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Leadership in environmental and energy design : a true sustainable development model?

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LEADERSHIP IN ENVIRONMENTAL AND ENERGY DESIGN:
A TRUE SUSTAINABLE DEVELOPMENT MODEL?

A Thesis

Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Master of Science

in

The Department of Environmental Sciences

by
Christopher Jay Loser
B.S., University of Maryland, 2010
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ABSTRACT

Suburban sprawl and sustainable development has received increasing worldwide attention over the past few decades. In 1998, sustainable development principles were codified in the Leadership in Energy and Environmental Design (LEED) certification system. The most recent LEED certification system to be released, LEED for New Development (LEED-ND), includes sustainable development goals with the addition of smart growth principles intended to curb sprawl.

This study examines and evaluates LEED-ND in order to determine if it meets the requirements of sustainable development to provide for the needs of future generations, as defined by the United Nation's World Commission on Environment and Development. It also analyzes certified LEED-ND projects to determine which portions of the rating system were utilized the most, and least, frequently, and provided recommendations for future LEED-ND revisions.

The study found that, while LEED-ND does promote most long-term sustainable development goals, it focuses more upon climate change and social equity than it does in combating sprawl and its environmental impacts. However, its inflexible and exclusory nature prevent many sustainable development goal from being fulfilled, and its use of double-counting credits exaggerates its sustainable development achievements.

1. INTRODUCTION

When man planted his first crop, he set upon a path of human settlement and state formation,; small settlements grew into cities, tribal leaders became kings and generals, and empires formed, then collapsed. This cycle continued for thousands of years, yet man was still, with few notable exceptions, living sustainably with nature, never taking more than could be naturally replenished (Mieth & Bork, 2010). Until, that is, the Industrial Revolution occurred, a period when man moved from an agrarian society to one dominated by technological advances, extreme population growth, and a society that began using natural resources faster than they could be replaced.

In 1972, the Club of Rome published *Limits to Growth*, a book detailing computer models that predicted that the current combination of population growth and its use of finite resources would result in humans reaching their carrying capacity and collapse as a species by the mid part of the 21st century (Meadows, Meadows, Randers, & Behrens, 1972). Its publication, which generated a lot of controversy, led the United Nations (UN) to create the World Commission on Environment and Development (WCED). Also known as the Brundtland commission, the WCED tackled the issue of sustainable development (Turner, 2008; WCED, 1987). In 1987, the WCED published the report *Our Common Future*, which popularly defined sustainable development as development that: “meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987). It also defined these requirements for sustainable development:

- A political system that secures effective citizen participation in decision making,
- An economic system that is able to generate surpluses and technical knowledge on a self-reliant and sustained basis,
- A social system that provides for solutions for the tensions arising from disharmonious development,
- A production system that respects the obligation to preserve the ecological base for development,
- A technological system that can search continuously for new solutions,
- An international system that fosters sustainable patterns of trade and finance, and
- An administrative system that is flexible and has the capacity for self-correction.

(WCED, 1987).

The issue of sustainable development received further worldwide attention after the 1992 UN Conference on Environment and Development, which issued 27 principles of how human populations can respect each other and protect the Earth from degradation (United Nations Environment Programme, 1992). In 1998, these principles were codified by the United States Green Building Council (USGBC), the Congress for New Urbanism, and the Natural Resources Defense council, when they created the Leadership in Energy and Environmental Design (LEED) certification system. (USGBC, 2011a). This certification system was originally designed to encompass individual buildings, with the intention of creating more energy efficient buildings throughout the U.S. in order to reduce greenhouse gas emissions through energy conservation (USGBC, 2011a). Over time, more rating systems were created; the latest being the LEED-New Development (LEED-ND) certification program which launched its pilot program in 2007 (USGBC, 2011b). This program’s main goals are to reduce automobile use, create more sustainable neighborhoods, and reduce human impacts on the environment by promoting smart growth principles (USGBC, 2011a).

2. INTENT AND METHODOLOGY

This thesis idea was motivated by the question of whether the LEED rating systems actually promoted sustainable land-use development, which I addressed through evaluating the LEED-ND rating system. In this thesis I intended to determine if the newest LEED system, the New Development program, meets the goals set out by the United States Green Building Council (USGBC) and the requirements of sustainable development to provide for the needs of future generations. I analyzed certified LEED-ND projects in order to determine which credits were utilized the most, verified if all of the sustainable goals are being met on an equal basis, and provided recommendations for future revisions.

I first collected a total of 93 out of 239 registered LEED-ND 2007 Pilot project scorecards, or 38.9% from the USGBC's website. I then attempted to contact each of the participants by email, asking them for a final copy of their scorecard and final review document. It must be noted that not all projects have been or will be completed, either due to financial reasons, an inability to achieve LEED-ND certification, or other unknown reasons. During this time of accumulating data, I also interviewed several architects on their firm's experiences with LEED-ND and their overall impression on the certification program. At no time were personal questions asked or a survey given.

In 2009, the USGBC made revisions to the Pilot program based on feedback from all participants and market research (USGBC, 2011a). Therefore, I compared the 2007 pilot program and the 2009 revisions to determine what was changed, added, and removed in order to more accurately analyze the 2009 LEED-ND rating system. I converted the 2007 scores into a comparable 2009 revision spreadsheet (shown in Appendix 1), and used these converted scores while analyzing the 2009 LEED-ND rating system.

3. ENVIRONMENTAL ISSUES

America has long been called the ‘land of opportunity’, where hard work results in personal success symbolized by a house in the suburbs with a white picket fence and a two-car garage (Hochschild, 1995; Rifkin, 2004). This commonly shared desire, known as the ‘American Dream’, values self-reliance and independence, and is expressed through the accumulation of wealth (Elkin, McLaren, & Hillman, 1991). This dream, along with governmental programs intended to grow the economy and improve American lives, has led to an exponential growth in the consumption of non-renewable resources, currently at three times the rate of population growth, as well as increased residential and commercial land use (Hochschild, 1995; Rifkin, 2004; USGBC, 2011a). This increased residential and commercial land use, in turn, has often taken on the characteristics of, suburban sprawl, which relies heavily upon the automobile as primary transport. Suburban sprawl’s continued expansion will only be exacerbated by a U.S. population growing from 315 million people to over 460 million by the year 2050 if the status quo continues (Elkin, McLaren, & Hillman, 1991; Martin & Fogel, 2006; United States Census Bureau, 2012).

Mieszkowski and Mills explain that population growth, higher household incomes, and transportation improvements are the three core reasons sprawl occurs (1993). Though these conditions may lead to urban sprawl in a number of other countries, the focus of this thesis is on the United States (Behan, Maoh, & Kanaroglou, 2008; Mawromatis & Constantino, 2002; Mobarkai, Mohammadi, & Zarabi, 2012; Rudel, 2009; Samaruutel, 2010). When compared to other developed and developing countries in Asia and Europe, the United States has a much lower urban density and a much higher number of registered personal automobiles, in which more daily trips are reported (Hyunsu, Nakagawa, Matsunaka, & Oba, 2012).

Suburban sprawl did not arise solely from the desire to own one’s home and property. The invention of the automobile allowed for people to commute further in the same amount of time and the federal interstate highway system increased the distance achievable (Rodrigue, 1998). In addition, since 1913, interest on mortgage payments has been tax-deductible in the United States, stimulating its citizens to own their own homes, rather than rent (Fox, n.d.). These drivers synergized with at least two other federal statutes to exacerbate urban sprawl: The U.S. Housing Act of 1937 created public housing for people hit hard by the Depression and the post-World War II G.I. Bill allowed for low-interest, no money down mortgages for returning veterans. These statutes increased new suburban home construction increased to 2 million per year by 1950 before stabilizing in the mid-1960s to 1.3 million per year (Cohen, 2003; Edson, n.d.).

As new suburban home construction increased rapidly and haphazardly, it resulted in many environmentally harmful consequences such as the conversion of natural and agricultural lands into urban landscapes, fragmentation of natural habitats, increased water pollution and decreased groundwater recharge due to impervious cover, lack of housing choices, increased traffic congestion and the resulting increased air pollution, expensive new infrastructure requirements, and decaying older urban centers (Downs, 2005; Mobarkai, Mohammadi, & Zarabi, 2012).

3.1 Fragmentation and Loss of Undeveloped Lands

Farmlands and undeveloped lands, known as greenfields, have many benefits to society: food production, increased water and air quality, flood abatement, regulation of the climate, carbon absorption, and, quite simply, an aesthetic appeal (Alberti, 1999; Nelson, 1992). Additionally, they provide habitat for many species of plants and animals, many of which may be endangered or threatened (Forman & Godron, 1986). However, greenfields

are being lost at an alarming rate, especially those that surround urban centers with a fast growing population, as homeowners are willing to commute further in order to live in an area with lower housing costs, larger lots, and more open areas (Jantz, Goetz, & Jantz, 2005).

Between 1982 and 2007, the United States Department of Agriculture (USDA) reports that farmland acreage in the U.S. decreased from 420 million acres to 357 million acres, mainly due to the Conservation Reserve Program which protects environmentally sensitive cropland by converting cultivated cropland to non-cultivated (2009). Of these 357 million acres, 326 million acres is classified as prime farmland, a 14 million-acre loss since 1982, mostly due to development (USDA, 2009). Forested lands and wetlands were also lost to development, but at a lower rate, presumably due to the associated additional construction costs (Jantz, Goetz, & Jantz, 2005). Overall, 40 million acres of farmland and undeveloped land was developed in the same 25 years, approximately one-third of all land ever developed in the continental United States (USDA, 2009). Figure 1 shows the millions of acres dedicated to cropland and developed land between 1982 and 2007, and Figure 2 shows the rate of development in the same time period (USDA, 2009).

