HIGH PERFORMANCE GREEN BUILDING DESIGN CHARRETTE REPORT

Greenbridge Mixed Use Project
Chapel Hill, NC

October 20 and 21, 2005

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SUMMARY

Greenbridge Green Mixed Use Project

Toben properties recently purchased a 1.22 acre property in Chapel Hill, NC with an eye toward future development. Tim Toben attended a LEED-NC Technical Review workshop in Greensboro in September.

7group was subsequently contacted to discuss the best methodology for beginning the green building process and recommended a two day education, goal setting and design charrette.

On October 20 and 21, 2005 potential members of the design team, investors and interested parties gathered at Pickards Meadow to discuss and evaluate sustainable design elements. This report provides the highlights of this two day charrette.

The charrette result concluded that LEED Gold Certification was possible within the project's construction budget.

After introductions the project's vision was reviewed by Toben. An educational session on integrated design was lead by 7group.

AGENDA

Chapel Hill Mixed Use Project
High Performance Green Building Design Meeting
October 20 and 21, 2005

A Summary of the Charrette Process

A successful high performance building is a solution that is greater than the sum of its parts. It is a system of integrated processes and products that increases the efficiency of the building systems and helps to reduce overall costs. A building that conserves energy alone does not constitute a high performance building. In the same respect, adding or overlaying environmental systems will not truly help the building to benefit from the connections and interdependencies of an integrated, or whole systems, design approach. This is the fundamental challenge of high performance building design.

High performance buildings are most effectively developed through a design process that invites the client, appropriate designers and consultants, a consulting general contractor/cost estimator and other appropriate stakeholders to participate from the very beginning of the project. This is done in a focused and collaborative design effort, or brainstorming session(s), known collectively as a design charrette process. The purpose of this composite design team and design process is to provide for an exchange of ideas and information that allows for truly integrated solutions to take form. A forum and methodology is provided where every team member is encouraged to cross fertilize one another with solutions to problems that may relate to, but are not typically addressed by, their specialty. The objective is to have every member of this composite design team understand the issues that the other members need to address. Thus more thorough and integrated solutions are the result.

The charrette method is very important when the client is not one person but consists of a number of interested people. This is a successful way to educate all the participants: architects, engineers, and the client team. There are many advantages in this. The client's staff members are invited to participate throughout the process. Participants are educated about the issues and "buy in" to the solutions. The education process is accelerated, decisions are verified, adversity is diminished, the nuances of organizational issues are learned and the design process is expedited. A final solution isn't necessarily produced in the charrette but most of the issues are explored with all the involved parties being present.

Most buildings have great potential for incorporating the most advanced green building design techniques and systems. Part of the job is to help find an acceptable balance between the economic, cultural, ecological areas of sustainability that will meet the Client's objectives and yet allow for future adaptation of new technologies and interactions with the community.

7group's approach is one of common sense application of thoughtful and integrated solutions. Market transformation in this area can only occur if environmentally responsible buildings can be built at conventional construction cost. The integrated design process is the key to producing high performance green buildings within budget.

Objectives for this charrette:
1. Gain an understanding of high performance green buildings.
2. Gain an understanding of the process required to realize high performance green goals.
3. Establish preliminary performance goals.
4. Familiarize participants with the importance of this approach.
5. Develop design concepts.
6. Establish next steps.

Day 1: 9:00 am - 5:00pm

Welcome
- Introduction of participants
- Overview of the day
- What is a high performance green building?
- Why are we concerned?

Project Overview - Toben Properties
- Program and site
- Opportunities and constraints, infrastructure issues, program concerns
- Overview of current design
- Community input

Core Values Exercise

Integrated Design: The Key to Producing High Performance Green Buildings within Budget
- What it is
- Examples of its effects
- How to do it
- Changes to the standard design process

LUNCH

High Performance Green Buildings: Credit-by-Credit Review of LEED
- Using the LEED rating system as a framework for discussion, we will review the many items that can compromise a high performance green building. Special emphasis will focus on the design process and the methodologies needed to achieve certain LEED credits. Specific project examples will demonstrate many of the concepts, techniques and technologies.

Sustainable Site Credits
Water Efficiency Credits
Energy & Atmosphere Credits
Materials & Resources Credits
Indoor Environmental Credits
Innovation & Design Credits

Day 2: 9:00 am - 4:30 pm

Site Issues
- Climactic Issues
- Regenerative/Restorative Design
- Integration of project into the community
- Sustainable site opportunities created by this project

Building Design
- Explore potential conceptual design solutions:
- Primary site components (storm water, utilities, circulation, parking, etc.)
- Orientation
- Functional relationships
- Massing
- Daylighting design

LUNCH

Breakout Sessions
- Focused small group sessions to explore and identify performance parameters and specific design solutions:

1. Site/Water
2. Energy
3. Design

Report results from the small group sessions.

Integration of Performance Parameters
- Review and integrate various performance metrics and design ideas from the breakout groups, targeting holistic solutions. Consider budget, environmental efficacy, achievability, core values and project mission.
- Establish specific performance goals for the project.

