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Eco-Industrial Urbanism
IN DAVIDSON, NC
a new economic development framework

THE
Littlejohn
GROUP

November 2009



(innovations)ⁿ

Innovations is GHD's program that is harnessing the creativity and knowledge of our people and partners across the world to work together and develop fresh ways to address current and future challenges. At the heart of the program is an emphasis on collaboration across industries, sectors and geographic boundaries to share knowledge and apply it to ideas that create value.

The key objective of the program is to develop solutions to the complex issues facing GHD's clients and the community by harnessing its people's diverse technical capabilities and professional experiences.

Integrated cross disciplinary collaboration is key to generating innovative solutions.



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A new economic development framework

The Need

The Town of Davidson owns a 19 acre property on Beaty Street. The pond in the center of the property is contained by an eroding dam. If the dam fails, large amounts of sedimentation and pollution will flow into Lake Davidson.

A neighboring property owner, Ralph Clontz, has expressed a desire to develop his property. The Town of Davidson desired to craft a vision for the area, ensuring any work on the dam and pond compliment future development.

The Response

The Town of Davidson engaged the GHD team to create a development vision for the site that incorporates the needs and desires of the Town, key stakeholders, and the public. To do this, the GHD team hosted a one-day, condensed planning workshop. Experienced professionals from varied backgrounds, including: architecture, landscape architecture, planning, environmental engineering, and sustainability were brought to Davidson to meet stakeholders, gather collective knowledge, and generate development concepts for the property.

What resulted is a framework of Eco-Industrial Urbanism, with the potential to generate:

- ▶ Sustainable development
- ▶ 5,100+ permanent jobs
- ▶ 3.2M square feet of new space
- ▶ Over \$400M new investment, not including equipment or fixtures

The Results

Eco-Industrial Urbanism is an economic development strategy driven by adherence to the triple bottom line of economic, environmental, and social sustainability. It seeks to integrate the best practices of Industrial Ecology and environmental science with sound economic policy, social concern, and urban design.

For Davidson, Eco-Industrial Urbanism in the study area means:

- ▶ “good” jobs (over 5,100 potential permanent positions) that pay good salaries and have higher multiplier effects;
- ▶ an increased, diversified tax base with \$90M tax revenue at year 2030;
- ▶ best-in-practice environmental performance: reducing stormwater runoff, waste, and energy use;
- ▶ a truly “mixed-use” environment, integrating industrial jobs within an urban environment; and
- ▶ an increase in residential units that meet the needs of workers in the immediate vicinity.

At the core of Eco-Industrial Urbanism is an integrated urban ecosystem where:

- ▶ the wastes (materials, energy, water, etc.) of one firm become the inputs of another;
- ▶ flows of consumer goods, services, and commuting patterns are internalized along with flows of industrial goods and wastes;
- ▶ opportunities to connect natural ecosystems with human systems are utilized; and
- ▶ all fiscally and environmentally responsible opportunities for resource sharing, reuse, and repurposing are maximized.

The next steps toward realizing the vision of Eco-Industrial Urbanism in Davidson are to:

- ▶ establish a “team of champions” to head the project;
- ▶ restore the dam;
- ▶ identify potential synergies through “synergy scoping;”
- ▶ identify catalyst projects; and
- ▶ identify funding mechanisms.

The following document details the process through which GHD developed the Eco-Industrial Urbanism strategy for the site, the overall vision for the area, and next steps toward implementation.



Background

Overview

The Town of Davidson currently owns five parcels (1), totaling 18.35 acres, in the wedge created between the northern portion of Beauty and Main Streets. The parcels, now commonly referred to as the “Beaty Property” were once part of a larger farm property owned by the Clontz family.

An unused agricultural pond (2) formed by the damming of an intermittent stream sits in the center of the property. Years of erosion of the earthen dam (3) now threaten its structural integrity. If the dam fails, it will send large amounts of sedimentation downstream into Lake Davidson (4), which has no natural outlet, and create significant pollution and water quality issues. The Town must act to remedy the situation, but wishes to do so in a manner fitting with future development of the land.

A neighboring property owner, Ralph Clontz, is seeking to develop his 19.6 acre property (5) across the street from the Beaty Property. The four contiguous parcels, commonly known as the “Clontz Property”, have a long shoreline on Lake Davidson. The elevation of the property rises over 44 feet from Lake Davidson on the southern edge to the northeastern corner, next to the Ingersoll Rand campus (6). Dense forest covers much of the Beaty and the Clontz properties.

Individual property owner interests and the desires of town government do not always dovetail and often conflict. Davidson has a unique opportunity as Mr. Clontz has expressed interest in working with the City to develop in a way that meets both his needs and provides a benefit to the town. This cooperation creates one of the last large, developable pieces of land close to Downtown Davidson.

The one-day workshop allowed the project team to work collaboratively with the Town and stakeholders to generate ideas for the site.

Challenges

Several challenges must be overcome to realize the successful development of the site.

- ▶ **Site constraints, including topography, access, and minimum impervious standards must be overcome with creative solutions to maximize the use of the available land.**
- ▶ **Market conditions are constantly changing. At the time of the study, little development was occurring in any sector. Planning for future demand in a time of economic uncertainty requires a vision that anticipates new growth sectors of the economy.**
- ▶ **Local community members have strong and varied expectations for the development of the property.**

The Response

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After the event, the GHD team further developed and refined these concepts into a sustainable urban/economic development framework focused on the principles of *industrial symbiosis*.

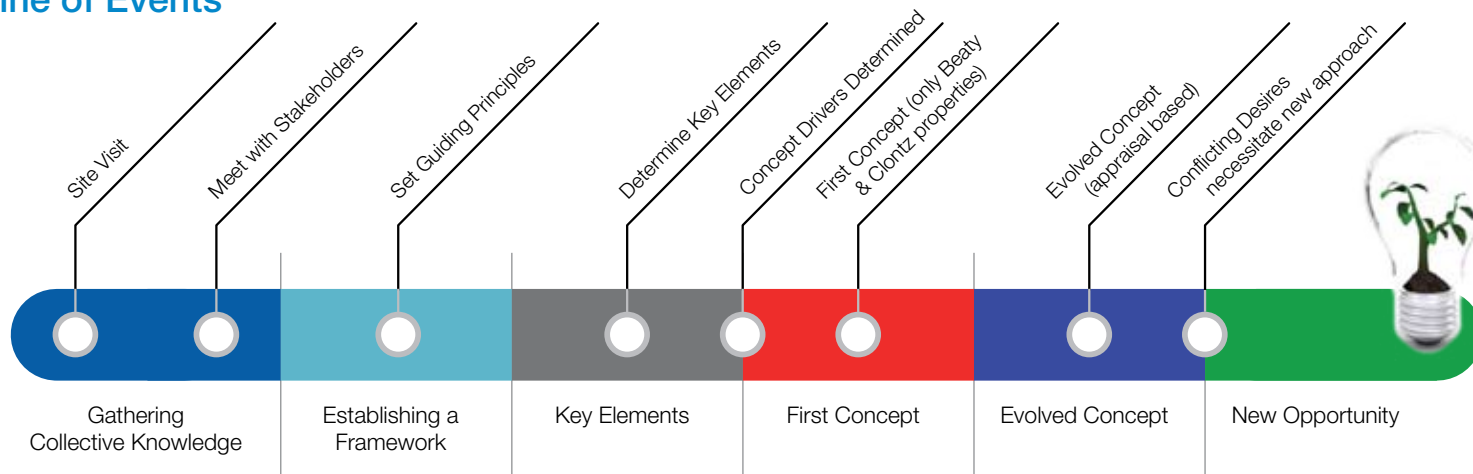


GHD team members consulted with area residents and stakeholders ▲

The Event

The GHD planning workshop and preceding site visit were designed to incorporate the key elements of the traditional charrette process in a condensed time frame. The goal of the event was not to solidify a design concept or plan, but to harness collective knowledge to generate ideas and concepts about how the property could develop.

Timeline of Events





Gathering collective knowledge

Site Visit

On the afternoon before the workshop the GHD team met with the Town of Davidson, the property owner, a representative from the Davidson Lands Conservancy, and a local resident. This group toured the site and conversed about each party's various needs, concerns, and desires. A representative from Ingersoll Rand met with the project team on the morning of the workshop.

- ▶ The dam can be repaired
- ▶ The Town desires a diversified tax base and sustainable development
- ▶ Mr. Clontz desires maximum value from his property
- ▶ Ingersoll Rand desires a compatible neighbor

Discoveries

1. No significant threat of habitat destruction exists

The team's environmental scientist observed no signs of wildlife species dependent upon this environment as a sole habitat. Those species present (squirrels, etc..) have readily adapted to urban settings. Vegetation present was largely non-native and/or invasive with no existing stands of old growth forest.

2. Citizens are using the land

Paths have been worn throughout the property by people who have used it as recreational space. A loop around the pond connects to neighboring streets at varying points, serving as an unofficial nature trail.

3. The dam is eroding, can be repaired, and serves a purpose.

The technical report on the dam, prepared for the Town by Centralina COG, stated the dam is eroding and in danger of failure. Despite this, it can and should be repaired. The pond serves as a catchment for stormwater from adjacent areas, slowing the water and filtering sediment and pollution before the water continues to Lake Davidson. This is an especially important role as Lake Davidson lacks a natural outlet, trapping all pollution and sediment it receives.

Needs, Concerns, and Desires

Town of Davidson

1. A desire to increase the tax base

Davidson's tax base is largely residential, which generally consumes more in services than it provides in revenue. The Town would like to see more commercial and industrial development occur to diversify the tax base and add revenue.

2. A concern about a the pipeline of single family homes

The Town has approximately 2,000 permitted single family lots which have yet to be developed. Davidson is concerned about any proposal to increase this reserve of permitted, detached single family residences.

3. A need for civic athletic facilities

The Town has more demand for civic use athletic fields and active recreation spaces than it can meet, particularly on this end of town.

4. A need for civic meeting facilities

Existing meeting facilities are booked to capacity, with additional demand from residents and civic groups for meeting spaces.

5. A desire to assist the athletic facility needs of the Community School of Davidson

Community School of Davidson does not currently have access to athletic fields. The Town would like to help the school meet this need while meeting its need for civic use facilities.

