A SUSTAINABLE DEVELOPMENT TEMPLATE
FOR BETTER HOUSING COALITION

APPLICATION TO WINCHESTER FOREST

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A SUSTAINABLE DEVELOPMENT TEMPLATE FOR BETTER HOUSING COALITION

APPLICATION TO WINCHESTER FOREST

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# TABLE OF CONTENTS

Executive Summary iii

**SECTION 1: Purpose and justification of the study**

Purpose of the study 1
Sustainable Development versus Green Practices 2
Why focus on sustainable development 4
Why follow a decision model 4

**SECTION 2: The spiral decision model**

Flow 6
What is achieved if the model is followed 7
The predevelopment and development process of BHC 7
Analytical description of the process 8
  - Pre-contract 9
  - Contract 11
  - Design 13
  - Construction 20
  - Maintenance 22

**SECTION 3: Application to Winchester Forest**

Site location 25
Limitations of this example 25
The suggested decisions 26
  - Design stage 26
  - Construction stage 34
  - Maintenance stage 35

**APPENDICES**

I – Assigning attributes to sustainable development:
  - the United Nations indicators 37
II – Assessing sustainable development – the Bellagio Principles 39
III – Strong and weak sustainable development 42
IV – Additional discussion on sustainable development 43
V – Images of Winchester Forest 46

References 48
LIST OF FIGURES, TABLES, MAPS AND IMAGES

Figure 1: The sustainable development decision model for BHC  
Figure 2: The most widely accepted model for sustainable development  
Figure 3: The 3-dimensional model of SD

Table 1: Considered sustainability issues and how they are addressed through site design and planning

Map 1: A more detailed view of Winchester Forest, and the larger development of Winchester Greens

Image 1: The location of Winchester Forest in Richmond Metro  
Image 2: Annotated aerial photograph of Winchester Greens and Winchester Forest  
Image 3: Detail of the aerial photo showing Winchester Forest site

INSERTS

Insert 1: Sample site plan of Winchester Forest community
Executive Summary

This study is a senior project for the Master’s degree in Urban and Regional Planning at Virginia Commonwealth University. A decision model has been created that helps the non-profit community development organization Better Housing Coalition move towards sustainable development. Afterwards, the model is applied to one of the organization’s developments, Winchester Forest, in order to provide a general example. The decision model is a thirty-step spiral process that revisits six sustainability aspects five times, under a different perspective each time. The five different perspectives are the five steps that the Better Housing Coalition usually takes when realizing a development project.

The sustainability aspects influencing decisions throughout the model’s five cycles are:

- Vision and mission
- Institutional values
- Issues of Environment, Economy, and Society
- Communication of decisions
- Strategic partnerships
- Assessment through the ten Bellagio Principles

The five cycles of the decision model are:

- Pre-contract (property speculation stage)
- Contract (feasibility analysis stage)
- Design (house and site planning stage)
- Construction
- Maintenance

Figure 1: The sustainable development decision model for Better Housing Coalition
SECTION 1

PURPOSE AND JUSTIFICATION OF THE STUDY

PURPOSE OF THE STUDY

Sustainable Development Decision Model

This study proposes a template that Better Housing Coalition can use to produce communities that promote the Sustainable Development concept. The template is then applied to a current development project of the organization.

This template is a decision model which sets up the framework that organizes all of the sub practices currently available to Better Housing Coalition and moves its projects towards sustainable development.

The study first identifies what sustainable development is. This includes a short discussion about the most accurate model of sustainability and a presentation of the conceptual methodology used to pursue sustainable development. Next, the model and methodologies are linked to the process that BHC follows to build communities. A template is then proposed that aims to guide the organization through the various requirements of sustainable development each time it undertakes a community development project. The template has the form of a decision model.

Finally, the proposed decision model is tested on Winchester Forest, a current BHC development project in Chesterfield County, Virginia. The purpose of this evaluation is to provide an example of how the proposed sustainable development decision model can be used in a given undertaking.

Better Housing Coalition (BHC)

BHC is a non-profit community development organization based in Richmond, Virginia. It was established in 1988 by civic leaders in order to increase affordable housing options and revitalize neighborhoods in Greater Richmond. Over the years BHC has established partnerships with the business world, public organizations, neighborhood associations, and other community-based organizations that give support to its affordable housing efforts.

The organization is led by a twenty-member board of directors and operates with seventeen professionals specialized in fields related to community and real estate development.

The types of development that BHC undertakes are single- and multi-family communities, with occasional commercial (retail) development. Development sites are either in city neighborhoods or near-city undeveloped areas, and the efforts include new development or re-development. Some of the properties are purchased by individuals, while other homes are leased and maintained by BHC. These ownership statuses have been realized so far in individual houses, apartment buildings and larger apartment communities,
or senior housing. Overall, BHC has developed about 380 rental senior apartments, 375 rental apartments or townhouses, and 195 owned houses to date.

The development activities of BHC span the full range of community development, from the initial stage of property identification to design and contracting to the final stage of maintenance. Professional services that BHC receives from other businesses mostly include architectural design, engineering consulting, and construction for ongoing projects.

Along with the commitment to affordable housing and neighborhood revitalization, BHC has recently decided to integrate ecologically friendly techniques in the design of its projects and committed to promote the concept of sustainable development. This commitment to a sensitive type of development, which is different from the popular form, is currently realized through two main schemes. The first scheme is the pursuit of EnergyStar and EarthCraft standards; the former for energy efficiency, and the latter for a more comprehensive ecological approach. The second scheme is an intuitive shift to impulses of sustainable development through more comprehensive development practices. These include some new urbanism approaches such as mixed development, mixed-income residencies, smaller lots, more efficient materials, and the constant commitment to affordable housing.

The best example of BHC's current approach to development is the Winchester Greens development and its planned addition, Winchester Forest. Although in a generally unsustainable suburban setting in Chesterfield County, Winchester Greens includes a combination of elements that promote sustainability. Efficient use of space through higher density; urban design elements that respect pedestrians; inclusion of retail and social service facilities, green space and vegetation, and homes that accommodate a variety of age and income categories; and efforts to create a sense of community are the most noticeable of these elements. The planned addition of Winchester Forest will provide additional elements to promote sustainability. These important elements include the integrated design of houses, which will make them resource and energy efficient and ecologically friendly by design; site planning that preserves the most possible natural resources, such as existing trees; and the considerable amount of community participation during the design process.

The voluntary consideration of these elements by a private developer is likely to have a heavy impact in community development and is a step closer to a sustainable society. Nevertheless, these efforts represent an intuitive and spontaneous call by committed professionals to do the right thing, and could best be described as an ecological or green approach to community development. As the rest of Section 1 argues, sustainable development is a more comprehensive response to this subconscious ‘call of duty,’ providing scope and a framework to the various green impulses of an organization. It therefore serves BHC in accomplishing its efforts.

SUSTAINABLE DEVELOPMENT VERSUS GREEN PRACTICES

Since the emergence of sustainable development as a concrete concept, there has been serious misconception about its meaning, confusion with other green practices, and manipulation of the idea for political and marketing reasons. The following seeks to distinguish sustainable development
from other green or ecological practices. For further understanding, a more detailed discussion is given in Appendix IV.

What Sustainable Development Is

Sustainable development is a concept of an optimum state in human society. However, it is concerned not only with theoretical discussions, but also with specific development practices that:

- Address specific issues that have been identified by the global community as the most critical for the global system\(^1\).

- Recommend how to move to the direction of the optimum state of sustainability, and which principles should underlie each decision.

- Provide a methodology to emphasize the larger picture of global and local interconnections: Environment, Economy, and Society (and in its newer version, Institutional, as well).

The original theoretical background and methodologies of sustainable development come mainly from the United Nations Organization. The specific elements of sustainable development, such as the three pillars of environment, society, and economy, are presented in Section 2.

What Sustainable Development Is Not

There are certain misconceptions about the nature of sustainable development. To explain some of the most important\(^2\), sustainable development is not:

- A set of technical standards about green architecture, ecological communities, or other similar practices.

- A solution that addresses only one issue that societies face, such as land segregation, transportation problems, poverty, recycling, environmental pollution, climate change, or economic performance.

- A solution that touches only the physical elements of a community. It focuses heavily on ‘soft’ structures as well; i.e. organization and communication.

- A set of guidelines that are a product of a specific country, region, ideology, or planning/architecture/engineering philosophy.

The Contrast to Green Practices

The term ‘green practices’ is used here to describe widely accepted and applied development viewpoints that differ from those about traditional growth and introduce a more comprehensive and broadminded viewpoint. These include:


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\(^1\) Global System: All interconnected elements of this planet; humans, flora, fauna, natural resources, and all the produced combinations from such elements, such as the human society, or the economy, or the climate.