Next Steps
- Application of integrated, whole-system design process
- Specific services required
- Schedule & Milestones

Adjourn

Greenbridge Mixed Use Design Charrette
October 20 and 21, 2005
Participants

First Name	Last Name	Company	Email	Phone
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Tim	Watson			

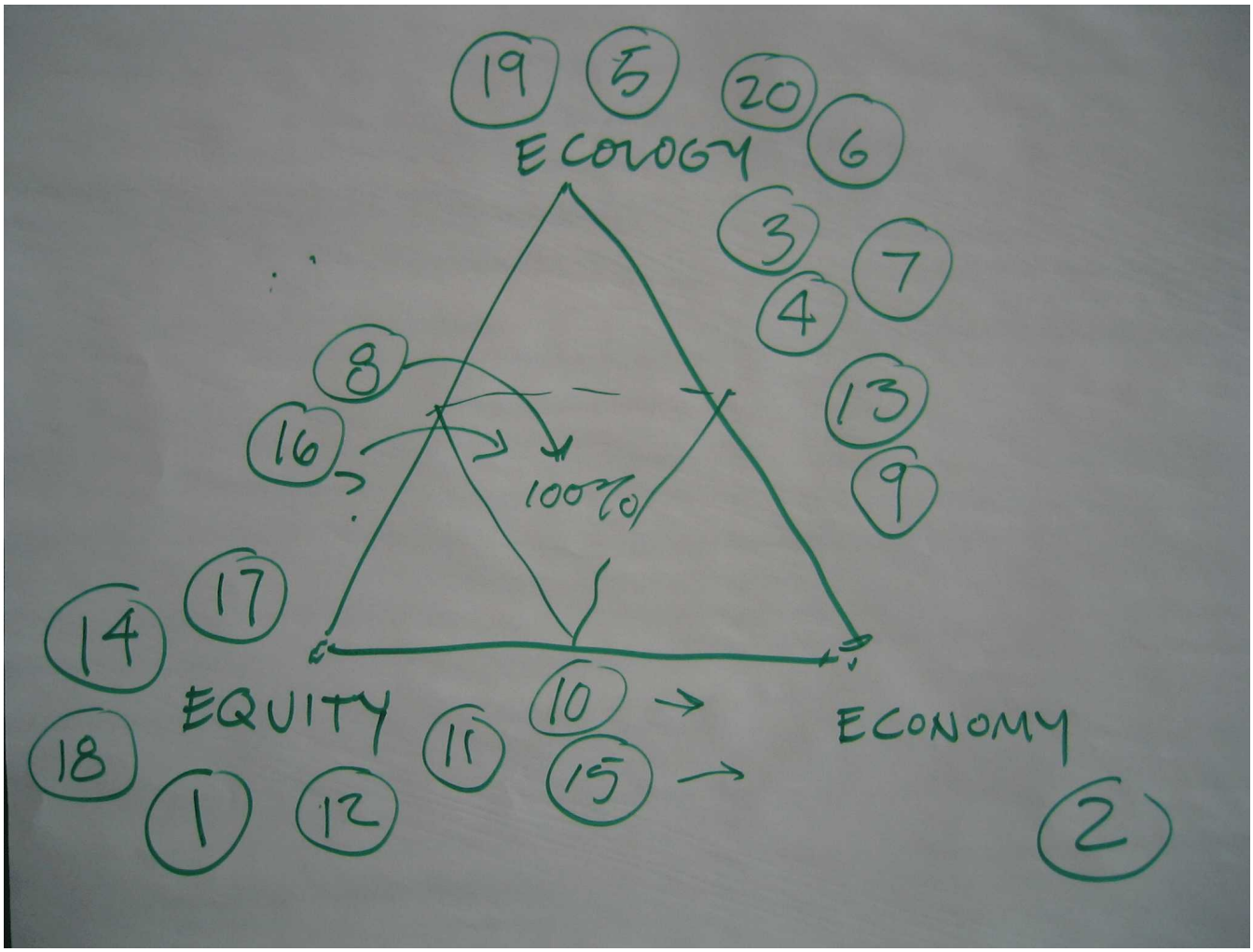
CORE VALUES EXERCISE

Greenbridge Mixed Use Project

A brain-storming session was initiated to list the core values of the group. The values listed are to be important design considerations for the project team. Once the list was generated each project team member was allowed to vote for their ten most important values. The results of the exercise are listed in the table below.

	Value	Votes
1	Community Connectivity (multi-cultural/generational)	40
2	Economic Viability/Market Desireability	27
3	Life Cycle Assessment/Low Impact Materials	21
4	Renewable/Solar Energy Generation and Use	19
5	Health of Place/Biodiversity	18
6	Reduced Ecological Footprint	18
7	Water Conservation	17
8	Spiritual/Historical Awareness	13
9	Flexibility/Durability/Longevity/Legacy	12
10	Catalyst for Changing How We Develope	11
11	The Project Educates	11
12	Community Participation/Involvement	9
13	Minimize Waste - Construction and Operations	8
14	Enhance Social Interations	7
15	Document a Replicable Process	7
16	On-Site Food Production	6
17	Pedestrian Friendly	4
18	Pride of Place	3
19	Carbon Neutral	3
20	Resource Exporter	2

The core values list above were plotted on a sustainability fractal by Mark Rylander, William McDonough + Partners. Of note is the relatively even spacing of the project's aspirations around the fractal - an indication of balanced goals.



Greenbridge Mixed Use Project

The project team reviewed the LEED Green Building Rating System on a credit-by-credit basis in the context of the project. Each credit was determined to be a “Yes” - it will be implemented on this project; a “Maybe” - these credits will require further investigation; and a “No” - these credits are not feasible for this project. A summary preliminary scorecard for the project is included on the following page. A complete score card with comments and tasks is contained in the Appendix.

In addition, each credit was assigned a cost implication value of “No”, “Low, “Medium” or “High” cost. The figures assigned to these values are summarized below along with a list of the quantity of credits by feasibility and cost implications.

Low - $0 - $25,000 Medium - $25,000 to $75,000 High - over $75,000

LEED™ Targeted Credits by Cost Implications

	Yes	Maybe	Totals
No Cost	38	5	43
Low Cost	6	6	12
Mid Cost		2	2
High Cost		1	1
Totals	44	14	58

The results of the LEED review indicate a total of 44 points targeted as feasible with 14 additional points listed as maybe. The project team has determined that LEED Gold level certification should be targeted.