As urban sprawl, is by definition haphazard development, it not only has the undesirable impact of reducing prime arable land, but also fragments the farmland into smaller plots leading to decreased yield due to air pollution and/or destruction of the crops by residents (Maasikamae, Hass, & Jurgenson, 2011; Nelson, 1992). Figure 3 shows a case study by Maasikamae, Hass, and Jurgenson on how parcels of land can be split by sprawl (2011). The demonstration of sprawl in this case study can also be applied to other undeveloped parcels of land, such as forested land, and is of particular concern because it removes existing natural habitat and fragments such habitat for many species (Forman & Godron, 1986).

3.2 Water Pollution

Water resources are another environmental factor affected by sprawl. Development of land alters the hydrological cycle due to impervious surfaces not allowing water to filter into aquifers and increasing surface runoff which can alter stream hydrographs, temperatures, and ecosystem dynamics (Erickson & Stefan, 2009; National Research Council, 2008; Nilsson, et al., 2003). For example, Erickson and Stefan modeled the Vermillion River in Minnesota, which was 60% undeveloped and 40% developed, and found that as the watershed was developed, infiltration decreased dramatically, up to a 30-40% annual reduction as the watershed became close to fully developed (2009). This would have severe negative effects on groundwater recharge, as well as the cold-water habitats of the surrounding streams (Erickson & Stefan, 2009).

The negative effects of impervious surfaces can also be seen in Baton Rouge, Louisiana, where the aquifer system is threatened with saltwater intrusion (Lovelace, 2007). While the majority of the blame is due to large withdrawals for public water and industrial uses, which has lowered aquifer levels and changed flow patterns, blame can also be laid on of impervious surfaces that have lowered groundwater recharge rates (City Parish Planning Commission, 2011; Lovelace, 2007). Figure 4 shows the percentage of impervious surface throughout East Baton Rouge Parish.

In addition, urban runoff also collects pollutants (e.g. sediments, nutrients, road salts, heavy metals, pathogens, petroleum hydrocarbons), which are quickly carried into nearby waterways (Environmental Protection Agency (EPA), 2000). This nonpoint source pollution severely degrades receiving waters by:

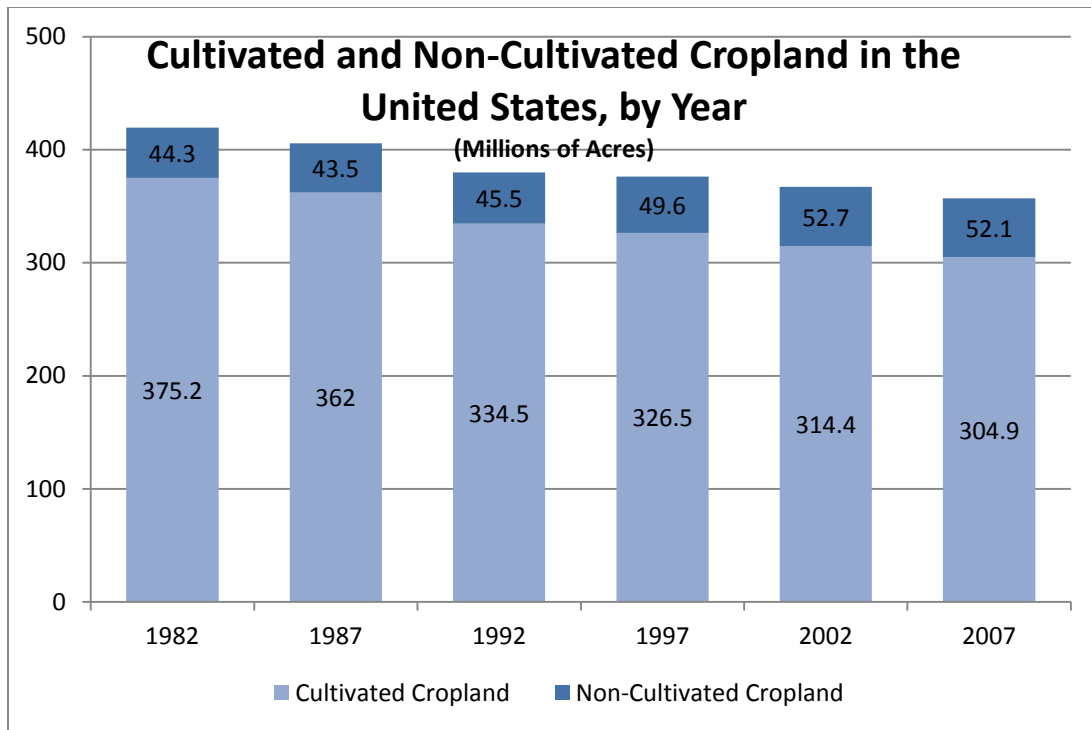


Figure 1: Cultivated and Non-Cultivated Cropland in the United States, by Year (in Millions of Acres)
(USDA, 2009)

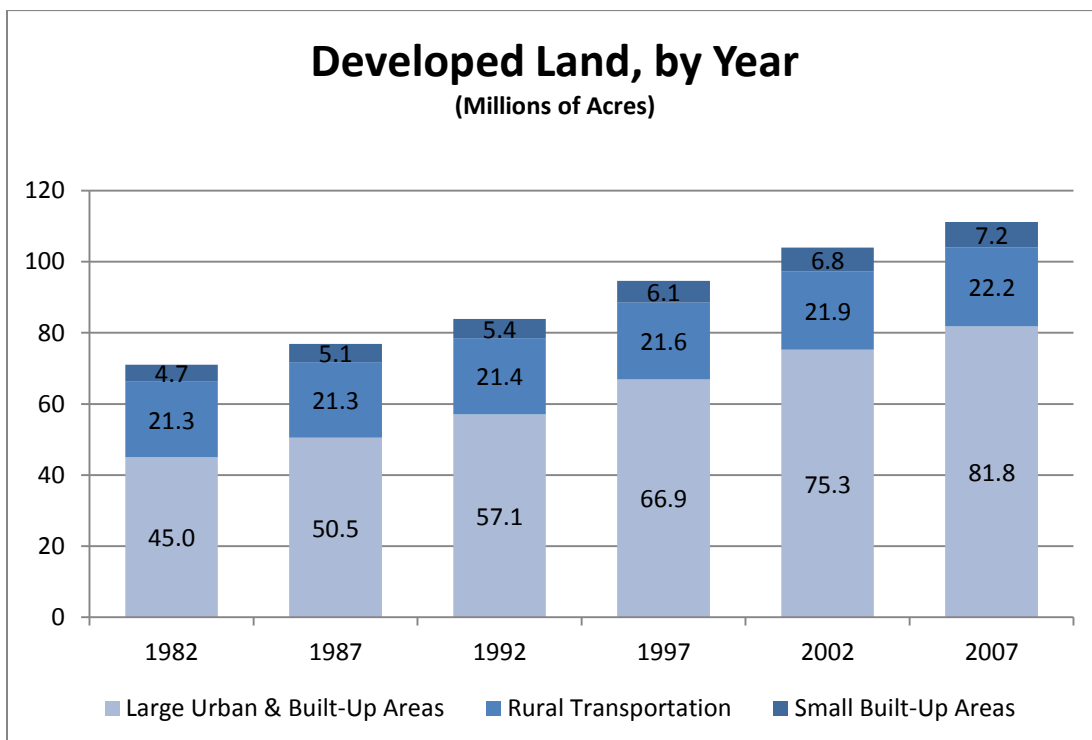


Figure 2: Developed Land, by Year (in Millions of Acres)
(USDA, 2009)

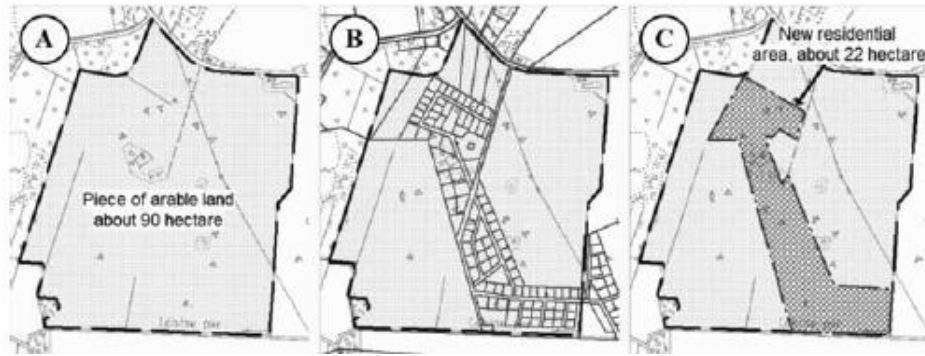


Figure 3: Demonstration of Unsustainable Sprawl Fragmenting Arable Lands and Habitats (Maasikamae, Hass, & Jurgenson, 2011)