\(^2\) These responses about what sustainable development is not are based primarily on discussions with professionals that are active in the fields of engineering, geosciences, constructions, architecture, and planning.
Development approaches that aim to address issues similar to what green practices do, but are more abstract. Examples: Low Impact Development, Smart Growth, Urban Renewal.

WHY FOCUS ON SUSTAINABLE DEVELOPMENT

The following points justify why sustainable development is more effective than a green practice alone. Sustainable development:

- Is significantly more comprehensive than green practices.
- Identifies the exact and critical issues of humanity.
- Is a product of the global community; not of a country, region, or community group.
- Grasps the big picture: Environment, Economy, and Society.
- Uses the term ‘development’ with the meaning of overall behavior, function, organization, and evolution; not just with the meaning of physical development.
- Gives meaning to green practices as techniques to achieve what sustainable development identifies as important.

In summary, sustainable development is better than green practices alone because:

Sustainable development produces an optimum state of economical, environmental, and societal balance, based on the critical issues the world is facing.

While all of the above-mentioned points are important, it is noted again that this study does not disregard green practices or any other practice with which BHC is familiar. Rather, it rather sets up the framework that takes positive advantage of these practices and puts them under the sustainability framework.

WHY FOLLOW A DECISION MODEL

The reasons for following a template or a decision model to approach projects under the sustainability scope are to:

- Manage the available knowledge, inside and outside BHC.
- Ensure legal and scientific credibility.

Managing the available knowledge

Each unit of knowledge that is part of, or can contribute to, sustainability provides guidance about certain parts of the overall effort to grasp the concept, approach, and practice of sustainable development and to assess progress.

Nevertheless, in this era of standardization, automation, and streamlining, a comprehensive guide of how to be sustainable would promote simplicity and credibility and would maximize performance. The available knowledge about certain aspects of sustainable development can be combined to serve that purpose.
Moreover, when an organization takes its first steps towards sustainability, a template based on current knowledge is the first priority. Once enough experience is gained through applying the template, modification of the guidelines and innovation occur in an effort to maximize efficiency and further adjust the template to the characteristics of the specific organization and area that is active. Finally, new knowledge that is generated by the developer (internally) and by the world community (externally) can raise the demand to alter the framework.

Therefore, the template suggested for the Better Housing Coalition will serve as a starting point for how the organization should understand sustainability and how it should behave in order both to promote it and to claim that it is, indeed, sustainable.

Legal and Scientific Credibility

The issue of credibility is important and deserves to be emphasized for two reasons. The first reason, scientific credibility, deals with the misconception about what sustainable development is, as presented in the introduction. Furthermore, not every method yields overall sustainability. For example, when aiming to secure a community from potential natural disasters, a designer could decide to canalize a stream. Although this popular practice aims to achieve community safety, it puts pressure on the ecosystem and is not economically viable in the long run. Therefore, as it does not promote sustainable development, it weakens the credibility of the developer and limits an NGO’s or non-profit organization’s ability to be beneficial and influential within its area of activity.

The second reason arises from the public claim of “being sustainable” and has to do with legal credibility. As the continuation of life on this planet is more at risk every year, western states are more eager to interfere in how society functions through sustainable development law, and – equally important – society is eager to accept this intervention for the sake of common good. The sustainable development discourse is indeed a global public issue among others. Therefore, we will see more and more legal requirements for sustainability in the future, with international law likely influencing national laws (Decleris, 2000).

The template will serve among others as a safe vehicle that ensures credibility.
SECTION 2

THE SPIRAL DECISION MODEL

FLOW

Every time BHC initiates a community development process, six steps should progressively be taken, repeatedly for each of the five stages in a BHC project. In other words, the process starts with going over the six steps while in the pre-contract stage. Following completion of this stage, the same steps are revisited during the contract stage. The process ends when these same six steps are completed at the maintenance stage, as the spiral form implies:

- Six decision-making steps, originated in the Sustainable Development requirements:
  1) Develop Vision/Mission
  2) Set Institutional Values
  3) Explore Environment, Economy, Society
  4) Communicate Results
  5) Seek Strategic Partners
  6) Assessment through Bellagio Principles

- Repeated five times for each phase of a BHC development project:
  1) Pre-contract
  2) Contract
  3) Design
  4) Construction
  5) Maintenance
The total stages of the decision process are thirty; six steps times five project phases. This does not imply, however, that each time a completely new picture is generated; rather, it ensures continuous evaluation and adjustment due to emerging factors. Each step is seen under a different perspective each time. Of course, some steps such as the vision/mission and institutional values don't change much throughout the development process, although they may undergo some fine-tuning. Other steps, however, change drastically throughout the process because they have a more focused scope. An example is the exploration of the environment, economy, and society in the design stage which is rather different from the same step in the maintenance stage. Appendix I explains how each decision step is or isn’t different in each phase of a BHC project.

WHAT IS ACHIEVED IF THE MODEL IS FOLLOWED

Each time BHC deals with a major step of a project (the five stages: pre-contract, contract, design, construction, maintenance,) the decisions affect the interconnected system of our society, environment, and economy.

The six decision steps of each of the five cycles carry the principles, requirements, and suggestions of sustainable development as developed by the global community.

By following the steps for the total of thirty times, BHC is expected to have decided and acted within the requirements of sustainability. This is because:

- The community addresses as many critical issues as possible,

Or at least,

- The decisions that have shaped the community have been made with the sustainable development constraints in mind.

In other words:

Whatever the decisions were [based on BHC's abilities and other constraints/opportunities], Sustainable Development is promoted because the model has ensured it.

Furthermore:

None of the things that BHC currently does has changed. Practices, phases, and tools are the same, but they are applied under the sustainability framework. This is the key to sustainable development.

THE PREDEVELOPMENT AND DEVELOPMENT PROCESS OF BHC

The decision model integrates:

The five stages of BHC predevelopment & development, and

The EarthCraft techniques.

Because of the idea that sustainable development is achieved mainly by organizing existing activities and putting them under a broader framework

The organization’s approach to a development project, from the acquisition of the property to the maintenance of the completed construction, includes five stages and is integrated into the sustainable development decision model:
1. Pre-contract Stage. During this period, properties for potential development are identified and evaluated according to such issues as budget & subsidies, development needs of the area, development alternatives, and ecological feasibility. It is the ‘opportunity’ or ‘speculative’ phase of the predevelopment process.

2. Contract Stage. After the initial evaluation the organization makes a contract with the property owner in order to explore the characteristics in more depth. This stage has to do mainly with financial feasibility and identification of major issues that would make development economically unviable. Based on the feasibility analyses of this stage, a decision is made about whether to buy the property or drop out of the contract.

3. Design Stage. During the design phase, architectural and site planning takes place. Options and alternatives are being explored and the building drafts are being produced.

4. Construction Stage. This stage is when the designs and other decisions about the project are physically realized on the development site.

5. Maintenance Stage. This phase includes all of the issues after the completion of construction. In the case that BHC decides to sell the property, maintenance does not exist. It is, however, a critical issue if the organization decides to keep ownership and issues such as energy use (and savings), resource efficiency, and waste generation & management are important for the successful ownership of the property.

Special emphasis is given to EarthCraft standards, which deal with green or ecological techniques. They are integrated in the proposed decision model because of the idea that sustainable development is achieved mainly by organizing existing activities and putting them under a broader framework (the sustainability ideology) and not by disregarding current practices in order to introduce new ones.

ANALYTICAL DECRPIPTION OF THE PROCESS

The following pages explain in more depth the proposed process for a development project. Each time a sustainable development concept is introduced, the reader is referred to the corresponding theory in the appendices.
PRE-CONTRACT STAGE

Develop Mission/Vision

1. Sustainable Development Mission. Agree on and respond to the following questions. As an organization,
   - Who are you?
   - What are you doing and why?

2. Develop a vision for the project you are starting. It must be a clear vision of sustainable development with goals that define that vision – what is the condition of your community when it is completed and inhabited?

Set Institutional Values

1. As an organization, meet the requirements of the United Nations Institutional theme for sustainable development:

   **Institutional Framework**
   - Strategic Implementation of SD
   - International Cooperation

   **Institutional Capacity**
   - Information Access
   - Communication Infrastructure
   - Science and Technology
   - Disaster Preparedness and Response

2. Meet the requirements of Bellagio Principle 10 (see Appendix II for information regarding the Bellagio Principles):

   **Bellagio Principle 10**
   Continuity of assessing progress toward sustainable development should be assured by:
   - Clearly assigning responsibility and providing ongoing support in the decision-making process,
   - Providing institutional capacity for data collection, maintenance, and documentation, and
   - Supporting development of local assessment capacity.
Explore Environment, Economy, Society

1. When selecting the site, keep in mind the United Nations sustainable development themes/subthemes (Appendix I), which are the key issues that our world faces. Make responsible site selection based on minimum interference with those themes/subthemes.

