	EA	$ 19,200.00	5	$ 96,000.00
31	TYPE K COPPER TUBING - 4" DIA.	LF	$ 36.00	2350	$ 84,600.00
32	GATE VALVE - MECHANICAL JOINTS - 4" DIA.	EA	$ 472.00	6	$ 2,832.00
33	GLOBE VALVE - 4" DIA.	EA	$ 300.00	6	$ 1,800.00
34	CAST IRON VALVE BOX - 5 1/4" DIA.	EA	$ 235.00	6	$ 1,410.00
	Subtotal				**$ 225,682.00**

ITEM NO.	ITEM DESCRIPTION	UNIT	PRICE	QTY	AMOUNT
.	**Pavement - New**				
35	ASPHALTIC CONCRETE TOPCOURSE	SY	$ 13.50	20250	$ 273,375.00
36	10" REINFORCED CONCRETE PAVEMENT	SY	$ 64.00	20250	$ 1,296,000.00
37	6" SUBBASE FOUNDATION MATERIAL FOR CONCRETE (TRUCK MEASURE)	CY	$ 40.85	3725	$ 152,166.25
38	FULL DEPTH COLOR ASPHALT PAVEMENT (GREENWAY)	SY	$ 29.75	1300	$ 38,675.00
39	4" CONCRETE SIDEWALK	SF	$ 4.30	12500	$ 53,750.00
40	CONCRETE PAVERS ON ASPHALT BASE	SY	$ 106.00	225	$ 23,850.00
41	THERMOPLASTIC REFLECTORIZED PAVEMENT MARKINGS (4" WIDE)	LF	$ 0.60	7500	$ 4,500.00
	Subtotal				**$ 1,842,316.25**
.	**Curbs**				
42	CONCRETE CURB	CY	$ 521.00	250	$ 130,250.00
43	STEEL FACED CONCRETE CURB	LF	$ 64.00	400	$ 25,600.00
44	GRANITE BLOCK LANDSCAPE EDGING	LF	$ 18.00	1350	24,300.00
	Subtotal				**$ 180,150.00**

ITEM NO.	ITEM DESCRIPTION	UNIT	PRICE	QTY	AMOUNT
.	**Site Furnishings**				
45	BENCH, TYPE A W/ WOOD SLATS*	LF	$ 100.00	128	$ 12,800.00
46	METAL TRASH RECEPTACLE	EA	$ 260.00	6	$ 1,560.00
47	FURNISHING NEW TRAFFIC SIGN POSTS	LF	$ 4.00	48	$ 192.00
48	FURNISHING NEW REFLECTORIZED TRAFFIC SIGNS	SF	$ 13.00	75	$ 975.00
49	INSTALLING TRAFFIC SIGNS	SF	$ 9.25	75	$ 693.75
50	BICYCLE RACKS	EA	$ 1,000.00	2	$ 2,000.00
	Subtotal				**$ 18,220.75**
.	**Bikeways**				
51	GREENWAY SIGN 1.75 SF-TWO SIDE	EA	$ 250.00	2	$500.00
52	YOKE FOR GREENWAY SIGN	EA	$ 170.00	2	$340.00
53	HFPRM-LANE AND CENTER LINES	LF	$ 2.35	1475	$3,466.25
54	HFPRM-ARROW	EA	$ 138.50	2	$277.00
55	HFPRM-BICYCLE SYMBOL	EA	$ 171.50	2	$343.00
56	HFPRM-PEDESTRIAN SYMBOL	EA	$ 172.00	2	$344.00
57	GREENWAY SIGN POST	EA	$ 190.00	2	$380.00
58	PAVEMENT MARKINGS 4" LINE-WHITE OR YELLOW	LF	$ 1.50	1475	$2,212.50
	Subtotal				**$7,862.75**
.	**Fence - New**				
59	CHAIN LINK FENCE 15'-0" HT. *	LF	$ 90.00	7300	$ 657,000.00
60	DOUBLE GATE FOR CLF 10'-0" HT. & OVER *	EA	$ 3,550.00	7	$ 24,850.00
	Subtotal				**$ 681,850.00**
.	**Landscape - General**				
61	MULCH, FABRIC, TOPSOIL, JUTE MESH, PLANT MATERIAL, STREET TREES, INCLUDING GRADING & PLANTING FOR STORMWATER CONTROL	LS	$ 1,500,000.00	1	$ 1,500,000.00
	Subtotal				**$ 1,500,000.00**

ITEM NO.	ITEM DESCRIPTION	UNIT	PRICE	QTY	AMOUNT
.	**Butler Buildings**				
	BUILDING STEEL, INSULATED WALLS, INSULATED ROOF, FRAMED OPENINGS AND MISC. FLASHINGS. MAX R=19 FOR WALLS AND R=30 FOR ROOF, INCLUDING EXCAVATION AND SLAB				
62	BUILDINGS: A, B, & D	SF	$ 70.00	110000	$ 7,700,000.00
63	BUILDINGS: C & E	SF	$ 80.00	240000	$ 19,200,000.00
64	BUILDINGS: HQ	SF	$ 80.00	10000	$ 800,000.00
65	ROOF RAIL (BUILDINGS OVER 22' HEIGHT)	LF	$ 200.00	7000	$ 1,400,000.00
	Subtotal				**$ 29,100,000.00**
.	**Conveyor System**				
66	BELT SYSTEM	LS	$ 10,000,000.00	1	$ 10,000,000.00
	Subtotal				**$ 10,000,000.00**
.	**Miscellaneous**				
67	PRECAST CONCRETE STRUCTURE (SCALES)	EA	$ 32,000.00	2	$ 64,000.00
	Subtotal				**$ 64,000.00**
x	BASE TOTAL W/O MOBILIZATION				**$ 47,960,855.25**
x	BASE TOTAL WITH MOBILIZATION				**$ 50,838,506.57**
	.TOTAL				**$ 50,838,506.57**

APPENDIX 3
Solar Power at Oak Point Eco-Industrial Park

by
Stephen A. Hammer, Ph.D.
Mesa Cosa LLC

Overview

Solar power systems convert sunlight into electrical power. There are two principal technologies for doing so: photovoltaic (PV) systems and concentrating solar systems. PV systems generate electricity by capturing electrons released from their substrate when light hits the panel. Concentrating solar technology involves the use of mirrors or lenses to focus the sun's energy onto a liquid-filled container, which heats up, generating steam which is then converted to electricity or thermal energy. Solar PV systems are far more commonplace, although there is a growing research focus on concentrating solar systems. At this time, however, concentrating solar systems are primarily constructed at a very large (i.e., utility) scale,[29] making them inappropriate for the eco-industrial park.[30] As a result, this section will focus exclusively on power generation from solar photovoltaic panels.

Solar photovoltaics are experiencing a surge in popularity around the US, with total deployment levels increasing from 50 MW nationally in 2001 to nearly 350 MW in 2006.[31] That number barely registers, however, when we consider how much electric power is consumed in the US on a daily basis. The story in New York City is much the same, with researchers at Bronx Community College reporting there were only 45 solar PV installations in the city as of November 2005, capable of generating 1230 MWh of power, or less than 0.002% of the power used citywide that year.[32]

Solar PV Potential at Oak Point

The low deployment levels are a bit of a paradox given that researchers regularly tout New York City's abundant solar resources, capable of generating 4.6 kWh of power per square meter per day. (This is a level just 30% below that achieved in Phoenix, Arizona, a city renowned for its sunny climate.)[33] Moreover, solar resources in New York City are generally available when they are needed most, on hot days when grid-based energy resources are stretched thin.

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29 Solar Energy Industry Association. *US Solar Industry Year in Review 2006*.
30 There are some innovative small scale systems currently under development that may eventually prove suitable for use at the eco-industrial park. For instance, eco-industrial park staff are encouraged to monitor the progress of the technology being developed by Energy Innovations. See www.energyinnovations.com/tech.html for more information.
31 Solar Energy Industry Association. *US Solar Industry Year in Review 2006*.
32 Center for Sustainable Energy at Bronx Community College. *New York City's Solar Energy Future – Part 1: The Market for Photovoltaic Systems in New York City*. January 2006. Page 13.
33 Perez, Richard. *Solar Energy Resource throughout New York*. Prepared for Interstate Renewable Energy Council. 2002.

