

**McCallum Graduate School of Business
Bentley University**

Highlands Center Building #16
Proposal for Rehabilitation and Showcase



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I. Background

Project Summary

The Highlands Center, Inc. (HCI) would like to renovate Building #16 to LEED Silver Certification standards so that it may serve as a model and standard for future environmentally conscious renovations at Highlands Center at Cape Cod National Seashore (former North Truro Air Force Station). The building will initially serve as a welcome center and workshop with classroom space exhibiting the green rehabilitation methods used. The space is intended to engage visitors so that the HCI may maximize its ability to promote further rehabilitation of the campus and spread awareness of Green Building initiatives and HCI partner programs. Eventually the space could transition into HCI administrative offices with exhibition and classroom capacity.

Future plans for the Highlands Center involve the creation of a campus that fosters a “multi-disciplinary and collaborative community of artists, scientists, and educators amidst the natural and cultural resources of the Outer Cape.”¹ Challenges facing the renovation project will center on toxic waste removal regulations as well compliance with National Park Service building guidelines. An initial focus will be placed on making the building habitable as quickly as possible. The final product will be series of recommended building solutions and operational strategies required for LEED Silver certification. This report will serve as both a guideline of how to make Building #16 operational as well as a template for green building rehabilitation at the Highlands Center at Cape Cod National Seashore.

Highlands Center Mission Statement:

The Highlands Center fosters the unique cultural and natural heritage of Cape Cod by facilitating scientific research, the arts tradition, and educational programs atop the dramatic sea cliffs of Cape Cod National Seashore.²

Highlands Center History [As excerpted from NPS website]

In 1994, Cape Cod National Seashore (CCNS) acquired the former North Truro Air Force Station. Since then, CCNS has made \$1 million in infrastructure improvements, allowing for the potential renovation and occupation of several buildings. There are up to 45 potentially usable buildings (approximately 115,000 square feet) organized around a central quadrangle, which will require structural repair, renovation and/or modification. Included are buildings originally used for common space, housing, administrative functions, storage space, and maintenance facilities.



One of the goals for the Highlands Center is to create a community of artists, scientists and educators who will pursue their work in a national park setting. The core of the Highlands Center will be its program partners, enriching each other's work through their distinctive activities and opportunities for interaction. These partner organizations will establish an active community of creative individuals and will help carry out the Center's mission. Together, these various perspectives will form a dynamic mosaic that reflects and celebrates the unique character of Cape Cod. The Highlands Center will explore how the Cape can hold on to a sense of this past while establishing an authentic link to the future.

Another ongoing goal for the Highlands Center is to adopt the National Park Service's commitment that special emphasis be placed on park efforts to incorporate environmentally sound practices. Environmental impacts in terms of resource usage and performance will be taken into consideration and assessed during a project's initial investment phase and throughout its lifetime. The Highlands Center will demonstrate environmental stewardship through the use of environmentally sustainable practices and technologies in its design, building rehabilitation, and ongoing operations.³

The Importance of Sustainability

Green building strategies are rapidly becoming a building industry standard. Today, buildings use two-fifths of the world's materials and consume one-sixth of its fresh water.⁴ It is more important than ever to start taking actions to preserve these dwindling resources. In the past, green building was generally regarded as too costly but studies are now showing that buildings can be built "green" with almost identical upfront cost as traditional building methods. The advantages of environmentally conscious building methods are many but the following apply to Building #16:

- **Cost and Revenue** – Sustainability can benefit HCI through increased revenues and lower operating costs. Increased revenue could result from the increased donor awareness and an improved community reputation. Lower costs will result from more efficient operations, process improvement and reduced regulatory fines.⁵
- **Regulations** - For Building #16 and the remainder of the North Truro Air Force Station the National Park Service has outlined building standards on federally protected oceanfront of the Cape Cod National Seashore. This plan will outline any regulations that apply in the ensuing "Recommended Initiatives: Phase One" section.
- **Societal and Moral Importance** – As outlined above, HCI recognizes the importance of the organization's impact on the environment. This responsibility is heightened by the fact that the Highlands Center campus is located in a nature preserve which includes some of the most pristine shoreline on the outer reaches of Cape Cod.

II. Recommended Initiatives

Phase One:

1. Procedures and Requirements

The first phase of this project is aimed at making Building #16 habitable. LEED certification will be addressed in Phase Two. This initial phase is an analysis of only the steps involved in making the building usable; any sustainable building processes that apply will be included. The National Park Service has outlined the steps required to rehabilitate structures on the Highlands Center in the *Appendix to the Site and Building Design and Rehabilitation Handbook*. The document calls for the following steps to be followed: Pre-design, Schematic Design, Design Development, Construction Documents, Bidding and Construction. This Building #16 report will pickup at the Schematic Design phase and follow through to habitation and eventual LEED certification. The following is an overview of the requirements involved in this process:

Pre-design: This first step has largely been completed as part of the ICON report entitled *Implementation Plan for the Highlands Center at Cape Cod National Seashore*. This consultation with ICON architects established the scope of the project.

Schematic Design: This step covers preliminary design and cost estimates. While some of this work has begun, HCI's current focus will be on a Development Advisory Board review for partnership construction approval. This will require a "regional office level review of the project, including schematic design concepts of the project site plans, building floor plans and elevations, and utility plans, with accompanying construction cost estimate, LEED, and a cost comparability analysis showing the cost is appropriate for the project checklist (see section III. Cost-Benefit Analysis for the checklist)."⁶

Design Development Phase: This phase requires detailed plans to be drawn up and submitted to the NPS for review as well as an archeologist when 75% complete. These plans must include all interior and exterior construction as well as any electrical, mechanical, plumbing and fire protection related installations. When final plans are established they must be resubmitted for another review by the NPS.

Construction Documents: If the Town of Truro requests a review of the construction plans they will be allowed 30 days to do so at this stage. This stage serves to finalize the documents to be used in construction and the NPS also has a final review.

Construction Permit: The permit must be obtained from the NPS before any work can commence. Additionally, a list of conditions of work must be met and will include: a safety and health plan, hazardous materials remediation plan, etc. Changes during construction need to be reported if they require design spec. changes.

Document Submission: The HCI will be required to submit documentation related to all architectural, engineering, construction and hazardous material analysis. See page 28 of the

Appendix to the Site and Building Design and Rehabilitation Handbook for exact document requirements.