Summary LEED Scorecard

44	14	11	**Total Project Score**	Possible Points 69

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

11	2	1	**Sustainable Sites**	Possible Points 14	
Y	?	N			
Y			Prereq 1	Erosion & Sedimentation Control	0
1			Credit 1	Site Selection	1
1			Credit 2	Development Density	1
1			Credit 3	Brownfield Redevelopment	1
1			Credit 4.1	Alternative Transportation, Public Transportation Access	1
1			Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	1		Credit 4.3	Alternative Transportation, Alternative Fuel Refueling Stations	1
1			Credit 4.4	Alternative Transportation, Parking Capacity	1
1			Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
		1	Credit 5.2	Reduced Site Disturbance, Development Footprint	1
1			Credit 6.1	Stormwater Management, Rate and Quantity	1
1			Credit 6.2	Stormwater Management, Treatment	1
1			Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
1			Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
	1		Credit 8	Light Pollution Reduction	1

5	0	0	**Water Efficiency**	Possible Points 5	
Y	?	N			
1			Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
1			Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
1			Credit 2	Innovative Wastewater Technologies	1
1			Credit 3.1	Water Use Reduction, 20% Reduction	1
1			Credit 3.2	Water Use Reduction, 30% Reduction	1

7	7	3	**Energy & Atmosphere**	Possible Points 17	
Y	?	N			
Y			Prereq 1	Fundamental Building Systems Commissioning	0
Y			Prereq 2	Minimum Energy Performance	0
Y			Prereq 3	CFC Reduction in HVAC&R Equipment	0
2			Credit 1.1	Optimize Energy Performance, 20% New / 10% Existing	2
2			Credit 1.2	Optimize Energy Performance, 30% New / 20% Existing	2
2			Credit 1.3	Optimize Energy Performance, 40% New / 30% Existing	2
	2		Credit 1.4	Optimize Energy Performance, 50% New / 40% Existing	2
		2	Credit 1.5	Optimize Energy Performance, 60% New / 50% Existing	2
	1		Credit 2.1	Renewable Energy, 5%	1
	1		Credit 2.2	Renewable Energy, 10%	1
	1		Credit 2.3	Renewable Energy, 20%	1
	1		Credit 3	Additional Commissioning	1
1			Credit 4	Ozone Depletion	1
	1		Credit 5	Measurement & Verification	1
		1	Credit 6	Green Power	1

7	1	5	**Materials & Resources**	Possible Points 13	
Y	?	N			
Y			Prereq 1	Storage & Collection of Recyclables	0
		1	Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
		1	Credit 1.2	Building Reuse, Maintain 100% of Existing Shell	1
		1	Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
1			Credit 2.1	Construction Waste Management, Divert 50%	1
1			Credit 2.2	Construction Waste Management, Divert 75%	1
		1	Credit 3.1	Resource Reuse, Specify 5%	1
		1	Credit 3.2	Resource Reuse, Specify 10%	1
1			Credit 4.1	Recycled Content, Specify 5%	1
1			Credit 4.2	Recycled Content, Specify 10%	1
1			Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
1			Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
	1		Credit 6	Rapidly Renewable Materials	1
1			Credit 7	Certified Wood	1

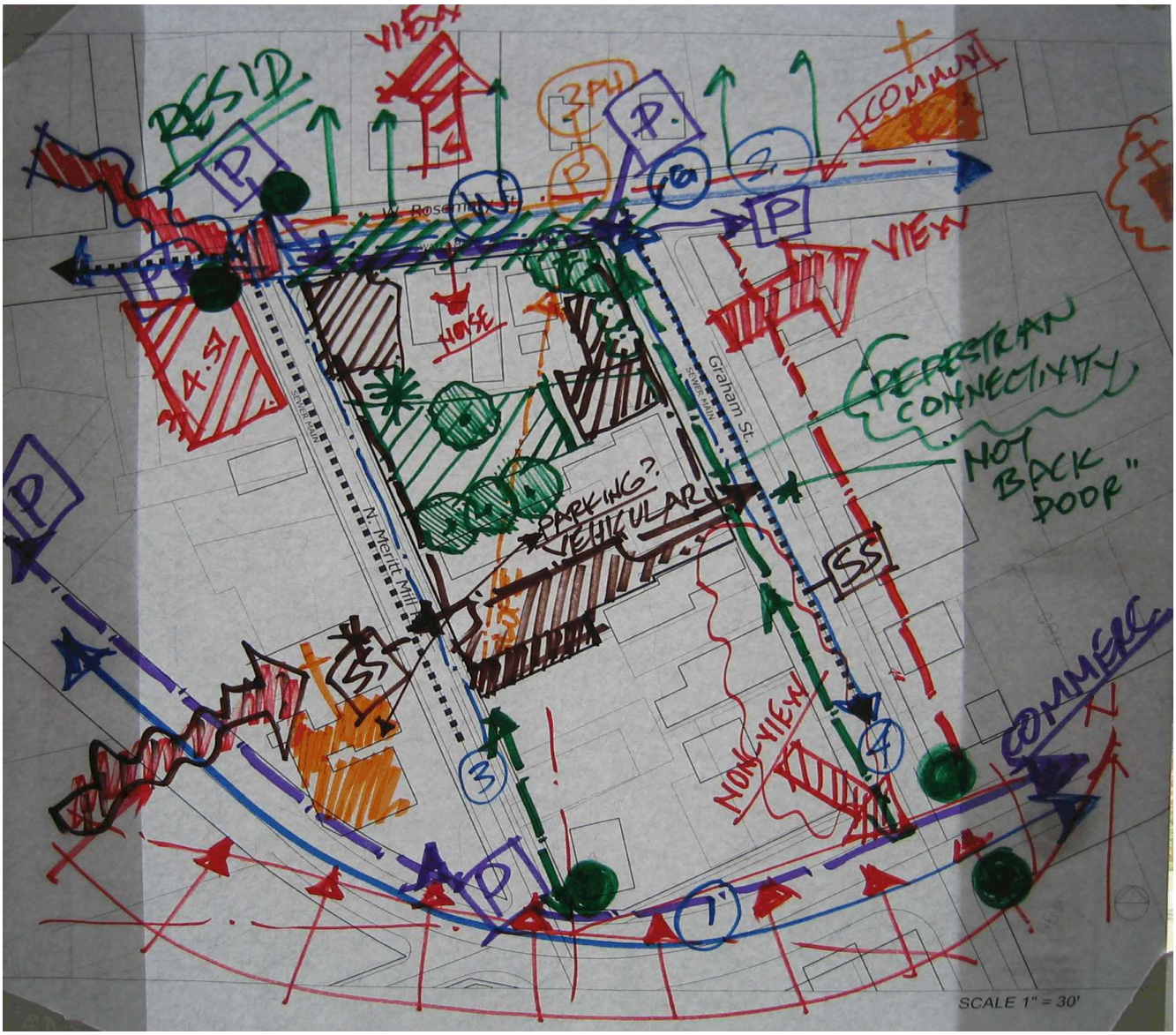
9	4	2	**Indoor Environmental Quality**	Possible Points 15	
Y	?	N			
Y			Prereq 1	Minimum IAQ Performance	0
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	0
	1		Credit 1	Carbon Dioxide (CO_2) Monitoring	1
		1	Credit 2	Increase Ventilation Effectiveness	1
		1	Credit 3.1	Construction IAQ Management Plan, During Construction	1
	1		Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
1			Credit 4.2	Low-Emitting Materials, Paints	1
1			Credit 4.3	Low-Emitting Materials, Carpet	1
1			Credit 4.4	Low-Emitting Materials, Composite Wood	1
1			Credit 5	Indoor Chemical & Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems, Perimeter	1
	1		Credit 6.2	Controllability of Systems, Non-Perimeter	1
1			Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
	1		Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
1			Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
1			Credit 8.2	Daylight & Views, Views for 90% of Spaces	1