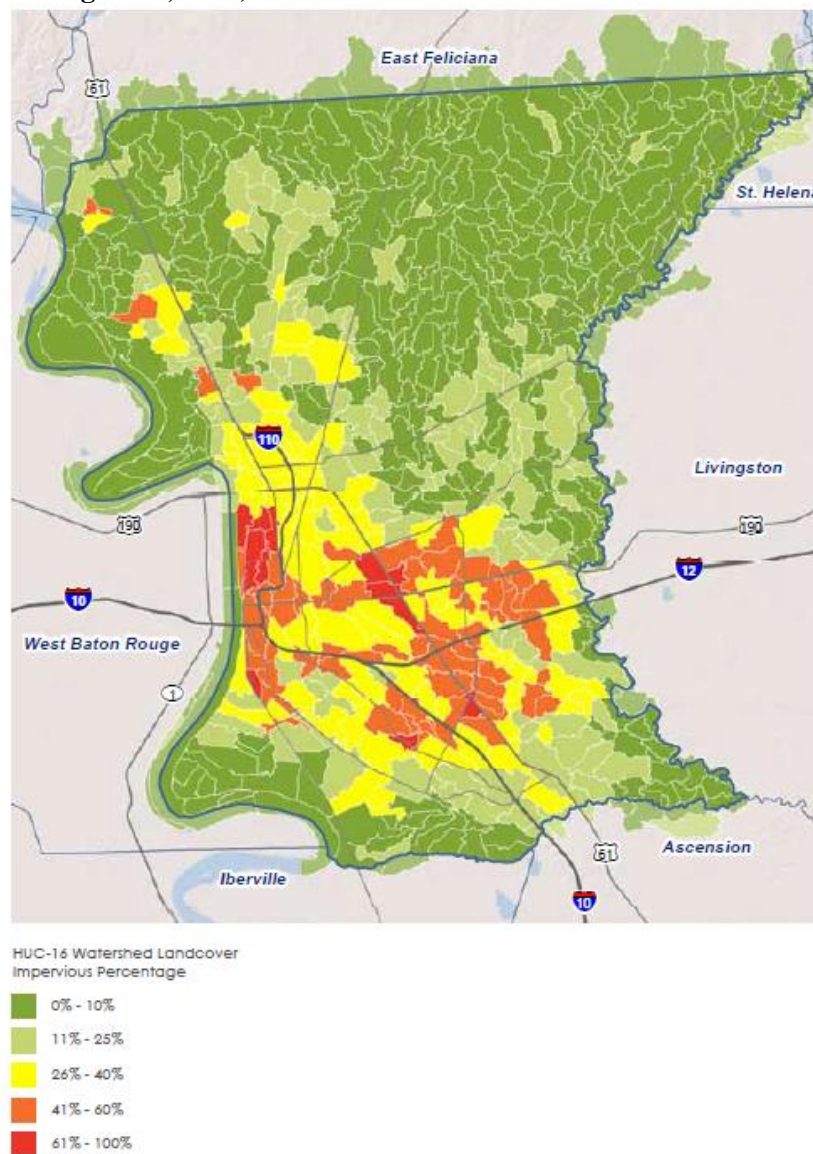


Figure 4: Percent of Impervious Cover in East Baton Rouge Parish, Louisiana (City Parish Planning Commission, 2011)

- **Sedimentation.** Sediments cause low dissolved oxygen levels as they increase the turbidity of the receiving waters which decreases photosynthetic activity and the death of submerged aquatic vegetation populations due to lesser light penetration, as well as absorbing solar energy that warms the surrounding water (Wright, 2008). Additionally, sediments can impair the respiration of fish and aquatic invertebrates, and settle over benthic communities causing suffocation (Wright, 2008).
- **Eutrophication.** Increased levels of nutrients in the receiving waters leads to increased phytoplankton growth causing algal blooms, which also leads to the death of aquatic submerged vegetation as the water becomes more turbid (Wright, 2008). The phytoplankton then die and become detritus, encouraging the growth of oxygen-depleting bacteria and the suffocation of aquatic communities including fish, crabs, oysters (Wright, 2008). Eutrophication lessens the aesthetic and recreational appeal of waterways, and in 2000 was the leading cause of impairment for lakes, ponds, and reservoirs (Ecological Society of America, 2008; EPA, 2000).
- **Pathogens.** The leading cause of river and stream impairment in 2000, exposure to pathogens through drinking water, the consumption of contaminated seafood, and contact during recreational activities, can cause acute and chronic illness (Gaffield, Goo, Richards, & Jackson, 2003). Surface runoff is associated with increased levels of *Giardia* and *Cryptosporidium*, both of which cause severe gastrointestinal illness (Atherholt, LeChavallier, Norton, & Rosen, 1998). It has been estimated that between 1948 and 1994 over half of all waterborne disease outbreaks occurred after extreme rainfall events (Curriero, Patz, Rose, & Lele, 2001). In 2011, 43% of coastal beaches monitored by the EPA had at least one advisory or closure, most of them due to excessive indicator bacteria in the water (EPA, 2012a).
- **Heavy Metals.** Mercury is the primary metal causing impairment in estuaries, lakes, ponds, and reservoirs, although significant concentrations of lead, cadmium, copper, zinc can be found in urban runoff (Bannerman, Owens, Dodds, & Hornewer, 1993; EPA, 2000). Heavy metals are of particular concern due to the toxic effects they can have on aquatic life, as well as how they bioaccumulate and affect the food chain, including humans (Gopalakrishnan, Thilagam, & Raja, 2008; Klaassen, 2008; Pourang, 1995).
- **Hydrocarbons.** Polycyclic aromatic hydrocarbons (PAH) are of similar concern as that of heavy metals. They have toxic effects on aquatic life, bioaccumulate, and can be passed through the food chain, including humans (Meador, Stein, Reichert, & Varanasi, 1995; Oros, Ross, Spies, & Mumley, 2007). PAHs have been shown to be highly carcinogenic and mutagenic, and are potent immunosuppressants (Klaassen, 2008).

3.3 Air Pollution

Sprawl contributes to air pollution mainly due to its dependence on the automobile for transportation (Elkin, McLaren, & Hillman, 1991). It also increases traffic congestion, resulting in even higher atmospheric contamination as transit times lengthen, including CO, NO_x, SO_x, hydrocarbons, and particulate matter due to incomplete combustion of petroleum by engines (Behan, Maoh, & Kanaroglou, 2008). Hydrocarbons and NO_x are precursors to ground-level ozone formation, which can cause respiratory and cardiovascular problems (Behan, Maoh, & Kanaroglou, 2008). Air pollutants have been linked to increased morbidity and mortality, and the majority of these emissions can be traced to the transportation sector (Colville, Hutchinson, Mindell, & Warren, 2001; Pope, Ezzati, & Dockery, 2009).

Change in land cover due to sprawl also has an effect on air pollution, especially when trees and shrubs are removed and not replaced (Nowak, Crane, & Stevens, 2006). Although air pollution removal rates vary due to

local conditions, including precipitation and in-leaf season, these plants can remove tons of atmospheric pollutants annually (Nowak, Crane, & Stevens, 2006). In urban areas with 100% tree cover, in one hour the air quality can improve up to 8% for particulates, 9% for nitrogen dioxide, and 16% for ozone and sulfur dioxide (Nowak, Crane, & Stevens, 2006).

3.4 Climate Change

Although sprawl contributes to climate change by reducing vegetation cover and its beneficial effects of evapotranspiration, thereby impacting regional temperatures and precipitation at the micro-climate level, the main contributions come from air pollutants and greenhouse gas emissions from the transportation sector, and inefficient energy usage in aging, sprawl-based buildings (Franczyk & Chang, 2009; Levine, et al., 2007; NASA, 2008). Annually, low-density development has 2.5 times the greenhouse gas emissions and two times the energy usage when compared to high-density development (Center for Sustainable Systems, 2012)

In 2004, it was estimated that the global direct-energy related CO₂ emissions from the building sector was approximately 3 Gt/year (Levine, et al., 2007). Levine, et al., estimated in 2007 that by using existing technologies to reduce energy consumption in buildings, it was possible to reduce the projected 2020 global CO₂ emissions by 29% (2007).

4. URBAN PLANNING

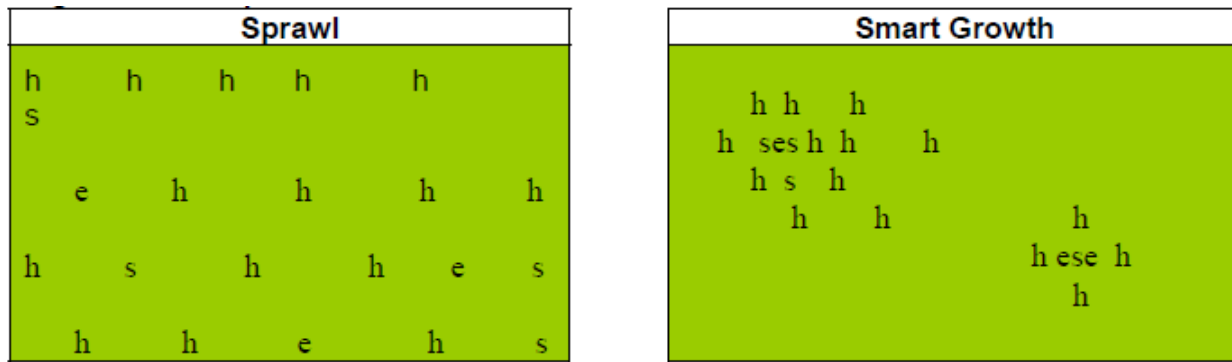
Throughout the history of civilization, man has planned settlements and passed laws to protect society. While some ancient cities may have grown organically, with buildings placed in a seemingly haphazard pattern, ancient builders obviously had to decide upon their placement (Smith, 2007). Many were planned to provide for military defense and city services, such as the Hippodamian grid and the Vitruvian radial plans created, respectively, in the 5th and 1st centuries BCE (Grammenos, Craig, Pollard, & Guerrero, 2008). Building codes, which can be traced back to ancient Babylon, where Hammurabi clearly and firmly organizes the laws of society, have expanded in the following millennia, typically in response to natural disasters, such as after the 1212 London fire when thatch roofing and wooden chimneys were banned in the city, or the Great London Fire in the 1600s when building proportions and height, as well as the location of certain trades, were regulated (Arnold, 2005; Fischel, 1999; Horne & Johns, 1998). The American colonies also regulated land-use and buildings in order to protect public health, safety, and general welfare; one of the earliest zoning regulations was passed in Massachusetts in 1692, restricting the placement of gunpowder storehouses, slaughterhouses, and liquor stills (Ferrey, 2010). Over the course of time, land use planning evolved, as evidenced by the first comprehensive land use plan enacted by New York City in order to control overcrowding, unsanitary conditions, and pollution, by separating industrial, commercial, and residential sectors (Ferrey, 2010).