Although this citywide data is helpful, there are on-line tools available that can help us estimate how much solar power can be generated at the eco-industrial park site in Oak Point. Using building footprint data for each of the six buildings proposed for the site – which collectively total 350,000 square feet of rooftop space – we can estimate how much power generation capacity can be installed on each building. Assuming that 40% of each of the six rooftops was available for PV system deployment,[34] this results in a potential generation capacity of approximately 1.5-2.1 MW.[35] A system of this size would far exceed total deployment levels citywide, and be one of the larger installations in the northeast, significantly enhancing the environmental attributes associated with the eco-industrial park.

PV System Costs – A General Overview

Solar PV has long been recognized as one of the more costly renewable power technologies. The price of electricity produced by solar PV systems has dropped considerably over the years, but is still generally far above the price paid for conventional grid-based power.

To help jumpstart the marketplace, PV systems have long enjoyed government subsidies that reduce systems costs, and subsequently, the cost of PV power. In New York City, projects less than 50 kW in size are currently eligible for $4/watt subsidies from the New York State Energy Research and Development Authority (NYSERDA). To receive this subsidy, the eco-industrial park must use a NYSERDA Eligible Installer, who will handle all paperwork associated with the subsidy program. Funding under this program is available through 30 December 2007, or until funds are exhausted. Effective March 1st, the maximum system size eligible for the $4/watt subsidy drops to 25 kW; systems between 25-50 kW will become eligible for a lower subsidy of $3.00/watt. No single customer can receive subsidies on more than 100 kW of photovoltaics.[36]

Once PON 716-02 expires, funding will be available through a new PON 1050 (PV Incentive program), which will be funded by New York State Renewable Portfolio Standard monies. Complete guidance for this PON has yet to be released.

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34 Given the peaked roof design of the "Butler" style steel shed buildings proposed for the site, less than 50% of the building roof will be available for deployment. For the purposes of this analysis, we have presumed that 40% of the roof can be allocated for solar system deployment. If flat roofs were used instead, PV deployment potential would increase, but that could introduce other complexities related to the construction costs of the facility.

35 The variability is a function of the "efficiency" of the solar panels. For this analysis, we used RETScreen® International Clean Energy Project Analysis software, which analyzes power generation potential and project costs based on data inputs provided by the user. Highly efficient Sanyo HIP-190BE2 panels (16.1% relative efficiency) and less efficient General Electric GEPVG-165-M panels (11.4% efficiency) were used to obtain high and low estimates of power generation potential. RETScreen® was also used to develop all cost calculations found elsewhere in this section.

36 See NYSERDA, *PON 716-02 (Photovoltaic Incentives for Eligible Installers). Revised 18 December 2006*. Page 3.

PV project funding previously available through a second program (PON 913 – New Construction Financial Incentives) has expired, and at this time, it does not appear as if it will be reauthorized.

A common misconception is that PV installations on new buildings will automatically qualify for the state's five-year Green Building Tax Credit. They will not, unless the building also meets the detailed criteria for green buildings spelled out in the 75-page long Section 638.7 of that law. These include requirements related to energy and water use within the building, ventilation and building materials requirements, and reporting requirements that must be completed each year the building owner seeks to receive the credit.[37] Based on information we have received to date, it is not clear whether the eco-industrial park will qualify for this tax credit.

A final area where state support is available is through the New York Energy $mart Loan Program, which buys down the rate of a commercial loan obtained by the borrower for the purpose of financing a solar PV installation. In New York City, loans of up to $1 million are eligible for ten-year loan rate reductions of 6.5% (650 basis points). To be eligible for this program, the project developer must first obtain a commercial loan for the system purchase; NYSERDA then buys-down the interest rate charged for this loan. PON 941 (New York State Energy $mart Loan Fund) is currently accepting applications through 30 April 2007.[38] At this point, it is not clear whether the loan reduction program will expire or be extended.

In addition to this direct state-level support, an eco-industrial park solar PV project will benefit from state sales and property tax exemptions.[39] As a commercial project, an eco-industrial park solar PV system would not be eligible for the state's net-metering program, which requires utilities to "buy" surplus power when it is available. Currently, only residential and farm-based renewables projects are eligible for net-metering.

Federal tax benefits will have a significant positive effect on any eco-industrial park solar installation. The Federal Business Energy Tax Credit gives commercial customers who install a PV system a tax credit equal to 30% of the cost of the solar equipment. The tax credit can be carried forward for 20 years if the value of the credit exceeds the firm's current tax liability. After 31 December 2008, the tax credit will revert back to 10%. There is no cap on the size of the tax credit that can be received.[40] An eco-industrial park solar PV project would also benefit from a Federal Modified Accelerated Cost-Recovery System (MACRS) schedule, which allows a

37 NYS DEC. *Rules and Regulations: 6 NYCRR Part 638 Green Building Tax Credit*. See pages 28-103.

38 NYSERDA. *PON 941 – New York Energy $mart Loan Fund (Revised 11/06).*

39 Solar energy systems are exempt from the 4% state sales tax until 1 December 2009. Solar PV systems deployed in New York City are also exempt from the 0.375% Metropolitan Commuter Transportation District tax and the 4% local sales tax. Collectively, these mean PV systems are exempt from the entire 8.375% sales tax normally assessed products sold in New York City. Property owners also receive a 15 year exemption from any property tax increase attributable to the installation of a solar PV system.

40 In December 2006 the Congress extended the solar investment tax credit an additional 12 months beyond its original 31 December 2007 expiration date. Other information based on: Solar Energy Industries Association. *Frequently Asked Questions about the New Federal Solar Tax Credit*. (undated).

PV system to be depreciated over a 5-year (rather than the normal 20 year) basis.[41] Depreciation costs are reported as operating expenses, thus lowering a firm's tax bill.

However, given the complex and ephemeral nature of these varying subsidies and tax incentives, the eco-industrial park developer is encouraged to consult with a tax professional regarding which incentives are available at the time the project actually moves forward, and which are most relevant to the eco-industrial park's decision-making.

The Cost of Solar at Oak Point

RETScreen® International Clean Energy Project Analysis software was developed by the Canadian government to allow users to develop cost analyses for a variety of different renewable technology projects, including those being proposed in the US. The software is fairly easy to use, and allows for a comprehensive financial analysis that takes into account all subsidies, tax credits, and accelerated depreciation benefits the eco-industrial park project would likely be eligible to receive. The software also includes built-in location specific insolation (solar availability) data, meaning we can develop our financial analysis using information tailored to the Hunts Point area.

The software is also flexible, allowing users to input or vary project-specific assumptions. In the case of the eco-industrial park, the following assumptions were made:

41 See Database of State Incentives for Renewables and Efficiency (www.DSIREusa.org), *Federal Incentives for Renewable Energy – Modified Accelerated Cost-Recovery System (MACRS).* Dated 31 May 2006.

* Cost of grid-based electricity = $0.121/kWh. (Note: this is our estimate of the rate eco-industrial park businesses would likely be charged.[42] It includes the "business incentive" which reduces the rate manufacturing businesses are charged in New York City for electricity delivered over Con Edison wires.)
1 Cost of solar PV system = $8.00/watt. This is much lower than the $9.51/watt rate Bronx Community College researchers found in their survey of solar PV projects deployed around New York City between 2003-2006, but we assume that given the extremely large size of this project some economies of scale would come into play.
2 Discount rate = 5% (figure provided by Sustainable Enterprise)
3 Inflation rate for grid-based power = 5% (based on comparison of 2006 and 2005 Con Ed tariff schedules)
4 Total project subsidy from NYSERDA = $350,000 (assumes 50 kW receives $4/watt subsidy, and 50 kW receives $3/watt subsidy, reflecting changes in subsidy levels scheduled to occur in March 2007.)
5 Annual maintenance costs = negligible
6 PV system lifespan = 25 years, except for the inverter, which will be replaced in year 13.