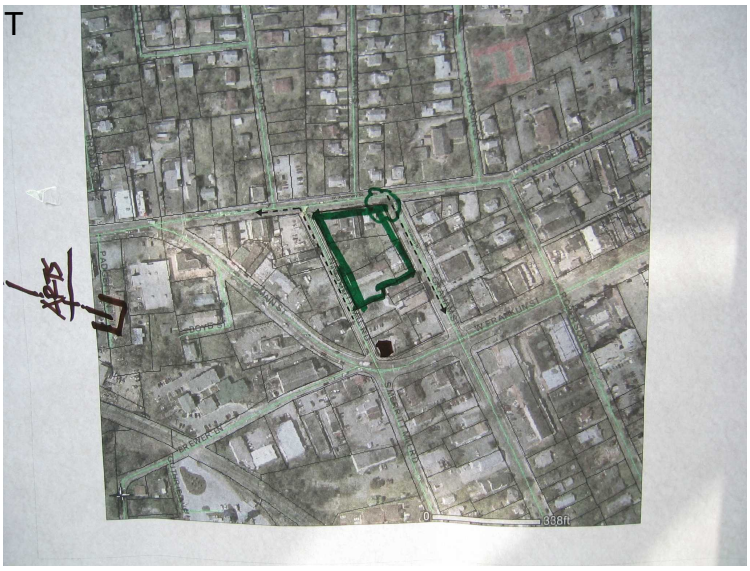
5	0	0	**Innovation & Design Process**	Possible Points 5	
Y	?	N			
1			Credit 1.1	Innovation in Design: Green Building Demonstration	1
1			Credit 1.2	Innovation in Design: Exemplary Performance MR 5.1	1
1			Credit 1.3	Innovation in Design: Exemplary Performance WE 2	1
1			Credit 1.4	Innovation in Design: Exemplary Performance WE 3	1
1			Credit 2	LEED™ Accredited Professional	1

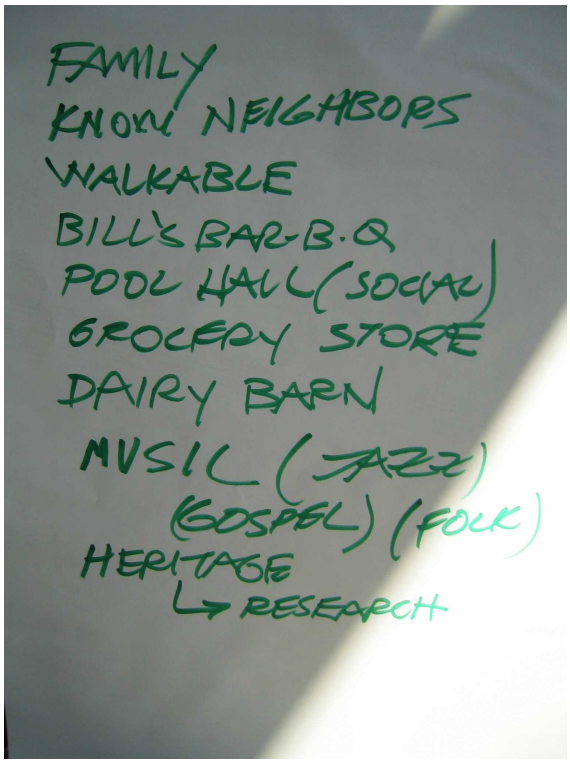
Greenbridge Mixed Use Project

Climactic issues were reviewed and discussed. These issues are summarized in the charts in the Appendix.