6. A desire and responsibility for sustainable development

The town of Davidson has a set of policies that require socially and environmentally responsible development.

7. A desire for open space

Area residents have expressed a desire to have a significant portion of the property remain as open space.



Ralph Clontz, Property Owner

1. A desire to maximize financial return on property while being a good steward of his family's historic land

Mr. Clontz wishes to unlock the value potential of his property to provide security and stability his family's future. Mr. Clontz wishes to honor the family's strong roots in Davidson, through any development that occurs on the property.

2. A desire to maximize the property's contribution to Davidson's tax base

Originally rooted in a desire to bring jobs to Davidson, Mr. Clontz refined his goal to better address the economic needs of the Town.

Mike Dawson, Ingersoll Rand, Stakeholder

1. A desire to gain a compatible neighbor

As a manufacturer, Ingersoll Rand desires a neighbor that will compliment its operations and/or is compatible with its current use.

2. A need to ensure security of its campus

Ingersoll Rand is concerned about controlling access into its corporate campus.

3. A desire to minimize traffic problems

Ingersoll Rand creates significant traffic events on Beaty Street at shift changes. Large trucks must also be able to easily access the facility. Any development should remain sensitive to the transportation needs of Ingersoll Rand and future industrial users.

From left to right: Severe erosion to the Beaty Pond dam threatens the water quality in Lake Davidson; Paths throughout the Beaty Property show citizens' use of the area; Beaty Pond, in its current state; Civic meeting space, such as that offered at the library, has greater demand than supply.

Establishing a framework

The team took the concerns and desires of the stakeholders and used them to establish a framework in which to explore potential site solutions. Any ideas generated were rooted within this framework, as outlined by a series of guiding principles:

- ▶ **Environmental Stewardship**
Any solutions considered must reflect a respect for the environment and seek to maintain and/or improve environmental performance
- ▶ **Sustainability**
Solutions must promote long-term environmental, social, and economic sustainability
- ▶ **Interpretation**
Opportunities should be sought to showcase and/or provide instructional opportunity about best practices utilized in sustainable development
- ▶ **Integration of Uses**
Rather than a simple mix, uses proposed for the site should be integrated, with logical connections between them
- ▶ **Added Value to the Community**
Solutions must add value to the Town of Davidson, contributing to the community's already high quality of life
- ▶ **Revenue Generation**
Any proposed development must help to diversify the tax base of the Town of Davidson
- ▶ **Inspired by Symbiosis**
Further expanding the integration of uses, development on the site must seek to minimize environmental damage and maximize efficiencies.

Key Elements

Pond Restoration

By stabilizing the dam, dredging and aerating the pond, creating wetlands along the pond's edge, restoring the stream between the pond and Lake Davidson, and creating a series of lower forebays on the creek, the Town will gain both a civic asset and a natural stormwater control device.

Athletic Fields

Town representatives expressed a need for athletic fields both for civic use and for use by the nearby Community School of Davidson. Previous studies have shown portions of the Clontz property developed with athletic fields. The topographic change of the property, and required cut and fill, would make this a financial and engineering challenge.

Civic Spaces

Davidson is an actively engaged community. Rooms at the Town Hall and library are often booked to capacity, with more groups wanting to use the space than time allows. The Town expressed a need for multi-use civic spaces that can accommodate groups ranging from neighborhood associations to book clubs and community education classes.

Interpretive Opportunities

Elements of sustainable site design and development should allow for interpretive observation. This could take several forms, from signs along the path network to integrating an education space into one of the structures.

Industrial Development

The Town's desire for an increased tax base, combined with Mr. Clontz's desire to assist the town and Ingersoll Rand's wishes for a compatible neighbor **all combine to necessitate some form of industrial development on the site.**

Residential Development

Town officials expressed concern about emphasizing residential in the area as a backlog of 2,000+ residential units currently exists. However, discussion did lead to a potential need for rental housing to meet the needs of both Davidson's low and moderate income citizens and those who do not desire to own. As such, some residential offerings were reflected in the concepts.

○ Concept Drivers

Recreational Trails

Public Beach

Pavilion / Public Gathering Space

Parking (pervious surface)

Light Industrial

Athletic Fields

Reconstructed Beaty Pond

Mixed Use Civic Building

Davidson Bay (Phase II)

Community School of Davidson

Traffic Control

Security

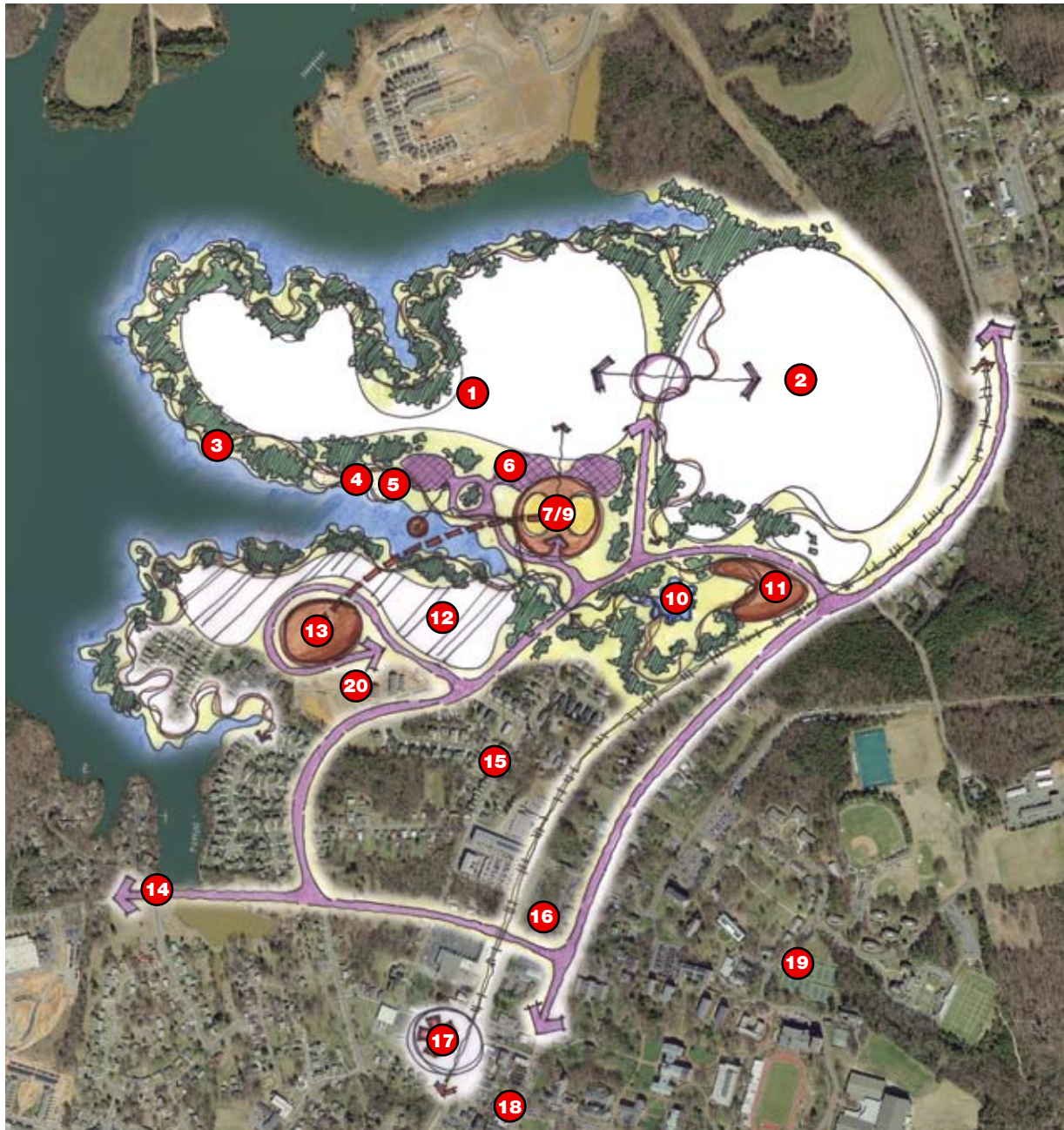
Existing Residential

Davidson College

Future Commuter Rail Station

Reconstructed Dam

First concept



Considers development potential only within the parameters of the Beaty and Clontz properties and synthesizing the desires of all parties

1. Ingersoll Rand
2. Ingersoll Rand (vacant land)
3. Trail
4. Beach
5. Pavilion / Public Gathering Space
6. Parking (pervious surface)
7. Light Industrial
8. Access Road
9. Roof-top Fields
10. Beaty Pond
11. Mixed Use Civic Building
12. Davidson Bay (Phase II)
13. Community School of Davidson
14. Griffith St. to I-77
15. Existing Residential
16. Davidson College Offices and SF residential
17. Future Commuter Rail Station
18. Downtown
19. Davidson College
20. Davidson Bay Phase I
21. Reconstructed Dam

About the Concept

Clontz Property

Central to the concept for the Clontz property is a large, industrial structure in the northeastern portion of the property. This structure is built into the hillside to take advantage of the topography. The building(s) are built with green roofs to allow for athletic field uses. Parking is moved behind the structure.

A series of public-use facilities are constructed along the lakeshore. A trail network connects to proposed trails in Davidson Bay, the Ingersoll Rand campus, and the Beaty property. Opportunities exist for a swimming beach with concession/cabana, terraced community gardens along the south-facing slope, and a dock for non-motorized watercraft.

The entire site is accessed by a winding road, purposefully designed to prevent direct exposure to the industrial facility, preserving the wooded character of the site.

Beaty Property

A mixed use structure defines the corner of Beaty and Main Streets and announces a sense of arrival along Davidson's northern gateway. The structure provides opportunities for ground-level tenant space, rental residential and/or professional office in the upper stories, and civic use facilities in a basement level that walks out to a restored and reshaped Beaty Pond.

The restored Beaty Pond serves as a natural amenity with trails and open space surrounding the water. An outdoor classroom for natural sciences education can occupy some of the civic space in the mixed-use structure.