Plugging this data into the RETScreen model, we determined:

- A 1.5-2.1 MW PV system spread out over the rooftops of the six eco-industrial park buildings will generate approximately 2.0-2.8 million kWh per year of solar electricity. This amounts to approximately 8.0-11.2% of the 25 million kWh of electricity that the plastics recycling facility proposed for the site will require on an annual basis.[43]
- The solar PV system will eliminate between 941-1,329 tons of CO2 emissions on an annual basis.
- The payback period for the PV system is approximately 21.3-21.5 years, fully accounting for all available subsidies and benefits. (NOTE: if no subsidies or tax credits were available, it is estimated the payback period for the system would amount to roughly 49 years)
- The cost of the PV system is expected to total between $11.8-$16.8 million, while over its projected 25 year lifespan, the PV system is expected to result in a (discounted) net cost savings to eco-industrial park customers of over $400,000.
- The unsubsidized cost of electricity produced by the solar PV system totals approximately $0.25/kWh. Once all potential benefits (subsidies, tax credits, accelerate depreciation) are taken into account, the projected cost of electricity from the PV system is approximately $0.11/kWh, a figure highly competitive with the cost of grid-based power.

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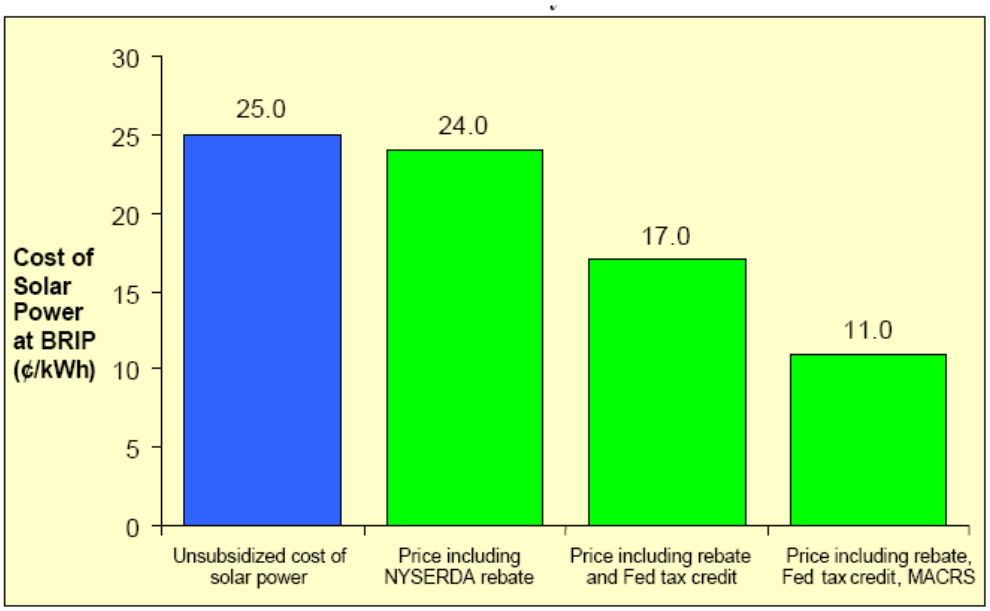
42 Calculated rate for General, Large, Rate I, Low Tension (SC-9) customers. See www.coned.com/documents/elec/271-281a.pdf.

43 Based on data provided by IntegriCo Composites LLC to Sustainable Enterprise LLC in 2006.

Figure 1

Impacts of State and Federal Incentives on the Levelized Cost of Electricity from a 1.5-2.1 MW Solar PV System at the Eco-Industrial Park



There are two points worth noting about Figure 1. First, the rebate/subsidy provided by NYSERDA has only a minute impact on the cost of electricity. This is because the subsidy is capped at 100 kW, a fraction of the overall system size. If NYSERDA were to raise the subsidy cap, it would significantly reduce the amount the eco-industrial park must invest, ultimately reducing the final cost of solar power to the eco-industrial park by several additional cents per kilowatt-hour.

Second, establishing a net-metering program for commercial projects could also provide a financial boost to this project. As will be discussed later, power produced by the system is expected to be completely consumed by eco-industrial park tenants Monday-Saturday. On Sunday, however, surplus power will exist, and to the extent this power could be sold back into the grid, this would help drop the price per kWh even further.

Solar Energy Service Contracts

One thing that becomes clear from this entire discussion is how complex and costly solar PV projects can be. The eco-industrial park developer or its advisors may need to:

- Keep track of which government subsidies and tax credits are available

- Put the project out for bid, select an installer, and maintain the system
- Finance the project on their own or obtain project financing from others
- Address interconnection issues with Con Edison
- Provide on-going monitoring and reporting to maintain eligibility for green building tax credits.

Clearly, these responsibilities have not stopped building owners from moving forward with deployment plans, but many in the industry believe there would be higher rates of deployment if a single firm played all of these roles, 'simplifying solar' for the buying public. That was the genesis of a company called SunEdison, the first of a handful of firms that sell one-stop shopping for solar energy services.[44]

A rudimentary outline of the SunEdison business model is found in Figure 2. In a nutshell, they develop and own the PV system, selling all electricity produced to the tenant or owner of the building hosting the system under a long-term power purchase agreement (PPA). Generally, electricity is sold at a price lower than the price charged for power from the local grid.[45] Most significantly, these deals typically require no up-front capital investment by the building owner or tenant.

Under the solar energy services model, the building hosting the PV system retains its link to the local electricity grid, drawing on grid-based power at nighttime and other periods when PV power generation falls short of the site's total demand.

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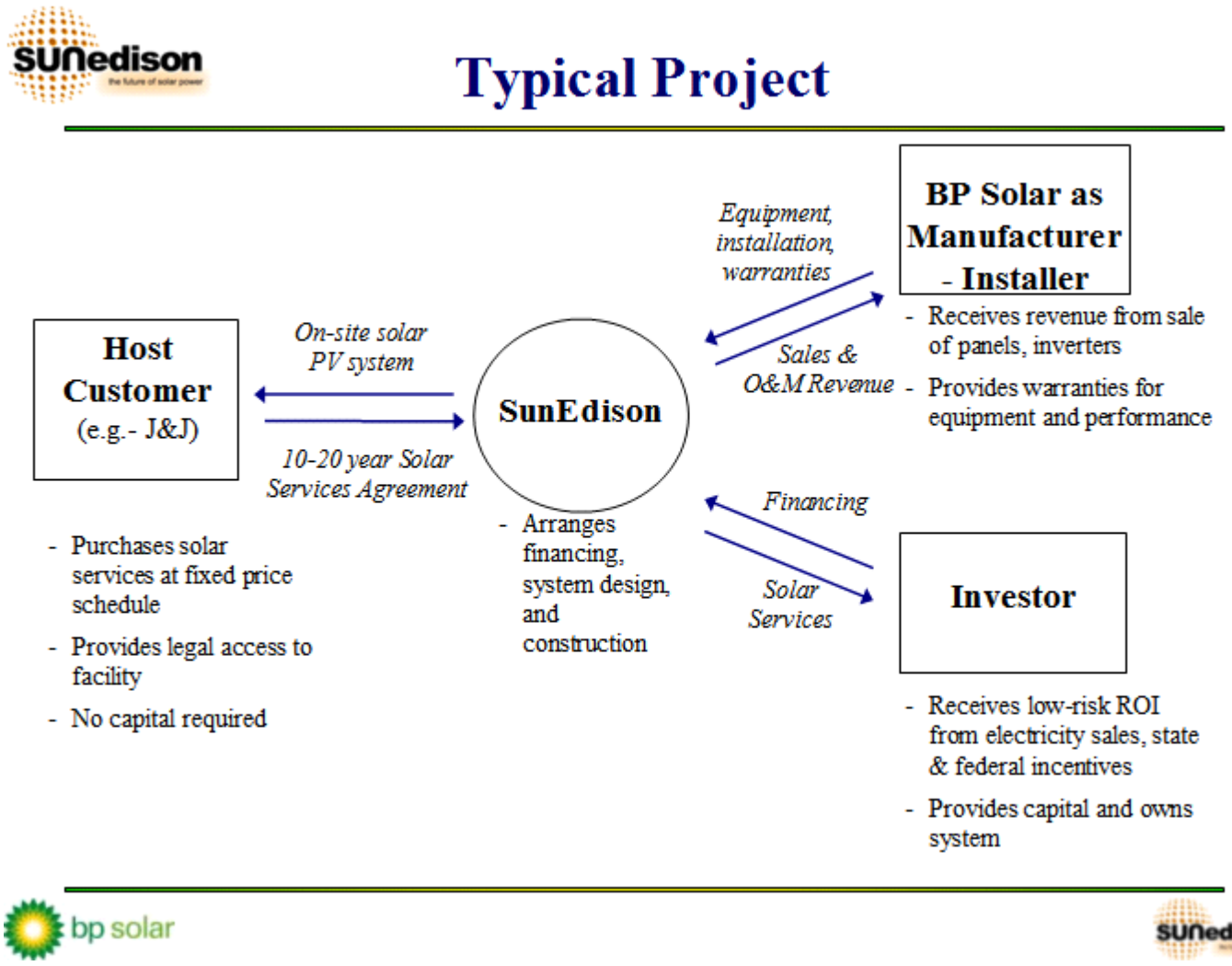
44 There are other firms that provide comparable services, including MMA Renewable Ventures (www.mmarenewableventures.com). News stories also indicate GE Energy Financial Services provides 3rd party financing of large solar installations, but their full-range of services appear to be less comprehensive than those provided by other firms.