2. Seek as many EarthCraft points as possible, from the following:
   - Site located within ¼ mile of mass transit.
   - Sidewalk connects house to business district.
   - Select brownfield site.
   - Pursue infill development.

Communicate Results

1. Only extensive internal communication. What will each member of BHC share in terms of assets & liabilities of the potential site, according to his/her specialization?

Seek Strategic Partners

1. The first internal discussions about what could be the benefits of selecting a site, in terms of strategic partnerships.
Assessment Through Bellagio Principles

1. Assess the decisions already made by referring to the Bellagio Principles (Appendix II). Some of them will directly assess current progress, while others will prepare you for the next stages of the project by telling you what is important for sustainable development.

2. The Bellagio principles are the final and starting point after the pre-contract stage. Along with the themes and subthemes from the United Nations, they are the most crucial part of sustainable development.

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**CONTRACT STAGE**

Develop Mission/Vision

1. There are no changes from the previous cycle. The vision and mission remain the same. Minor adjustments may be made based on emerging facts, but it is important not to alter them severely because they are the foundation of the process.

Set Institutional Values

1. No change in Institutional Values.
Explore Environment, Economy, Society

1. Understandably, there are a great number of feasibility studies that take place in this stage. Keep in mind that economic feasibility is only one aspect of economic performance. The project needs to be feasible for BHC, but sustainability, as the word suggests, requires that the resident deserves this, too. This will be achieved not only with an affordable price, but with an affordable project life: energy savings & water efficiency satisfy this requirement at almost 90 percent. Review the United Nations themes and subthemes; these are the goal (Appendix I).

2. Apply the EarthCraft techniques

- Phase I environmental testing and remediation.
- Housing affordability 5%, or
- Housing affordability 10%

Communicate Results

1. As in the previous cycle, only internal communication is required here. By having each member contribute his own expertise and concerns, a big difference is made. Internal communication is a big requirement of sustainable development.

Seek Strategic Partners

1. Start identifying potential strategic partnerships that will help balance the environmental & social requirements with the economic aspect with grants, loans, special deals, knowledge sharing, and other similar assistance. The key issues for sustainable development are contained in the United Nations sustainability themes and subthemes.
1. Refer to Bellagio Principles (Appendix II) to assess if the decisions made promote sustainable development adequately. There is no qualitative way in the principles, but they make their point in an especially clear way.

**DESIGN STAGE**

**Develop Mission/Vision**

1. No change in the mission and vision.

**Set Institutional Values**

1. No change in institutional values. They ensure that if there is a change in the project designer, he or she finds the information database to continue under the current framework. The views might be different, but the template ensures that the designer stays within the sustainable development constraints.
1. Review the United Nations sustainability themes & subthemes. Use the knowledge and experience of BHC staff to connect the project to the key sustainability issues; common sense and reference to past projects provide the best connections. Site and house planning should address the following key issues, as assumed by the United Nations:

**SOCIAL**

- **Equity**
- Poverty
- Gender Equality

- **Health**
  - Nutritional Status
  - Mortality
  - Sanitation
  - Drinking Water
  - Healthcare Delivery

- **Education**
  - Education Level
  - Literacy

- **Housing**
  - Living Conditions

- **Security**
  - Crime

- **Population**
  - Population Change

**ENVIRONMENTAL**

- **Atmosphere**
  - Climate Change
  - Ozone Layer Depletion
  - Air Quality

- **Land**
  - Agriculture
  - Forests
  - Desertification
  - Urbanization

- **Oceans, Seas and Coasts**
  - Coastal Zones
  - Fisheries

- **Fresh Water**
  - Water Quantity
  - Water Quality

- **Biodiversity**
  - Ecosystem
  - Species

**ECONOMIC**

- **Economic Structure**
- Economic Performance
- Trade
- Financial Status

- **Consumption and Production Patterns**
  - Materials Consumption
  - Energy Use
  - Waste Generation and Management
  - Transportation

**these themes are under review in each of the five cycles – also given in Appendix I**
2. Conduct the site analysis, guided by the three pillars of Environment, Economy, and Society and their themes/subthemes. Remember that sustainable development is the goal: to make the site how it should be and not to guide actions based on what is already there. Nevertheless: potential opportunities or significant imbalances between the three pillars should be identified here and influence the decisions. Opportunities and imbalances are named using strictly the UN themes/sub-themes terminology.

3. Decide which form of sustainable development you will pursue (refer to Appendix III for the theoretical background):

   - **Strong:**
     - Apply 100% of the highly favorable techniques (see next step), and at least 80% of each one of the favorable and adequate techniques.
     
     - Deficiencies in one component are much more important than good performance in the other two. This influences decisions, because optimum balance is pursued rather than random good practices.

   - **Weak:**
     - Apply as many techniques as possible, without seeking balance between the three components. Overall good performance is the goal in the weak form of sustainable development.

4. Consider the following EarthCraft techniques. When selecting:

   - First, choose the ones that address the identified imbalances and preserve the opportunities (it doesn't matter if they are highly favorable, favorable, or adequate).
   
   - Afterwards, choose the highly favorable first, then the favorable, and finally, the adequate.

**Highly Favorable: Address all three elements**

- **Home must be certified Energy Star**
- **Homes must meet or exceed all requirements of the 2000 IEC Code**
- **Required air sealing measures**
- **Air leakage test-blower door**
- **Required insulation**
- **Additional insulation**
- **Windows**
- **Heating & cooling equipment**
- **Ductwork/air handler**
- **Duct blaster test**
- **Energy efficient appliances and lighting**

**Materials**

- Subfloor urea-formaldehyde free
- All cabinets, shelves, and countertops urea-formaldehyde free
- All surfaces of particle board in house sealed with water-based sealant
Reduced VOC paints (less than 250 g/L)
Low VOC paints (less than 150 g/L)
Reduced VOC stains and finishes on wood floors
Reduced VOC sealants and adhesives
Low VOC carpet certified by the Carpet & Rug Institute
Alternative termite treatment
Alternative pest control system
Outdoor structures made from non-CCA pressure treated lumber
Central vacuum system with outside collection receptacle
Filter/air cleaner with minimum MERV 8
Filter, two-inch pleated or better
Ducts protected until construction is completed

*Water-Indoor*
All units sub-metered
Front loading clothes washer
Low-flow showerheads
Low-flush toilets
Faucets with tamper-resistant strainer or flow control in fixture
Hot water demand re-circulation
Manifold distribution system
Shower drain heat recovery device
High efficiency water heater
Tankless gas water heater
Water heater tank insulation
Water heater pipe insulation
Heat recovery water heating
Solar domestic water heating
Heat pump water heater

*Water-Outdoors*
HBA water smart program
Xeriscape™ guidebook given to homeowner
Soil tested and amended
Sod intentionally minimized
No irrigation system installed
Drip irrigation system
Greywater irrigation
Rainwater harvest system
Permeable pavement

*Bonus Points*
Street trees at a minimum interval of 40 feet
Solar electric system
Solar electric system providing 10% of project requirements
Alternative transportation accommodation
Dedicated pedestrian and bicycle access to surrounding areas
Infrastructure connectivity to surrounding sites
Average density greater than 15 units per acre
Home exceeds Energy Star

**Favorable: Address two elements**

**Resource Efficient Design**

- Total floor area of house less than 1800 sq. ft.
- Total floor area of house between 1800 and 2100 sq. ft.
- Total floor area of house between 2100 and 2500 sq. ft.
- Outside dimensions of floor plan adheres to 2-ft dimensions
- Floor joists at 24-inch centers
- Floor joists at 19.2-inch centers
- Non-load bearing wall studs at 24-inch centers
- All wall studs at 24-inch centers
- Window rough openings eliminate jack stud
- Non-structural headers in non-load bearing walls
- Single top plate with stacked framing
- 2-stud corners with drywall clips or alternative framing
- T-walls with drywall clips or alternative framing

**Resource Efficient Building Materials**

- Recycled and natural content materials
- Advanced products
- Durability

**Indoor Air Quality**

- Radon/soil gas vent system
- Energy Star bath fans
- Plastic as footing wrap or capillary break between footing and foundation
- Foundation drain on top of footing
- Foundation drain at outside edge of footing
- Drainage board for below grade walls
- Complete gutter system, all buildings
- Roof gutters that discharge water 5 feet away from foundation
- Gravel bed beneath slab
- Vapor barrier beneath slab (above gravel) and in crawl space
- Plastic in crawl space 100% coverage and all seams sealed to piers, walls
- Condensation prevention for cold water pipes
- Mold resistant materials at tub/shower enclosures
- Water heater overflow and leaks captured by drains

**Bonus Points**

- Exterior lighting designed to reduce light pollution
- Proximity to regional bike path--existing
- Proximity to regional bike-path--planned
- Common areas use alternative energy
- American Lung Association Health House
- Innovation points
Adequate: Address one element

*Indoor Air Quality*
- Detached garage or no garage
- Attached garage-air sealing
- Attached garage-exhaust fan
- Direct vent, sealed combustion fireplace
- Heat pumps located within conditioned space
- Sealed combustion furnace or furnace isolated from conditioned area
- Power vented water heater
- Direct vent water heater or water heater isolated from conditioned space
- Carbon monoxide detector
- Backdraft depressurization test
- Capillary break between foundation and framing
- Energy Star bath fans
- Bath fans ducted with rigid duct
- Automatic tub/shower room fan controls
- Exhaust fan wired with lights in bathrooms
- Kitchen range hood or downdraft vented to exterior
- Ceiling fans
- Whole house fan
- Basement or crawlspace dehumidification system
- Vented garage storage room
- No power roof vents
- Vented storage room outside building envelope
- Outside air intake tied directly into return plenum
- Outside air intake without damper
- Outside air intake with dampers
- Ventilation timer on outside air intakes
- Energy Recovery Ventilator (ERV)

5. Conduct house and site planning using the following guides:

- The opportunities and imbalances should be the first to influence site and house design. It is reminded that opportunities and imbalances are named using the UN themes/sub-themes terminology.