Due to the 10th Amendment of the Constitution, which affirms the relationship between federal and state governments, it is unlikely that Congress would ever be able to constitutionally enact a comprehensive urban plan for the nation, even though it can stimulate such planning at the state level through financial incentives (Howard, 1961; The Constitution of the United States). Additionally, as of 2010, there were a number of states that leave the adoption of codes to local jurisdictions, as well as a number of jurisdictions that have not implemented mandatory codes or instituted zoning controls (Herb, 2010). These areas typically consist of very sparsely populated rural communities that most likely do not have the resources to implement land use regulations (Herb, 2010).

4.1 Smart Growth Principles

Smart Growth, also called New Urbanism, is a set of development principles and practices that intentionally cluster residential and commercial uses together in higher densities in order to reduce low density sprawl, promote the use of infill and redevelopment locations to prevent habitat fragmentation and green space loss, promote pedestrian access to lower automobile usage, as well as encourage affordable housing to low-income residents (Litman, 2011). These principles are not specific to urban, suburban, or rural communities, as they can be applied under all settings due to their general nature of increasing efficiency (Litman, 2011). Urban Smart Growth principles emphasize redevelopment of existing neighborhoods and the use of infill sites, while enhancing public transport and walking; suburban areas promote building residential areas from low density to medium, providing more public services and employment opportunities while providing more complete communities (i.e. stimulating more commercial businesses within suburban areas); and rural communities can develop into mixed-use areas by locating schools, businesses, public services, and housing close together to encourage walking and cycling (Litman, 2011). Figure 5 shows how sprawl and smart growth building patterns differ.

There are many critics of smart growth policies and green-building certification programs. According to Todd Litman of the Victoria Transport Policy Institute, the main criticisms of smart growth are: homeowners'



Both boxes contain the same overall density of housing (h), employment (e) and services (s), but on the left they are more dispersed and on the right they are more clustered, creating “villages.”

Figure 5: Comparison of Sprawl and Smart Growth Patterns
(Litman, 2011)

preference towards sprawl and dependence on automobiles; the reduction of personal freedoms due to smart growth policies; rising housing costs as a result of smart growth policies, worsening the affordability of homeownership; increasing traffic congestion in smart growth areas; increasing public service costs due to smart growth; negligible public transit benefits; and general detriment to the economy on account of smart growth (2011). Additionally, from interviewing several developers and architects, criticism of LEED-ND as well as other third party certification programs, includes inflexible requirements (Harper, 2011). There are some legitimate and logical criticisms, however research into these denunciations have shown no compelling evidence supporting a policy of not instituting smart growth policies across the United States (Litman, 2011).

However, opponents of smart growth are the majority, most likely because of the major fundamental differences between the current, sprawl-oriented development, and its smart growth counterpart (Downs, 2005). Smart growth will require the average citizen to rethink their version of the American Dream, a deeply entrenched set of ideals (Rifkin, 2004). Current homeowners may be reluctant to support new development for fear that their own homes would depreciate in value, as well as a fear of what negatives a higher density neighborhood would bring, such as increased traffic congestion, crimes, and “undesirable” lower-income households (Downs, 2005).

New land-use policies will also challenge the political status quo, as they require a shift from land-use laws being controlled at the local governmental level to a regional or state-wide level (Downs, 2005). The implementation of new policies would also increase the amount of paperwork and requirements developers have to overcome, such as preparing environmental impact statements and complying with certification programs, which will not only raise the costs of new homes, but also increase resistance from developers at a political level (Downs, 2005).

Overall, propagating the passage of new smart growth policies will require a concerted effort by grassroots organizations to overcome these obstacles through education and persuasion (O'Connell, 2008). Therefore, the only way to confront suburban sprawl and its negative environmental and social impacts is the voluntary implementation of principles designed to result in a more efficient use of land available for development.

4.2 LEED-ND

In order to promote sustainable development principles, the United States Green Building Council, the Congress for New Urbanism, and the Natural Resources Defense council, came together to create the Leadership in Energy and Environmental Design (LEED) certification system in 1998 (USGBC, 2011a). The original rating system only covered individual buildings, intending to create more energy efficient buildings throughout the U.S. in order to reduce greenhouse gas emissions through energy (USGBC, 2011a). Over time, more rating systems were created; the latest being the LEED-New Development (LEED-ND) certification program which launched its pilot program in 2007 (USGBC, 2011a). This program's main goals are reducing human impacts on the environment by promoting smart growth principles: choosing a smart location, designing efficient transportation and site designs, producing efficient infrastructure, and protecting sensitive lands, public health, social equity, the climate through energy reduction, and water resources (USGBC, 2011a). These principles encompass the requirements that the Brundtland commission set forth for the pursuit of sustainable development (WCED, 1987). The highly complex interaction of these principles can be seen in Figure 6 below.

In order for a project to be considered for a LEED-ND rating, it must first meet 5 minimum prerequisites in the Smart Location & Linkage (SLL) section of the certification system, 3 in Neighborhood Pattern & Design (NPD), and 4 in Green Infrastructure and Building (GIB) (USGBC, 2011a). These requirements are mandatory and no exceptions will be made, even for projects that would otherwise receive exemplary grades (USGBC, 2011a).

The Smart Location and Linkage section of LEED-ND centers on minimalizing environmental impacts due to new developments and urban sprawl (USGBC, 2011a). This is done by choosing locations near to or in existing communities while protecting imperiled species, wetlands and other water bodies, agricultural lands, and by avoiding floodplain locations (USGBC, 2011a). Neighborhood Pattern and Design focuses on creating communities that are medium- to high-density, walkable, connected to nearby neighborhoods, and are aesthetically pleasing (USGBC, 2011a). The Green Infrastructure and Building portion of LEED-ND focuses on minimizing environmental impacts in the construction and operation of buildings and infrastructure by requiring that a certain number of buildings be certified under another LEED program, or equivalent, having minimum standards on energy and water consumption, and preventing pollution due to construction activity (USGBC, 2011a).

There are four levels of certification in the LEED-ND system: Certified, Silver, Gold, and Platinum (USGBC, 2011b). Documentation for projects is submitted to a USGBC certification panel that determines if a project meets the prerequisites and assesses points in each of five credit categories: 9 credits are available in Smart Location and Linkage, 15 in Neighborhood Pattern and Design, 17 in Green Infrastructure and Building, 2 in Innovation and Design Process, and 1 in Regional Priority (USGBC, 2011a). Each credit is worth a varying amount of points for meeting certain thresholds (USGBC, 2011a). Projects are awarded the lowest rating, Certified by earning at least 40 credit points, Silver by earning at least 50 points, Gold by 60 points, or Platinum by 80 or more points (USGBC, 2011a).

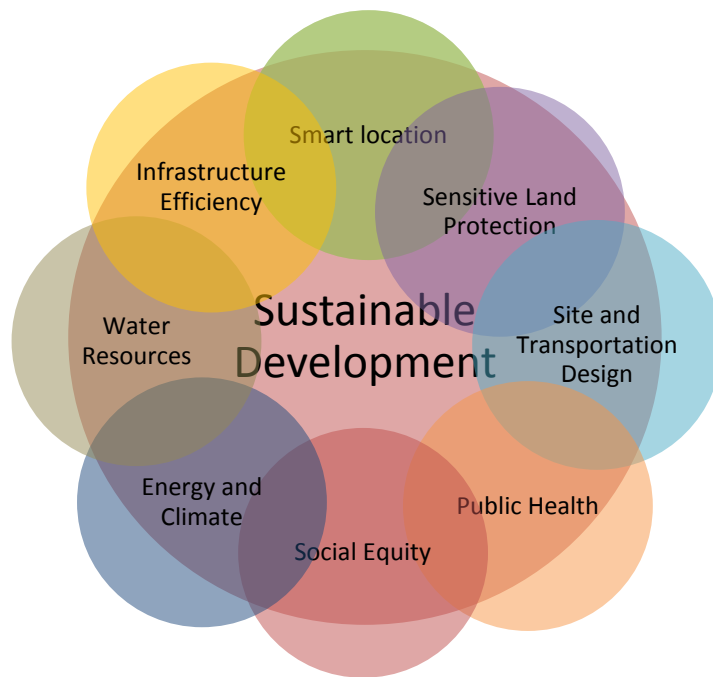


Figure 6: A Simplistic Representation of the Complex Interaction of the Eight Facets of LEED-ND:
Every facet interacts with each other facet, and all are needed at a certain level to attain sustainable development.

5. DISCUSSION

This thesis evaluated every LEED-ND prerequisite and credit available and determined if they accurately met the sustainable development goals of the USGBC. It then provided recommendations for the future revisions of LEED-ND to promote these goals and principles in order to become a more sustainable rating system.

Although not without flaws, it became obvious during the evaluation of LEED-ND that it promotes long-term sustainable development goals. It focuses more upon climate change and social equity than it does in combating sprawl and its environmental impacts (see Appendix 2 for the tables detailing the points available and the median points earned in), showing that the desire to curb sprawl and become a LEED-ND certified project is a voluntary decision to invest in redevelopment and additional construction in already heavily populated urban areas. Expanding the reach of LEED-ND, and other sustainable building standards, should be an all-inclusive, flexible, and ever changing system willing to adapt to local conditions.