45 In Hawaii, one of SunEdison's customers reportedly enjoys rates fully 25% less than the cost of grid-based power. In an October 2006 NY Times article, General Motors noted that a similar deal on a GM parts warehouse in California will result in a 10% decrease in electricity costs at that facility.

Figure 2
Basic SunEdison Solar Energy Services Business Model



There are some problems with this model that may confound efforts to employ a third-party financing strategy at the eco-industrial park. Principal among them is the fact most solar energy services deals occur in states like New Jersey, Nevada, and California. According to Jigar Shah, CEO of SunEdison, this is because the subsidy and tax incentive programs in those states are highly advantageous, making it easier for SunEdison and its competitors to combine multiple revenue streams into a package that is viable for both parties. For instance, in New Jersey, solar PV systems up to 2 MW are eligible for subsidy, compared to the 50 kW system (or 100 kW/customer) cap in New York. New Jersey also allows commercial businesses to net-meter, meaning they can "sell" surplus power back to the grid. As noted previously, in New York state, net-metering is limited to residential and farm-based systems.

Managers at MMA Renewable Ventures who were interviewed for this project have stated that although the current regulatory environment is not ideal, they might be able to structure a deal at the eco-industrial park. The prospects would dramatically improve if the NYSERDA were to

raise its subsidy caps or allow commercial net-metering. The prospects of either occurring are unknown, however, so we encourage the eco-industrial park to establish relationships with several solar energy services firms as the eco-industrial park becomes closer to fruition. This will help the eco-industrial park developer ascertain whether the local regulatory/subsidy landscape has changed so it is more advantageous, or whether these firms have changed their business model in a way that makes NYC-based projects more viable. A list of contact persons at MMA Renewable Ventures and SunEdison is found in the Appendix to this section.

Impediments to Solar – Interconnection Issues

Aside from cost issues, interconnection difficulties rank as the greatest impediment to the more widespread deployment of solar PV around the city. Under rules established by the New York State Public Service Commission, solar PV systems can be interconnected to the local grid so long as they have a nameplate rating of less than 2 MW. Rules established by the Public Service Commission – known as Standard Interconnection Requirements (SIR) – govern the process utilities must follow in evaluating any interconnection proposal. The rules do not dictate the outcome, and utilities are generally given considerable latitude in determining what technical requirements will be imposed on any individual interconnection.

In the past it has been argued that Con Edison seeks to minimize the total number of interconnections occurring in the city because on-site power systems can reduce the amount of power that Con Edison distributes to local customers, a primary source of their revenue. Con Edison sees the problem differently, arguing that interconnection problems stem from the basic design of the local grid, which presumes a one-way flow of electricity from large power plants to the 2+ million customers served by the Con Ed distribution system. Solar PV violates this presumption because the possibility exists that power generated by a solar PV system can flow backwards into the grid. When electrons flow backward, they trip circuit breakers and other network protection devices installed by Con Edison to maintain system integrity and protect their employees working on the system.

At the eco-industrial park, ‘backfeed’ would be a problem if power demand at the site falls below the level of the power generated by any solar PV system. As we understand it, electricity demand at the eco-industrial park will generally be quite high during normal daylight hours, given the constant 4 MW demand of the proposed plastics recycling operation. When combined with demand from the other facilities, electricity use should easily outstrip what can be generated by any solar PV system. A potential problem arises, however, on weekends and holidays, when eco-industrial park businesses are closed, but the PV system remains operational. As part of the interconnection approval process, Con Edison has the capacity to limit the overall size of the system or insist that a reverse relay switch be installed. The latter cuts off the flow of power from the eco-industrial park site if electrons begin to migrate into the Con Edison grid. This relay switch would then be reset when operations recommence at the eco-industrial park. The cost of this technical fix is relatively low compared to the overall system cost, but a more relevant issue for the eco-industrial park is that the PV system will effectively have no economic value once the relay switch has been triggered.

The eco-industrial park could seek to register as a utility with the Public Service Commission and "sell" the surplus power back into the grid, but this is any onerous and costly process, with regular filing requirements. Moreover, the economic value of any power sold is greatly diminished, equal only to the wholesale rate at which Con Edison buys electricity. Analyzing the steps and impacts of this alternative approach goes beyond the scope of this study, and we generally do not believe it is in the eco-industrial park's interest to explore this option.

The backfeed problem echoes one that occurred at the Greenpoint Manufacturing and Design Center in Brooklyn back in late 2002. Their 59 kW solar PV system was installed amidst great fanfare in late October, but it did not become fully operational for another 18 months, a result of objections raised by Con Edison over the risk of backfeed. Ultimately, the solar system installer (Powerlight Corporation of California) was forced to install storage batteries to capture surplus electricity generated on weekends and holidays. The battery experiment failed, however, and eventually a reverse relay switch was installed. At it turns out, the base load power demand at GMDC is sufficient to utilize all of the solar power produced by the system – even on Sundays – meaning the reverse power relay proved unnecessary.

Should Con Edison require the use of battery storage at the eco-industrial park, a more recent case study may prove relevant. The New York Power Authority is currently piloting the deployment of a 1 MW sodium sulfide battery storage system on Long Island. That system, with a storage capacity of 6.5 MWh, costs approximately $3.85 million dollars. The experimental NYPA battery system occupies a footprint of approximately 1000 square feet; the eco-industrial park may require a system twice that size. One obvious benefit of a battery storage system is that its power would be available to supplement power generation from the PV system during the week, or provide PV-based power during nighttime hours when no PV power would ordinarily be available. Such a system could help reduce eco-industrial park tenant expenditures on grid-based power, although the payback period would depend on when the stored power is utilized.

Other Regulatory Issues

There are no other significant regulatory issues that would impede solar PV deployment at the eco-industrial park. According to staff at the Department of City Planning, solar panels are considered an "accessory use," meaning there are no particular zoning or building code issues that inhibit their use. The process to be followed by local installers in presenting PV system plans to the Department of Buildings is well established, meaning there should be few delays. There will be some minor costs involved, however. As of 2006, any PV system installation must be reviewed by a nationally-recognized 3rd party evaluator, who will be looking to ensure the system follows the National Electric Code and New York City-specific amendments. This requirement exists to provide a greater measure of public safety, but it does have the effect of slightly slowing the installation process and increasing project costs by $2000-$3000.

Should the eco-industrial park be required to proceed with a large battery storage system, close interaction with the DOB's Bureau of Electric Control and Electrical Advisory Board would be

required. This would be the first deployment of this technology in the city, and they will closely scrutinize any application to ensure it does not jeopardize public safety or adversely affect the local grid. Any PV system installer that has done business in New York City should be familiar with both of these entities.

Conclusion/Recommendation

The prospects for solar power generation at Oak Point are very good, and a system deployed across the roofs of the eco-industrial park buildings could generate approximately 8-11% of the power required by the eco-industrial park's most energy intensive tenant. The cost of deploying solar is high, however, requiring a significant up-front capital investment by the eco-industrial park developer. Over the life of the project, a solar PV installation would have a positive net present value (payback), successfully displacing the cost of ever-more expensive grid-based power. The payback period is quite lengthy, however – 21+ years – which may be too long when compared to the duration of an average eco-industrial park tenant lease.