- Next, the rest of the UN themes/subthemes have to influence the design elements of the project.

- Finally, let the EarthCraft techniques that were selected according to the adoption of strong or weak sustainability influence the design.
Communicate Results

After the Sustainable Development components have been reviewed and integrated into project design, BHC will be quite ready to present to the community a strong roadmap of what it aims to develop, how to proceed, and why it decided to go this way with the project, as discussed in the credibility section. This will make communication much easier because better results are achieved with specific reasoning than with a broad set of intentions loosely connected to each other. Of course, the communication stage has to be flexible due to its nature, but flexibility has to apply to an already developed strong roadmap. The project is for the community, after all, but BHC has to present the professional expertise. Finally, this step will increase time and resources efficiency due to the strong reasoning of the decision making process.

Seek Strategic Partners

The design stage of the project should have given by now a clear view about what the project should look like. Use this along with the decision process itself (which will increase credibility and clarity) to:

1. Identify the right partners and cooperate with them more easily.
2. Identify your own business (industrial) cluster of sustainable development organizations and companies, with all the subsequent financial and marketing advantages.

Assessment through Bellagio Principles

1. Refer to Bellagio Principles (Appendix II) to assess progress so far.
2. Is there any major fault in the design decisions identified by the Bellagio principles? If yes, make adjustments before moving to construction.
CONSTRUCTION STAGE

Develop Mission/Vision

1. No changes and further actions regarding this step.
2. However, this step still influences the entire project.

Set Institutional Values

1. No changes and further actions regarding this step.
2. However, this step still influences how you work as an organization.

Explore Environment, Economy, Society

1. Review the United Nations sustainability themes & subthemes (Appendix I). Use the knowledge and experience of BHC staff to discuss how construction practices and situations could affect the key sustainability issues and to make educated decisions.

2. Apply the following EarthCraft techniques. Based on the imbalances and opportunities identified in the previous cycle (design):
   - First, choose the ones that address the identified imbalances and preserve the opportunities (it doesn't matter if they are highly favorable, favorable, or adequate).
Afterwards, apply all of the following techniques:

**Highly Favorable**

- Road/Vehicle protocols
- Downstream water quality testing
- Donation of excess materials or re-use
- Recycle construction waste

**Favorable**

- On-call sedimentation/erosion control personnel
- Phase I environmental testing and remediation
- Materials management plan posted and enforced

**Adequate**

- Plant materials from disturbed site areas relocated
- Job site framing plan and cut list
- Job site framing plan with stud locations, joist locations, and roof structure and cut list
- Roofing completion and penetration plan posted and enforced

---

**Communicate Results**

1. Communicate your mission, vision, decisions, and complete views for the project to contractors and community. Seek feedback and make appropriate readjustments.

2. Don’t present directions and drawings only. Educate constructors & community about BHC and what it wants and has done for this project so far.

---

**Seek Strategic Partners**

1. Non-Existent
Assessment through Bellagio Principles

1. As always, assess your success rate by referring to the Bellagio Principles (Appendix II). Always make educated decisions according to these ten principles/requirements.

MAINTENANCE STAGE

Develop Mission/Vision

1. No changes.

Set Institutional Values

1. No changes
Explore Environment, Economy, Society

1. Skip this step. The final step (assessment through Bellagio principles) satisfies this one.

Communicate Results

1. Communicate your ideology about the project, your mission, and your vision to maintenance staff and residents.

2. Practice preventive maintenance: The technical & maintenance staff should provide information about the frequency of maintenance without waiting for a part to fail.

3. Apply the following EarthCraft techniques:

   - Home buyer education
   - Guaranteed energy bills
   - Review energy operations
   - Review irrigation system operations
   - Built-in recycling center
   - Local recycling contact
   - Household hazardous waste resources
   - Environmental checklist

Seek Strategic Partners

1. Non existent.
Assessment through Bellagio Principles

1. Does the maintenance scheme follow the principles (Appendix II)? Does it put pressure on any of the sustainability themes and subthemes (Appendix I)?

2. If yes, continuous evaluation is required (from the principles) in time intervals that BHC staff find realistic.

3. If not, re-initiate the model’s final (maintenance) cycle to identify which steps imply changes that produce more sustainable results.

4. Adopt the ten principles as your roadmap for the administration of the community. Extensive inter-organizational cooperation will develop some simple indicators, as required by the ideology of the principles. These must be either qualitative or quantitative.
   - If quantitative, an independent entity – other than BHC – must develop the standards.
   - If qualitative, BHC must extract from the community what is a “good quality” for them.
SECTION 3

APPLICATION TO WINCHESTER FOREST

SITE LOCATION

As an example, the proposed sustainable development decision model will be applied to the Winchester Forest development. Winchester Forest is a single-family residential development and a phase of a larger-scale multi/single-family and light-commercial development at the northeast of Chesterfield County, Virginia. The site is located on the west side of Jefferson Davis Highway, or Route One, at approximately the 8000 block of this road. This is about one mile south of Chippenham Parkway, and southeast of the site lies the Defense Supply Center of Richmond (DSCR). Image 1 shows the general location of the site in the Greater Richmond area, and Map 1 shows its more exact location. More detailed representations of Winchester Forest are given in Appendix V. Also, Insert 1 represents the detailed topography and some survey data of the site.

LIMITATIONS OF THIS EXAMPLE

There are some limitations in this effort to apply the sustainable development model in the development phase of Winchester Greens that should be noted.

First, the site has been purchased, the decision to pursue the projects has been made, and the project is already in the design stage. This means that this study will initiate the decision process at the design stage of the model, which is the first step of the third cycle in the spiral.
Second, the student conducting this study does not have actual control of decisions, access to the required meetings and negotiations among BHC and the other involved governmental and private entities, or the resources to conduct a large scale site analysis. This means that some assumptions must be made throughout the process.

Nevertheless, the constraints and assumptions mentioned are not considered as a serious limitation because the purpose is to give an example of how the model proposed in section two can be applied to a BHC development project.

THE SUGGESTED DECISIONS

DESIGN STAGE

MISSION

BHC’s existing mission:

“Better Housing Coalition builds quality affordable housing while creating sustainable communities throughout the greater Richmond area.”

BHC’s existing vision:

“Better Housing Coalition aspires to be a nationally recognized community development leader, building sustainable communities that promote a balance of economic prosperity, human dignity, and environmental responsibility.

Better Housing Coalition seeks to make a positive difference in the lives of Virginia residents through community development initiatives that provide citizens the opportunity to enjoy the highest quality of life.”

Putting the previous text into a new context, the following mission is suggested:

- Better Housing Coalition is a non-profit community developer.
- We pursue affordable sustainable development throughout the Greater Richmond area, promoting a balance of economic prosperity, human dignity, and environmental responsibility in our communities.
- We are committed to this way of developing because we seek to:
  i) make a positive difference in the lives of Virginia residents,
  ii) provide them the opportunity to enjoy the highest quality of life, and
  iii) be a nationally recognized community development leader

VISION

Based on the principles of sustainable development and the organization’s mission, the following vision, specific for Winchester Forest, is proposed:

Winchester Forest is an affordable sustainable community. It promotes an optimum balance between society, economy, and environment, providing a high quality of life to Virginia’s residents while respecting the key issues that our world is facing.
INSTITUTIONAL VALUES

- We expect excellence in all of our endeavors. By establishing strong corporate governance practices, we foster a culture of integrity and accountability through compliance with all laws.

- We recognize that every function in the organization is critical to providing excellent customer service. Respect is at the core of successful human relationships and endeavors.

- We have a universal policy to promote sustainability of both the projects and the organization.

- We actively pursue the appropriate international standards that deal with the issues of sustainability.