Construction Project Implementation: The main concern of the NPS is that all aspects of the renovation are clearly documented and approved. No habitation is allowed until all “construction and utility services are complete in the interests of satisfying all basic life safety codes.”⁷

The National Park Service owns and operates the Cape Cod National Seashore on which Building #16 resides. As a result any construction must first comply with the following procedural guidelines as defined by the National Park Service:

- CCNS legislative purpose, themes and mission, as further defined in the General Management Plan for the park;
- Commitments defined in public planning documents regarding the Highlands Center, including the Site Plan and Environmental Assessment;
- Responsibilities in law associated with federal ownership of property, including but not limited to: National Environmental Policy Act, National Historic Preservation Act (archeological clearance), Freedom of Information Act, applicable building codes and the Americans with Disabilities Act, McKinney Act, Anti-Deficiency Act;
- Responsibilities in policy associated with federal ownership of property, including but not limited to: NPS Management Policies, 36 Part 18 NPS Leasing Regulations, NPS Director's Order 21: Fundraising and Donations & OMB Circular A-110, NPS Director's Order 35A: Sale or Lease of Park Services, Resources, or Water in Support of Activities Outside the Boundaries of National Park Areas; NPS Concessions policy and cooperative agreement parameters and special park uses regulations;
- Specific requirements of NPS Leasing authority, as contained in 36 Part 18 NPS Leasing Regulations, including but not limited to limitations on additions and new construction limitations (some of this also discussed in EA and its Finding of No Significant Impact and the RFP/RFQ);
- Terms and conditions of RFP/RFQ, criteria and submission requirements, including such issues as leasing purposes, lessee requirements and use of housing for program partner activities at HCI, etc.;
- Letters of Intent with three initial Program Partners as well as the terms and conditions set forth in the Cooperative and Task Agreements as well as the pending Fundraising Agreement with HCI;
- \$2.5 million Congressional funding cap language contained in FY02 Department of the Interior Appropriations bill;

Additional constraints that also affect site redevelopment include facility and security concerns regarding the adjacent FAA land and its operations, unfulfilled or incomplete USAF septic system and clean-up commitments, and interactions with and commitments made to adjoining communities.⁸

2. Hazardous Waste Removal

Once arrangements are made to satisfy all the aforementioned regulations, HCI can begin the Design Development Phase. Toxic waste removal will be the first and main issue that will need to be addressed. Building #16 will require a detailed investigation by an architect or engineer to determine the types of hazardous materials contained within. Once this is complete a hazardous materials remediation plan can be drafted.

“Remediation of hazardous materials must comply with applicable federal and state laws, regulations and codes, including requirements for state-certified abatement specialists and proper methods of abatement and disposal or encapsulation. Current applicable codes will be provided upon request so the most up-to-date information is supplied. Storage and disposal of hazardous material must be in compliance with 40 CFR (Environmental Protection Agency) and 310 CMR 30.00 (Massachusetts Department of Environmental Protection Hazardous Waste Regulations). Proof of compliance with such laws and regulations is necessary, including location of disposal area. No occupancy of buildings is permitted prior to hazardous materials abatement and compliance with all applicable building codes and state and federal hazardous waste regulations.”⁹

It is clear from this excerpt from the *Appendix to the Site and Building Design and Rehabilitation Handbook* that the hazardous waste removal should be a primary focus. As discussed, no habitation is allowed until all “construction and utility services are complete in the interests of satisfying all basic life safety codes.”¹⁰ This will require special removal for the following materials that are known to exist in some of the Highland buildings [as discovered during two NPS contracted preliminary assessments in 2000 and 2001]:

- Asbestos-containing materials (including siding and floor tiles, drywall compound, adhesives, pipe insulation, roofing)
- Lead-based paint
- Oil and other hazardous materials (including mercury, PCBs, mechanical equipment containing oils, CFCs, or old cleansers, batteries, oils and solvents and possible pesticide residue in soils).¹¹

To put together a hazardous materials remediation plan a thorough inspection from an experienced hazardous waste abatement crew will be required. This will be under the supervision of the architect and/or engineer.

3. Renovation

The renovation of Building #16 will transform the dilapidated 1950s structure into a cutting-edge building that both inspires and serves as a functional administration building. Plans will go beyond the typical renovation to attain LEED Silver certification. Therefore, all decisions will be made with respect to their impact on the environment. HCI is fortunate to have the cooperation of the National Park Service that recently renovated the nearby Atlantic Research Center Laboratory and Classroom. The mission of the Building #16 project will be to follow the lead of the NPS and then take it one big step further into LEED certification. Gaining this certification will be a challenging but attainable endeavor which should help to raise awareness of the HCI's larger goal of transforming the campus at the North Truro Air Force Station into a collaborative campus. The renovation during Phase One will focus on making the building habitable and any green building undertaken during this phase will be those that are also required for habitability.

As discussed above, hazardous waste removal will be the first undertaking. Once a waste removal company is hired that fully understands the special requirements of hazardous removal on a nationally protected site demo of Building #16 can begin. Asbestos and lead paint will be the main targets of the interior demolition and will require clean storage, transport and disposal. The project's contractor will be a good resource when searching for a professional abatement company.

Once all hazardous materials have been successfully removed construction can begin on the elements that are required for habitation. These steps include: plumbing, new efficient windows, flooring, drywall, no or low VOC paint, roofing, heating, etc. The existing foundation will be reused to reduce ground disturbance. Wherever it is deemed safe to reuse the existing structure the contractor should do so. Also any items like metal that are recyclable should be recycled. The diversion of waste from landfills can generate double the amount that it would cost the state economy. In other words, if a ton of waste added to the waste stream costs the state economy \$500, the money generated for the economy by reusing would be roughly \$1,000.¹² Maximizing the maintenance of the original structure will serve to both speed up construction time and keep material out of the waste stream. Leading up to this period of building and during the construction, material donations should be sought in order to reduce cost

The following is a brief list of some of the primary Phase One building solutions (see section III. Cost-Benefit Analysis for more detail):

- **Roofing** – Natural materials or layered asphalt
- **Plumbing** – Low flow faucets and composting toilets
- **Sustainable wood products** – Wooden shingles in the existing style
- **Flooring** - Recycled Glass tiles (NPS lab) or recycled linoleum w' cork powder (Wellfleet Audubon Bldg)
- **Windows** – Energy star rated (Northern/Central Region compliance standards)
- **Insulation** – Of *vital* importance to reduce energy costs related to heating and cooling. Money spent here will go far in reducing HVAC costs immediately and over time. One potential solution is organic reused materials.