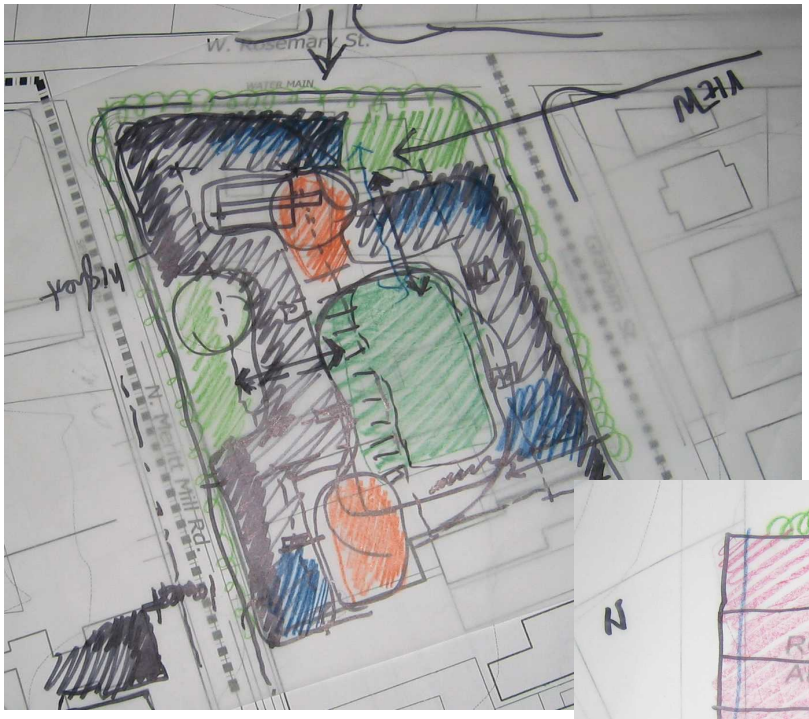
A site forces exercise was undertaken to determine design criteria and context. Solar access, prevailing winds, views, car and pedestrian traffic flows, parking, community connectivity, existing vegetation and other issues were discussed and mapped (see below).



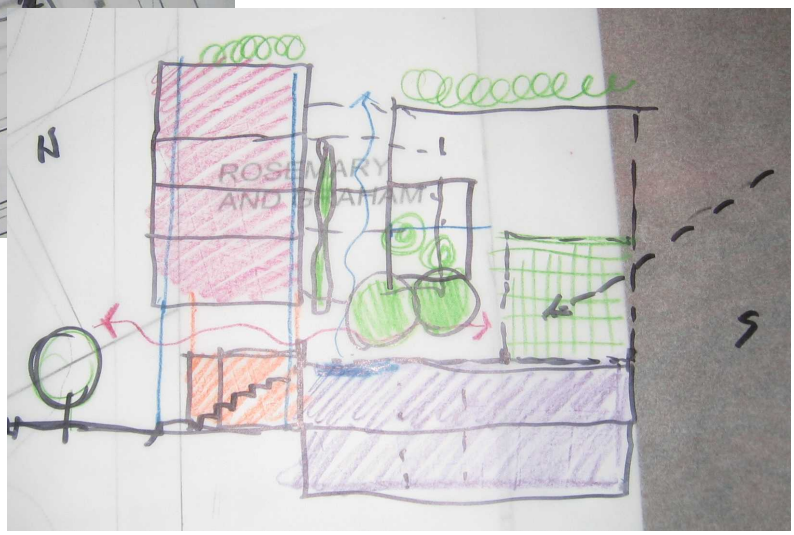




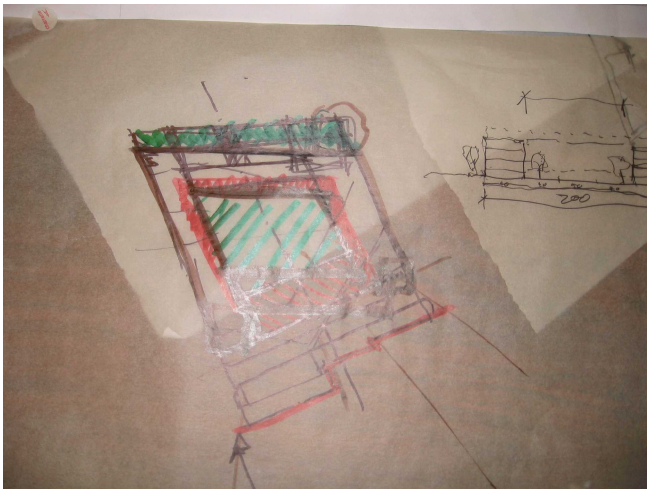
The larger community context was also discussed.