This chapter details the prerequisites and credits of the rating system while providing recommendations for the future of LEED-ND and its sustainable developmental goals.

5.1 LEED-ND Prerequisites

As previously stated, in order for a project to be considered for a LEED-ND rating, it must first meet 5 minimum prerequisites in the Smart Location & Linkage (SLL) section, 3 in Neighborhood Pattern & Design (NPD), and 4 in Green Infrastructure & Building (GIB) (USGBC, 2011a). These requirements are mandatory and no exemptions will be made, even for projects which otherwise would receive exemplary grades (USGBC, 2011a).

Each prerequisite was designed to meet one of eight sustainable development goals. For each prerequisite, the following symbols will be placed next to its name to indicate which development goal was achieved:

Table 1: Legend of Sustainable Development Goals Achieved in Each Prerequisite

 = Smart Location	 =Social Equity
 = Sensitive Land Protection	 =Energy and Climate
 =Site and Transportation Design	 =Water Resources
 =Public Health	 = Infrastructure Efficiency

In addition, after each description of these prerequisites, a table will show the name of the prerequisite, if different options are available to achieve its requirements, and the utilization percentage of developments achieving LEED-ND status in the pilot program from the data collected in this thesis.

5.1.1 Smart Location & Linkage

This section of prerequisites primarily focuses on ecological protections and, although it is very strict and inflexible, does minimize the effects that new developments have upon undisturbed lands and, for the projects achieving a rating of Certified or above, the effects of sprawl. Yet its inflexibility to adapt to local conditions is of concern.

Table 2: Smart Location and Linkage Prerequisites

Credit	Title	Options
SLL Prerequisite 1	Smart Location	1,2,3,4
SLL Prerequisite 2	Imperiled Species and Ecological Communities Conservation	1,2,3
SLL Prerequisite 3	Wetland and Water Body Conservation	1,2
SLL Prerequisite 4	Agricultural Land Conservation	1,2,3,4,5
SLL Prerequisite 5	Floodplain Avoidance	1,2,3

5.1.1.1 Smart Location



The first SLL prerequisite is intended to promote development near existing communities, restrain expansion of the area by redeveloping brown- or grey-fields while protecting greenfields, and lower automobile use by encouraging public transit and walkable developments (USGBC, 2011a). This is accomplished by requiring that (1) all projects be served by publically owned water and wastewater infrastructure, either an existing one, or one which has been legally approved and will be built during the construction of the project, and (2) that the project meets one of four detailed locational options (USGBC, 2011a).

The requirements of this prerequisite appear to be aligned with its stated goals to develop near and /or within already existing communities and metropolitan areas; however it does have a few weaknesses. First, requiring that all projects be served by a *publicly owned* water and wastewater infrastructure prevents projects that are serviced by either privately owned water and/or wastewater facilities. While publicly owned systems constitute more than 95% of the wastewater industry, only about a third of all drinking water systems are privately owned, serving about 15% of the population (Copeland & Tiemann, 2010). This may be a reason that Baton Rouge, Louisiana does not have a LEED-ND project, as the Baton Rouge Water Company is a privately owned company, established in 1888 (2012).

Another flaw in requiring publicly owned water and wastewater is the evolving relationship between private industry and public infrastructure due to the deteriorating conditions of our wastewater infrastructure. In 2009, the American Society of Engineers reported that broken or blocked wastewater pipes result in approximately 10 billion gallons of raw sewage discharging into the waters of the United States (2009). To update and replace aging infrastructures, as well as building new plants to serve our growing population, the EPA reported in 2002 that an investment of almost \$500 billion dollars will be required by 2020 (EPA, 2012b). However, funding these needed repairs and upgrades is a challenge, with several schools of thought, such as Senator Robert Menendez's (D-NJ) bill introduced to the Senate, *S.939 Sustainable Water Infrastructure Investment Act of 2011*, intending to raise private investments by amending the tax code by lifting the cap on the amount of bonds the federal government can offer (Menendez, 2011). Others, such as the Organisation for Economic Co-operation and Development (OECD), the Urban Land Institute, and Congresswoman Rosa DeLauro (D-CT), propose that the creation of a National Infrastructure Bank will channel more private investments into infrastructure in the form of public-private partnerships (OECD, 2012; Urban Land Institute and Ernst & Young, 2010).

I recommend that this prerequisite be amended to allow for projects to be served by privately owned water and wastewater industries, yet still not allow the use of septic systems, not only because it would allow participation in the LEED-ND program by more populations in the present, but it would also promote the repair

and replacement of the deteriorating wastewater infrastructure in the United States by promoting private party investments and partnerships.

Option 1 of Smart Location stipulates that the project be an infill site, or a location in which the surrounding area has been previously developed (USGBC, 2011a). I have no recommendation to change this option, as it fulfills the goal of promoting development near or within existing populations. Over 90% of LEED-ND approved projects chose this option.

Option 2, which is new in the 2009 revisions, requires a certain amount of connected streets from existing developments into the proposed development; however these streets may not have been funded by, nor built by, the project developer in the past 10 years (USGBC, 2011a). Additionally, this option removes the connected street exemptions listed in the Neighborhood Pattern and Design Prerequisite 3, which address portions of the boundary where there is a physical obstacle which makes it impossible to create such a connection (USGBC, 2011a).

Attempting to curb urban sprawl by defining the conditions of an adjacent site is an important facet of the Smart Location purpose; however the requirement that a project developer may have neither funded nor built the connecting roads is an arbitrary and capricious decision. If an alternative developer can achieve LEED-ND certification, but not the original developer, it penalizes successful sustainable development goals. It is this author's opinion that this hinders developers attempts for LEED-ND status for any adjacent project they may work on, or to determine another avenue to achieve LEED-ND status; however, future research is needed in this area when data becomes available to determine if sustainable development is hindered by this requirement.

I recommend that either: (1) this option be removed completely from the LEED-ND rating system as NPD Prerequisite 3, Connected and Open Community, addresses street connectivity with appropriate exemptions; (2), that this option be modified by removing the 10-year restriction and thereby allowing the developer to create new connections while planning or building the proposed development, as well as keeping the rest of the connecting roads optional requirement in order to further encourage infill and adjacent development in high-density areas; or (3), that this option be modified by defining appropriate adjacent site locations without the street connection requirements.

Options 3 and 4 are intended to provide for walkable neighborhoods by requiring that either most buildings be within reasonable walking distance of public transportation with a minimum number of daily stops, or located in a way that the populace can walk to a diverse amount of services (USGBC, 2011a). The flaw in these requirements is that the walk distance must be on a network of connected pedestrian amenities; at times the pathways the pedestrian may be forced to use are not in control of the developer, and should not be counted against them for land-use decisions not located within the project boundaries (USGBC, 2011a). Only approximately 3% of developers utilized the third option, while 5% utilized the fourth. I recommend that the walk distance requirements for both options remain the same, with amendments for developers to only provide for connected pedestrian amenities within the project boundary itself.

Finally, the definitions of an "adjacent site" and "previously developed" property should be reevaluated. Permanently protected lands should not have a maximum size requirement in the adjacent site definition, but should be redefined as to a minimum size requirement in order to respect the decisions of the government. Previously developed land must take into account the number of populations that do not have building codes and/or zoning laws in order to expand the LEED-ND program to increase sustainable principles not just in the urban area, but also in suburban and rural areas (Herb, 2010). I recommend that suburban and rural areas, for

which local municipalities have developed and adopted comprehensive land use plans, be allowed to apply for LEED-ND status.

Table 3: Smart Location and Option Utilization

Smart Location	Total	Percentage of Total*
Prerequisite	93	100%
Option 1	84	90.3%
Option 2	--	--
Option 3	3	3.2%
Option 4	5	5.4%

*Not all options reported

5.1.1.2 Imperiled Species and Ecological Communities Conservation 2

This prerequisite is designed to protect and preserve endangered species because, as Congress declared in the Endangered Species Act, “these species of fish, wildlife, and plants are of esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people” (1973). This is accomplished by requiring the developer consult with state fish and wildlife agencies and the Natural Heritage Program to ensure that a species listed in federal and state Endangered Species Acts, or categorized by NatureServe as possibly extinct, critically imperiled, or imperiled, does not exist on the project site (USGBC, 2011a). If conditions exist that a species might be found, a qualified biologist must survey the site for all species that may be present on the property (USGBC, 2011a). If a species is found, or has a high probability of appearing, the project must create a habitat conservation plan to protect said species (USGBC, 2011a).

I fully support this prerequisite’s intention and implementation, and have no recommendations on how to improve it.

Table 4: Imperiled Species and Option Utilization

Imperiled Species	Total	Percentage of Total
Prerequisite	93	100%
Option 1	84	90.3%
Option 2	5	5.4%
Option 3	4	4.3%

5.1.1.3 Wetland and Water Body Conservation 2 7

The wetland and water body conservation prerequisite is intended to limit any development’s effects on water quality and current hydrologic conditions, as well as protecting biodiversity and species habitat (USGBC, 2011a). This is achieved by siting the project such that it is not located near wetlands or water bodies without an appropriate buffer zone, or by ensuring that new development would not have any effect on pre-project wetlands, water bodies, and the land surrounding them (USGBC, 2011a). The prerequisite also requires that all local, state, and federal wetland and water body conservation laws must be followed, allows for exemptions for man-made water bodies and wetlands, and permits certain minor improvements within the buffer zone in order to maintain or restore the wetland or water body (USGBC, 2011a).