- **Paint** – No/low VOCs in colors that promote energy conservation
- **Boiler** - Efficient, heavily insulated
- **Lighting** - Efficient motion detected lighting fixtures
- **Solar** - Use natural daylight to aid in heating and ventilating (awnings and drapes).
Phase 2 will involve Solar panel installation (electricity and hot water).

II. Recommended Initiatives

Phase Two: LEED Certification During Occupancy

LEED stands for The Leadership in Energy and Environmental Design (LEED) Green Building Rating System and is a “nationally accepted benchmark for the design, construction and operation of high performance green buildings.”¹³ The LEED system was developed by the U.S. Green Building Council in an effort to create a universal system to benchmark the green building industry. The major benefit of LEED Silver certification in the rehabilitation of Building #16 is the ability to demonstrate to stakeholders, peers and the community of outer Cape Cod that the facility is minimally impacting the surrounding environment and does not pose a threat to the health of visitors. In addition to this, certification may lead to local and state government incentives and generate positive press for HCI.

LEED Certification cannot be pursued until twelve months of occupation within Building #16 is has elapsed. The final three months of this period will need to be the “Performance Period,” during which all certification points that require improvement over time need to be gauged as outlined in the *LEED for New Construction and Major Renovation* handbook.¹⁴ These points can be measured using the EPA’s Energy Star¹⁵ program and include:

- **Electricity** – measured using a centrally installed Energy meter. Offsite renewable energy sources such as green certified utility programs should be pursued.
- **Stormwater** - collection measured if system installed
- **Water usage** – 10% reduction increments in indoor plumbing earn 1 point up to 30%
- **Irrigation** – compare a local estimate of irrigation needs to measured usage
- **Operations** – measure heating, cooling, lighting etc to track building controls that are impacted by inhabitants

Occupancy of at least seventy-five percent of the building is required during this period. Once this timeframe is complete, the HCI must register for LEED certification by downloading and submitting the *LEED: Leadership in Energy and Environmental Design Project Registration* from the U.S. Green Building Council’s website.¹⁶ The cost of applying is \$1,500 and can be done online at www.usgbc.org or via mail. An important piece of this phase will be the involvement of building professionals such as architects and contractors who are LEED-accredited to make sure that all necessary steps are taken at the correct time to avoid any delays in application. The application process requires several application steps before, during and after construction and each step has a 2-4 week processing time so timely execution of these steps is important. Below is an outline of the process.

Combined Design & Construction Review* Existing Buildings Review (initial certification and recertification)		Split Design & Construction Review	
Review phase	Length	Review phase	Length
Preliminary review: The project team submits all attempted credits and prerequisites. USGBC returns them to the project team as "earned," "clarify," or "denied."**	25 business days <i>Expedited: 12 business days</i>	Preliminary design-phase review: Before substantial completion, the project team submits all attempted Design credits and prerequisites. USGBC returns them to the project team as "anticipated," "clarify," or "denied."**	25 business days <i>Expedited: 12 business days</i>
PROJECT TEAM Preliminary Review Response: Project team responds to any credits or prerequisites marked as "clarify" and resubmits to USGBC.	Up to 25 business days <i>Expedited: 10 business days</i>	PROJECT TEAM Preliminary design-phase response: Project team responds to any credits or prerequisites marked as "clarify" and resubmits to USGBC.	Up to 25 business days <i>Expedited: 10 business days</i>
Final review: USGBC reviews the resubmitted credits and returns a final review of all credits and prerequisites, which will either be marked "earned" or "denied."	15 business days <i>Expedited: 7 business days</i>	Final design-phase review: USGBC reviews the resubmitted credits and returns a final review of all Design credits and prerequisites, which will either be marked "anticipated" or "denied."	15 business days <i>Expedited: 7 business days</i>
PROJECT TEAM Accept or Appeal: The project team has 25 business days to choose to accept or appeal the results of the final review.	Up to 25 business days	PROJECT TEAM Accept or Appeal: The project team has 25 business days to choose to accept or appeal the results of the final design-phase review.	Up to 25 business days
Appeal: Denied credits or prerequisites may be resubmitted to USGBC for appeal. USGBC will return the appealed prerequisite(s) or credit(s) to the project team as "earned" or "denied."	25 business days <i>Expedited: 12 business days</i>	Design-phase Appeal: Denied design-phase credits or prerequisites may be resubmitted to USGBC for appeal. USGBC will return the appealed prerequisite(s) or credit(s) to the project team as anticipated or denied. Project teams may also appeal design-phase credits at the end of the construction-phase review.	25 business days <i>Expedited: 12 business days</i>
		Preliminary construction-phase review: After substantial completion, the project team submits all attempted Construction and/or NEW Design credits and prerequisites. USGBC returns them to the project team as "earned," "clarify," or "denied."**	25 business days <i>Expedited: 12 business days</i>
		PROJECT TEAM Preliminary construction-phase response: Project team responds to any credits or prerequisites marked as "clarify," and resubmits to USGBC.	Up to 25 business days <i>Expedited: 10 business days</i>
		Final construction-phase review: USGBC reviews the resubmitted credits and returns a final review of all credits.	15 business days <i>Expedited: 7 business days</i>
		PROJECT TEAM Accept or Appeal: The project team has 25 business days to choose to accept or appeal the results of the final review.	Up to 25 business days
		Construction-phase Appeal: Denied Construction OR Design credits or prerequisites may be appealed. USGBC will return the appealed prerequisite(s) or credit(s) to the project team as anticipated or denied.	25 business days <i>Expedited: 12 business days</i> ¹⁷

The building steps left remaining that can be implemented after habitation are as follows.

- **Showroom Concept** – Label sustainable building processes and materials to increase awareness. Install moving walls, lighting fixtures, furniture that will allow for adaptive use of the space. This will enable potential partners to more easily envision an HCI building meeting their needs.
- **Plantings** – Should be used to encourage rainwater collection (Native groundcover wherever possible). Planting will meet NPS guidelines.
- **Walkways** - Must be asphalt or stone dust¹⁸ and permeable asphalts may work where stone dust does not.
- **Roofing** - Cedar shingles or other green material that reflects heat to reduce heat island.
- **Irrigation** - Storm water collection for irrigation stored in underground tanks.
- **Exterior Lighting** - Limit light pollution by using smart design in exterior lighting (solar powered).
- **Interior air** - Use environmentally friendly furnishings and cleaning products. Install ceiling fans to reduce cooling needs.
- **Solar** – Install heavy drapes to control lighting/heating and cooling if an awning is not used. Use these in tandem with south-facing awnings to manage seasonal light.
- **Solar hot water/electricity** – There will be no showers so there will be a low demand for hot water.¹⁹ The building will be a good candidate for solar hot water
- **Bike Rack** - To encourage clean transportation.