Challenges with the Concept

Value Potential

Mr. Clontz wishes to maximize the value of his property. An existing appraisal for the property recommends residential as the highest and best use. This does not fit well with Davidson's desire for a more diversified tax base or with ideas of industrial uses on the Clontz property.

Sustainability / Environment

Integrating athletic fields and or industrial space on the site, while technically feasible, presents challenges to environmental and economic sustainability.

Significant earth moving is required to create a level pad suited for either use. Such earth moving would destroy a significant portion of the established canopy on the site. Additionally, the steep hillside would require extensive sedimentation and erosion control to prevent further water quality deterioration in Lake Davidson.

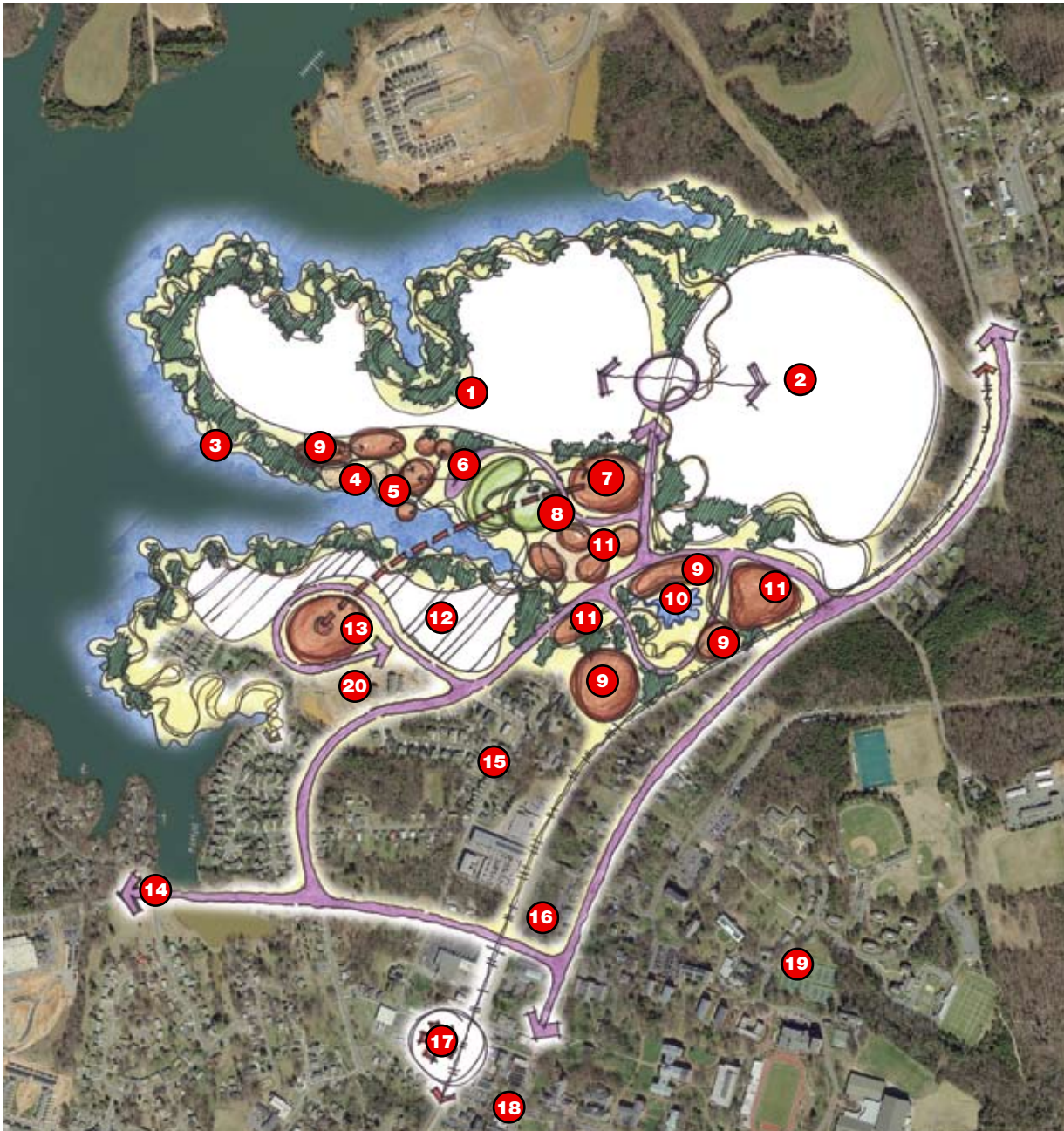
Placing fields on top of industrial buildings that have been built into the hillside is a plausible design solution, but would likely be too expensive to be feasible. Many competing opportunities exist for industrial space on more level, buildable land. Additional concerns include ventilation from the industrial functions onto the playing fields, as well as security concerns.

Access

Existing property lines and development constraints along the stream limit access to the Clontz property to one, narrow section of Beaty St. Steep slopes immediately across Beaty from this access make access to the Town property from this point quite difficult. Creating access to both properties thus requires the addition of two more points of conflict along Beaty, further contributing to existing concerns about traffic along the road.

◀ Athletic fields for the neighboring Sterling Elementary School were built on top of the CATS parking deck at the I-485 station in Charlotte, NC.

Evolved concept



Considering adjacent land uses, the Clontz Property's appraisal, and a mixed-use program.

1. Ingersoll Rand
2. Ingersoll Rand (vacant land)
3. Trail
4. Beach
5. Pavilion / Public Gathering Space
6. Parking (pervious surface)
7. Light Industrial
8. Access Road
9. New Residential
10. Beaty Pond
11. New Mixed Use
12. Davidson Bay
13. Community School of Davidson
14. Griffith St. to I-77
15. Existing Residential
16. Davidson College Offices and SF residential
17. Future Commuter Rail Station
18. Downtown
19. Davidson College
20. Davidson Bay Phase I
21. Reconstructed Dam / Loop Road

About the Concept

This concept developed toward the end of the workshop as a “what-if” scenario. It assumes residential as the “highest and best use” for the properties and seeks to maximize the number of units.

Access issues to the Clontz site are resolved by converting Ingersoll Rand’s driveway to a public access road.

Clontz Property

New mixed-use structures occupy the eastern portions of the Clontz property and the Ingersoll Rand parcel along the new access road. Public parkland sits in the middle of the site as well as along the shoreline. Residential units in both the mixed use structures and in the far western reaches of the site benefit from the natural amenities of the water and tree canopy.

Beaty Property

In addition to the mixed-use building present in the first concept, this concept creates a loop road around the pond. The loop road opens several portions of the site for residential development. A restored pond remains on the site, as do the series of smaller pools en route to Lake Davidson.

Challenges with the Concept

Revenue Generation

Residential development with a mix of some office represents the status quo and provides no additional benefit.

Sustainability

Land is used much more intensely in this concept, which can be understood as either beneficial or counterproductive to environmental sustainability. More people live on less land, but more land is disturbed.

Access

Access to the Clontz property is greatly improved in this concept. Potential points of conflict are created along Beaty Road through the creation of the loop road, but could be remedied through a right-in-right-out configuration.

The conflicting desires of:

- ▶ Revenue generation through industrial development v. Residential appraisal
- ▶ Large footprint uses (industry / athletic fields) v. environmental sustainability and canopy preservation

Cannot be adequately addressed on the Beaty and Clontz sites alone.



○ New opportunity

Responding to Constraints

Initial concepts proved the original study area inadequately positioned to accommodate the varied desires of the stakeholders. The Clontz and Beaty properties' topography makes them unsuitable for large footprint developments like industry and athletic fields. Their accessibility creates problems for traffic on Beaty. And the residential recommendation of the appraisal does not enable tax base diversification for the town.

The Site Grows

Ingersoll Rand desires a compatible neighbor and owns 84 acres of relatively flat, vacant land (1) between its campus and NC-115. Combined with other vacant and/or underdeveloped parcels along Beaty Street (2) an additional 102 acres are added to the site. The company has expressed interest in either expanding its operation and/or developing the property at some point in the future. Its topography as well as its proximity to current industrial uses and the initial study area made it a logical extension of the study area. Combined with the original site, (3) and (4), the total study area encompasses 140.4 acres.

Unlocking Development Potential

Constructing a new road along the current Ingersoll Rand entrance creates two developable corner parcels of land while opening up the interior of Ingersoll Rand's vacant property for new industrial development. Framing the corner of Beaty Street and the new road with street-fronting buildings creates an opportunity for a well-defined, significant gateway into Ingersoll Rand and the new Industrial Area. Now an intersection of two public streets, it can more easily be signaled to increase both vehicular and pedestrian connectivity.

Industrial Symbiosis is widely considered as one of the most effective policy and business concepts to realize sustainable development.

Eco-Industrial Urbanism: Planning for Sustainability

In the Planning process, many opportunities exist to make more out of less: More tax revenue, more uses, more jobs with less resources, less impact on the environment. In turn, an opportunity exists to develop in a way that requires less over the long-term so that resources are shared and reused as efficiently as possible.

Some approaches already explored in development, include:

- ▶ **Low Impact Development;**
- ▶ **LEED and LEED-ND; and**
- ▶ **Mixed-use development.**

Each of these addresses one or more elements of sustainable urban development, but none effectively integrate industrial activity with other elements of an urban ecosystem.

Industry with Urbanism

“Industrial Symbiosis is widely considered as one of the most effective policy and business concepts to realize sustainable developments, which reduce local and global environmental emission while providing feasible profits and motivations for business sectors, municipalities, and citizen groups.”¹ The resulting, successful products generally take the form of Eco-Industrial Developments. While they can go by many other names (eg, green industry parks) they are areas dedicated primarily to industrial processes.

Where new opportunity exists for Davidson, and for communities across the country, is in the integration of the industrial processes and concepts of Industrial Symbiosis with the complex systems of urban environments. This integration allows for greater optimization of flows, not only of industrial products and by-products, but also of people, goods, and services. The resulting development pattern creates opportunities for numerous synergies, like:

- ▶ **live-work options for all sectors of employees – not just business professionals and service-sector workers;**
- ▶ **energy optimization – using waste heat/energy to supply residences and commerce along with industry; and**
- ▶ **trip reduction – more jobs in more sectors in close proximity to housing can reduce or eliminate the longest trip.**



Green Idea: Industrial Symbiosis

In nature, ecosystems function through mutually-beneficial, or “symbiotic” relationships. Similarly, urban environments can be examined as ecosystems that include the natural ecosystem, comprised of abiotic factors (air, water, rocks, energy) and biotic factors (plants, animals, and microorganisms) and human-constructed systems, such as buildings, the flow of goods and services, materials, infrastructure, and roads.