Over 75% of all certified projects were located in areas where there were either no wetlands or water bodies within 50 and 100 feet of land, respectively, achieving this prerequisite under option 1. Between 2004 and 2009, urban land use was estimated to have caused a loss of 52,050 hectares of wetlands, approximately 23 percent of all wetland loss in the United States during that time frame (Dahl, 2011). Therefore, I recommend this

option increase these distances in order to further protect these critical areas to 100 feet for wetlands and 150 feet for water bodies. This should be done for the many ecological benefits of wetlands, such as their abilities to act as nutrient sinks, provide habitat for unique animal and plant species, and act as buffers against storm surges and flooding. However, I also recommend it allow for the use of GIB Credit 8, Stormwater Management, in order to bring the buffer zones to the current prerequisite of 50 feet for wetlands and 100 feet for water bodies. This would have the added benefit of further promoting the sustainable development principle of reducing or eliminating water pollution due to land use.

Option 2 was utilized about 25% of the time; if my recommendation above was implemented, this option may be utilized at a higher rate. In order to prevent this option to be utilized at the same rate as the first option, due to the use of Stormwater Management controls, I would recommend that developments that have pre-project wetlands earn at least 2 points under GIB Credit 8 and these areas must be previously developed lands. Undeveloped sites that would use this option to fulfill this prerequisite must earn at least 3 points.

Table 5: Wetland Conservation and Option Utilization

Wetland Conservation	Total	Percentage of Total
Prerequisite	93	100%
Option 1	70	75.3%
Option 2	23	24.7%

5.1.1.4 Agricultural Land Conservation ²

This fourth prerequisite is intended to preserve forest and farmland, mainly through the use of identifying and protecting unique, prime, and area-specific/significant soils (USGBC, 2011a).

I fully support preserving agricultural resources, as doing so fulfills the sustainability definition of preserving resources for our future generations. However, more research will have to be completed as data is collected from projects utilizing the 2009 LEED-ND Revised system because the 2007 data does not compare adequately to make any conclusions due to the increase in options available. Also, there was some slight inconsistency with SLL Prerequisite 4, option 2 (utilized 72% of the time), which would also fulfill SLL Prerequisite 1, option 1 (utilized 90.3% of the time). While it could be assumed this was either overlooked by the developers or intended as the certification process underwent review, further research and interviews with developers would help understanding and future revisions to the certification process.

Table 6: Agricultural Land Conservation and Option Utilization

Agricultural Land Conservation	Total	Percentage of Total
Prerequisite	93	100%
Option 1*	--	--
Option 2	67	72.0%
Option 3*	--	--
Option 4	0	0%
Option 5*	--	--

* New in 2009

5.1.1.5 Floodplain Avoidance ²

The final SLL prerequisite is intended to avoid development in floodplains, not only for the protection of human life and property, but also to conserve open space, provide habitat, improve water quality, and increase the

efficiency of natural hydrological systems (USGBC, 2011a). If a project is determined to be within a high- or moderate-risk 100 year floodplain, developers must comply with the Federal Emergency Management Agency's (FEMA) floodplain mitigation plans and the National Flood Insurance Program (NFIP) design requirements, and design and build critical buildings to withstand a 500 year event (USGBC, 2011a).

This prerequisite fulfills its stated goals as over 78% of projects completely avoided higher risk floodplain development, while the remaining 22% mitigated the impacts of flooding by complying with FEMA and NFIP requirements using options two and three. However, FEMA, which oversees the NFIP program, is a federal governmental agency and its mission, authority, and/or budget can be altered at any time by Congressional action or Executive order, which can lead to the weakening of this LEED-ND prerequisite. For example, projects must consult a FEMA created map to determine if it is sited in a floodplain, yet the creation or modification of these maps can be delayed due to Congress not appropriating previously authorized fund, or the budget changing dramatically for this expense in a following year. Such a scenario happened between 2011 and 2012, when FEMA's Flood Map Modernization Fund was reduced over 50% from \$204 million to \$97 million; the requested 2013 flood hazard mapping budget of \$89 million has been reduced due to the Sequestration Transparency Act of 2012, enacted on March 1, 2013, by an additional 8.2%, and could possibly be reduced further by spending cuts as the 2013 budget has yet to be introduced by the 113th U.S. Congress (FEMA, 2012; White House, 2012). This is not to say that the quality or quantity of the maps produced by FEMA have, or will have, decreased, thereby weakening this prerequisite. Yet it is a cause of concern and should be addressed by the USGBC by adding a fourth option allowing for an independent flood plain study by qualified scientists. Additionally, due to these concerns, the USGBC should replace the NFIP design requirements with the more rigorous building standards created by the International Code Council (ICC), as the ICC is an independent association whose mission is not influenced by politics, is the primary building code in the United States, and as the NFIP uses similar standards (FEMA, 2006; ICC, 2012a).

Table 7: Floodplain Avoidance and Option Utilization

Floodplain Avoidance	Total	Percentage of Total
Prerequisite	93	100%
Option 1	73	78.5%
Option 2	19	20.4%
Option 3	1	1.1%

5.1.2 Neighborhood Pattern & Design

This set of prerequisites focuses on the creation of "compact, walkable, vibrant, mixed-use neighborhoods with good connections to nearby communities" (USGBC, 2011a). It mainly encourages using transportation other than privately owned automobiles, such as walking, bicycling, or other public transport. This section, while providing thresholds to meet, is flexible as it only affects project design.

Table 8: Neighborhood Pattern and Design Prerequisites

Credit	Title	Options
NPD Prerequisite 1	Walkable Streets	--
NPD Prerequisite 2	Compact Development	1,2
NPD Prerequisite 3	Connected and Open Community	1,2

5.1.2.1 Walkable Streets

The first NPD prerequisite aims to create street environments that promote walking, not only to reduce vehicle miles traveled (similar to the third SLL prerequisite), but also to enhance public health by reducing pedestrian injuries due to traffic and boost daily physical activity (USGBC, 2011a). This prerequisite is new in the 2009 revisions and provides for a minimum level of aesthetic design (USGBC, 2011a).

As additional data becomes available, more research will be needed to see how the introduction of this prerequisite affected developers.

Table 9: Walkable Streets and Option Utilization

Walkable Streets	Total	Percentage of Total
Prerequisite	--	--

5.1.2.2 Compact Development

The Compact Development prerequisite is also intended to promote walking by improving public transportation efficiency and reducing vehicle miles traveled, as well as to conserve land (USGBC, 2011a). It fulfills this by requiring that developments meet certain building density thresholds depending upon, if located in a transit corridor, the walk distance to public transportation, and if not in such a location, a specific density threshold (USGBC, 2011a). This type of development focuses on compact, high- to medium-density, communities which greatly reduce the impacts of sprawl.

Other than the previously discussed changes in defining walk distance (see SLL Prerequisite 1, Smart Location), I have no further recommendations on improving this requirement.

Table 10: Compact Development and Option Utilization

Compact Development	Total	Percentage of Total
Prerequisite	93	100%
Option 1*	--	--
Option 2*	--	--

* New in 2009

5.1.2.3 Connected and Open Community

The final NPD prerequisite intends to create an internally connected community accessible to the surrounding areas (USGBC, 2011a). It specifies the number of internal intersections (none of which can be gated) and the number of streets intersecting its project boundary (USGBC, 2011a).

As previously discussed (see SLL Prerequisite 1, Option 2), defining how adjacent sites are connected to the surrounding community is an important facet of both the Smart Location and the Connected and Open Community prerequisites. Yet, these two prerequisites seem to work against each other by not allowing a developer to create new connections in the Smart Location option 2, or have the exemptions listed in this NPD prerequisite. This prerequisite should either: (1) be removed, with the requirement regarding no gated communities be merged into NPD Prerequisite 1, along with the passage of my second recommendation of improving SLL Prerequisite 1, Option 2; or (2) be left as is, along with the complete removal of SLL Prerequisite 1, Option 2.

Table 11: Connected and Open Community and Option Utilization

Connected and Open Community	Total	Percentage of Total
Prerequisite	93	100%
Option 1*	--	--

* New in 2009

5.1.3 Green Infrastructure and Buildings

The Green Infrastructure and Building portion of LEED-ND focuses on minimizing environmental impacts in the construction and operation of buildings and infrastructure (USGBC, 2011a). This section focuses on building design and technologies to reduce GHG emissions, increase available water resources, and protect existing trees and native vegetation (USGBC, 2011a). Additionally, it lessens the impacts of construction practices by reducing construction waste typically diverted to landfills and limiting the development footprint to preserve sensitive lands and site ecology (USGBC, 2011a).

Table 12: Green Infrastructure and Building Prerequisites

Credit	Title	Options
GIB Prerequisite 1	Certified Green Building	--
GIB Prerequisite 2	Minimum Building Energy Efficiency	--
GIB Prerequisite 3	Minimum Building Water Efficiency	--
GIB Prerequisite 4	Construction Activity Pollution Prevention	--

5.1.3.1 Certified Green Building

The first prerequisite states that at least one building in the project be certified by another LEED rating program, or through another third party that conforms with the International Organization for Standardization auditing standards (International Organization for Standardization, 2012; USGBC, 2011a). Green, sustainable, buildings have substantially lower impacts to the environment over the course of the complete building's life cycle (Office of the Federal Environmental Executive, 2003).

This requirement was added in the 2009 revisions, so there is no data yet available to determine if this prerequisite deterred the use of the LEED-ND system by developers yet (USGBC, 2011a&b). However, as 40 projects (43%) utilized the 2007 GIB Credit 1, Certified Green Buildings, for having buildings certified under such a system, any deterrence for this reason seems minimal. I have no recommendations on improving this prerequisite.

Table 13: Certified Green Building Utilization

Certified Green Building	Total	Percentage of Total
Prerequisite	--	--

5.1.3.2 Minimum Building Energy Efficiency

Intended to encourage the energy efficiency of the project's structures, this prerequisite requires that 90% of all new buildings must demonstrate a 10% reduction in energy consumption and buildings undergoing renovations must demonstrate a 5% reduction (USGBC, 2011a).