Phase Three:

Campus

This document will serve as a template for how to apply the sustainable building process and practice to other buildings on the HCI campus. Since most of the reusable buildings on the site were built in a similar fashion during the 1950s, rehabilitation of any of the surrounding buildings will require a similar process. Ideally, the remainder of the Highlands Center surrounding site will be rehabilitated or demolished as outlined in the ICON report to create a collaborative campus environment. Within Building #16 a labeling system should be used to help raise awareness amongst visitors to the various green strategies used in the rehabilitation of the building. Once the project is completed a walking guide of the building and the surrounding campus could be printed to educate visitors and potential partners of all the steps taken to preserve resources onsite. Studies show that people look more favorably upon organizations that are eco-friendly. If the building is outfitted with moveable walls, furniture and lighting the building will be able to adapt to the needs of the visitors to better demonstrate the usefulness of the site. For example, if a potential partner needs more open space and less office space, walls and furniture could be moved to open up the space and accommodate their needs.

Operational Practices

The deciding factor in whether or not this project achieves LEED Silver certification will ultimately come down to the behavior of the inhabitants of Building #16. As a result the management and behaviors of the HCI members and visitors to the building will have to be clearly outlined and trained. The following four categories will be a focus.

- 1) Recycling** – recycling collection bins should be placed strategically throughout the building and procedures should be drafted on how to reduce waste production.
- 2) Reuse** – Reuse of any materials onsite will additionally reduce waste.
- 3) Water Conservation** – Design list of norms and practices for inhabitants to encourage conservation (electricity as well).
- 4) Waste Management** – HCI members must take “ownership” of materials used onsite to avoid wasteful habits.

A primary focus of this effort will be advanced thermal and lighting controls as well as material and water usage. Thermal controls will allow the occupants to program the heating and cooling to reduce usage when the building is both occupied and vacant. Lighting systems will be installed that turn off lighting fixtures when occupants leave building zones. While these technologies can go a long way to reduce energy use but they are only as effective as their operators. The thermostat for example will need to be programmed so that it maximizes efficiency while still providing adequate heating and cooling. Lighting fixtures and other electronics will need to be used in a responsible manner. HCI members and their guests will be encouraged to limit their use of water during washing and irrigation. Responsible use of cleaning chemicals is also expected. Cleaning chemicals should be selected based on their VOC content and used in moderation. Wherever possible the use of chemical free cleaning solutions, such as steam cleaning, should be used.

The best way to maximize operational efficiency is to follow change management best practices. One commonly accepted formula involves successful completion of the following steps:

Establish a Sense of Urgency: Right now the Highlands Center is beginning to take tangible steps toward the rehabilitation of Building #16. Once in the building members will need to use the same resolve in how they manage their resources. The inhabitants of the building must understand that successful LEED certification will rely heavily upon their actions. This certification will be a vital piece of HCI’s long-term goal of raising awareness within the community as well as acting as an example to other organizations interested in joining the facility.

Form a Strong Guiding Coalition: Successful operations management will require a strong leader who has the support of all levels of the organization to take the measures required to meet the stringent requirements for certification.

Create a Vision: HCI’s strategy for operations within the building is clear; to make every effort to reduce, reuse and recycle resources within the building.

Communicate the Vision: The coalition leader must provide a clear outline of how inhabitants of the building must behave in regards to eco-friendly behavior. This can be achieved through clear signage for visitors and instructional training for regular HCI members.

Empower Action: HCI members will need to have the freedom to enact change when they identify an area for improvement.

Generate Short-Term Wins: By keeping things like trash and electricity needs to a minimum and keeping visitors updated on that performance, Building #16 can leave a lasting impression on visitors.

Anchor New Approaches in the Culture: The HCI inhabitants of Building #16 must all subscribe to a common mentality that values sustainability and the preservation of the resources of the outer Cape.

III. Cost Benefit Analysis

1. Costs

The goal of this project goes beyond creating an efficient building. Building #16 will be an environment that is healthier to be in and will encourage productivity. Sustainable building is often thought of as cost prohibitive. With technological advances within the industry green building alternatives are roughly equivalent in cost to traditional building methods. Most green industry fabricators and suppliers know that they must offer comparable performance at the same cost to stay competitive. Generally speaking, a contractor who chooses sustainable building solutions can anticipate to spend an additional 2% upfront to see a total lifecycle savings of 20%.²⁰ This means that if Building #16 was built at a cost of \$500,000 the additional upfront costs for sustainable solutions could be as little as \$10,000 and over an estimated 20-year lifetime of the building there could be a savings of \$100,000. While it is true that not all projects are the same, this estimate shows what can be achieved through a willingness to incorporate these strategies early on in the process.

Below are the results of a 2003 study into sustainable building costs which tracked the costs of eighteen LEED Silver certified projects.²¹

<u>Year of Completion and Average Green Cost Premiums for Buildings with Silver Certification</u>	
Year Completed	Average Green Cost Premium
1997-1998	2.20%
1999-2000	2.49%
2001-2002	1.40%
2003-2004	2.21%
Avg. of 18 Silver buildings	2.11%

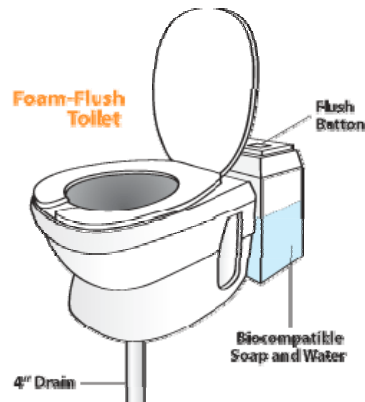
What follows a look at some of the cutting-edge building strategies open to Building #16. These recommendations will be subject to availability and ultimately the discretion of the chosen architect and contractor. It is crucial that both of these firms/individuals are well versed in green building on the Cape. Without the full commitment to green building of all members of the rehabilitation process the project ability to attain LEED certification is in jeopardy. The first half of these recommendations will be part of phase one will be required before inhabitation.