This can be achieved by using the tools of **Industrial Symbiosis** - a concept intended to intentionally examine and mimic, in an urban/ industrial setting, the natural environmental relationships that exist in ecosystems.

While the term comes out of academia, the real-world implications of Industrial Symbiosis are starting to be realized and are demonstrating real dollar savings in addition to environmental benefits.

Examples exist world-wide and in the U.S. of industrial areas that utilize industrial symbiosis principles to create benefits to the bottom line, reduce waste sent to landfills, and increase resource efficiency and security.

1 Center for Regional Industrial Symbiosis Research, Toyo University, web

Eco-Industrial Development in action

EcoComplex, Catawba County, NC, USA



The complex is a system that recovers usable products and by-products from a group of public and private partners located in a defined area. The EcoComplex promotes Catawba County as a center for “Green” innovation and enterprise in the areas of energy, agriculture, and the environment.

“One man’s trash is another man’s treasure.”

- ▶ Resource Recovery
- ▶ Economic Development
- ▶ Job Creation
- ▶ Center for “green” innovation

Synergies

- ▶ waste as energy (electricity, steam, or heat)
- ▶ waste as a raw material for the production of their own product

Goals

- ▶ focus on making and using “green” energy
- ▶ economic development for Catawba County

Realizing the Vision

Blackburn Resource Recovery Facility and Landfill Gas to Energy Facility

- ▶ Methane gas to energy = \$600,000/year energy revenue
- ▶ Waste heat to wood manufacturer for drying raw lumber
- ▶ Waste lumber to pallet manufacturer
- ▶ By products of pallet and lumber mill will be fuel for future bio-energy facility
- ▶ Feedstock crops occupy the required landfill buffer – harvested by local farmers
- ▶ Crop will become fuel supply for the bio-fuel research facility

Upcoming Components of the EcoComplex

- ▶ BioEnergy Facility – Boiler/Gasifier System
- ▶ Biosolids (Sludge) Management Facility
- ▶ Biodiesel Research and Production Facility
- ▶ Agricultural R&D – Algae and Food Crop Production

Proposed Components of the EcoComplex

- ▶ Organic Waste Management Facility
- ▶ Compost and Soil Amendment Processing Facility
- ▶ Greenhouse Operations
- ▶ Brick and Pottery Manufacturing
- ▶ Ceramic / Recycled Glass
- ▶ Recycling Plastic Pelletization
- ▶ Bio-fuel Research
- ▶ LEED Certified Smart Grid Education Facility

Impact

- ▶ 350 jobs at completion
- ▶ 800 acres
- ▶ \$500 M in total public/private investment generating favorable returns

Source: Catawba County Engineering and Utilities

EcoStar Devens, Ayer, MA, USA



Fort Devens is a decommissioned military base redeveloped with regional synergies in mind. During redevelopment, existing assets were reviewed and investigated for the best use of the area to match community needs and minimize resource needs. Businesses and organizations in the Devens gain eco-efficiencies by pursuing strategies to improve environmental and economic performance.

- ▶ Smart Growth
- ▶ Economic Development
- ▶ Job Creation
- ▶ Public-private partnership

Synergies

- ▶ Educational forums and technical assistance
- ▶ Networking and partnering opportunities result in:
 - pollution prevention initiatives and recycling
 - waste and toxics use reduction
 - water and energy efficiency
 - purchasing of environmentally preferable products

Goals

- ▶ Stimulate economic investment and job creation
- ▶ Smart Growth and “green” development
- ▶ Influence future development and create new opportunities for business growth

Realizing the Vision

- ▶ 4,000-acres, 2,100 acres of open space and recreation lands
- ▶ Industries: high tech, medical device and plastics
- ▶ Total Projected Build-out 8,500,000 SF
- ▶ 75-day permitting process, competitively priced land, commercial infrastructure
- ▶ Financing and tax incentives
- ▶ High quality of life with available housing, education and recreational facilities
- ▶ Financing Affordable Housing
- ▶ Benefits of housing variation

Impact

- ▶ Two year snapshot of results (2004-2005)
 - financed more than 350 projects
 - created 15,000 new jobs
 - built more than 5,000 new housing units for families, seniors and students
 - Focus on providing good jobs
 - More than 80 companies today employ more than 4,200
 - Jobs at Devens pay \$51,279 on average – compare to Massachusetts average of \$48,916 and U.S. average of \$39,354
 - Estimated wages of non-profit, private, and public Devens employees in 2005 totaled nearly \$220 million
- ▶ Public/Private Investment
 - Combined investment of private businesses, residents, U.S. military, and Commonwealth of Massachusetts equals \$745 million

Source: Mass Development

Eco-Industrial Development in action

Existing and Developing Eco-Industrial Sites in North America

Benefits of Eco-Industrial Urbanism

Communities

- Expanded local business opportunities
- Increased tax base and good jobs
- Recruitment of higher quality companies
- Reduced waste disposal costs
- Improved environment and habitat
- Improved health for employees and community
- Partnership with business
- Minimized impact on infrastructure
- Enhanced quality of life

Environment

- Continuous environmental improvement
- Reduced pollution
- Innovative environmental solutions
- Increased protection of natural ecosystems
- More efficient use of natural resources
- Protection and preservation of natural habitat

Business

- Higher profitability and improved efficiency
- Increased employee productivity
- Enhanced market and public image
- High performance workplaces
- Access to financing and higher value for developers
- Regulatory flexibility
- Reduction of operation costs (i.e. energy, materials)
- Reduction in disposal costs
- Income from sale of by-products
- Reduction of environmental liability

Londonderry Eco-Industrial Park, Londonderry, NH
Plastics, power generation, preservation of agricultural heritage and promotion of environmentally & culturally appropriate development

Northwest Louisiana Eco-Industrial Park, Shreveport, LA
15,000 acre army ammunition facility redeveloping under principles of industrial ecology and permaculture

Berks County Eco-Industrial Park, Berks County, PA
Landfill gas to energy for manufacturing (public/private project)

Burnside Eco-Industrial Park, Nova Scotia, Canada
Eco-Efficiency Center in collaboration with Dalhousie University to “green” the park and serve as business coordinator within park and regionally

Cabazon Resource Recovery Park, Mecca, CA
Biomass electricity generation plant and recycling-manufacturing company - products from used tires

Civano Industrial Eco Park, Tucson, AZ
Business center for the development of sustainable technology

Coffee Creek Center, Chesterton, IN
Mixed-use model supporting green tech and consulting groups

East Shore Eco-Industrial Park, Oakland, CA
Group of four alternative waste processing companies operating under environmental schemata, with expansion plans under way

Fairfield Eco-Industrial Park, Baltimore, MD
Boasts an impressive list of major US and international corporations adhering to strict eco-guidelines in city-created empowerment zone

Franklin County Eco-Industrial Park, Youngsville, NC
Eco-design solar-powered building in which tenants sell or service technology or products involving alternate energy, recycling, or sustainable building

The Green Institute, Minneapolis, MN
Cluster of four programs including re-use center to redistribute usable materials to public, a community gardening project, non-profit green technology advocacy group, and an eco-enterprise building housing companies, non-profits, and affiliated programs

Port of Cape Charles Sustainable Technologies Industrial Park, Eastville, VA
HUB Zone, foreign trade zone, and Virginia Enterprise Zone with specific incentives for photovoltaic producers, clean fuel vehicle manufacture, and recycled material producers.

Raymond Green Eco-Industrial Park, Raymond, WA
Located within a sustainably harvested forest, works with local resources and processes waste streams on site

Riverside Eco- Park, Burlington, VT
An agro-industrial park using biomass and other cooperative reprocessing techniques

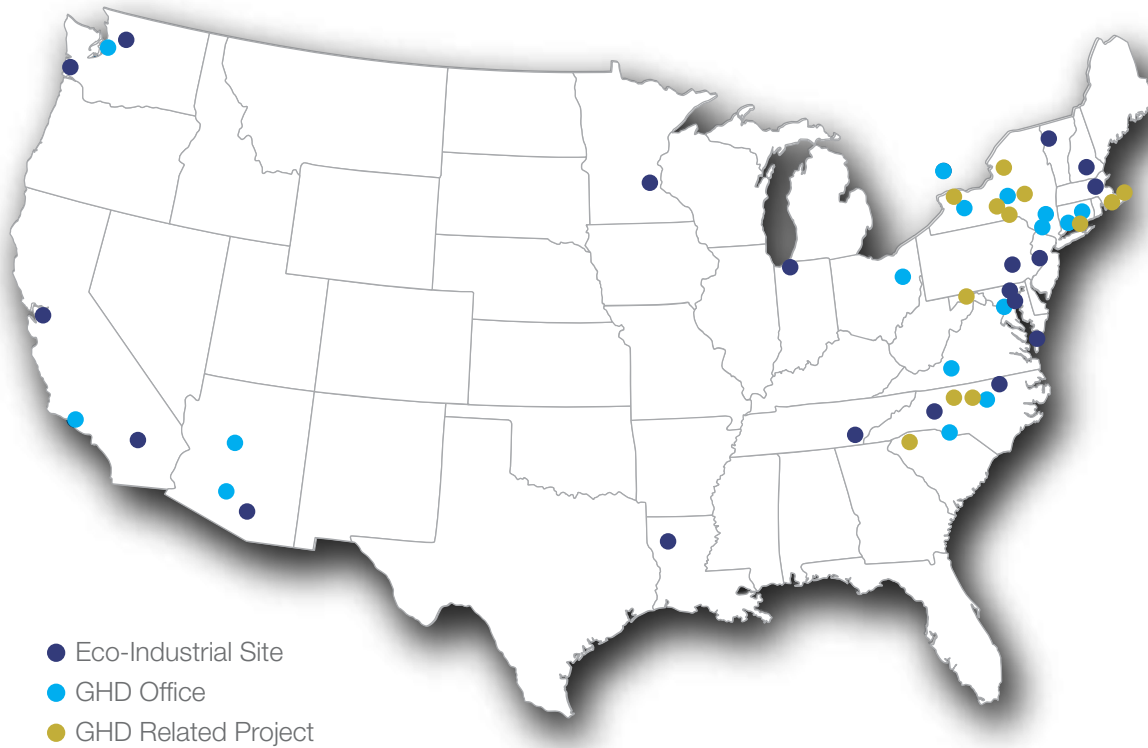
Skagit County Environmental Industrial Park, Skagit County, WA
Sustainably built recovery center as centerpiece of park which includes production, community center, sales and marketing center, and environmental business center