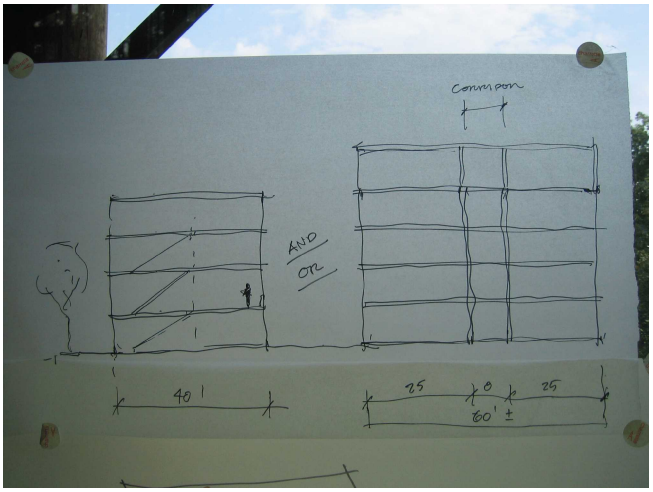


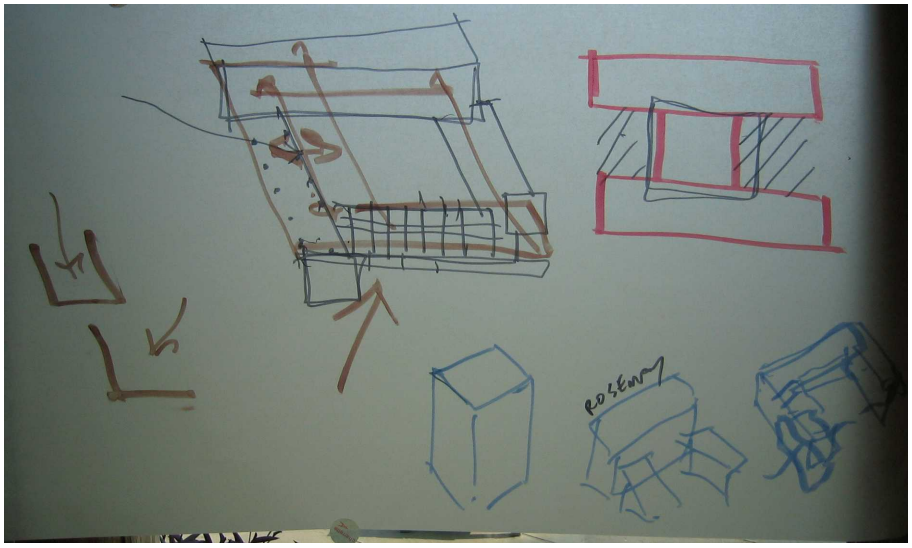
Early design discussions focused on massing and the location of green space, vehicular access and parking.



The large group discussion continued with additional discussion on massing, orientation and optimal configuration.







A north-south oriented building with properly shaded windows, will typically use 10% to 30% less energy than a building oriented east-west. In addition, daylighting goals will be significantly easier and less costly to attain.

Greenbridge Mixed Use Project

A breakout session was convened to focus discussion on issues related to water and energy. Half the group participated in a brainstorming session focused on these issues while the remaining group continued to flesh out design issues.

Water

Water related ideas were discussed first. The local requirement for stormwater retention works in our favor not only for stormwater related issues but for rainwater harvesting as well.

Use concrete water tanks integrated into the perimeter of the underground parking structure (tanks are similar to septic tanks -10 x 6 x 5 - 1500 gallons each).

Rainwater Uses
- toilet flushing
- irrigation
- fire protection (will require further investigation)
- may require UV or chlorination treatment - investigate
- rain barrel for terraces (option)

Water Efficiency
- common laundry facilities (make washer/dryer an option)
- dual flush toilets
- low flow faucets (0.5 GPM in bathrooms and kitchens)
- low flow showerheads (1.8 GPM)
- water saving dishwashers
- front load washing machines

Consider sharing excess water with neighbors.

Energy

Load reduction strategies were discussed first. These include:

- high performance glazing (spectrally selective)
- operable windows - casements open toward prevailing breezes
- overhangs on the south side of the building
- glass block pavers on terraces to let in light
- air sealing by a qualified contractor (blower door testing, infrared scans to test results)
- wall insulation (typical R13) - target R25
    - SIPS
    - wall spray cellulose
    - 2 inch thermal break in steel stud assembly

- attic insulation (typical R30) - target R40
    - blown cellulose
    - radiant barrier (investigate)
- daylighting design
    - perform comprehensive daylighting analysis to determine performance
    - maximize south/north exposures
    - minimize east/west exposures
- lighting
    - use compact fluorescent fixtures
    - centralized lighting control (master switch by the door)
    - exterior solar lighting (walkways, terraces)
- Energy Star appliances

Passive solar design was stressed including properly sized thermal mass.

HVAC system options were discussed next. The initial conversation centered on the use of common systems versus independent system. The tenant typically pays the energy bill and this is an important consideration for the owner.

A variety of potential HVAC systems were discussed:

- groundsource heat pumps
    - deep well systems (very deep but fewer wells - used in urban situations)
    - freon based systems
- absorption chillers
- boiler/chiller with fan coil units
    - can be metered at individual units (hot water/chilled water)
- air-to-air heat pumps
- water source heat pumps (cooling tower)
- desiccant dehumidification

It was agreed upon that the project team should thoroughly investigate a central system. The efficiency gains are substantial. The investigation should concentrate on systems where the majority of the energy use is on the tenant meter and a minimal amount on the house meter. GSHP fit this kind of a hybrid approach with the pumping energy for the well field and internal circulation on the house meter but the individual heat pumps could be on the tenant meter. Other systems could accommodate this arrangement as well.

Ventilation air was also discussed.

- energy recovery units
- use ceiling fans
- high level of filtration

Solar domestic hot water heating should be provided.

On-site electric generation could be accomplished with photovoltaic systems or a biodiesel generator. Options and potential funding streams should be investigated.

Energy Performance Criteria

Establish goals for common energy performance parameters. A few ideas are listed below:

Overall - $/square foot

Overall - BTU/square foot

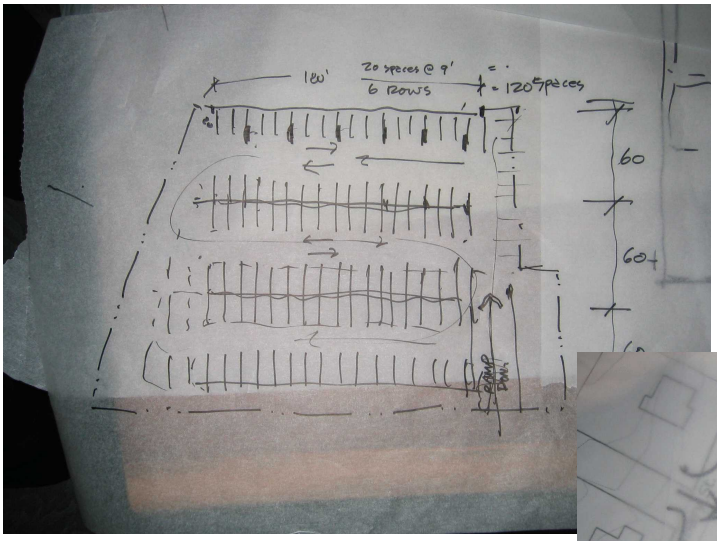
Lighting - watts/square foot

plugload - watt/square foot

cooling load - square foot/ton

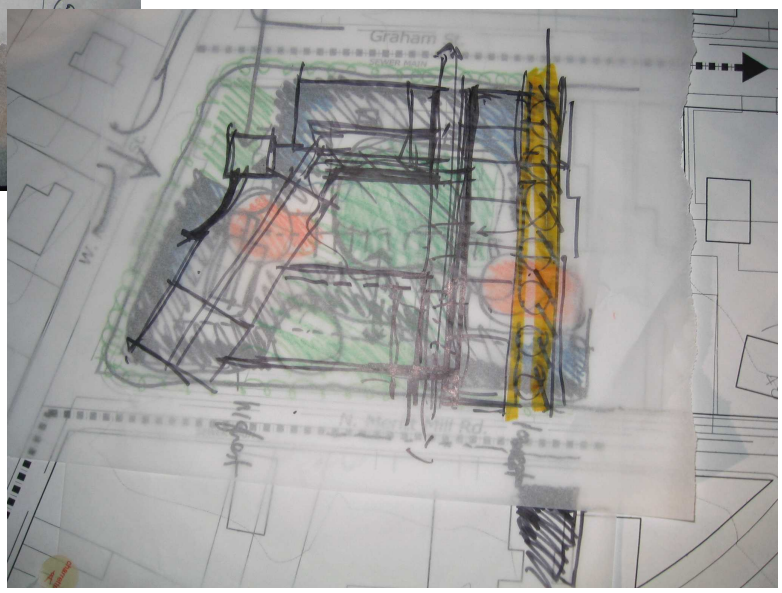
Design

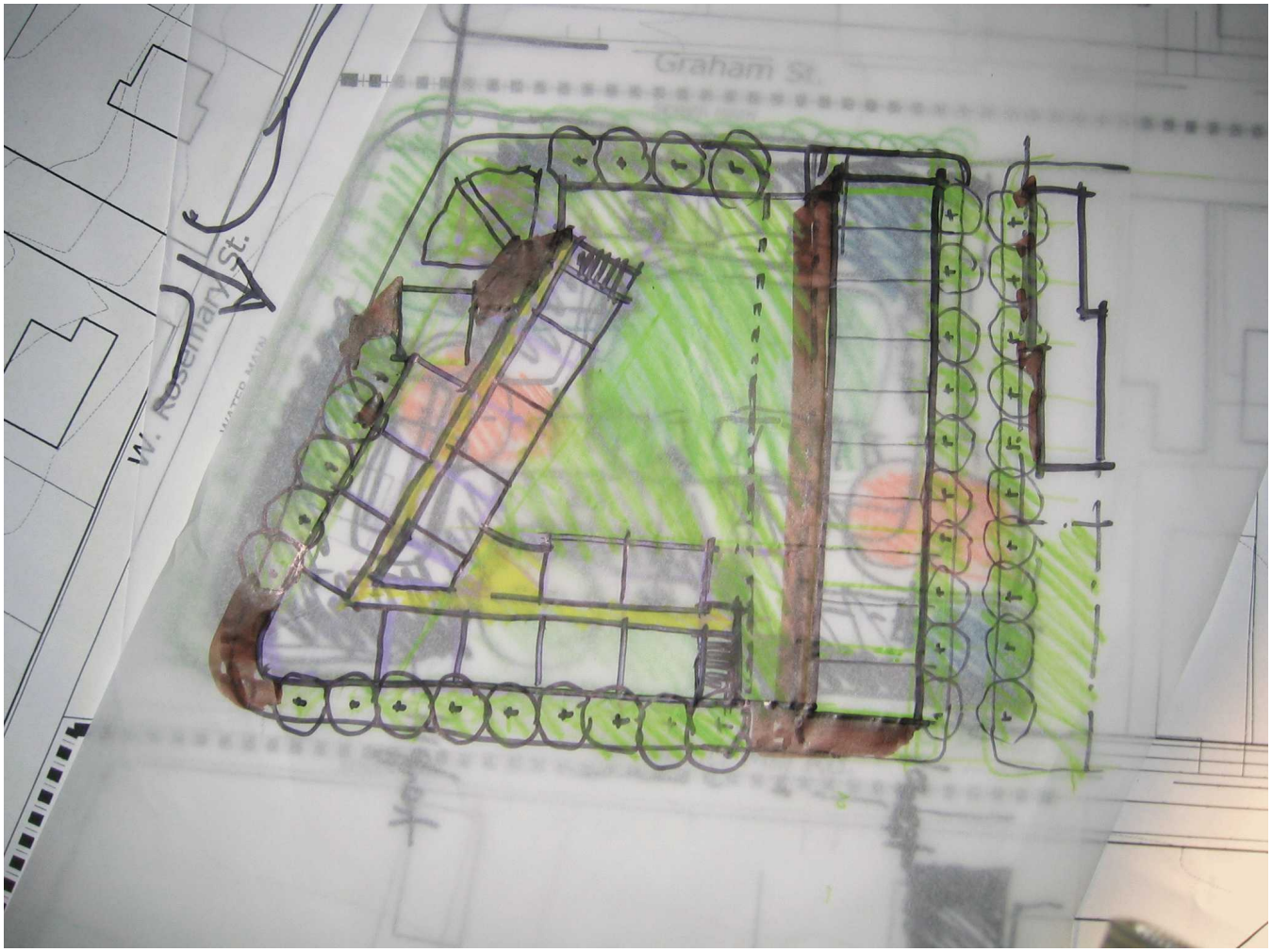
While the water/energy group was generating ideas for these systems the design group continued to flesh out the preliminary design of the project.