Phase One

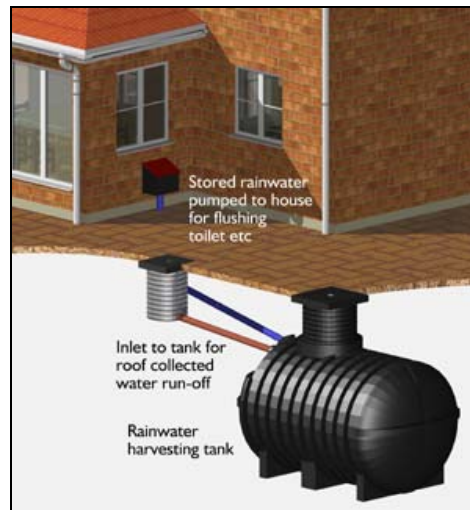
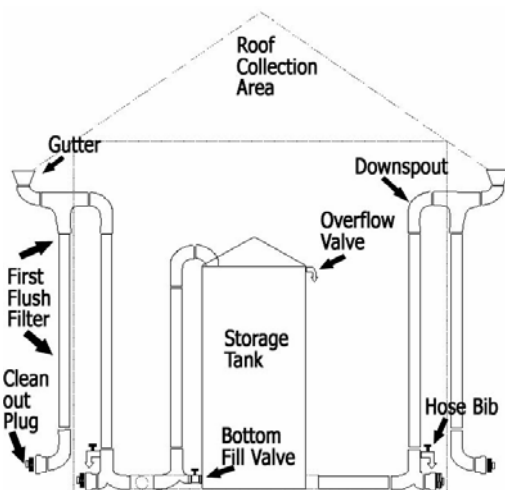
Water Consumption: Low flow faucet aerators from \$10 and up or motion activated faucets from \$150 and up.



Foam composting toilet: Uses 3-6 oz. of water and a few drops of biodegradable soap per flush. Used with underground composting tank.

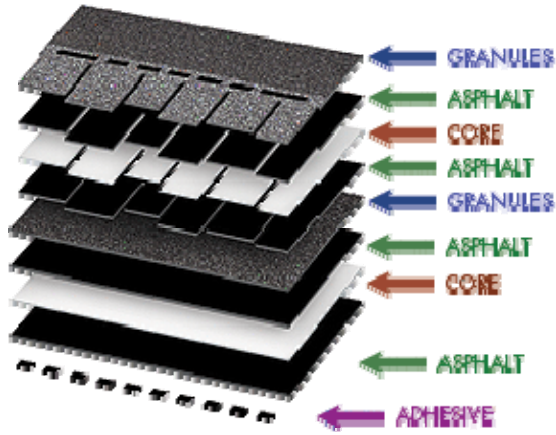


Water collection system: Could be fabricated from plumbing supply store or purchased as a self contained unit.

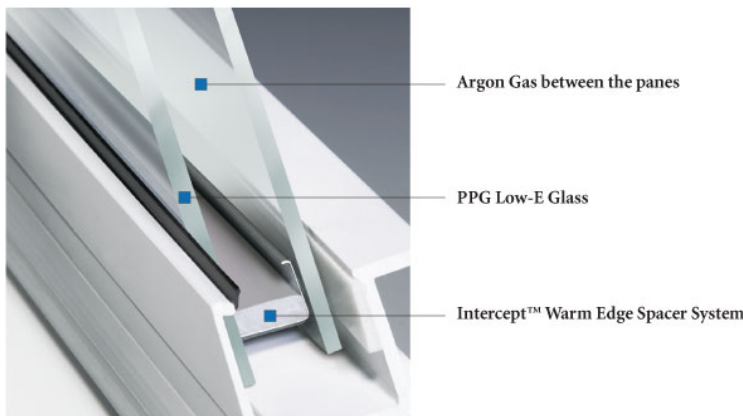


Flooring – Potential solutions include recycled Glass tiles, recycled linoleum with cork powder or any reclaimed flooring.

Roofing - Reflective shingles that fall within NPS regulation. A typical heavily layered system is shown below.



Windows – Double-paned, argon gas filled and energy star rated to Northern/Central Region compliance standards.

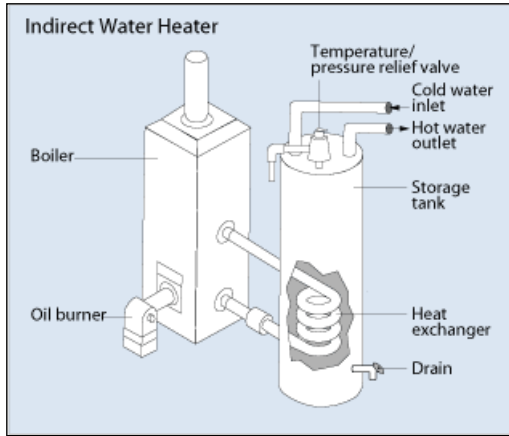


Insulation – Options for eco-friendly insulation are varied. Materials such as recycled clothing, post-consumer paper pulp (pictured below) and even improved traditional insulation like fiberglass made from recycled glass.



Paint – No or low volatile organic compounds (VOC). Choose lighter colors that promote energy conservation by requiring less artificial light.

Boiler – Efficient boiler with radiant floor heating and passive solar that manages seasonal light.

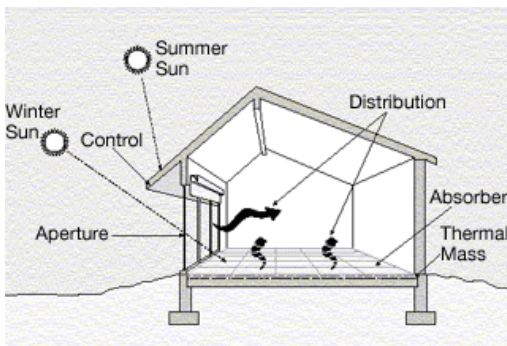


Lighting - Motion detecting light switches start at \$25/each should be combined with efficient light bulbs with low or mercury amounts.

MOTION ONLY



Solar: Use natural daylight to assist in heating and possibly ventilating. If overhangs are not built into the design of Building # 16 awnings and drapes could be added in Phase 2.