- We discuss our past and current projects with similar organizations throughout the World.

- We have established a database containing: (i) all information and knowledge about BHC projects, and (ii) all techniques or theories referred to in order to make this project happen.

- We make our projects’ information available to everyone.

- We have access to high quality communication and make it available to all members.

- We allocate financial and time resources to sciences and technologies that can be used to promote sustainable development.

- We are prepared to respond to circumstances that threat the physical existence of BHC. We have backed up databases and organizational framework so that new members can carry out our mission without serious problems.

- All of our staff is informed about and participates in decisions about a project.

- We follow simple assessment criteria and constantly use them to achieve higher standards of sustainability. We support or initiate local entities for this.

ENVIRONMENT, SOCIETY, ECONOMY

Site analysis

The socioeconomic information presented here is for the Census tract that contains Winchester Forest (Census Tract 1004.6, Chesterfield County, Virginia in Zip Code 23237). Environmental and other physical information are site specific. The site analysis was guided by the United Nations themes and subthemes about sustainable development.

Social Characteristics

- The tract that contains Winchester Forest has lost 40% of its population since 1989. The 1989 total population was 1586 – 38% males and 62% females. The 1999 total population of the tract was 966 – 44% males and 56% females. All of the 2000 population is urban.

- Twenty-six percent of total households (83/316) in the tract are below the poverty threshold, earning less than $15,071 annually.\(^2\)

- Regarding the economic aspect of gender equality, 229 female residents are below poverty level, while the number for male residents is 97, for a total of 326 residents that

\(^2\) The result is based on the average household size of 2.78 persons and the poverty threshold of $15,071 for 3-person households. Source: US Census Bureau.
are below poverty level in the tract. Referring to total population, 42% of total female and 23% of total male residents are below poverty level. This suggests a considerable inequality between genders, because economic status is a main indicator to study gender equality. As for unemployment, no inequality is observed; the unemployment rates of the workforce over sixteen years old are 3% for women and 4% for men.

-About 74% of males have either completed or attended high school, while the rest have a college education, mostly undergraduate level. About 70% of the female population in the tract has attended high school. The rest have mostly undergraduate experience. A few of the total population have a master's or professional degree, and none of them holds a doctorate. These facts suggest that the population is literate, but with basic educational supplies.

-Regarding housing and living conditions around Winchester Forest, the median age of the structures is 35 years. The total number of housing units is 381, with a median number of rooms of 4.4. Half of the structures contain one housing unit (most of them are detached,) 28% contain five to nine units, and most of the rest contain two units. The vast majority of the units have two or three bedrooms, all of them have complete plumbing facilities, and eight (out of 381) units don’t have completed kitchen facilities. The median value of owned or vacant houses is $67,300, while the median rent asked for vacant rental units is $575. All owner-occupied units have telephone service, while 25 out of 231 renter-occupied housing units have no telephone service. An alarming fact is that 17 of the 99 renters that live below poverty level do not have telephone service available.

-A church is within walking distance, southeast from the site across from Alcott road.

-Only three percent of the population that is over sixteen years old is unemployed. As mentioned earlier, 4% of males are unemployed, while the percentage for females is 3%.

-The major industry that employs the tract’s male population is construction. After this, transportation, warehousing, and retail trade employ a few men. Women are employed mainly by the following industries: health care and social assistance, professional, scientific, and technical services, accommodation and food services, public administration, transportation and warehousing. This suggests that the tract’s population is employed in low wage jobs, which correlates with their educational attainment.

-Eighty-three percent of the male population works thirty-five or more hours per week. The percentage for women is seventy-two percent. Ninety-six percent do not work at home.

-The transportation and commuting profile of the tract that contains Winchester Forest is as follows: 85% of the employed population over sixteen years old owns a car, truck or van. Sixty-five percent of those vehicle owners drove alone to work, and overall 99% of the population uses private vehicles to go to work. The great majority of workers leave their homes for work between six and eight in
Eighty percent of workers work outside their place of residence; furthermore nearly half of them work in a county other than Chesterfield. Sixty-three percent of workers travel between 15 and 34 minutes to work. As with many cases in the western world, an overwhelming dependency on automobile – even for walking, biking, or transit distances – is observed.

The house heating patterns in the tract are as follows: 44% of the occupied housing units are heated by natural gas – one of the cleanest energy sources, 37% is heated by electricity and 15% percent by fuel oil. None of the units uses solar energy.

The larger development which contains Winchester Forest includes some commercial space along Jefferson Davis Highway. A retail market analysis was prepared for BHC by Jennifer B. Wickham in 2002. The study concludes that the retail uses with the most potential are a gas station, a barber shop, a fast food or carryout establishment, a nail salon, and a shoe repair shop.

Environmental Characteristics

-Atmosphere: Air quality in the area is good. Of course the nearby Jefferson Davis Highway and Chippenham Parkway are likely to put a little more stress in the atmosphere in terms of engine-generated air pollutants and particles and solid pollutants by tires and pavement. No local industrial sources of air pollutants are listed in the EPA regulated sites list.  

-The Winchester Forest site connects with the sustainability issue of oceans, seas, and coasts only through a small creek running near its southern end. An environmentally sensitive area exists along the creek that could be characterized as its flood zone and a small ‘wetland’. Chesapeake Bay Preservation Act applies to this stream. There is no special or moderate flood hazard area in the site.

-A shallow aquifer exists below the broader area. There are several drills on the site that monitor ground water quality and are currently working to alleviate pollution from the adjacent military installation. The presence of a small stream has been mentioned in the previous paragraph. As for water quantity, the site’s ground seems to be quite saturated in water. A fresh water connection is available in the area from Chesterfield County.

-The site is quite densely forested, providing a habitat for local flora and fauna. The broader ecosystem, however, is greatly segregated, or non-existent in most cases, due to haphazard development. A survey has identified 54 individual trees, which are the healthiest of the population and the more valuable for the local ecosystem (Insert 1).

-The area around the site is highly urbanized, with a high percentage of impervious cover which puts pressure on the local ecosystem. No implications about desertification are known, which makes sense because of the abundance of water in the area.

But remember that this is true only for the environmental analysis of the site. Every decision about techniques and materials affects the global status of oceans, seas, and coasts. (Theoretically, the creek is connected to the Chesapeake Bay, and the Bay in turn is connected to Atlantic Ocean, for example.)

In summary, the requirements of the act are a “no-intervention” area of 100 feet on both sides of the creek that needs to remain in an optimum natural condition.

Based on the U.S. Federal Emergency Management Agency (FEMA) Digital Q3 Flood Data.

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3 Environmental Protection Agency (EPA) ‘Window to my Environment’

4 Based on the U.S. Federal Emergency Management Agency (FEMA) Digital Q3 Flood Data.
Opportunities & Imbalances

The following are the most important issues to be kept in mind while proceeding with the design:

The median value of the houses is quite low, with the socioeconomic status of the community being basic to low. This suggests that since BHC presents the opportunity to the local community housing of greater quality at the affordable range of prices, it holds a competitive and comparative advantage in the market: competitive because of the quality and sustainable sensitivity, and comparative because of the affordable price. This advantage in the market gives some space to make the price a little bit higher to include more practices that promote sustainable development and still meet the supply-demand scheme.

The Winchester Forest site is quite densely forested, with high humidity, and an assumed healthy micro-ecosystem in contrast to the surrounding area which is urbanized and randomly developed. The natural assets of the site and its contrast to the surrounding area suggest the opportunity of giving the example of a minimum footprint development that uses fewer natural resources – mostly referring to water and energy. If the naturalness of the area remains, it is predicted that the new community will have an additional advantage in the market. It is suggested that the “waste equals food” principle is followed internally (reuse) and externally (sell). Donation of useful waste looks like a sensitive action, but it does not follow market principles. Reuse of resources will make a greater change if it is integrated into the market and not just donated out of any existing financial framework. The area around the stream should be left as is. Capturing storm water for use in human activities and use of solar energy are suggested. A community garden will greatly support the whole scheme of sustainability.

Most of the local workforce is specialized in construction. They should be educated about sustainable development and be used in the construction of a project in their own community.

The context of the site is its greatest imbalance. The adjacent military installation has put stress on the aquifer’s health. The surrounding scattered development and Jefferson Davis Highway are an environmental imbalance with economic implications, as well. The socioeconomic profile of the community around Winchester Forest – as mentioned previously – is not judged as an imbalance, but as an opportunity to help the local society. A major problem is that the location of the broader Winchester Greens development is quite unsustainable: far from dense development, away from serious alternative transportation, and taking up undeveloped natural landscape. This creates an additional responsibility to minimize the footprint of Winchester Forest.