Given the complexities involved in a project of this size, we believe the eco-industrial park should partner with a solar energy services provider to manage this project on the eco-industrial park's behalf. The changing regulatory and market landscape currently makes it impossible for these firms to make any commitments so far in advance of when a project would actually be deployed, but based on conversations held to date, the interest is clearly there.

Such a partnership arrangement eliminates the need for any up-front capital investment by the eco-industrial park, while simultaneously delivering electricity at a price below that available from the grid. The eco-industrial park also avoids issues related to the design, permitting, construction, or on-going maintenance of the system. In other words, the interests of the eco-industrial park are extraordinarily well-served by such an arrangement, and we enthusiastically endorse this approach.

Appendix 4
Wind Power at Oak Point Eco-Industrial Park

by
Stephen A. Hammer, Ph.D.
Mesa Cosa LLC

Wind Power in New York City

New York City has a long history of exploiting wind power, dating back to the early days of the city's history when it was settled by the Dutch. More recently, New York was the site of the first modern urban wind installation, atop a row house in the East Village in the 1970s.[1] In 1979, a 40 kW wind turbine[2] was installed by the Bronx Frontier Development Corporation at the end of Barretto Street in Hunts Point. This experimental 80-ft. high system operated for approximately 22 months, providing power to a local composting operation.[3]

Recent history has been less friendly to local wind turbine projects. In 2003 the first design for the new Freedom Tower in Lower Manhattan incorporated wind turbines into the superstructure at the top of the building; this concept was eliminated when the building was redesigned two years later. In 2004, the design for the City's proposed football and 2012 Olympics stadium on the west side of Manhattan was released, with wind turbines lining the ridge of the building. When that project was redesigned one year later, the wind turbine elements had been eliminated. The most active wind project currently under consideration is at the now-closed Fresh Kills landfill on Staten Island. BQ Energy has installed wind meters to assess the viability of large turbines at that location, which is destined to be transformed into a public park over the next 20 years. These wind monitoring studies are expected to be completed in May 2007.[4]

Technical considerations

Wind turbines convert the kinetic energy of wind to electricity. Because winds rarely blow steadily, wind turbines cannot be expected to provide a constant flow of power to their host facility. In general wind turbines generate power 25-33% of the time, forcing the system owner to also have access to other forms of primary or backup power.

An important factor to be considered is the "cut-in" speed of a wind turbine, or the wind speed at which it will start spinning. Oak Point's waterfront location is quite exposed, but it is only after

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[1] Urban Task Force. *Windmill Power for City People: A Documentation of the First Urban Wind Energy System.* 1977.
[2] Although the manufacturer rated the turbine as a 40 kW system, power production levels at the site never exceeded 25 kW.
[3] NYSERDA. *Commercial Wind Energy Conversion System Monitoring and Utility Impacts Study*. September 1981.
[4] Personal communication with Paul Curran, President, BQ Energy, 08 January 2007.

the wind achieves and maintains a certain minimum speed that a turbine will generate a steady flow of power. Wind speed is also a function of the height of a turbine, with higher wind speeds found at higher elevations. Calculations by AWS Truewind for NYSERDA project that on an annual basis, wind speeds at Oak Point[5] will average 9.7-13.7 mph depending on the elevation. These wind conditions are considered suitable – but low – for small wind system installations;[6] large utility-scale wind project developers would typically reject a site with these wind characteristics.

Table 1
Projected Wind Speed at Oak Point
Source: AWS TrueWind LLC interactive map

Elevation	Avg. Annual Wind Speed (mph)
24 meters (~79 ft.)	9.7 mph
30 meters (~98 ft.)	10.2 mph
37 meters (~121 ft.)	10.7 mph
50 meters (~164 ft.)	11.4 mph
70 meters (~230 ft.)	12.4 mph
100 meters (~329 ft.)	13.7 mph

Table 2
Actual Recorded Wind Speeds at Bronx Frontier Development Corporation Turbine Site
Source: NYSERDA, September 1981

	Average Monthly Wind Speeds at 64 ft. elevation (in mph)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
Turbine nacelle	n/a	n/a	n/a	n/a	n/a	n/a	8.6	8.8	8.3	9.4	13.1	n/a	**9.64**
Meteorological tower	10.2	11.0	11.0	8.4	8.5	8.1	8.3	9.3	7.9	10.2	11.4	11.0	**9.60**

AWS Truewind's projections are just that, however, computer projections based on complex modeling of local geography and atmospheric conditions around the state. To ensure the highest levels of accuracy, most wind system developers insist on obtaining actual wind speed meter readings at the site in question, typically for a full 12 month period. Depending on the height of the metering tower and the level of monitoring involved, this type of metering will cost in the range of $500-$10,000. Fortuitously, we do have access to data collected between 1979-1981, when a 40 kW turbine and separate meteorological testing tower were installed at the end of Barretto Street, approximately 0.4 miles away from the Oak Point site.

The summary report documenting the history of that turbine project provides somewhat contradictory information. In one section the report states that wind at the site averaged 10-11 mph over the course of the year.[7] In another section of the report, however, there is a table listing wind speeds measured at both the nacelle (hub) of the turbine and the meteorological testing tower, neither of which matches this level. (See Table 2.)

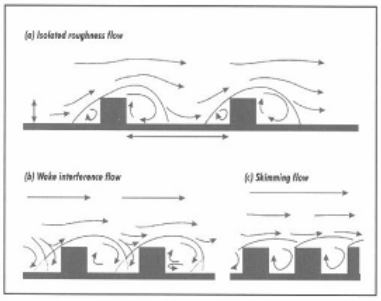
The winds at Baretto Point were measured at an elevation of 64 feet, or 19.5 meters. Because TrueWind projects a 9.7 mph wind speed at 24 meters (78.7 feet), it may be reasonable to conclude that TrueWind's projections accurately reflect real conditions in the Oak Point vicinity.

Given that the Oak Point site may also include the development of a new multi-story prison, there will be issues related to where any turbine(s) should optimally be sited. Buildings or trees in close proximity to a turbine can disrupt local wind patterns, creating turbulence that reduces

[5] The AWS Truewind mapping project covers the entire state, with detailed projections available for any specific location in New York state.
[6] Wind power projects are generally categorized as "large" projects if their nameplate (maximum) power generation capacity exceeds 100kW. Small wind turbines are capable of generating power levels below that level.
[7] NYSERDA. *Commercial Wind Energy Conversion System Monitoring and Utility Impacts Study*. September 1981. Page 1-3.

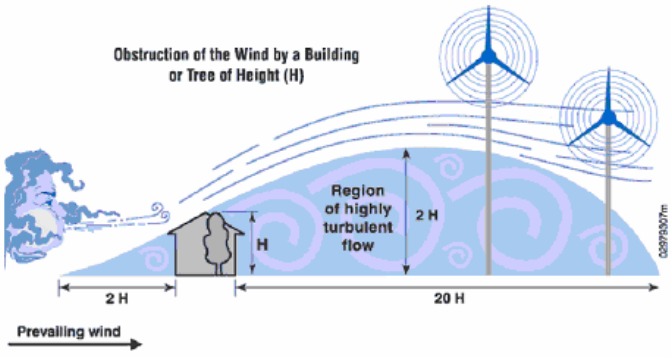
power output and potentially jeopardizes the integrity of the turbine.[8] (See Figure 1) Turbines should therefore be optimally located at least twice the height of any nearby obstructions.[9] (See Figure 2.) Within the eco-industrial park itself, this means the turbines should be at least 80 ft. high, given the 40' height of the planned 'Butler-style' metal shed buildings.

Figure 1
Wind flow turbulence in Urban Areas



Source: M. Santamouris (ed.), Energy and Climate in the Urban Built Environment, London: James & James 2001, page 76.

Figure 2
Suggested Wind Turbine Height



Source: American Wind Energy Association

Turbines of this height would not appear to be a problem, despite its proximity to LaGuardia Airport across Long Island Sound. The US Code of Federal Regulations (Title 14, Part 77.23(a)1) states the FAA must be notified of any structures over 200 feet tall within three miles of the airport perimeter, due to concerns that the turbine(s) could constitute a hazard for local air traffic. Turbine height can also potentially raise aesthetic concerns by neighboring businesses or households, although this may be less of a problem at Oak Point given the industrialized nature of the area and the fact the nearby New York Organic Fertilizer Company facility already has visually obtrusive red/white striped smokestacks in the vicinity.