Suppliers: Use locally made products when available. A great source to start with might be Provincetown's Green Lumberyard New England Green Building (NE Green), a division of Conwell ACE Hardware and Lumber, Inc as a potential supplier.²²

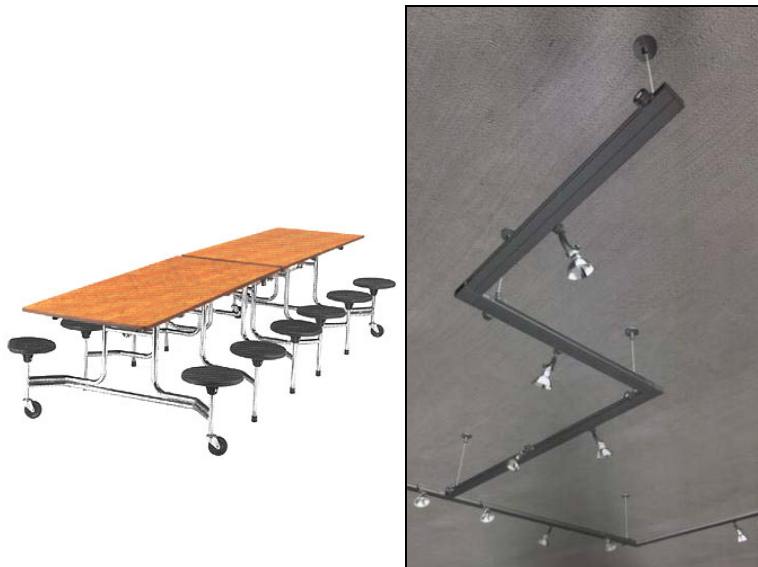


Phase Two - After Habitability

Showroom Concept – Modular walls



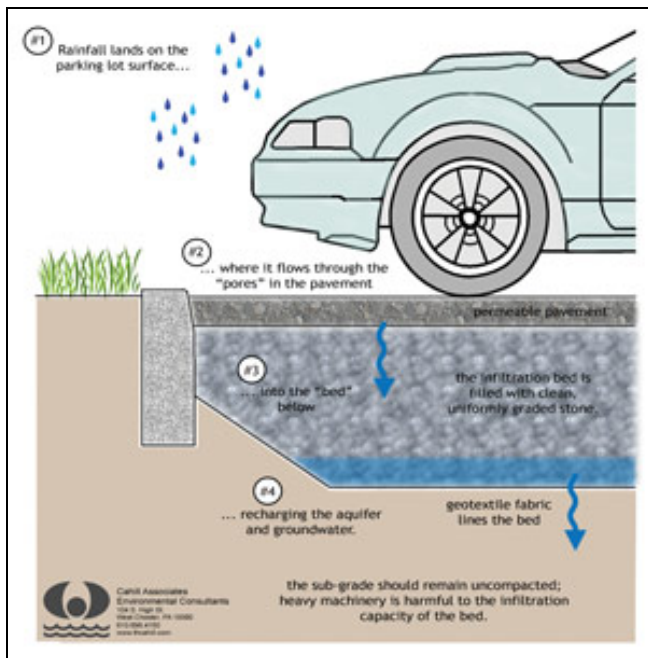
Showroom Concept - Movable lighting fixtures and Furniture that will allow for adaptive use of the space.



Plantings – Native groundcover wherever possible (Outer Cape shrubs, Beach Plum and Black Oak pictured below)



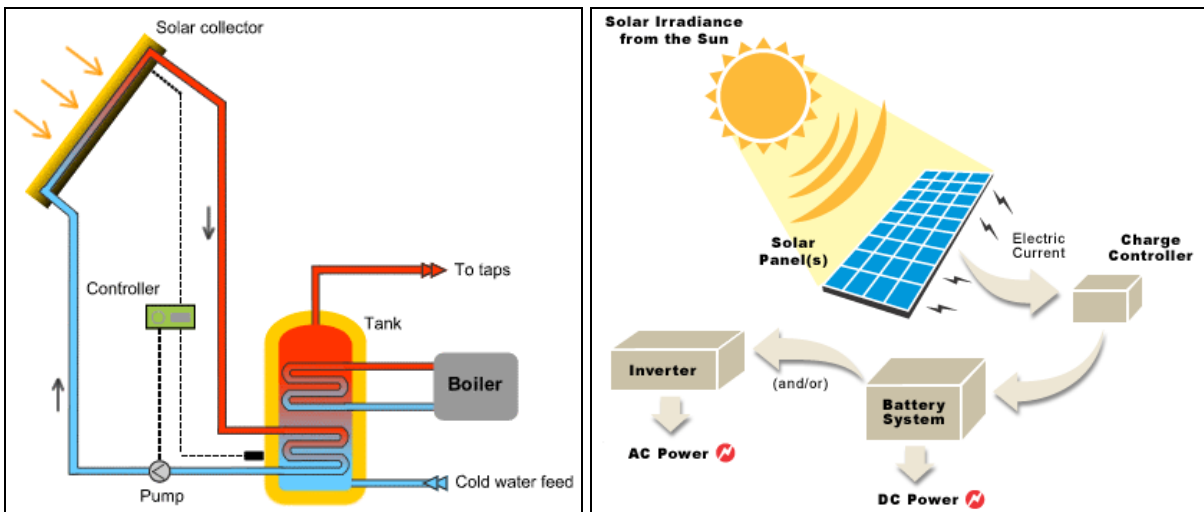
Walkways - Must be asphalt or stone dust²³ and permeable asphalts may work where stone dust does not to reduce runoff. Permeable asphalt uses larger rock pebbles and less tar to create gaps for water to percolate through.



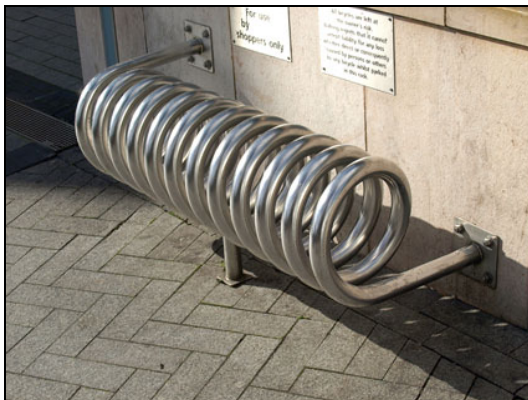
Exterior Lighting - Limit light pollution by using smart design in exterior lighting (solar powered and NPS approved).



Solar - hot water/electricity



Bike Rack - To encourage clean transportation.