Finally it is suggested that the unmet retail demand showed by J. Wickham’s analysis should be applied in a different context. The gas station should be excluded because it does not promote the concept of sustainability and it puts the ecosystem at risk. Personal care or food services are most appropriate to be mixed in corners and central places within the residential area and not out of it. There is no better addition than a shoe repair shop or a restaurant that provides services to the community and is located in the community, even offering a few jobs at a place where one could also live. This is true sustainability and

7 The term ‘minimum footprint’ is not used in a very specialized or technical way here. It means that, overall, the development has to affect few of the existing natural things or not lower the current health of the site’s system.
communicating the whole rationale of this paper should yield community support. A community garden, greenhouses, and an agricultural educational or training center could be placed in the commercial space along Jefferson Davis Highway, providing a green buffer from the road and further contributing to sustainable development. The educational center could work with market principles and still benefit the community, meaning helping people, but taking care of profit as well.

Based on the preceding discussion on opportunities and imbalances, the following connection with sustainability themes can be made:

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**Imbalances:**
- Urbanization
- Ecosystem
- Transportation
- Energy Use

**Opportunities:**
- Forests
- Water Quantity
- Living Conditions
- Financial Status
- Economic Performance

---

**Form of Sustainable Development**

Because it is an example, the study proposes the stricter form of sustainable development ("strong sustainable development"). Imbalances are more important than good performance elsewhere, and the 100%-80%-80% application of EarthCraft Techniques is followed.

1. The techniques that are of great importance (because they can help with the opportunities and imbalances):
   - Average density greater than 15 units per acre
   - Total floor area of house less than 1800 sq.ft.
   - Alternative termite treatment
   - Alternative pest control system
   - Permeable pavement
   - Water heater overflow and leaks captured by drains
   - Exterior lighting designed to reduce light pollution
   - Alternative transportation accommodation
   - Dedicated pedestrian and bicycle access to surrounding areas
   - Home must be certified Energy Star
   - Homes must meet or exceed all requirements of the 2000 IEC Code
   - Required air sealing measures
   - Air leakage test-blower door
   - Additional insulation
   - Windows
   - Heating & cooling equipment
   - Energy efficient appliances and lighting
   - Solar domestic water heating
   - Heat recovery water heating
   - Water heater pipe insulation
   - Water heater tank insulation
   - Shower drain heat recovery device
   - Hot water demand re-circulation
   - Solar electric system providing 10% of project requirements
   - Home exceeds Energy Star
   - Energy Star bath fans
   - Energy Recovery Ventilator (ERV)
   - Ventilation timer on outside air intakes
   - No power roof vents
   - Ceiling fans
   - Whole house fan
   - All units sub-metered
   - Front loading clothes washer
   - Low-flow showerheads
   - Low-flush toilets
   - Faucets with tamper-resistant strainer or flow control in fixture
- HBA water smart program
- Xeriscape™ guidebook given to homeowner
- Soil tested and amended
- Sod intentionally minimized
- No irrigation system installed
- Drip irrigation system
- Greywater irrigation
- Rainwater harvest system

Notes:

- The urbanization issue could ideally be addressed in the pre-contract stage by selecting a city site to develop.

- Living conditions in a western society is a very subjective issue since all of the basic needs are covered (in contrast to the developing world). The designer has to seek feedback from the community (next step: communication of results) and make decisions.

- For some issues it is more appropriate to address them in the construction cycle of the model (next cycle).

2. The selection of the rest of the techniques is left to the discretion of the designer and the organization. The suggestion that can be made here is to choose according to favorability.

Site Planning

Based on the imbalances and opportunities of the site, the rest of the key issues to be addressed according to the United Nations themes and sub-themes for sustainability, and the EarthCraft techniques available, a site plan has been drafted.

The second element of this step, house planning, is not addressed here because the study is conducted by a planning student who contributes according to his own knowledge, as the model requires. In reality, the communication step requires all BHC staff to participate in the process, so the project designer or architect should be able to address the house design issue according to his own understanding, but guided by this model which makes the sustainability knowledge available to the organization.

According to my understanding, I have drafted a site plan that addresses the imbalances, opportunities, and the rest of the sustainability themes/subthemes in the following ways:

<table>
<thead>
<tr>
<th>Sustainable Development Issue</th>
<th>Site Design Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunities &amp; Imbalances are shown in <strong>bold</strong>; other subthemes are shown in regular font weight.</td>
<td></td>
</tr>
<tr>
<td><strong>Urbanization</strong></td>
<td>Compact form:</td>
</tr>
<tr>
<td><strong>Ecosystem</strong></td>
<td>- preserves ½ of the available space.</td>
</tr>
<tr>
<td><strong>Forests</strong></td>
<td>- New development is placed next to existing development.</td>
</tr>
<tr>
<td><strong>Transportation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Materials Consumption</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Air Quality</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Forests</strong></td>
<td>Strong trees are preserved:</td>
</tr>
<tr>
<td><strong>Urbanization</strong></td>
<td>- A 100 ft buffer around the healthiest and more valuable for the ecosystem trees has been developed.</td>
</tr>
<tr>
<td><strong>Water Quantity</strong></td>
<td>- New development has been placed around the natural area.</td>
</tr>
<tr>
<td><strong>Water Quality</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Ecosystem</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Species</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Materials Consumption</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Waste Generation and Management</strong></td>
<td></td>
</tr>
<tr>
<td>-Forests</td>
<td>Local species are disturbed as little as possible:</td>
</tr>
<tr>
<td>-Urbanization</td>
<td>-The natural, undeveloped area is a continuous zone, allowing for species movement, and giving them the maximum possible habitat. This contributes to the compact form of development, as well.</td>
</tr>
<tr>
<td>-Ecosystem</td>
<td>-Private exterior lighting and streetlights are of low luminosity, in order not to disturb night species.</td>
</tr>
<tr>
<td>-Species</td>
<td></td>
</tr>
<tr>
<td>-Energy Use</td>
<td></td>
</tr>
<tr>
<td>-Living Conditions</td>
<td>Utilization of greywater &amp; stormwater:</td>
</tr>
<tr>
<td>-Species</td>
<td>-Greywater and stormwater are collected into a relatively low topographic point, where the neighborhood’s park is located. The water is treated and progressively cleaned using appropriate plants.</td>
</tr>
<tr>
<td>-Water Quantity</td>
<td>-At the final stage the park’s water is safe to be used in gardening, irrigation, and other secondary uses.</td>
</tr>
<tr>
<td>-Water Quality</td>
<td></td>
</tr>
<tr>
<td>-Economic Performance</td>
<td></td>
</tr>
<tr>
<td>-Waste Generation and Management</td>
<td></td>
</tr>
<tr>
<td>-Poverty</td>
<td>Community gardens in several points of the neighborhood:</td>
</tr>
<tr>
<td>-Agriculture</td>
<td>-Represent a productive and potentially profitable use of land between houses.</td>
</tr>
<tr>
<td>-Species</td>
<td>-Can initiate or mobilize potentially existing social capital.</td>
</tr>
<tr>
<td>-Economic Performance</td>
<td></td>
</tr>
<tr>
<td>-Trade</td>
<td></td>
</tr>
<tr>
<td>-Financial Status</td>
<td></td>
</tr>
<tr>
<td>-Urbanization</td>
<td>No private lots:</td>
</tr>
<tr>
<td>-Ecosystem</td>
<td>-Allows for more efficient use of space, and for more options of house placing.</td>
</tr>
<tr>
<td>-Species</td>
<td>-Provides the common space between houses for the community gardens.</td>
</tr>
<tr>
<td>-Materials Consumption</td>
<td>-Like the community gardens, the presence of communal space between houses (instead of lots) initiates, mobilizes, or strengthens social capital and tightens inter-community relations, creating a real neighborhood and not a collection of individual houses.</td>
</tr>
<tr>
<td>-Poverty</td>
<td>A distinct neighborhood center:</td>
</tr>
<tr>
<td>-Living Conditions</td>
<td>-The water treatment park and the retail plaza create a distinct place that serves as a physical and psychological neighborhood center. This enhances the neighborhood’s livability and social fabric.</td>
</tr>
<tr>
<td>-Urbanization</td>
<td></td>
</tr>
<tr>
<td>-Poverty</td>
<td>Retail pedestrian plaza:</td>
</tr>
<tr>
<td>-Living Conditions</td>
<td>-Provides services, jobs, and entertainment to the community.</td>
</tr>
<tr>
<td>-Urbanization</td>
<td>-Cooperates with the community gardens, providing the space for selling the products.</td>
</tr>
<tr>
<td>-Economic Performance</td>
<td></td>
</tr>
<tr>
<td>-Financial Status</td>
<td></td>
</tr>
<tr>
<td><strong>Living Conditions</strong></td>
<td>Street furniture:</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>-Benches are located on sidewalks throughout the neighborhood, in order to encourage residents to use the entire site and further tighten social connections in ways other than a community center.</td>
<td></td>
</tr>
<tr>
<td>-Street lights enhance security in the neighborhood.</td>
<td></td>
</tr>
<tr>
<td>-Benches, streetlights, and street trees are placed not in consistent intervals, creating a dynamic serial vision and a more interesting place.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Economic Performance</strong></th>
<th>A different kind of site design:</th>
</tr>
</thead>
<tbody>
<tr>
<td>-The site differs from traditional suburban development. This uniqueness is a ready-to-use marketing advantage and compensates for the locational disadvantage of the site.</td>
<td></td>
</tr>
</tbody>
</table>

**STRATEGIC PARTNERS**

- Identify businesses that can help you with the most important EarthCraft techniques. The help can be in the form of information sharing or business deals.