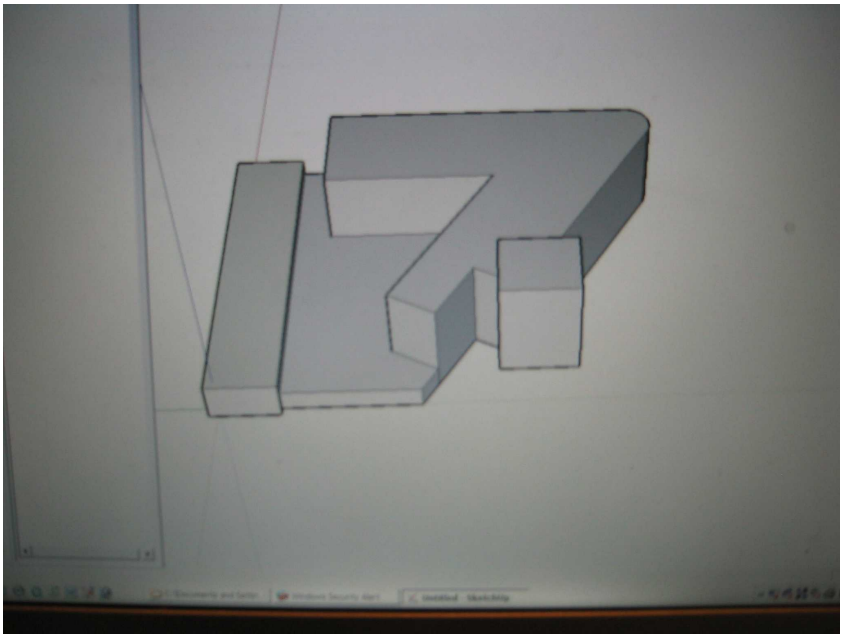
Accommodating the parking on-site was an initial issue. It was determined that adequate parking could be placed underground on two levels in approximately 33,000 square feet.

Some initial sketches were generated.



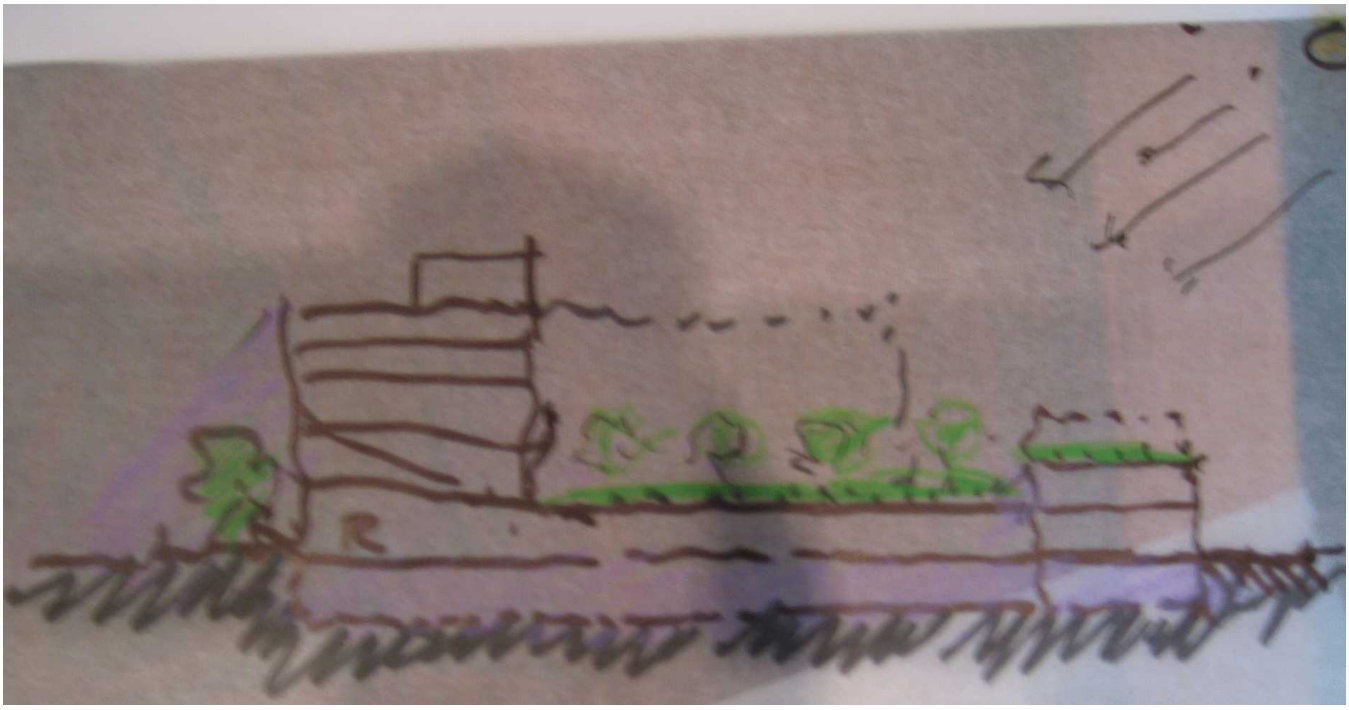


The original concept was flipped.



A Sketch Up image showing massing from the Graham Street side.

The higher portion of the building is a 4 to 5 story condominium. A two level parking structure has one level below and one level above grade. The structure to the south is envisioned as town houses.



A section shows the condominiums to the left, the two story parking structure with a planted green roof and the townhouses to the right.

The larger group then reconvened to review the conceptual plan developed by the design group.

RESULTS AND NEXT STEPS

Greenbridge Mixed Use Project

The charrette resulted in the education of the design and owner team as well as the creation of a preliminary LEED scorecard, a list of actions and responsibilities, recommendations for site placement, a preliminary floor plan and elevation.

Next Steps

1. Hiring of the design and construction team
2. Determine scope of work needed to complete the design
3. Analysis - structural systems, energy modeling, daylighting analysis, rainwater harvesting
4. Investigation - local zoning, roofing materials, finish materials, etc

Appendix