Shady Side Eco-Business Park, Shady Side, MD
Marine-based park with high level of local community participation

Trenton Eco-Industrial Complex, Trenton, NJ
Urban network, not geographically contiguous

The Volunteer Site/Enterprise South Eco-Industrial Park, Chattanooga, TN
Business development center on underused military facility using “cluster” approach to target specific industries

Source: Maile Deppe and Ed Cohen-Rosenthal, Handbook of Codes, Covenants, and Restrictions for Eco-Industrial Development, Work and Environment Initiative



Eco-Industrial Urbanism is:

- ▶ Sustainable Development
- ▶ Smart Growth
- ▶ Economic Development
- ▶ A Reason for Public/Private Partnership
- ▶ “Green Jobs” and establishing a “Green Economy”

GHD Related Project Examples

Compost Facility Expansion
Amherst, NY

Constructed Wetlands for Stormwater Treatment
Orleans, MA

Lake Source Cooling
Ithaca, NY

Electricity from Landfill Gas Study
Barnstable, MA

Environmentally Sensitive Stormwater
Norwalk, CT

Water Reuse Alternatives for
Wastewater Treatment Plans
Burlington, NC

Trap Grease to Electricity Study
Barnstable, MA

Cogeneration Study
Cumberland, MD

Industrial Wastewater Reuse
Easley, SC

Landfill Gas Collection
Broome County, NY

Methane Gas Utilization
Durham, NC

Natural Stream Channel Design
Madison County, NY

Bio-Energy Facility
Adams, NY



Eco-Industrial Urbanism: the business case for Davidson

Regional Growth, Quality of Life and Davidson

The Charlotte region is established in the global economy with more than 600 foreign companies and over 100,000 employees. Charlotte has climbed to the second largest financial centre in the US and is home to eight Fortune 500 corporate headquarters. Entrepreneur Magazine recognizes Charlotte as one of the top places to start a new business and Site Selection Magazine has consistently ranked North Charlotte as Top Micropolitan Area in the nation for new corporate facilities and expansions.¹

Expansion has largely been driven by low cost of living, relocation incentives and exceptional quality of life. People want to live in Charlotte and so it is a great place for businesses to relocate. To sustain this growth Charlotte must protect its quality of life.

Davidson has been a leader in progressive development policy and has achieved an incredible balance between new growth and retaining its small town character. An opportunity to leverage this experience and recognition to create a new hub for sustainable growth and “good job” creation exists in Davidson.

An unparalleled quality of life exists in the Town and, in a global economy where anything can be made and sold anywhere, businesses will continue to locate and expand where people want to live and work. Davidson is this place.

¹ Charlotte Regional Partnership

Industrial Market Snapshot

Current Conditions

The Charlotte region industrial market has seen vibrant expansion in past years and compared to other market sectors has remained stable locally and nationally. Current inventory throughout the region is 143,886,549 SF, of which the North submarket represents 31,864,218 SF, or roughly 22%.²

Effect of Proposed New Development

The concept presented herein represents 985,365 SF of new space coming online through year 2024, or less than 1% of current regional supply and 3% of the current North submarket supply. Vacancy rates are low throughout the market and currently lowest in the North submarket at 5.8%. This opportunity for expansion is further enhanced by the unique positioning of such a product offering. Demand potential would likely drive competition for space and rental rates at this location.²

Opportunity

- ▶ Existing Anchor Tenant: Ingersoll Rand, 1,200 employees with expansion potential
- + Industrial Market Demand (current and future)
- + Developable Land: 124 acres
- + Next to Davidson College
- + Adjacent to Historic Downtown Davidson
- + Proximity to Future Transit Hub
- + Proximity to Lake Norman
- + Proximity to Lowe's corporate campus and related development
- + Desire for Compact Dense Development
- + Desire for Sustainability
- + Desire for "Good Job" Growth

= conditions favorable for Eco-Industrial Urbanism



Green Idea: Trigeneration



United Technologies Corporation

Trigeneration, or "Trigen," is the centralized production of electricity, heating and cooling. Modern trigen units are roughly the size of a few dumpsters and have the ability to run on multiple fuel sources up to, and including, hydrogen.

Trigen delivers efficiency both through scale and through the capture and reuse of "waste" heat. The ability to run on multiple fuel sources reduces dependence on the local grid, which is largely dependent upon coal.



Integrating housing

Understanding Residential Demand

Predominantly residential development would not yield the economic benefits desired by the Town, and an industrial facility with playing fields would not provide the desired financial return for the property owner and is questionable at best in terms of its economic feasibility.

The Town was concerned about adding to what it perceived as a large, 2,000 plus unit, backlog of permitted, single-family residential development. Mr. Clontz desired to receive a fair price for his property, which an appraisal stated as best suited for residential.

To help resolve this issue, GHD engaged the Littlejohn Group to provide a residential market analysis for the Town of Davidson.

Market Summary

Davidson, North Carolina is one of Mecklenburg County's most desirable residential real estate markets. The vibrant town center, college, convenient location and pleasant landscape make the town resonate with buyer profiles including young professionals, families and empty nesters. Planning policy has kept housing supply in equilibrium with demand by creating a scarcity that pushes price point. An affordable housing policy was enacted to help ease affordability issues.

A diverse mix of housing product has come online in Davidson over the past 10 years: Approximately 2/3 of new units have been traditional single-family homes. 1/3 of new units have been attached product such as town homes, condominiums and mixed use lofts.

Trends & Projections

- ▶ **Approx. 1,100 new, for-sale units constructed between 2000 and 2009**
- ▶ **3,000 additional residents expected by 2020**
- ▶ **Growth will create demand for 1,200 new units by 2020**
- ▶ **260 rental units needed by 2020**

Davidson is expected to grow by close to 3,000 new residents by 2020, which will create demand for 1,200 new homes, roughly 80% of which should be for-sale housing.

Roughly 20% of households in Davidson live in rental housing, making it an important part of the market. Of the 1,200 new housing units built from 2000 to 2009, only 15% were rental housing. It is estimated that the town will need 260 new rental units to accommodate demand through 2020.

The chart below shows Davidson’s market for new housing in reference to the North submarket (Davidson, Huntersville, Cornelius), and the county overall. Davidson makes up only 3% of the new homes sold in 2008 in Mecklenburg County. Pricewise, Davidson is consistently higher than the county and north submarket for all product types except condominiums.

Going forward, Davidson will need to find flexibility in residential housing development to meet the needs of an evolving market. Distinct development directives will limit developability of land and drive prices up. Going forward, housing will likely begin to be more specialized, with site planning and product designed to accommodate specific markets. Guidelines for density should be set, but allow for product and tenure flexibility that meet market need. Notable market forces in Davidson in the next 10 years include:

- ▶ **Empty Nesters-** Empty nesters are a growing group of buyers. As boomers age, they will require new types of housing including smaller, lower maintenance homes such as town homes, condominiums and patio homes, assisted living communities and nursing homes. The ability to stay in their community is important and delivering a broad range of housing options can help with this.
- ▶ **Families-** Davidson has long been a popular community for families. In general, families prefer single family homes. However, the market is moving away from large homes on large lots to smaller floor plans on smaller lots.

The Clontz property is a unique piece of land that would support a broad range of marketable development options. Accessibility to Davidson College makes it viable to accommodate student housing. Water views and potential access give it potential to create a premium attached product targeted to empty nesters and young professionals. Access to the Ingersoll Rand plant makes it desirable as work force housing. It is prudent to consider the entire site, including the Ingersoll Rand plant, for housing potential. The water views and access are highly desirable and quality site planning and efficiencies may allow more housing to be incorporated.

Number of New Construction Closings - 2009

	Davidson			North Submarket	Mecklenburg County
	# of Closings	% of North Submarket	% of Mecklenburg County	# of Closings	# of Closings
Single Family	110	17%	3%	649	3705
Town House	25	23%	3%	110	799
Condo	7	6%	1%	112	964

Dollar Value of New Construction Closings - 2009

	Davidson			North Submarket	Mecklenburg County
	Avg \$ of Closings	% of North Submarket	% of Mecklenburg County	Avg \$ of Closings	Avg \$ of Closings
Single Family	\$ 388,616	137%	143%	\$ 283,000	\$ 271,000
Town House	\$ 247,000	115%	105%	\$ 215,000	\$ 234,000
Condo	\$ 249,750	129%	83%	\$ 194,000	\$ 291,000

Eco-Industrial Urbanism: planning for symbiosis

Complex relationships are at work within any urban system: firms provide services to one another, people travel to and from various destinations, and vegetation exchanges CO² for oxygen. These relationships are a result of the system's unique assets. An asset is anything that enables service delivery: commerce, mobility, and oxygen production can all be thought of as services enabled by the respective assets of firms, transportation infrastructure, and vegetation.

Planning for symbiosis seeks to discover the existing relationships and set up a framework for development that best takes advantage of the site's existing assets and relationships in a manner that is both responsible to the environment and creates positive economic outcomes. No two locations have the same set of assets and, as a result, unique approaches must be used in each new location.

Implementation Framework:

1. Identify the project
2. Begin with a champion or team of champions
3. Identify the project scale
4. Identify interests active in region
5. Form an Advisory Committee
6. Develop the Vision
7. Plan for Eco-Industrial Development
8. Design and implement Eco-Industrial Development
9. Market your product to attract tenants
10. Options for Financing Eco-Industrial Development
11. Operation and Management

1. Identify Existing Characteristics

Every site has a unique set of characteristics with which to work. These include the:

- ▶ physical (topography, soil, vegetation);
- ▶ social (skill set of workforce, governmental policy); and
- ▶ relational (proximity, situation).