- Chesterfield is especially positive towards sustainable development and environmentally correct development. Can its departments help in a similar way as the businesses?

- Based on what has to be done and by what techniques, certain contractors, companies, and other service providers must be contacted. This is BHC’s special industrial cluster for this kind of development. Great business and efficiency advantages are hidden in mutual cooperation within your cluster (long and short term).

**ASSESSMENT**

- The decisions that have been made so far have been assessed through Bellagio principles. Adjustments have been made, and BHC proceeds to the next cycle (construction).

**CONSTRUCTION STAGE**

**MISSION**

No changes in mission.

**VISION**

No changes in Vision

**COMMUNICATION OF RESULTS**

- The drafts of the housing and site plans should now be presented in conjunction with the mission, vision, ideology, and site analysis on sustainable development.

- An agreement on what the community and potential clients regard as good living conditions should become clear from this step.
ENVIRONMENT, SOCIETY, ECONOMY

EarthCraft Techniques
1. The techniques that are of great importance
   - Plant materials from disturbed site areas relocated
   - Downstream water quality testing
   - On-call sedimentation/erosion control personnel
   - Phase I environmental testing and remediation

2. Since the strong form of sustainable development is being pursued, all three components must be in good standing. Therefore, applying all highly favorable EarthCraft techniques (beyond those already selected) is recommended:
   - Road/Vehicle protocols
   - Donation of excess materials or re-use
   - Recycle construction waste

From the rest of the techniques, as many as possible should be applied.

COMMUNICATION OF RESULTS

- The contractors and other service providers related to construction have been informed about the whole ideology of sustainable development and about why the development will have the selected parameters.
- Feedback from the contractors and service providers has been considered and adjustments have been made, if needed.

STRATEGIC PARTNERS
No action is needed.

ASSESSMENT

- Construction decisions have been compared with the outcomes sought by the Bellagio principles, and adjustments have been made as needed.

MAINTENANCE STAGE

MISSION
No changes in mission.

VISION
No changes in Vision

ENVIRONMENT, SOCIETY, ECONOMY
No action is needed.

COMMUNICATION OF RESULTS

- Maintenance staff has been informed of and educated about why the development follows sustainability and what the various components of the community mean for the concept.
- Preventive maintenance is applied by the appropriate staff.
- The Home Buyer Education techniques are applied by BHC for residents and administrative staff.

STRATEGIC PARTNERS
No action is needed.
ASSESSMENT

The operation/administration of site and structures is guided\(^8\) by the ten Bellagio principles (Appendix II).

\(^8\) Overseen, in a sense
## APPENDIX I

### ASSIGNING ATTRIBUTES TO SUSTAINABLE DEVELOPMENT: THE UNITED NATIONS INDICATORS

<table>
<thead>
<tr>
<th>SOCIAL</th>
<th>ENVIRONMENTAL</th>
<th>ECONOMIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>Atmosphere</td>
<td>Economic Structure</td>
</tr>
<tr>
<td>Poverty</td>
<td>Climate Change</td>
<td>Economic Performance</td>
</tr>
<tr>
<td>Gender Equality</td>
<td>Ozone Layer Depletion</td>
<td>Trade</td>
</tr>
<tr>
<td>Health</td>
<td>Air Quality</td>
<td>Financial Status</td>
</tr>
<tr>
<td>Nutritional Status</td>
<td>Land</td>
<td>Consumption and Production Patterns</td>
</tr>
<tr>
<td>Mortality</td>
<td>Agriculture</td>
<td>Materials Consumption</td>
</tr>
<tr>
<td>Sanitation</td>
<td>Forests</td>
<td>Energy Use</td>
</tr>
<tr>
<td>Drinking Water</td>
<td>Desertification</td>
<td>Waste Generation and Management</td>
</tr>
<tr>
<td>Healthcare Delivery</td>
<td>Urbanization</td>
<td>Transportation</td>
</tr>
</tbody>
</table>

| Education | Oceans, Seas and Coasts |
| Education Level | Coastal Zones |
| Literacy | Fisheries |
| Housing | Fresh Water |
| Living Conditions | Water Quantity |
| Security | Water Quality |
| Crime | Biodiversity |
| Population | Ecosystem |
| Population Change | Species |

Important note:

There is one more theme: Institutional. It is omitted here, and included in the “Set Institutional Values” step, of pre-contract cycle.

Above are the key issues that our world is facing, according to the United Nations. They are categorized in themes (*in italics*) and subthemes. The actual performance indicators are omitted here because they refer to national governments and their economic, social, and development policies. However, the themes and subthemes are crucial for BHC, because they identify what are the issues to be addressed.

A potential problem nowadays could be the seamless information about practices, models, and indicators coming from numerous entities throughout the world. This study adopts the themes and sub-themes of the United Nations indicators for sustainable development for three reasons:

- First, they have been produced by a highly credible organization, with tremendous knowledge and research on sustainability.
Second, the themes and indicators were developed by the UN to serve as an introduction point; they are flexible tools allowing further customization.

Third, the indicators themselves almost exclusively refer to national governments, and it is extremely difficult to use them ‘as is’ for small-scale development projects. The themes and sub-themes, however, (or, in other words, the sustainability categories,) can provide strong guidance to such projects. This is because they represent the key issues to be addressed in order for a society to be sustainable.

The UN sustainable development indicators are classified into four themes: social, economic, environmental, and institutional. All of them offer a comprehensive approach to a development project, whether it is the national development policy of a country or a local community development project by a not-for-profit developer. The four categories are the four key themes for sustainable development and, as mentioned previously, they offer decision-making guidance for development.

It should be noted that some sub-themes are quite far from the responsibilities of a private or non-for-profit developer. They help, however, to grasp the big picture of how sustainable development functions. Moreover, even though the developer is not required to “deliver” or “ensure” a theme, the developer can always consider it during the planning stage. For instance, healthcare delivery, which is a sustainability sub-theme, is certainly out of the responsibilities of private development, but assisting in healthcare delivery can be done by situating development sites within the service range of health care providers. The following are the themes and sub-themes that the United Nations have used to categorize actions towards sustainability.

For BHC, the idea of sustainable development implies, among others, that every decision affects some or all of these issues directly or indirectly, locally or globally, in short or long term. This is why review of these issues and connection to the project is required in each of the five project cycles, in the “Explore Environment, Economy, Society” step.
APPENDIX II

ASSESSING SUSTAINABLE DEVELOPMENT: THE BELLAGIO PRINCIPLES

The Bellagio Principles are another very important sustainability framework developed by the world community in 1997. They serve as a roadmap for the complete assessment of sustainable development undertaken by an entity. The principles are intended for use in starting and improving assessment activities of community groups, NGOs, corporations, national governments, and international institutions (IISD, 1997). The Bellagio Principles can be grouped into four categories/aspects of assessing progress towards sustainable development; vision (1), content (2-5), key issues (6-8), and continuous improvement (9-10). They are:

1. GUIDING VISION AND GOALS

Assessment of progress toward sustainable development should:
• be guided by a clear vision of sustainable development and goals that define that vision.

2. HOLISTIC PERSPECTIVE

Assessment of progress toward sustainable development should:
• include review of the whole system as well as its parts,
• consider the well-being of social, ecological, and economic sub-systems, their state as well as the direction and rate of change of that state, of their component parts, and the interaction between parts, and
• consider both positive and negative consequences of human activity in a way that reflects the costs and benefits for human and ecological systems, in monetary and non-monetary terms.

3. ESSENTIAL ELEMENTS

Assessment of progress toward sustainable development should:
• consider equity and disparity within the current population and between present and future generations, dealing with such concerns as resource use, over-consumption, poverty, human rights, and access to services, as appropriate,
• consider the ecological conditions on which life depends, and
• consider economic development and other, non-market activities that contribute to human/social well-being.

4. ADEQUATE SCOPE

Assessment of progress toward sustainable development should:
• adopt a time horizon long enough to capture both human and ecosystem time scales, thus responding to needs of future generations (as well as those current) through short term decision-making,
• define the space of study large enough to include not only local but also long distance impacts on people and ecosystems, and
• build on historic and current conditions to anticipate future conditions - where we want to go, where we could go.