This requirement was added in the 2009 revisions, so there is no data yet available to determine if this prerequisite deterred the use of the LEED-ND system by developers yet (USGBC, 2011a&b). However, as 44

projects (47.3%) utilized the 2007 GIB Credit 2, Building Energy Efficiency, for having buildings certified under such a system, any deterrence for this reason seems minimal. I have no recommendations on improving this prerequisite.

Table 14: Minimum Building Energy Efficiency Utilization

Minimum Building Energy Efficiency	Total	Percentage of Total
Prerequisite	--	--

5.1.3.3 Minimum Building Water Efficiency

New in the 2009 revisions, this prerequisite requires that 90% of new buildings, and buildings undergoing renovations, demonstrate a 20% water use reduction (USGBC, 2011a). Additionally, 90% of single-family homes and new multiunit residences under three stories must meet the requirements in the LEED for Homes 2008 Credit 3, Indoor Water Use that would earn them 3 points (USGBC, 2011a).

This requirement was added in the 2009 revisions, so there is no data yet available to determine if this prerequisite deterred the use of the LEED-ND system by developers yet (USGBC, 2011a&b). However, as 62 projects (66.7%) utilized the 2007 GIB Credit 2, Building Water Efficiency, for having buildings certified under such a system, any deterrence for this reason seems minimal.

I recommend that the LEED-ND publication detailing these requirements define the combinations of fixtures that would meet the 3-point requirement, instead of having to reference another source.

Table 15: Minimum Building Water Efficiency Utilization

Minimum Building Water Efficiency	Total	Percentage of Total
Prerequisite	--	--

5.1.3.4 Construction Activity Pollution Prevention

The final GIB prerequisite is intended to reduce soil erosion due to construction activity (USGBC, 2011a). All projects must create and implement an erosion control plan using the Washington State Department of Ecology's Stormwater Management Manual in selecting the best management practices (USGBC, 2011a). As many local jurisdictions require the use of an erosion control plan to comply with building codes, this is not an unreasonable prerequisite. I have no recommendations for improvement.

Table 16: Construction Activity Pollution Prevention Utilization

Construction Activity Pollution Prevention	Total	Percentage of Total
Prerequisite	--	--





5.2 LEED-ND Credits

After completion of the prerequisites, each project is rated and either rejected or given a level of LEED-ND approval: certified, silver, gold, or platinum (USGBC, 2011a). Points can be earned in five categories: Smart Location and Linkage (9), Neighborhood Pattern and Design (15), Green Infrastructure and Building (17),

Innovation and Design Process (2), and Regional Priority(1) (USGBC, 2011a). Each credit is worth a varying amount of points for meeting certain thresholds (USGBC, 2011a).

Each credit was designed to meet one of eight sustainable development goals: smart location, sensitive lands protection, site and transportation design, public health, social equity, energy and climate, water resources, and infrastructure efficiency. For each prerequisite, the following symbols are placed next to its name to indicate which development goal LEED-ND intended to address:

Table 17: Legend of Sustainable Development Goals Achieved in Each Credit

 = Smart Location	 =Social Equity
 = Sensitive Land Protection	 =Energy and Climate
 =Site and Transportation Design	 =Water Resources
 =Public Health	 = Infrastructure Efficiency

In addition, after each description of these prerequisites, a table will show the name of the prerequisite, if different options are available to achieve its requirements, and the utilization percentage of developments achieving LEED-ND status in the pilot program from the data collected in this thesis.

5.2.1 Smart Location and Linkage

The intent of this section of credits is the same as the SLL Prerequisites, although it is not as inflexible as many options are available for most credits. It reduces urban sprawl by promoting growth in large urban areas, redevelops and decontaminates brownfields, protects and conserves wetlands, water bodies, and steep slopes, and reduces automobile dependence.

5.2.1.1 Preferred Locations

The first SLL Credit, worth between one and a maximum of ten points, intends to boost development within existing cities to reduce urban sprawl, as well as reduce resource uses associated with the construction and maintenance of infrastructure (USGBC, 2011a). Three options, which can be combined, are available to earn up to ten points under this credit.

First, a project's location is considered. One point is awarded for being a previously developed site not an adjacent or infill site; two are awarded for being a previously developed adjacent site; three for being a non-developed infill site; or five for being a developed infill site (USGBC, 2011a). These points can be earned in conjunction with SLL Prerequisite 1, Options 1 and 2.

Second, projects may earn between one and five points for the number of preexisting intersections within ½ mile of the project boundary (USGBC, 2011a). None of these intersections within the site may have been constructed or funded by the developer within the past 10 years, similar to SLL Prerequisite, Option 2 (USGBC, 2011a). Previously, I argued against this type of requirement, stating that it hinders sustainable development; yet, as I see how the system could be manipulated to achieve a higher certification level, I fully support this requirement for the first SLL credit.

Finally, new in the 2009 revisions, a project may earn an additional 3 points for earning at least 2 points in NPD Credit 4, Mixed-Income Diverse Communities, Option 2, which almost 51% of all LEED-ND certified projects utilized. This is a form of double-counting, which makes statistical analysis problematic, as well as being ethically questionable as it artificially inflates the social equity facet of sustainable development (Mayo, 2008; Senn, 2009). I recommend this option be removed and the available points for NPD Credit 4 be increased to encourage its use instead.

Table 18: Preferred Locations Utilization

SLL Credit 1 (1-10)	Total	Percentage of Total	Mean Point Total
Preferred Locations	90	96.8%	7.8

5.2.1.2 Brownfields Redevelopment



This credit is intended to promote the redevelopment of brownfield locations, thereby reducing urban sprawl (USGBC, 2011a). A project may earn one point for being located on a documented brownfield location or two points for being located in a documented high-priority brownfield area, such as those listed under the EPA's National Priorities List, otherwise known as Superfund sites (USGBC, 2011a).

According to the EPA, there are an estimated 450,000 brownfields locations across the United States (EPA, 2012c). Reinvesting in and decontaminating these properties not only protects the environment, but also allows for existing infrastructure to be used, while reducing urban blight (EPA, 2012c). Initially, the 2007 pilot program gave one more point for investing in brownfield redevelopment; it is unclear as to why the 2009 revisions reduced this amount, as almost 59% of participants utilized this credit to achieve certification, which would argue for keeping the status quo, if not raising the points available, in order to promote such reinvestment in previously developed, environmentally unfriendly, locations (USGBC, 2011b). As more data becomes available, further research will be needed to determine if fewer participants utilized this credit using the 2009 revisions; if so, I would suggest the initial point value be reinstated.

Table 19: Brownfields Redevelopment and Option Utilization

SLL Credit 2 (1-2)	Total	Percentage of Total	Mean Point Total
Brownfields Redevelopment	55	59.1%	2.5
Option 1	29	31.2%	2
Option 2	26	27.9%	3

5.2.1.3 Locations with Reduced Automobile Dependence



The third SLL credit encourages locating the project either in an area with a public transit service or a metropolitan area which has a low vehicle miles traveled (VMT) per capita in order to reduce motor vehicle use and its related greenhouse gas and air pollution emissions (USGBC, 2011a). It has two options for which points cannot be combined, with a maximum of seven points that may be awarded.

The first option stipulates that the project must be located where at least 50% of buildings will be within a reasonable walking distance to existing public transit service (USGBC, 2011a). More points are awarded for locations with a higher number of transit trips completed per day, in aggregate, for a maximum of seven points. Over 83% of projects utilized this option, which also meets the requirements of SLL Prerequisite 1, Option 3.

The second option, which only 1 project used, requires that the location of the project be in an area with low VMT verified by a local metropolitan planning organization (USGBC, 2011a). More points are awarded for meeting increased threshold levels.

The pilot program had a third option giving a point if the project had a vehicle-sharing program viable for a minimum of three years (USGBC, 2011b). This option was moved to NPD Credit 8 in the 2009 revisions (USGBC, 2011a&b).

Reducing automobile use has many environmental and public health benefits (Behan, Maoh, & Kanaroglou, 2008; Grabow, et al., 2012; Intergovernmental Panel on Climate Change, 2008). Expanding this credit by allowing projects with planned public transit to be able to earn points under option 1, as allowed in SLL Prerequisite 1, Option 3 should be implemented in the next LEED-ND revision. As doing so would make it slightly easier for projects to attain certification, which is not the intent of this recommendation, the point awarded for meeting the prerequisite baseline of SLL Prerequisite 1, Option 3, should also be removed and replaced with SLL Credit 4, discussed below.

Table 20: Locations with Reduced Automobile Dependence and Option Utilization

SLL Credit 3 (1-7)	Total	Percentage of Total	Mean Point Total
Locations with Reduced Automobile Dependence*	85	91.4%	5.2
Option 1	78	83.9%	5.1
Option 2	1	1.1%	4.0
Option 3	15	16.1%	1.0

* Not all projects reported the option utilized

5.2.1.4 Bicycle Network and Storage



Over 47% of all projects earned the possible point in SLL credit 4, which intends to promote bicycling, thereby reducing VMT and increasing public health (USGBC, 2011a). This credit can be earned by locating the project near an existing bicycle network, or within a certain distance to schools, employment centers, and/or neighborhood centers (USGBC, 2011a). Additionally, all new buildings must provide secure, enclosed bicycle storage space, the size determined by a percentage of planned occupancy (USGBC, 2011a). Additionally, nonresidential buildings must provide one on-site shower and changing facility for the first 100 workers and an additional facility for each additional 150 workers thereafter (USGBC, 2011a).