State and Local Regulatory Environment

There have yet to be any turbines (large or small) permitted in New York City, so how smoothly the process will flow is unknown. In general, wind systems are subject to the same approval procedures faced by any new or altered structure in New York City. Work permit applications must be filed the Department of Buildings (DOB), where the plans are reviewed for compliance with local zoning rules (including height restrictions) and structural integrity. Applications will

[8] Traditional horizontal turbines are designed to achieve maximum power output from wind flowing along a horizontal plane. Updrafts or downdrafts (such as those shown in Figure 1 above) can stress a turbine blade, shortening its lifespan, or in extreme cases, leading to failure/breakage.

[9] The US Department of Energy suggests an alternative rule of thumb, which is to install a wind turbine on a tower with the bottom of the rotor blades at least 30 feet above any obstacle that is within 300 feet of the tower. (Source: US Department of Energy, *Small Wind Electric Systems – A New York Consumers Guide.* February 2005. Page 5.)

also be reviewed by the Electrical Advisory Board, the DOB unit that examines 'non-traditional' electric system installations. According to the DOB, this entire review process would likely take 2-3 months.[10]

As with solar PV installations, full system operating approval is also contingent upon the receipt of certification from an independent 3rd party evaluator like Underwriters Laboratory (UL). This requirement may increase the time required to permit a system and will increase project costs by $2,000-$3,000 dollars.[11]

One question DOB was unable to answer was whether they would require the use of guy wires to provide extra stability to a turbine installation. Such a decision would be made on a case by case basis.[12] If guy wires were required, they could significantly increase the amount of space needed to install the system, essentially making it impossible to erect a tall freestanding turbine at the congested Oak Point site.[13]

Zoning rules are an important consideration in siting a turbine at the site. According to staff from the Department of City Planning, there is no explicit prohibition on the construction of turbines at the site. There are, however, height limits that are a function of the 'sky exposure plane' requirement at the site. At Oak Point, structures are subject to a 5.6:1 setback, which effectively limits any turbine (including the blade) to a maximum 100' height. This is more than adequate for a small turbine, but generally will limit the eco-industrial park to a 15 kW turbine with 10 meter diameter blade sweep.[14]

Figure 3 depicts the layout of the proposed eco-industrial park at Oak Point, along with our suggestion of where the turbine could optimally be located. This site is set back from the edge of the site, allowing us to construct an 84' (~25 meter) tower; with the blades, the turbine would have total system height of approximately 100'. The footprint for the tapered monopole tower (i.e., meaning no guy wires are required) would likely be in the 150-200 square foot range, including extra perimeter space about the base of the tower to ensure that it remains protected from vehicle traffic.

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[10] Personal communication with Deborah Taylor, Executive Director, NYC Department of Buildings, 2 January 2007.

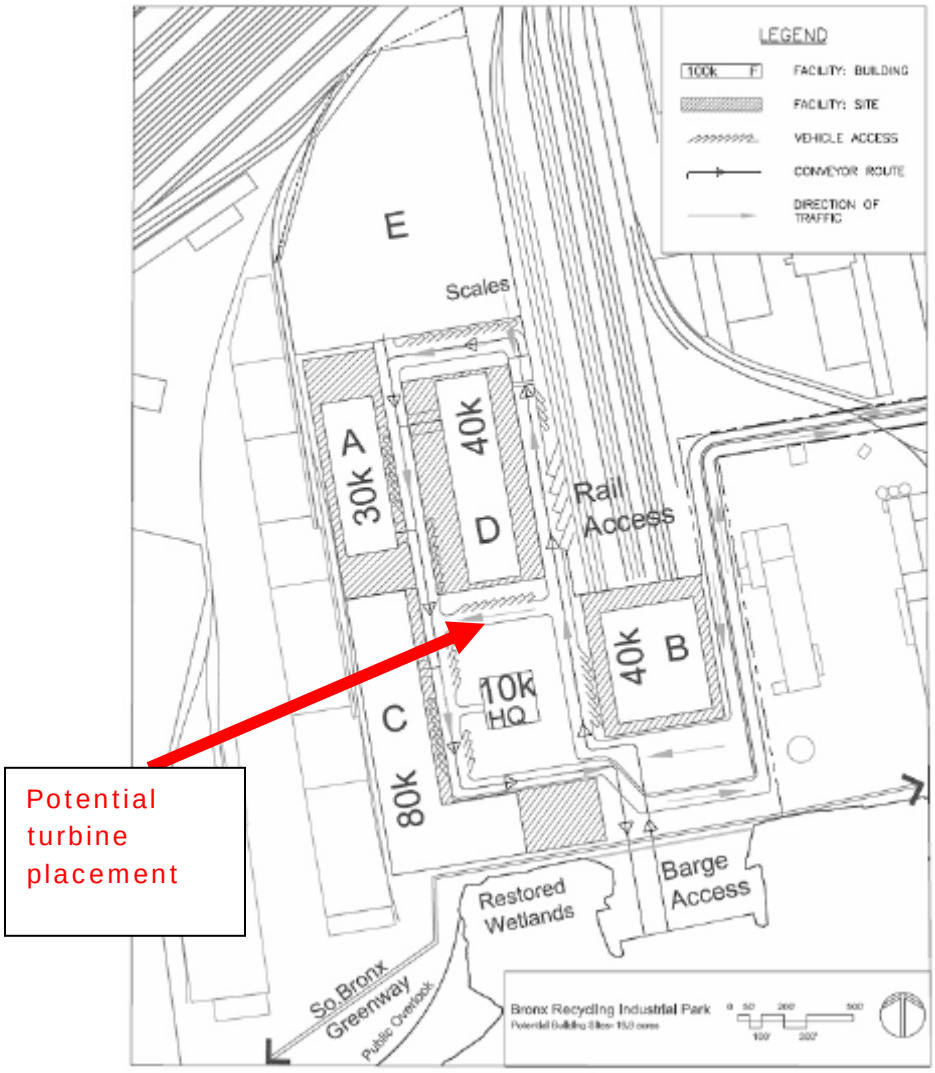
[11] Personal communication with Anthony Pereira, President, AltPower, 3 January 2007. AltPower is one of the leading solar PV system installers in New York City, and was responsible for a temporary small wind turbine installation along the East River in 2003.

[12] Personal communication with Deborah Taylor, Executive Director NYC Department of Buildings, 2 January 2007.

[13] Guy wires are usually spaced "75% of the height of the tower away from the tower's base." In other words, for an 84' tower, guy wires would extend 63' out from the base. (Source: Mick Sagrillo, "Wind Generator Tower Styles," *AWEA Windletter*. Volume 25(4). April 2006.)

[14] Proven and Cyclone Anhua are two manufacturers that manufacture 15 kW turbines. As noted in Appendix 2, neither of these systems are currently eligible for subsidies from NYSERDA. The largest systems currently eligible for subsidy are 10 kW systems manufactured by Bergey, Fortis, and Wind Turbine Industries.

Figure 3
Draft Site Plan & Recommended Turbine Location



It does not appear as if any permits would be required from the New York State Department of Environmental Conservation (DEC). DEC environmental permitting staff indicated that to-date, their focus on wind projects has been limited to large turbine installations, and small turbines "are not yet a concern for the agency."[15] This could change if an eco-industrial park wind project triggered an automatic review, such as if it were proposed on a wetlands portion of the Oak Point site. The site's proximity to North and South Brother Island does not appear to be an issue for DEC, as smaller turbines are currently not seen as presenting a significant threat to local birdlife.[16]

[15] Personal communication with Jack Nasca, Environmental Permits Unit, NYS DEC. 3 January 2007.
[16] Ibid.