LEED Certification Checklist with Cost-Benefit Analysis

Highlands Center, Inc. Building #16 - LEED Certification Analysis		Total Points	Phase One - Habitable	LEED Silver: 43-50 pts	Benefit	Cost
Sustainable Sites (14 points)		14				
Prereq 1	Erosion & Sedimentation Control	Req'd	x	*		
Prereq 2	Age of Building	Req'd	x	*		
Credit 1.1	Plan for Green Site & Building Exterior Management - 4 specific actions	1	x	1		
Credit 1.2	Plan for Green Site & Building Exterior Management - 8 specific actions	1	x	1		
Credit 2	High Development Density Building & Area	1				
Credit 3.1	Alternative Transportation - Public Transportation Access	1				
Credit 3.2	Alternative Transportation - Bicycle Storage & Changing Rooms	1		1		Cost of Bike Rack
Credit 3.3	Alternative Transportation - Alternative Fuel Vehicles	1				
Credit 3.4	Alternative Transportation - Car Pooling & Telecommuting	1				
Credit 4.1	Reduced Site Disturbance - Protect or Restore Open Space (50% of site area)	1	x	1		
Credit 4.2	Reduced Site Disturbance - Protect or Restore Open Space (75% of site area)	1	x	1		
Credit 5.1	Stormwater Management - 25% Rate and Quantity Reduction	1		1	Water Savings	Cost of system install
Credit 5.2	Stormwater Management - 50% Rate and Quantity Reduction	1		1	Water Savings	Cost of system install
Credit 6.1	Heat Island Reduction - Non-Roof	1				
Credit 6.2	Heat Island Reduction - Roof	1	x	1	Energy cost savings	Initial premium on shingles.
Credit 7	Light Pollution Reduction	1				
Water Efficiency (5 points)		5				
Prereq 1	Minimum Water Efficiency	Req'd		*		
Prereq 2	Discharge Water Compliance	Req'd		*		
Credit 1.1	Water Efficient Landscaping - Reduce Potable Water Use by 50%	1	x	1	Water Savings, Goodwill	Cost of stormwater system
Credit 1.2	Water Efficient Landscaping - Reduce Potable Water Use by 95%	1				
Credit 2	Innovative Wastewater Technologies	1		1	Water Savings, Goodwill	Premium on installation
Credit 3.1	Water Use Reduction - 10% Reduction	1		1	Water Savings, Goodwill	
Credit 3.2	Water Use Reduction - 20% Reduction	1		1	Water Savings, Goodwill	
Energy and Atmosphere (23 points)		23				
Prereq 1	Existing Building Commissioning	Req'd		*		
Prereq 2	Minimum Energy Performance - Energy Star 60	Req'd		*		
Prereq 3	Ozone Protection	Req'd	x	*		
Credit 1	Optimize Energy Performance	1 to 10	x	1	Usage savings (gas, electric) and Greenhouse gas reduction	Cost to install measurement system. Can be offset by utility incentives.
	Energy Star Rating - 63	1		1		
	Energy Star Rating - 67	2		1		
	Energy Star Rating - 71	3		1		
	Energy Star Rating - 75	4		1		
	Energy Star Rating - 79	5		1		
	Energy Star Rating - 83	6				
	Energy Star Rating - 87	7				
	Energy Star Rating - 91	8				
	Energy Star Rating - 95	9				
	Energy Star Rating - 99	10				
Credit 2.1	Renewable Energy - On-site 3% / Off-site 15%	1		1		
Credit 2.2	Renewable Energy - On-site 6% / Off-site 30%	1		1		
Credit 2.3	Renewable Energy - On-site 9% / Off-site 45%	1		1		
Credit 2.4	Renewable Energy - On-site 12% / Off-site 60%	1		1		
Credit 3.1	Building Operation & Maintenance - Staff Education	1		1	Carbon Footprint reduction, community perception	Minimal
Credit 3.2	Building Operation & Maintenance - Building Systems Maintenance	1		1		
Credit 3.3	Building Operation & Maintenance - Building Systems Monitoring	1		1		
Credit 4	Additional Ozone Protection	1	x	1		
Credit 5.1	Performance Measurement - Enhanced Metering (4 specific actions)	1				
Credit 5.2	Performance Measurement - Enhanced Metering (8 specific actions)	1				
Credit 5.3	Performance Measurement - Enhanced Metering (12 specific actions)	1				
Credit 5.4	Performance Measurement - Emission Reduction Reporting	1		1		Cost to track
Credit 6	Documenting Sustainable Building Cost Impacts (Green Power)	1		1		