The first step in planning for symbiosis is to develop a detailed inventory of all characteristics. Relevant descriptive information should be gathered for each characteristic for quantification and analysis. Database programs or even simple spreadsheets aid in this data collection and enable easy transfer into other applications, such as a GIS.

2. Identify Existing Flows & Synergies

Once all assets are identified, existing flows of resources and wastes must be documented along with current synergistic relationships. Typical flows include:

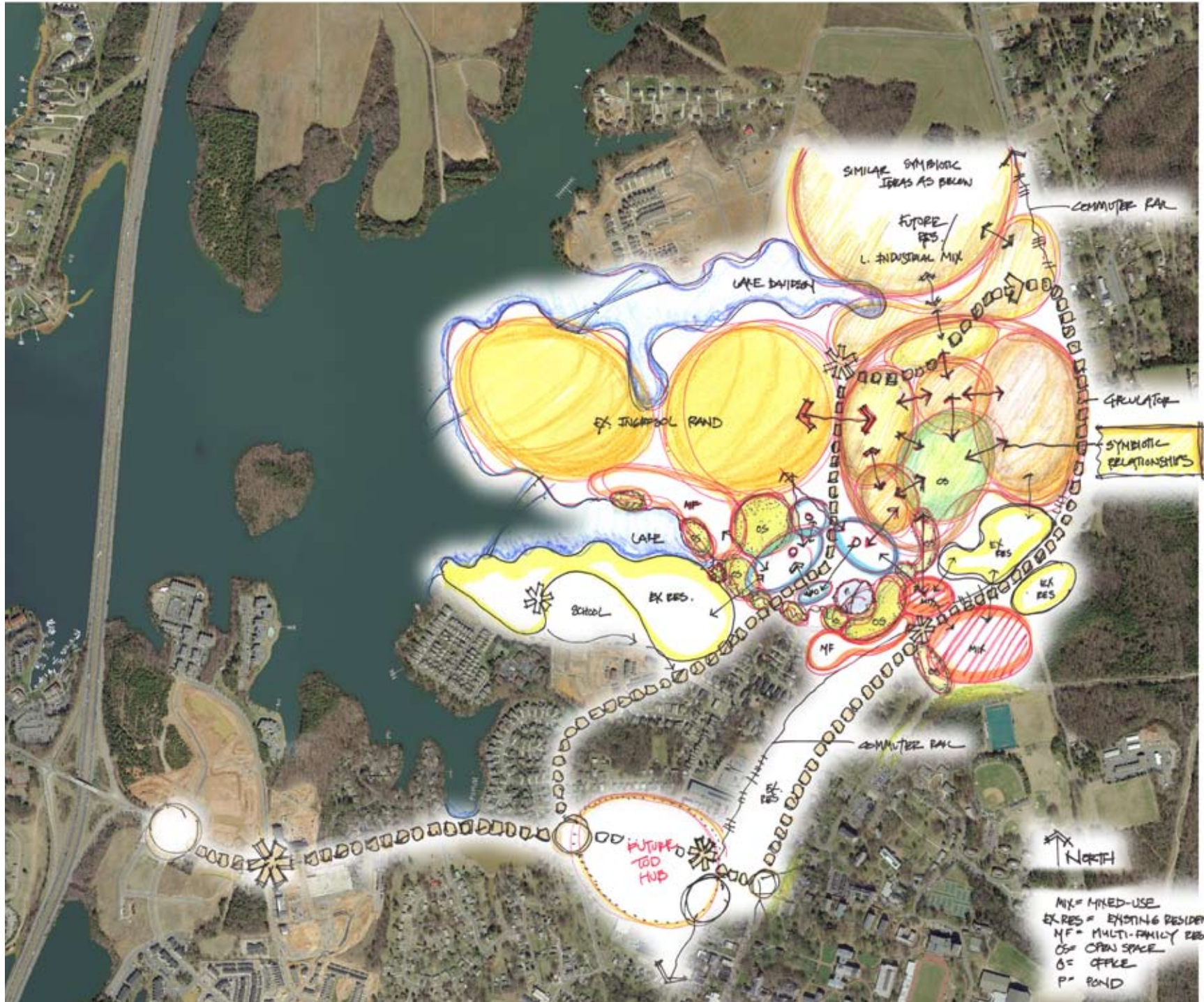
- ▶ energy flows;
- ▶ raw material flows;
- ▶ waste products; and
- ▶ human flows (commuting patterns, etc).

Common methods for the documentation of these flows include flow diagrams and computerized input/output models.

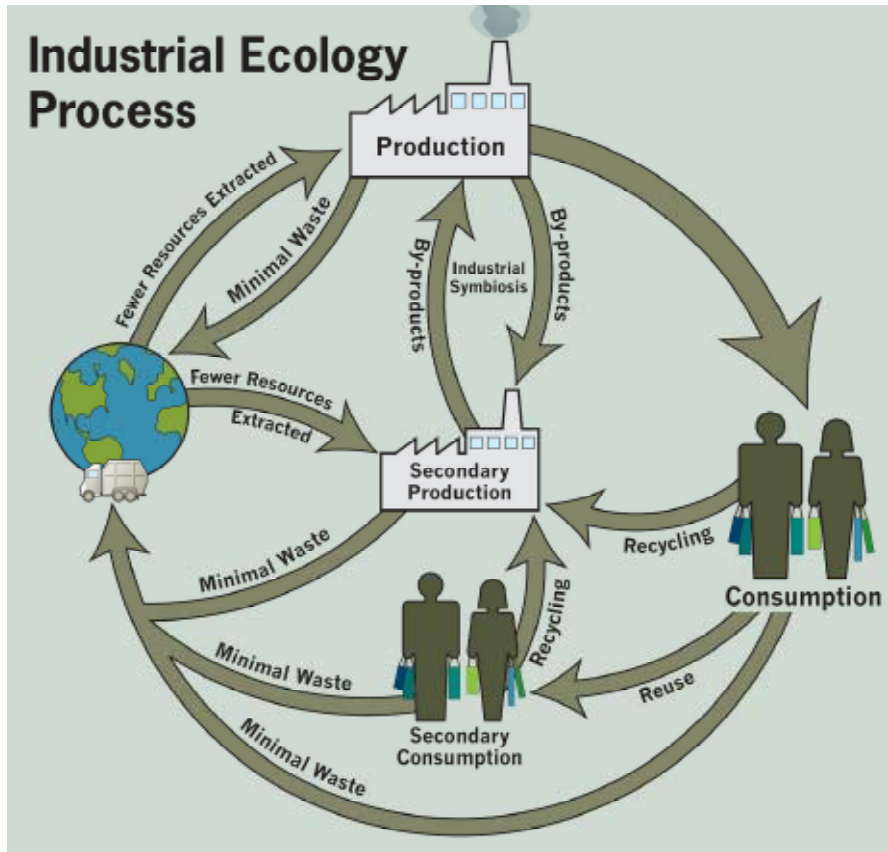
3. Seek Opportunities to Further Optimize Flows & Synergies

All planning decisions and strategies should seek to further optimize the flows and synergies of the urban ecosystem. Optimization techniques may include:

- ▶ targeting new industrial development to either use an existing waste product or contribute a by-product to another industry;
- ▶ creating new residential development to meet the housing needs of workers in the immediate area; and
- ▶ creating incentive structures to enable the desired development pattern and tenant mix.



A New vision



International Society for Industrial Ecology

New Opportunity...

For Davidson

- ▶ Sustainable Development
- ▶ Additional Revenue
- ▶ Athletic Facilities

For Mr. Clontz

By allowing for the desired industrial development and athletic fields to occur on adjacent property, Mr. Clontz is able to fully realize the value of his property through residential development. Adjacent recreational and employment centers provide potential amenities for the site while meeting the goals of the Town.

For Ingersoll Rand

The new development vision creates opportunity for Ingersoll Rand to capitalize on its real estate assets through either: expansion onto, development, or sale of its vacant land.

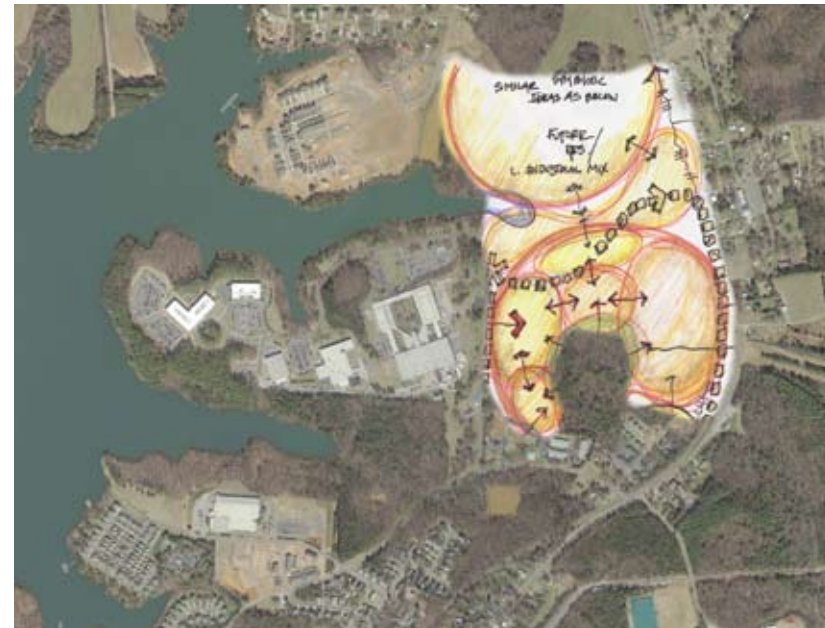
Acting as developer or selling the land allows for Ingersoll Rand to seek the compatible neighbor it desires. The new road network creates two corner parcels that can host attractive structures that would serve to define a gateway into Ingersoll Rand's campus.