5. PRACTICAL FOCUS

Assessment of progress toward sustainable development should be based on:
• an explicit set of categories or an organizing framework that links vision and goals to indicators and assessment criteria,
• a limited number of key issues for analysis,
• a limited number of indicators or indicator combinations to provide a clearer signal of progress,
• standardizing measurement wherever possible to permit comparison, and
• comparing indicator values to targets, reference values, ranges, thresholds, or direction of trends, as appropriate.

6. OPENNESS

Assessment of progress toward sustainable development should:
• make the methods and data that are used accessible to all and
• make explicit all judgments, assumptions, and uncertainties in data and interpretations.

7. EFFECTIVE COMMUNICATION

Assessment of progress toward sustainable development should:
• be designed to address the needs of the audience and set of users,
• draw from indicators and other tools that are stimulating and serve to engage decision-makers, and
• aim, from the outset, for simplicity in structure and use of clear and plain language.

8. BROAD PARTICIPATION

Assessment of progress toward sustainable development should:
• obtain broad representation of key grass-roots, professional, technical and social groups, including youth, women, and indigenous people - to ensure recognition of diverse and changing values, and
• ensure the participation of decision-makers to secure a firm link to adopted policies and resulting action.
9. ONGOING ASSESSMENT

Assessment of progress toward sustainable development should:
• develop a capacity for repeated measurement to determine trends,
• be iterative, adaptive, and responsive to change and uncertainty because systems are complex and change frequently,
• adjust goals, frameworks, and indicators as new insights are gained, and
• promote development of collective learning and feedback to decision-making.

10. INSTITUTIONAL CAPACITY

Continuity of assessing progress toward sustainable development should be assured by:
• clearly assigning responsibility and providing ongoing support in the decision-making process,
• providing institutional capacity for data collection, maintenance, and documentation, and
• supporting development of local assessment capacity.
APPENDIX III

STRONG AND WEAK SUSTAINABLE DEVELOPMENT

A model that was developed in the World Bank by Serageldin and Steer – the Capital Stock Model – accepts the stock equilibrium between an integrated and universal “Earth Capital” \([K_{sd}]\) and the three components of sustainability: Environmental, Environmental, and Social Capital \([K_{env}, K_{econ}, K_{soc}]\), respectively:

\[ K_{sd} = K_{env} + K_{econ} + K_{soc} \]

This model implies that the earth’s capital stock, meaning its resources, cannot be consumed without compensation. Most importantly, it accepts that Sustainability is achieved when a system – or, ideally, the global system – is maintained by the interest rather than the capital stock. So when approaching sustainable development one can move within and adjust the three dimensions of sustainability: environmental, economic, and social capital stock. For BHC, the following implication of the model is very important:

The Capital Stock Model also identifies certain types of sustainable development: strong and weak are two of them. Certain critical limits have to be assigned to each of the three capital stocks for the simple reason that none of them should become zero – or diminish, in other words – in the long term, because they are the fundamental components of both a system under the sustainable development viewpoint. These limits need to be specific for every situation and critical deficiencies in one stock are more important for consideration than positive values in another one. Accepting this standard, one follows strong sustainable development. Weak sustainable development would be the approach where only the aggregate earth capital stock should not turn zero and that the three capitals can be modified without limits to achieve the goal.\(^2\)

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1 Serageldin & Steer, 1994
2 Swiss Agency for Development and Cooperation & Federal Office for Spatial Development, 2004
APPENDIX IV

ADDITIONAL DISCUSSION ON SUSTAINABLE DEVELOPMENT

Introduction

Every human activity has been continuously researched, evaluated, and discussed throughout history into all fields where intellectual activity and interaction occurs. Natural, life, medical, liberal, and engineering sciences, along with every business, commercial, formal, or informal interpersonal communication deal with the ways that human societies work, the values upon which they are based, and seek better methods to become more efficient. This universal concern is particularly true when a problem arises that has multidimensional consequences into the Human Society. In general and with the reaction time varying, the first major response to a serious problem is the generation of a discourse. This discourse could be present within a limited group or scientific field at first, but if the malfunction is serious enough, it spreads into all formal and informal intellectual interactions of people. Of course, depending on the circumstances, political and cultural details, and place and time in history the discourse can either evolve into a mass social movement, a scientific viewpoint or solution, a business world solution, or a political action. Moreover, the discourse – or its evolved more practical form – could be more or less influential, fade away in a short time, or grow strong and global, and may or may not generate solutions. In other words, the formative power of a discourse varies (Lundqvist, 2003).

The notion of Sustainable Development has been through many of the stages just mentioned. One could say that it has not been a discourse itself, but it emerged as a response from one – most logically assumed the environmental pollution discourse. Either way, the result that is crucial for this study is that the concept of Sustainable Development was globally and most credibly introduced in 1987 by the World Commission on Environment and Development in the report entitled “Our Common Future”. The commission however is more commonly referred to as the Brundtland Commission and the report as the Brundtland report, after the commission’s chairwoman G. H. Brundtland, prime minister of Norway at that time. The report came up with views and guidelines for sustainable development that shaped what we regard as sustainable development nowadays. Most importantly, it introduced – or declared formally – a different way to pursue development. It has to be noted that most of the elements that compose sustainable development were, or are, not new at all. It created a new ethical and ideological basis on how we perceive our presence in the planet and how the global society should develop. Therefore, from this point of the study it is clarified that Sustainable Development is not single or simple development model. It is a concept – or ethical principle, or ideology – that can be achieved through a number of models, methods, or approaches. These can be applied together or individually to an organized human activity, namely a project, a government, a city, or an organization, in order to achieve sustainability thus following the concept of sustainable development or practicing sustainable development. The following paragraph presents the original definition of sustainable development, along with secondary descriptions and clarifications that have emerged since it was first introduced to global community.

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3 Federal Office for Spatial Development, Switzerland
The Original Definition

According to the Brundtland Commission, “Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” This definition itself does not imply the three components of a later popular definition. There has been a significant ongoing debate over the years about what sustainability is. The result was that the term was often manipulated for political reasons (Silberstein, 2000). In addition, this uncertainty has been generated a labyrinth of practices and models that are tagged as sustainable – again for political or marketing reasons – but do not move human activities towards sustainability satisfactorily. On the other hand, the Brundtland definition is clear enough to provide an explicit basis for further work that is flexible and creative but is still attached to this solid basis that states that future generations have to meet their needs. In other words, the explicit nature of the original definition comes from the argument that our children are either able or not able to meet their needs due to how we are developing. So, even though the definition has generated misconceptions, the primary/direct or secondary/indirect actions of an entity benefit, as opposed to not affecting, or even harming, future generations. Based upon the flexible and yet explicit ruling of the Brundtland definition, supportive definitions have been used to better frame the notion of sustainability so it can be achieved in a logically structured scientific way.

Models

The three-component (triangle) model

The most well-known and used model of sustainable development breaks the concept down into three distinct components; natural environment, economy, and society. In terms of what to achieve, the three components can be presented as environmental protection, economic development, and social equity. These elements should be sought simultaneously and seen as interdependent. It has been traditionally accepted among the academic community that the optimum balance among the three elements of sustainable development indicates a state of sustainability. Visually, the model consists of three overlapping circles with the center area being the sustainability state. An alternative visualization has been the triangle, with each angle representing one of the three elements.

Figure 2: The most widely accepted model for Sustainable Development (SD).

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4 i.e. a development project (direct action) or the organizational behavior (indirect action); of course every classification is relevant (ref. A. Einstein), regarding the direct and indirect terms
This model most likely owes its wide recognition to the simple and direct visual impact it has to people. It conceptualizes and describes what sustainability is through a very simple icon; probably a kind of modern archetype\(^5\). This model and its visualization have been quite effective in introducing, communicating, and arguing for the notion of sustainable development. Further work on this basis, however, has produced an enhanced model, called the three-dimensional model of sustainable development.

**The 3D Model**

The three dimensional model adds time and space into the three original elements by inserting the Brundtland definition into the three-component (or triangular) model and reminds us of the differences between the world regions. It does not introduce a new viewpoint but it clarifies the first model to a high extent. The vertical axis states that global interrelations have to be considered when planning for sustainability. For example, the Developed World’s (North) industrial and post-industrial attitudes towards the natural environment should not be spread to the developing Nations (South/East). The horizontal axis reminds the Brundtland definition about the connection between today’s generation and its children.

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\(^5\) Ref. to K. Young’s theory for Archetypes.
APPENDIX V

IMAGES OF WINCHESTER FOREST
The annotated image on the previous page (Image 2) shows the specific location of Winchester Greens development and its next phase, Winchester Forest. North is towards the left edge of the image. At the bottom of the image, east of the development site, is the Richmond Defense Supply Center. Image 3 shows the exiting development and the undeveloped site in finer detail. North is towards the upper edge of the image.