		Total Points	Phase One - Habitable	LEED Silver: 43-50 pts	Benefit	Cost
Materials and Resources (16 points)		16				
Prereq 1.1	Source Reduction & Waste Management - Waste Stream Audit	Req'd	x	*	Scrap metal resale potential	Cost of separation and delivery.
Prereq 1.2	Source Reduction & Waste Management - Storage & Collection	Req'd		*		
Prereq 2	Toxic Material Source Reduction - Reduced Mercury in Light Bulbs	Req'd	x	*		
Credit 1.1	Construction, Demolition & Renovation Waste Management - Divert 50%	1	x	1	Wastestream reduction	Small premium on initial cost
Credit 1.2	Construction, Demolition & Renovation Waste Management - Divert 75%	1				
Credit 2.1	Optimize Use of Alternative Materials - 10% of Total Purchases	1	x	1		
Credit 2.2	Optimize Use of Alternative Materials - 20% of Total Purchases	1		1		
Credit 2.3	Optimize Use of Alternative Materials - 30% of Total Purchases	1		1		
Credit 2.4	Optimize Use of Alternative Materials - 40% of Total Purchases	1		1		
Credit 2.5	Optimize Use of Alternative Materials - 50% of Total Purchases	1		1		
Credit 3.1	Optimize Use of IAQ Compliant Products - 45% of Annual Purchases	1			Carbon Footprint reduction	Small premium
Credit 3.2	Optimize Use of IAQ Compliant Products - 90% of Annual Purchases	1				
Credit 4.1	Sustainable Cleaning Products & Materials - 30% of Annual Purchases	1		1		
Credit 4.2	Sustainable Cleaning Products & Materials - 60% of Annual Purchases	1		1	Carbon Footprint reduction	Small premium
Credit 4.3	Sustainable Cleaning Products & Materials - 90% of Annual Purchases	1		1	Carbon Footprint reduction	Small premium
Credit 5.1	Occupant Recycling - Recycle 30% of the Total Waste Stream	1		1	Carbon Footprint reduction	Negligible
Credit 5.2	Occupant Recycling - Recycle 40% of the Total Waste Stream	1		1	Carbon Footprint reduction	Negligible
Credit 5.3	Occupant Recycling - Recycle 50% of the Total Waste Stream	1		1	Carbon Footprint reduction	Negligible
Credit 6	Additional Toxic Material Source Reduction - Reduced Mercury Light Bulbs	1		1		
Indoor Environmental Quality (22 points)		22				
Prereq 1	Outside Air Introduction & Exhaust Systems	Req'd		*	Health benefits	None
Prereq 2	Environmental Tobacco Smoke (ETS) Control	Req'd		*		
Prereq 3	Asbestos Removal or Encapsulation	Req'd		*		
Prereq 4	PCB Removal	Req'd		*		
Credit 1	Outside Air Delivery Monitoring	1			Health benefits	None
Credit 2	Increased Ventilation	1		1		
Credit 3	Construction IAQ Management Plan	1	x	1		
Credit 4.1	Documenting Productivity Impacts - Absenteeism & Healthcare Cost Impacts	1				
Credit 4.2	Documenting Productivity Impacts - Other Productivity Impacts	1				
Credit 5.1	Indoor Chemical & Pollutant Source Control - Reduce Particulates in Air	1		1		
Credit 5.2	Indoor Chemical & Pollutant Source Control - Isolation of Copy Room	1				
Credit 6.1	Controllability of Systems - Lighting	1		1	Reduced Electricity Cost	Long-term savings
Credit 6.2	Controllability of Systems - Temperature & Ventilation	1		1	Reduced Electricity/gas Cost	Long-term savings
Credit 7.1	Thermal Comfort - Compliance	1		1	Productivity increases and reduced artificial light use	Initial window installation cost
Credit 7.2	Thermal Comfort - Permanent Monitoring System	1		1		
Credit 8.1	Daylight & Views - Daylight for 50% of Spaces	1		1		
Credit 8.2	Daylight & Views - Daylight for 75% of Spaces	1		1		
Credit 8.3	Daylight & Views - Views for 45% of Spaces	1		1		
Credit 8.4	Daylight & Views - Views for 90% of Spaces	1		1	Productivity increases and reduced artificial light use	Initial window installation cost
Credit 9	Contemporary IAQ Practice (No HVAC pollutants during Construction)	1		1	Health related to reduced airborne pollutants	Minimal initial cost None if already in building design.
Credit 10.1	Green Cleaning - Entryway Systems (Grate at entryways)	1		1	Health and safety improvement	
Credit 10.2	Green Cleaning - Isolation of Janitorial Closets	1		1		
Credit 10.3	Green Cleaning - Low Environmental Impact Cleaning Policy	1				
Credit 10.4	Green Cleaning - Low Environmental Impact Pest Management Policy	1				
Credit 10.5	Green Cleaning - Low Environmental Impact Pest Management Policy	1				
Credit 10.6	Green Cleaning - Low Environmental Impact Cleaning Equipment Policy	1				
Innovation and Design Process (5 points)		5				
Credit 1.1	Innovation in Upgrades, Operation & Maintenance	1		NA		
Credit 1.2	Innovation in Upgrades, Operation & Maintenance	1		NA		
Credit 1.3	Innovation in Upgrades, Operation & Maintenance	1		NA		
Credit 1.4	Innovation in Upgrades, Operation & Maintenance	1		NA		
Credit 2	LEED™ Accredited Professional	1		NA		
Total		85		55		

1. Potential Roadblocks

What follows is a SWOT analysis which is designed to give a snapshot of Building #16 current project strengths, weaknesses, opportunities and threats.

Strengths <ul style="list-style-type: none">• HCI Stakeholder Commitment• NPS Partnership• Site potential• Willingness to build in a sustainable way• Community Support	Weaknesses <ul style="list-style-type: none">• Fundraising• Awareness• Condition of existing structure
Opportunities <ul style="list-style-type: none">• For a community enriching campus• Proliferation of arts and science on the outer Cape• To make use of unused developed land on the Cape• To Increase awareness of eco-friendly building	Threats <ul style="list-style-type: none">• Capital• Unforeseen Hazardous Waste Removal• Demolition and Construction delays• Economic Market shifts that might reduce donations and community support• Delays in LEED application procedure

IV. Closing Remarks

This document is meant to be helpful to the Highlands Center, Inc. in its goal to transform the former North Truro Air Force Station into a thriving, culturally rich community. This project was designed to map out the path required to get Building #16 both up and running and LEED certified and it is clear that HCI has the resolve to see it through to the end. Ultimately the Cape Cod community stands to benefit greatly from a cleaned up site that offers opportunities to members of the arts and sciences community as well as the community as a whole. The Highlands Center will provide lasting enjoyment for generations to come.

V. Appendix

¹ Implementation Plan for the Highlands Center at Cape Cod National Seashore. Prepared by ICON Architecture, Inc. In association with FXM Associates: Carol R. Johnson Associates, Judith Nitsch Engineering and Michael Singer.

² NPS Website. Highlands Center at Cape Cod National Seashore.

<http://www.nps.gov/caco/planyourvisit/highlands-center-at-cape-cod-national-seashore.htm>

³ Ibid.

⁴ *The Energy Challenge: A New Agenda for Corporate Real Estate*. Rocky Mountain Institute. CoreNet. 2007.

⁵ Epstein, Mark J. (January 2008) *Making Sustainability Work: Best Practices in Managing and Measuring Corporate Social, Environmental and Economic Impacts*, Berrett-Kohler Publishers, San Francisco.

⁶ Lauren McKean. National Park Service. November, 26th, 2008.

⁷ Ibid, pg 27.

⁸ Implementation Plan for the Highlands Center at Cape Cod National Seashore. Prepared by ICON Architecture, Inc. In association with FXM Associates: Carol R. Johnson Associates, Judith Nitsch Engineering and Michael Singer.

⁹ *Highlands Center at CCNS: Appendix to the Site and Building Design and Rehabilitation Handbook*. September 2005, pg 23.

¹⁰ Ibid, pg 27.

¹¹ Ibid, pg 23.

¹² *A Report to California's Sustainable Building Task Force* October 2003.

www.usgbc.org/Docs/News/News477.pdf

¹³ <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222>

¹⁴ <http://www.usgbc.org/ShowFile.aspx?DocumentID=3179>

¹⁵ http://www.energystar.gov/index.cfm?c=guidelines_evaluate_performance.measure

¹⁶ <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221#v2008>

¹⁷ <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1497>

¹⁸ *Highlands Center at Cape Cod National Seashore Site and Building Design and Rehabilitation Handbook*. Sept 2005, pg 27

¹⁹ *Highlands Center at CCNS: Appendix to the Site and Building Design and Rehabilitation Handbook*. September 2005, pg 23.

²⁰ *The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force*. October 2003. Greg Kats

²¹ Ibid.

²² <http://www.negreen.com/ContactUs.html>

²³ *Highlands Center at Cape Cod National Seashore Site and Building Design and Rehabilitation Handbook*. Sept 2005, pg 27