As noted in the solar section of this report, Con Edison must approve any turbine installation project so long as the eco-industrial park maintains a connection to the local grid. It is not clear how or if the turbine system would connect to a solar PV project, or whether Con Ed would require another reverse relay switch to be dedicated to this system. Unlike solar power, wind turbines may operate during nighttime hours, although the 24-hour/day nature of certain eco-industrial park businesses means there will a ready consumer for any electricity. As with solar power, however, the possibility that the turbine would generate power while eco-industrial park businesses are closed could necessitate the installation of a relay switch or battery storage system, which would substantially increase the cost of the system. Prior to pursuing any wind project, the eco-industrial park and their energy consultant/contractor should meet with Con Edison to discuss these issues so no surprises arise once a project has begun.

One final area worth noting is the issue of safety. Modern turbines are designed with safety in mind, and the eco-industrial park should not be concerned about blade breakage, even on the windiest days.[17] Icing on the blades during winter months should be a cause for concern, however. Several wind system installers in snow-belt regions and turbine manufacturers contacted for this report emphasized this hazard. The added weight on the blade will tend to prevent the turbine from spinning, meaning melting ice will not be flung long distances.[18] It will eventually be shed, however, typically falling straight down near the base of the turbine, much like snow or ice falling off any tall structure. Allocating a larger footprint to the turbine tower may thus be a prudent decision, as would trying to ensure the turbine remains relatively isolated from heavily trafficked areas.

Project Economics – General Overview

Utility-scale wind turbine installations generally have highly favorable project economics, given the huge quantities of power they can produce. However, with a wingspan that can exceed that of a large jet airplane, height restrictions at the site make a large system impossible. This discussion shall therefore focus on the economics of smaller turbine systems.

On average, the US Department of Energy estimates small turbines cost between $1000-$3000/kilowatt installed.[19] The American Wind Energy Association concurs, estimating a 10 kW turbine costs approximately $32,000.[20] A 24-meter monopole turbine tower[21] adds

[17] Naturally, in extreme weather events such as hurricanes, damage may occur. In general, however, turbines are designed to withstand winds in the 50-80 mph range.
[18] Personal communication with: Johan Kuikman, Fortis Wind Energy, 17 January 2007; John Wands, Lake Michigan Wind and Sun, 17 January 2007; Steve Wilke, Bergey Windpower, 22 January 2007; and Mark Dickinson, Facilities Division, Macalester College, St. Paul MN, 17 January 2007.
[19] US Department of Energy, *Small Wind Electric Systems – A New York Consumer's Guide*. February 2005. pg 7.
[20] Ibid.
[21] Guy wires are not required for monopole installations due to the greater structural integrity of the tower.

approximately $20,000 to the total system price,[22] while engineering drawings, permits, and other miscellaneous expenses might total an additional $10,000.

As with solar power, there are several government programs designed to reduce the cost of small wind system installations. The New York State Energy Research and Development Authority (NYSERDA) currently offers a 50% rebate on the cost of any commercial wind turbine installation up to 10 kW in size, provided the turbine is on NYSERDA's approved list and is installed by a NYSERDA-authorized installer. [See Appendix 2.] Systems between 10-80 kW receive a rebate according to the following formula:

Incentive % = [rated capacity (kW) x (-0.5)] + 55
i.e., for a 15 kW machine, the incentive = [15 x (-0.5)] + 55 = 47.5%

Customers may not receive more than $100,000 in turbine subsidies over the life of this program, which is scheduled to expire 30 March 2006.[23] At that point the program will be replaced by PON 1098 (Wind Incentives for Eligible Installers); no information has been released to date on how that program will operate.

The solar PV writeup described other state and federal incentives that also apply to small wind installations, so long as all other program requirements are met:

- New York State Green Building Tax Credit
- New York State Energy $mart Loan Program
- State and local sales tax and property tax exemptions
- Federal Business Energy Tax Credit
- Federal Modified Accelerated Cost Recovery System (MACRS)

As was also noted, however, given the complex and ephemeral nature of these varying subsidies and tax incentives, the eco-industrial park developer is encouraged to consult with a tax professional regarding which incentives are available at the time the project actually moves forward, and which are most relevant to the eco-industrial park's decision-making about a wind turbine project.

Because of the relatively small cost and size of these projects, we have not heard of any plan by third-party finance firms to enter this market space. The eco-industrial park would likely be rebuffed if it did seek to find such a project partner, as the high transaction costs involved make small projects unprofitable for these firms. In this regard, small wind projects are like small solar projects – project development must typically be managed and financed by the owner of the facility.

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[22] Source: US Solar & Wind. Published prices for Osprey wind turbine systems, including 24-meter towers. (http://wind.dynalias.com/Wind/OPS.pdf) Viewed 27 January 2007. We have increased these published prices by approximately 33% to account for necessary site work and bollards around the perimeter of the turbine tower.
[23] NYSERDA. Summary *of Revisions – Wind Incentives for Eligible Installers (PON 792)*, 18 December 2006.

The Cost of Wind Power at Oak Point

To calculate the total payback period and price per kilowatt-hour for a wind system at Oak Point, we utilized the RETScreen computer model designed for wind system projects. As with the spreadsheet designed for solar PV projects, RETScreen (Wind) includes pre-programmed technical information for a variety of different turbine systems. The system can be tailored to use wind speed information specific to the location in question.

To model the costs associated with a wind turbine installation at the eco-industrial park, the following assumptions were used:

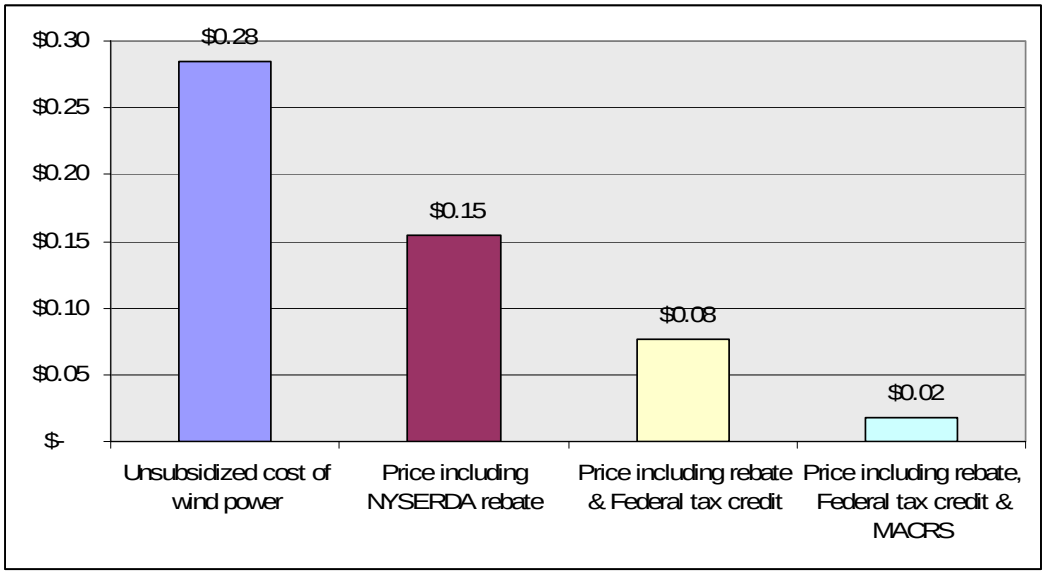
- Cost of grid-based electricity = $0.121/kWh. (Note: this is our estimate of the rate eco-industrial park businesses would likely be charged.[24] It includes the "business incentive" which reduces the rate manufacturing businesses are charged in New York City for electricity delivered over Con Edison wires.)
- Size and model of wind turbine system to be installed = 10 kW Bergey BWC Excel (Note: although the site can accommodate a 15 kW turbine, the RETScreen program only includes pre-programmed information for Bergey's 10 kW system)
- Price of wind turbine = $3,000/kW, or $30,000 total
- Price of 84' monopole turbine tower = $20,000 (based on prices published by US Solar & Wind; price was increased by 1/3 to account for installation of safety bollards around the perimeter of the tower)
- Miscellaneous other permitting and installation costs = $10,000
- Discount rate = 5% (figure provided by Sustainable Enterprise)
- Inflation rate for grid-based power = 5% (based on comparison of 2006 and 2005 Con Ed tariff schedules)
- Total project subsidy from NYSERDA = $30,000 (PON 792 covers 50% of the installed system cost)
- Annual maintenance costs = negligible
- Lifespan of wind system = 25 years, except for the inverter, which will be replaced in year 13
- Average windspeed at 64' elevation = 9.6 mph (based on actual metered speeds at Barretto Point) [Note: RETScreen automatically converts the wind speed and elevation data to a projected wind speed for the desired hub height – in our case 84' – using complex algorithms.]
- Projected system downtime = 2% (to account for scheduled maintenance, turbine failure, etc.)
- Miscellaneous losses = 3% (to account for loss of energy production due to excess wind speed, transmission losses, etc.)