Ingersoll Rand is well-versed in sustainable practice and issues an annual report on its own performance. Taking an active role in developing its land into an example of Eco-industrial urbanism provides the company with yet another opportunity to demonstrate itself as a leader in sustainable industrial practice.

Room for everything...in its proper place

Industrial Space

With a new access road more suitable land is available for industrial development. With 84 acres of new land for industrial development, the Town of Davidson will be able to diversify its tax base. By focusing on synergistic relationships between firms, the community, and the natural environment, this area of industrial production can serve as a model for sustainable urban development.



Recreational Space

The large, vacant land owned by Ingersoll Rand is the land best suited for recreational fields as well as industrial buildings. This creates several opportunities for symbiotic relationships. Fields in the center of the property, surrounded by industrial buildings, provide opportunities for shared parking and rainwater harvesting for field irrigation. By day the space can be utilized as an amenity simultaneously by workers on break and by students from the nearby Davidson Community School - a 3,500 foot walk away (only 1,500 feet further than the Clontz property).

Other recreational opportunities abound on the site and include an integrated network of trails and a ribbon of green space stretching from the new ball fields, through the Beaty Property and onto the Clontz Property. Opportunities exist on the Clontz property to construct a public beach, concession area, and/or community gardens in the 50 percent of the space that must remain impervious.



A New vision

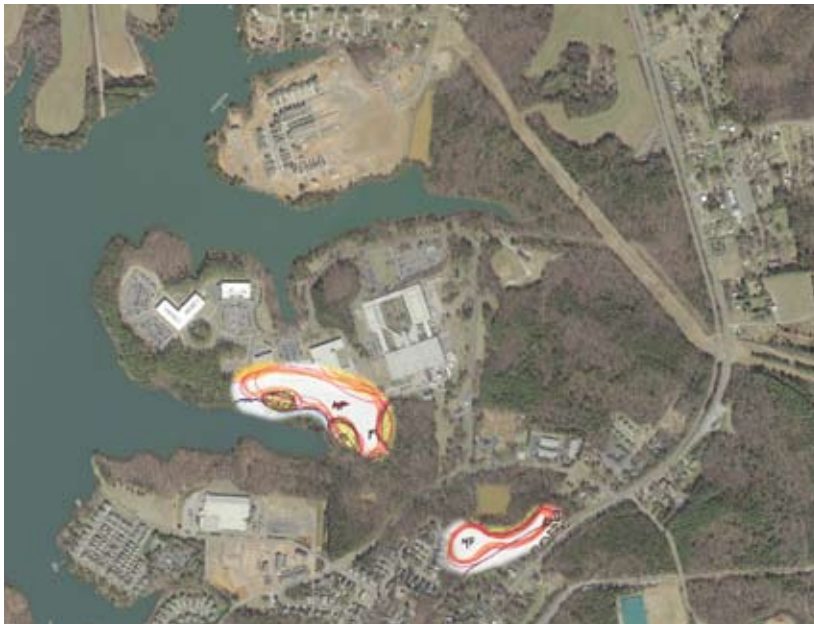


Mixed-Use Space

Ground floor tenant spaces in proposed mixed-use buildings at the corners of Beaty & NC115 and Beaty & the new access road provide opportunity for commercial use. These spaces would primarily serve as professional office space while providing options for neighborhood/office support retail as the market allows.

Civic Space

Indoor civic spaces for general use are best suited included in a portion of a proposed mixed-use structure at the corner of Beaty & NC 115. These spaces could occupy either the rear of the building or an upper level, allowing for professional office tenant spaces at street level.



Residential Space

Residential units targeted toward market demand are best suited on the Clontz and Beaty properties. Their smaller footprints require less grading, less canopy removal, and will be the best neighbors to the civic spaces along the waterfront and pond. Additional residential units can occupy the upper levels of proposed mixed-use structures at the corners of Beaty & NC 115 and Beaty & the new access road. A mixture of residential types and price points will help to ensure employees in the industrial firms have the option to live near their work.

Office Space

Corner parcels at the intersection of Beaty St. and the new access road create opportunity for the development of office-use structures. Development of this corner creates a defined, urban gateway to the eco-industrial area. These office spaces could serve as either professional office or support for the adjoining eco-industrial space.



SUMMARY PROJECTIONS

Total Residential Units:	932
Total Residential SF:	1,257,566
Residential Units @ 1200 SF:	793
Residential Single Family:	139
Rental Units:	480
Sale Units:	452
Total Retail SF:	194,942
Neighborhood Retail SF:	34,402
Other Retail SF:	160,540

Total Commercial SF:	167,421
Total Office SF:	687,656
Neighborhood Office SF:	79,896
Support Office SF:	607,760
Total Eco-Industrial SF:	948,717
Total Proposed SF:	3,256,302
Total Parking Spaces:	3,543
Permanent Jobs:	5,178

Conceptual Project Buildout and impact 2013-2030

		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
One Story	Eco Industrial	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000	70,000
	Other Commercial	21,000	21,000	21,000	21,000	21,000	21,000	21,000	20,421			
Two Story (level one of mixed-use)												
	Neighborhood retail		6,000	6,000	6,000	6,000	6,000	4,402				
	Neighborhood office		6,000	6,000	6,000	6,000	6,000	4,402				
	Support office		27,000	27,000	27,000	27,000	27,000	25,540				
Two Story (level two of mixed-use)												
	Support office		13,500	13,500	13,500	13,500	13,500	12,770				
	Residential (@1200SF each)		25,000	25,000	25,000	25,000	25,000	24,073				
Two Story (single family detached)												
	Residential (@ 2200 SF/each unit)				32,000	32,000	32,000	32,000	32,000	32,000	32,000	32,000
Three Story (level one of mixed-use)												
	Other retail								55,000			
	Neighborhood office								16,000			
	Support Office								85,000			
Three Story (level two of mixed-use)												
	Support office								38,500			
	Residential								115,000			
Three Story (level-one of mixed-use)												
	Residential								155,000			
TOTAL BUILDING AREA		91,000	168,500	168,500	200,500	200,500	200,500	194,187	586,921	102,000	102,000	102,000
Parking 1												
	Centralized Parking Structure (80%)	48	155	155	179	179	179	168	627	37	37	37
	On-street parking (20%)	10	31	31	36	36	36	34	125	7	7	7
Other Impervious Area												
Jobs Created 2												
	Permanent	182	374	374	374	374	374	357	794	140	140	140
	Temporary	189	495	495	627	627	627	605	2,088	273	273	273
ECONOMIC BENEFIT												
	Building Construction 3	5,075,000	15,470,850	15,780,267	19,491,738	19,881,573	20,279,204	19,771,421	77,121,666	7,850,118	8,007,120	8,167,263
	Infrastructure Improvements 4	1,170,000	1,193,400	1,241,613	1,317,610	1,426,223	1,574,666	1,773,330	2,036,998	2,386,668	2,852,289	3,476,925
	Structured Parking 5	714,000	2,378,640	2,426,213	2,845,195	2,902,099	2,960,141	2,830,920	10,805,901	655,064	668,165	681,529
	Total Tax Base Increase	6,959,000	19,042,890	19,448,093	23,654,543	24,209,895	24,814,011	24,375,671	89,964,565	10,891,850	11,527,575	12,325,716
	TOTAL Compounded Value 6	6,959,000	26,647,177	48,566,183	76,724,123	108,048,416	142,881,432	180,506,069	287,208,421	324,732,246	366,371,269	412,669,493
	New Bondable Tax Increment (per year) 7	86,083	329,626	600,764	949,077	1,336,559	1,767,443	2,232,860	3,552,768	4,016,938	4,532,013	5,104,722
	Total New Tax Increment	86,083	415,708	1,016,472	1,965,549	3,302,108	5,069,552	7,302,412	10,855,180	14,872,118	19,404,130	24,508,852
	Total Bond Value (NPV Increment PMTS) 8	\$328,547,207										

Assumptions:

- 1) Parking ratios - Eco-Industrial = .25/1000; Commercial = 2/1000; Retail = 3.5/1000; Office = 2/1000; Multi-family Residential = 1/1200; Single Family Residential = 2/unit.
- 2) Permanent job creation - Eco-Industrial = 2/1000; Commercial = 2/1000; Retail = 1/1000; Office = 4/1000. Temporary job creation - Eco-Industrial = 2/1000; Commercial = 2/1000; Retail = 1/1000; Office = 4/1000; Residential = 4/1000.
- 3) Construction Costs - Eco-Industrial \$50/SF; Commercial \$75/SF; Retail \$115/SF; Office \$135/SF; Multi-family Residential \$125/SF; Single Family Residential \$100/SF. Costs grow 2% annually.
- 4) Infrastructure Improvements - \$150,000/acre distributed equally across 18 year project schedule. Costs grow 2% annually.
- 5) Parking Structure(s) - \$15,000/space. Costs grow 2% annually.
- 6) Values grow 3% annually.
- 7) \$1.237/100.
- 8) Net present value of cash flow payments from new incremental tax generated above year one basis. 30 year term, 8% discount rate.