Plugging this data into the RETScreen model, the results were rather remarkable.

[24] Calculated rate for General, Large, Rate I, Low Tension (SC-9) customers. See www.coned.com/documents/elec/271-281a.pdf.

- A 10 kW Bergey wind turbine installed at Oak Point will generate approximately 9,000 kWh of wind power each year, or just a tiny fraction (0.00036%) of the 25 million kWh of electricity the plastics recycling facility proposed for the site will require on an annual basis.[25]
- The wind turbine system will eliminate four (4) tons of CO_2 emissions on an annual basis, or roughly 70% of the emissions released by a single passenger car each year.[26]
- Without any subsidies or other financial incentives, the payback period for the turbine system is approximately 27 years. However, when the 50% NYSERDA subsidy, 30% Federal tax credit, and accelerated depreciation schedule are taken into account, the system recoups its entire up-front capital investment in less than a single year. Over the entire life of the system, the eco-industrial park achieves a positive net-present value of $28,830, meaning this is money that the eco-industrial park saves over and above the cost of the system.
- The unsubsidized cost of electricity produced by the wind turbine system is $0.28/kWh. Once all potential benefits (subsidies, tax credits, accelerated depreciation) are taken into account, the projected cost of electricity from the turbine system is approximately $0.02/kWh, a figure vastly superior to the cost of grid-based power.

Figure 1
Impacts of State and Federal Incentives on the Levelized Cost of Electricity from a 10 kW wind turbine system



It is important to remember that many of the subsidies and tax benefits on which these projections are based will expire in the next two years. The eco-industrial park should therefore not assume that a wind project deployed in 3-5 years will necessarily enjoy the same favorable

[25] Based on data provided by IntegriCo Composites LLC to Sustainable Enterprise LLC in 2006.
[26] US EPA. Average Annual Emissions and Fuel Consumption for Passenger Cars and Light Trucks. April 2000. Viewed at http://www.epa.gov/otaq/consumer/f00013.htm on 27 January 2007.

economic profile. As previously noted, a more up-to-date analysis should be conducted closer to the point at which the eco-industrial park is preparing to finance or break ground for the facility.

Conclusion/Recommendation

Compared to opportunities for solar power deployment, two factors may ultimately limit the role wind can play at the eco-industrial park's Oak Point location. The economics are currently extraordinarily favorable but there is no guarantee that incentives currently in place will be there when planning for the eco-industrial park enters its final stages. Second, because turbines have yet to be sited anywhere around the city, the planning approval process holds great uncertainty, and even a successful application could be subject to significant time delays.

A separate set of issues will govern the eco-industrial park's decision to move forward with a wind project. We project a 10 kW wind turbine system at Oak Point would generate approximately 9000 kWh of electricity each year. Given the huge power demand of certain proposed eco-industrial park businesses, this output appears almost inconsequential.

Not all buildings will consume massive quantities of power, however. The exhibition-incubator building, for instance, could conceivably have over 80% of its annual power demand met by the turbine.[27] This would fit neatly with the idea that the building will serve as an environmental education center. The fact that the power would be provided by a visually iconic technology at an extremely cheap price makes the concept all the more appealing.

Project economics are not the only factor to be considered, however. Siting the turbine within the congested eco-industrial park complex may be problematic due to safety concerns. Given the setback requirements dictated by local zoning requirements, the turbine must be located close to the center of the complex. The exhibition-incubator building parking lot is an obvious choice, but the eco-industrial park must make any siting decision knowing that it will be giving up precious parking space and possibly creating issues with falling ice during the winter months. This latter point cannot be ignored for liability reasons, and may ultimately prove to be *the* crucial factor determining whether to deploy a wind turbine at the facility.

[27] We were not provided with any energy demand information for this facility, so we developed crude projections based on 'average' building data. According to the US Energy Information Administration, occupied commercial space consumes an average of 11.1 kWh per square foot per year. Applying this to the eco-industrial park, total annual power demand for the 10,000 square foot exhibition-incubator building would equal 11,100 kWh/year. By producing 9,000 kWh of power each year, the 10 kW turbine would be capable of delivering nearly 82% of this total, an extraordinarily noteworthy level. (Source: US EIA, *Table 2a. Electricity Consumption and Electricity Intensities, per Square Foot, Specific to Occupied and Vacant Floorspace, 1992*, viewed at http://www.eia.doe.gov/emeu/cbecs/Squareft/sqtab_2a.html on 28 January 2007)

Attachment: Small Wind Resources for New York City

New York State Energy Research and Development Authority (NYSERDA) Wind Program

General Information
http://www.powernaturally.org/programs/Wind/default.asp?i=8

Wind Energy Toolkit
http://www.powernaturally.org/Programs/Wind/toolkit.asp

Trade Groups/Industry Associations

Association for Clean Energy New York (ACENY)
www.aceny.org
(518) 432-1405

Northeast Sustainable Energy Association (NESEA)
www.nesea.org
(413)774-6051

Wind System Installers conducting business in New York City who are eligible to participate in NYSERDA small wind subsidy programs

For current list, see http://www.powernaturally.org/programs/wind/OnSite_SmallWind.asp?i=8

Robert Boender
Alternative Energy Solutions, LLC
163 North Main Street, Suite 202
Stamford, CT 06902
Phone: 203-316-9219
robert.boender@snet.net
Eligible to install: any qualified wind turbine 10kW or less

Gay Canough
ETM Solar Works
533 Woodford Avenue
Endicott, NY 13760
Phone: 607-785-6499 / 607-786-3388
info@etmsolar.com
Eligible to install: any qualified wind turbine 10kW or less

George McConochie/Ernest Pritchard/Loren Pruskowski/Joseph Swaha
Sustainable Energy Developments, Inc.
6304 Furnace Road
Ontario, NY 14519
Phone: 315-524-9010
info@sed-net.com
Eligible to install: any qualified wind turbine 10kW or less

Anthony Pereira
Altpower, Inc.

160 Fifth Avenue, Suite 807
New York, NY 10010-7028
Phone: 212-206-0547
anthony@altpower.com
Eligible to install: any qualified wind turbine 10kW or less

Art Weaver
Renovus Energy, Inc.
102 Cherry Street
Ithaca, NY 14850
Phone: 607-277-1777
art@renovusenergy.com
Eligible to install: any qualified wind turbine 10kW or less

Small Wind Systems currently eligible for NYSERDA subsidies

For current list, see: http://www.powernaturally.org/Programs/Wind/qualified_wind.asp?i=8

Qualified Wind Generators as of June 2006:

Bergey Windpower	BWC XL.1	1 kW Wind Turbine
Bergey Windpower	BWC EXCEL	10 kW Wind Turbine
Fortis	Espada	0.8 kW Wind Turbine
Fortis	Montana	5.8 kW Wind Turbine
Fortis	Alize	10 kW Wind Turbine
Furhlander	FL 25	25 kW Wind Turbine
Furhlander	FL 30	30 kW Wind Turbine
Furhlander	FL 100	100 kW Wind Turbine
Furhlander	FL 250	250 kW Wind Turbine
Northern Power Systems	North Wind 100	100 kW Wind Turbine
Southwest Windpower	Whisper 100	0.9 kW Wind Turbine
Southwest Windpower	Whisper 200	1 kW Wind Turbine
Southwest Windpower	Whisper 500	3 kW Wind Turbine
Wind Energy Solutions	WES 5	2.5 kW Wind Turbine
Wind Energy Solutions	WES 18	80 kW Wind Turbine
Wind Energy Solutions	WES 30	250 kW Wind Turbine
Wind Turbine Industries	23-10	10 kW Jacobs 23-10 Wind Turbine
Wind Turbine Industries	31-20	20 kW Jacobs 31-20 Wind Turbine