							TOTAL STUDY AREA (acres)		140	
							(less 50% pervious land requirement)		70	
							Proposed SF	Total Developable Surface Land Area (SF)		3,057,912
2024	2025	2026	2027	2028	2029	2030	Allocation of Developable Area			
70,000	70,000	38,717					948,717	1,116,138	36.5%	(surface land area)
							167,421	948,717	85%	
							34,402	167,421	15%	
							34,402	229,343	7.5%	(surface land area)
							160,540	34,402	15%	
							80,270	160,540	70%	
							149,073	229,343	(level two)	
								80,270	35%	
								149,073	65%	
32,000	17,791						305,791	305,791	10%	(surface land area)
	55,000					50,540	160,540	458,687	15%	(surface land area)
	16,000					13,494	45,494	160,540	35%	
	85,000					82,278	252,278	45,869	10%	
	38,500					37,672	114,672	252,278	55%	
	115,000					114,015	344,015	458,687	(level two)	
	155,000					148,687	458,687	114,672	25%	
102,000	552,291					446,686	3,256,302	344,015	75%	
								458,687	(level three)	
								458,687	100%	
								3,256,676	69.0%	(total allowable impervious area)
37	584					530	2,953	432,000	14.13%	(surface land area)
7	117	0	0	0	0	106	591	118,115	3.9%	(surface land area)
								374,883	12%	(surface land area)
								3,034,957	99%	Total developable surface land area
140	753	77	0	0	0	584	5,178			
273	1,985	77	0	0	0	1,708	10,615			
8,330,608	81,404,154	2,504,241	0	0	0	79,344,324	\$388,479,546			
4,323,119	5,482,760	7,092,535	9,358,449	12,595,241	17,290,566	24,210,967	\$100,803,362			
695,159	11,112,443	0	0	0	0	11,135,220	\$52,810,691			
13,348,886	97,999,358	9,596,776	9,358,449	12,595,241	17,290,566	114,690,511	\$542,093,598			
464,283,984	605,335,002	671,062,678	742,646,756	824,105,402	917,812,790	1,117,609,329	\$1,117,609,329			
5,743,193	7,487,994	8,301,045	9,186,540	10,194,184	11,353,344	13,824,827	\$90,599,980			
30,252,045	37,740,039	46,041,084	55,227,625	65,421,808	76,775,153	90,599,980				
							\$328,547,207			



Next Steps

Establish a Team of Champions

Creating an Eco-Industrial framework requires the energy and experience of a diverse set of persons. Identifying the “champions” of the project early on helps to create the initial momentum to carry the project forward. For Davidson, this team would likely include:

- ▶ **The Town of Davidson;**
- ▶ **Ingersoll Rand;**
- ▶ **Lake Norman Region Economic Development Corporation; and**
- ▶ **GHD.**

Restore the Dam

Stabilize the dam in combination with the construction of a loop road around the pond. The road will provide access to the Beauty Property, enabling future development. Restore the pond by dredging and aerating the existing pond, creating wetlands along the pond’s edge, restoring the stream between the pond and Lake Davidson, and creating a series of lower forebays on the creek. This process will increase biodiversity in the pond while creating a civic amenity and a natural stormwater control device.

Inventory Existing Characteristics, Flows & Synergies

Create a baseline from which to work, documenting all existing characteristics and flows - as outlined on page 20. Using the inventory as a base, begin to structure a vision to include:

- ▶ **potential tenants;**
- ▶ **marketing & recruitment strategies; and**
- ▶ **financial mechanisms.**

Identify Potential Synergies

Building from the inventory of existing characteristics and flows, identify potential synergies for future development. Potential synergies may exist in industrial production, waste reduction, energy reduction, resource reuse and trip reduction.

This process, also known as “Synergy Scoping,” helps to add further detail to the Eco-Industrial vision. Synergies discovered will influence the selection of catalyst projects, funding mechanisms and strategies for marketing and recruitment.

Identify Catalyst Projects

Using the information gained from the synergy scoping, identify key projects to serve as a catalyst for the development. Actual projects will vary depending upon the synergies identified, but may include:

- ▶ **Infrastructure improvements;**

Such as: water/wastewater service, roads, electrical (tri)generation, stormwater controls and pedestrian facilities.

- ▶ **Civic improvements; and/or**

Such as: parks, trails, civic buildings, and athletic fields.

- ▶ **Speculative industrial space.**

To provide the first tenants with “move-in ready” space.

Identify Funding Mechanisms

Once the catalyst projects are identified, identify potential funding sources. Funding will depend upon the project, but likely sources include:

- ▶ **Tax Increment Financing (TIF)**

Officially known in North Carolina as “Project Development Financing,” TIF allows local governments to issue bonds backed by, and paid for with, additional tax revenue generated by new development enabled by TIF-funded projects. TIF speeds up the development process by aiding development that would not occur without TIF-financed projects.

Funds are eligible for a wide variety of uses including infrastructure, land acquisition, most civic facilities, industrial development, school and college facilities and low to moderate income housing.

- ▶ **Grant Programs**

Funding opportunities are subject to yearly change and availability. At the time of this project, programs of interest include the EPA's 2009 Community Action for a Renewed Environment (CARE) Grants, and the NC Clean Water Management Trust Fund.

Implementation Framework

1. Identify the project
2. Begin with a champion or team of champions
 - a. Town of Davidson
 - b. Ingersoll Rand
 - c. Lake Norman Region Economic Development Corporation
 - d. GHD
3. Identify the project scale
 - a. Connect with the region
 - b. Connect with business/industry
 - c. Connect with community
4. Identify interests active in region
 - a. Growth industries ¹
 - i. Fabricated Metal Products
 - ii. Transportation and Warehousing
 - iii. Transportation Equipment Manufacturing
 - iv. Finance, Insurance and Real Estate
 - v. Health Care and Social Assistance
 - vi. Educational Services
 - b. Synergy scoping exercise
 - i. Identify potential industrial collocations
 - ii. Identify input/output synergies among other future uses
5. Form an Advisory Committee
 - a. Often represented by key stakeholders
 - b. Begin community engagement
6. Develop the Vision
 - a. Create a “Big Idea”
 - b. Build awareness and commitment among stakeholders
 - c. Establish a long-term framework
 - d. Identify items for action planning
 - e. Create goals and criteria for evaluating success
 - f. Motivate general and business community
7. Planning for Eco-Industrial Development
 - a. Baseline study – how will this fit into the community?
 - b. Fill in holes in the economic and social system
 - c. Imagine possibilities – efficiencies, optimum collocations, untapped markets, etc.
 - d. Action planning
 - i. Clear concise items for implementation
 - ii. Short and long term goals established
8. Designing an Eco-Industrial Development
 - a. Similar to traditional development process
 - b. Overlay visioning process, tenant prospecting/locating, and synergy scoping as part of this integrated design process
 - c. Comprehensive, dynamic, holistic and market based
9. Market your product to attract tenants
 - a. Provide for flexibility within framework/plan
 - b. Address quality of life as top priority – achieve competitive advantage
 - c. Access to cost-effective quality resources - cost efficiencies through optimum collocations (people and product resources) – achieve competitive advantage
 - d. Market to broad range and scale of businesses
 - e. Maintain ties to communities
 - i. Market amenities to public (meeting space, pathways, boardwalks, recreational facilities, etc.)
 - ii. Encourage community integration and mixed uses
 - iii. Right-To-Know Information – provide environmental management records to public to prove safe operation and bolster support
 - iv. Public Access – consider community voice in codes, covenants and restrictions and regulate eco-industrial activity
 - v. Involve community in recruiting new business

10. Options for Financing Eco-Industrial Development

It is crucial to understand that eco-industrial development requires creative financing, and as a result has been successfully implemented through the world. Such financing structures almost always take the form of advanced public/private partnerships integrating traditional financing, rebates, bond revenue, grants, foundation support - and most notably TIF (tax increment financing).

- a. Green buildings
 - i. Traditional equity financing
 - ii. Federal EPA, EDA, DOE grants and rebate programs
 - iii. Utility company low interest loans and rebates
 - iv. Reinvestment of annual operational savings
 - b. Environmental management systems
 - i. Federal EPA grants for EMS
 - c. Eco-industrial development and green technologies
 - i. Conventional financing
 - ii. General obligation and revenue bonds
 - iii. Industrial development bonds
 - iv. Tax increment financing and other public/private partnerships
 - v. Lease-purchase options
 - vi. Federal grants
 - 01. US fish and wildlife, natural area
 - 02. US EPA Infrastructure
 - vii. Local and regional philanthropic foundations focused on community development
- ## 11. Operation and Management
- An on-going commitment to continual environmental improvement and networking with the business within the park, the region and the community.
- a. Planning
 - i. Identifying and selecting possible sites
 - ii. Conducting environmental impact assessments
 - iii. Undertaking pre-planning
 - iv. Transport of goods, people and materials
 - v. Layout design
 - vi. Developing and environmental policy and setting environmental performance objectives
 - vii. Establishing a regulatory framework (codes, covenants and restrictions)
 - viii. Locating sources of funding for financing of project phases
 - b. Operating
 - i. Constructing infrastructure and services
 - ii. Operating infrastructure and services
 - iii. Designing individual facility sites
 - iv. Constructing facilities
 - v. Landscaping sites
 - vi. Marketing environmental quality
 - vii. Attracting industry
 - viii. Facilitating networks
 - c. Control
 - i. Monitoring emission and media quality
 - ii. Motivating environmental achievement
 - iii. Enforcing regulations or covenants
 - iv. Auditing environment
 - v. Reporting on environmental performance of companies and park
 - vi. Common safety issues
 - d. Integrating environmental management systems
 - i. Benefits
 - 01. Protecting the environmental for future generations
 - 02. Protecting the environment for significant economic benefits
 - 03. Sustainable use of natural resources
 - 04. Reduction of waste
 - 05. Wise use of energy
 - 06. Marketing of safe products and services
 - ii. Types of Management
 - 01. ISO 14000 (formal)
 - 02. environmental planning, ecological design, cleaner production and by-product exchange

Sources:

¹ Economic Development Handbook, North Carolina Economic Developers Association

² Eco-Industrial Development Workbook, National Center for Eco-Industrial Development, Cornell University

Additional Information

Organizations & Institutions

Catawba County EcoComplex

<http://www.catawbacountync.gov/DEPTS/u&e/ecocomplex.asp>

Center for Industrial Ecology, Yale University

<http://cie.research.yale.edu/>

Center for Regional Industrial Symbiosis Research, Toyo University, Japan

<http://team-6.eng.toyo.ac.jp/cris/en>

Journal of Industrial Ecology

<http://www.yale.edu/jie/>

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Mitchell, L. "Resource Manual on Infrastructure for Eco-Industrial Development." University of Southern California, Center for Economic Development, School of Policy, Planning, and Development, CA, USA, July 2002.

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van Beers, Dick. "Capturing Regional Synergies in the Kwinana Industrial Area: 2006 Status Report." Centre for Sustainable Resource Planning. Online. http://csrp.com.au/_media/downloads/vanBeers_3B1_StatusReport_Sep06.pdf.



WHILE THE WORLD TALKS ABOUT THE PROBLEM, GHD HAS DELIVERED SUSTAINABLE PROJECTS IN THE UNITED STATES, AUSTRALIA, NEW ZEALAND, ASIA, THE MIDDLE EAST, AND EUROPE.



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