As this credit is placed in the Smart Location and Linkage section, it was intended to promote the smart location of a project, not the design of the project itself. I recommend that this credit be deleted from future revisions and merged into two different credits: (1) locating the project with a nearby, extensive, bicycle network should be an additional option in SLL Credit 3, Locations with Reduced Automobile Dependence, with a point awarded, and (2) merging the bicycle storage option into NPD Credit 8, Transportation Demand Management (discussed below).

Table 21: Bicycle Network and Storage utilization

SLL Credit 4 (1)	Total	Percentage of Total	Mean Point Total
Bicycle Network and Storage	44	47.3%	1

5.2.1.5 Housing and Jobs Proximity



A maximum of three points can be awarded with this credit by meeting the one-point requirement of NPD Credit 4, Mixed-Income Diverse Communities, Option 2, as well as having at least 30% of its building space be residential, and being within a ½-mile walk of existing full-time employment whose number is equal to the number of dwelling units (USGBC, 2011a). Two points can be earned for the same residential space requirements, without fulfilling NPD Credit 4, Option 2 (USGBC, 2011a). One point is available for 30% of the building space being nonresidential, being an infill site within a ½-mile walk to existing public transit, and within ½-mile walk to existing residences whose number is equal to at least half of new full-time employment (USGBC, 2011a).

Encouraging diverse, mixed-use, and affordable communities is a key constituent of creating sustainable urban developments (Litman, 2011; USGBC, 2011a). However, once again NPD Credit 4, Option 2, is being awarded additional credits. As previously discussed, this is an ethically questionable practice as it artificially inflates the social equity facet of sustainable development that LEED-ND intends to address in NPD Credit 4. I recommend the first option of SLL Credit 5, which was new in the 2009 revisions, be removed from the rating system.

Additionally, the 2009 revisions modified the second and third options, requiring the amount of building space used from 25% to 30% for both residential and nonresidential buildings while lowering the amount of points available to be awarded. (USGBC, 2011a&b). Additional research will be needed as data related to the 2009 revisions becomes available in order to determine if the utilization of this credit declined with this increased requirement.

Table 22: Housing and Jobs Proximity and Option Utilization

SLL Credit 5 (1-3)	Total	Percentage of Total	Mean Point Total
Housing and Jobs Proximity*	79	85.0%	3.0
Option 1	--	--	--
Option 2	72	77.4%	3.0
Option 3	4	4.3%	3.0

* Not all projects reported the option utilized

5.2.1.6 Steep Slope Protection



Steep slope protection is intended to reduce erosion and prevent sedimentation of nearby water bodies by regulating construction on slopes above 15% (USGBC, 2011a). Three options are given to earn one point: (1) have the project located on a site with no slopes over 15% or avoid building on those slopes; (2) redevelop sites with 15% or higher slopes while restoring the slope habitats with native or adapted plants and protecting the slope with covenants, conditions, and restrictions (CC&R); or, (3) build on undeveloped sites in a way that at least 40% of slopes at 15% or more will be unaffected and protected with CC&Rs (USGBC, 2011a).

This credit was only completed by 64.5% of participants, a lower number than I would have expected as steep slopes are not ideal for development. Further research is needed to determine if the CC&Rs may be a possible source for projects excluding this credit from their certification process.

Table 23: Steep Slope Protection and Option Utilization

SLL Credit 6 (1)	Total	Percentage of Total	Mean Point Total
Steep Slope Protection*	60	64.5%	1.0
Option 1	49	52.7%	1.0
Option 2	8	8.6%	1.0
Option 3	1	1.1%	1.0

* Not all projects reported the option utilized

5.2.1.7 Site Design for Habitat or Wetland and Water Body Conservation

This credit intends to conserve the natural flora of an area, its wildlife habitats, and any wetlands and/or water bodies in the project by going beyond the baseline requirements discussed in SLL Prerequisite 2, Imperiled Species and Ecological Communities Conservation and/or SLL Prerequisite 3, Wetlands and Water Body Conservation (USGBC, 2011a). It expands the number of possible imperiled species and requires a donation of lands in perpetuity which either are significant habitat areas or have wetland or water bodies (USGBC, 2011a).

In the 2007 pilot program, 29 projects earned a point in this credit, or 31.2%; however, this credit was modified in the 2009 revisions and moved an option for using native plants for vegetation into GIB Credit 4, Water-Efficient Landscaping (USGBC, 2011b). Only one project would have earned a point if utilizing the revised version of LEED-ND.

I fully support the intent and implementation of this credit; however, due to lack of use and the importance of protecting ecosystems, I recommend that two points be awarded instead of the current one point. Additionally, as data becomes available for the 2009 revisions, more research is needed to determine if the utilization of this credit is reduced as indicated by the converted Pilot scorecards.

Table 24: Site Design for Habitat or Wetland and Water Body Conservation

SLL Credit 7 (1)	Total	Percentage of Total	Mean Point Total
Site Design for Habitat or Wetland and Water Body Conservation	1	31.2%	1.0
Option 1*	--	--	--
Option 2	1	1.1%	1.0
Option 3	0	0	0

* New in 2009 Revisions

5.2.1.8 Restoration of Habitat or Wetlands and Water Bodies

Almost 10% of all pilot projects completed this credit, which awards a point for restoring habitat and wetlands that have been altered by human activities (USGBC, 2011a). It requires that a land area equal to at least 10% of the development footprint be restored to predevelopment conditions, these lands be protected in perpetuity by donating or selling them to an accredited land trust, and the land be managed and maintained for a minimum of three years after the project is completed or the land is restored, using the later date for starting these activities (USGBC, 2011a).

It is not surprising that this credit is not utilized often, as restoring land is not as profitable as developing it, nor is it an easy task to accomplish (Miller & Hobbs, 2007). As Miller & Hobbs discuss, many ecological factors can make restoration likely to fail: severe environmental degradation, species habitat area thresholds, climate change, and the ecological role of invasive species (Miller & Hobbs, 2007). There are also financial and social concerns which can make restoration impossible (Miller & Hobbs, 2007).

This credit was expanded to be more stringent in the 2009 revisions, so more research is needed to determine if its use has lowered (USGBC, 2011a&b). Given the difficulty restoration can be, I suggest this credit award 2 points, instead of the current one, but also be altered that 10-year term be required to maintain any restoration project.

Table 25: Restoration of Habitat or Wetlands and Water Bodies Utilization

SLL Credit 8 (1)	Total	Percentage of Total	Mean Point Total
Restoration of Habitat or Wetlands and Water Bodies	9	9.7%	1.0

5.2.1.9 Long-Term Conservation Management of Habitat or Wetlands and Water Bodies

The final SLL credit awards one point for protecting new or existing native habitats, wetlands, and water bodies onsite by requiring at least a 10-year management plan (USGBC, 2011a). Even though only 15% of all projects utilized this credit, it is not onerous and, while more research would be needed to determine why it was not used often, seems to be weighted adequately. I have no recommendations on improvement of SLL Credit 9.

Table 26: Long-Term Conservation Management of Habitat or Wetlands and Water Bodies Utilization

SLL Credit 9 (1)	Total	Percentage of Total	Mean Point Total
Long-Term Conservation Management of Habitat or Wetlands and Water Bodies	14	15.0%	1.0

5.2.2 Neighborhood Pattern and Design

This set of credits focuses on the creation of “compact, walkable, vibrant, mixed-use neighborhoods with good connections to nearby communities” (USGBC, 2011a).

5.2.2.1 Walkable Streets

Promoting walkable streets intends to reduce VMT as well as support public health by encouraging walking in the community (USGBC, 2011a). This credit expands on NPD Prerequisite 1, Walkable Streets, by providing sixteen design features regarding façades, entries, sidewalks, ground-level use and parking, and design speeds for safe pedestrian and travel, and assigns points on achieving each set of two options (USGBC, 2011a).

The requirements are similar to the 2007 pilot program; however the way the points are distributed is new in the 2009 revisions, now giving 1-12 points instead of the initial 4-8 (USGBC, 2011a&b). Based on a logical conversion, it would appear that the mean point distribution is approximately the same, yet more research would be required to determine the exact point total in any conversion as well as the impact of broadening the available points in the two programs. Until such research is completed, I have no recommendations on this credit. It is necessary to note there is a wide three-point gap between 9 and 10 items achieved, an issue in which more research would be required, and the high number of available points achievable when compared to most other credits.

Table 27: Walkable Streets Utilization

NPD Credit 1 (1-12)	Total	Percentage of Total	Mean Point Total*
Walkable Streets	66	71.0%	5.6

* Unable to convert to 2009 revisions

5.2.2.2 Compact Development



Compact Development, NPD Credit 2 is just an extension of NPD Prerequisite 2, which intends to encourage development within existing areas (USGBC, 2011a). Residential and nonresidential density minimums are calculated with points allotted to meeting specific thresholds, which are higher than the prerequisites (USGBC, 2011a). There are no recommendations to improve this credit's implementation or point structure.

Table 28: Compact Development Utilization

NPD Credit 2 (1-6)	Total	Percentage of Total	Mean Point Total
Compact Development	88	94.6%	4.4

5.2.2.3 Mixed-Use Neighborhood Centers



The third NPD credit intends to cluster together residential and a retail center in order to reduce dependence on the personal automobile (USGBC, 2011a). To earn this credit, projects must have over 50% of residential units located within a walk of ¼ mile to at least 4 different existing or planned diverse uses, including one grocery store (USGBC, 2011a). Additionally, if a project has more than 150,000 square feet of retail uses, they must earn one point under SLL Credit 3, Option 1, and for each additional 50,000 square feet, they must earn another point under SLL Credit 3, Option 1 (USGBC, 2011a). Points are given only on meeting thresholds on diverse uses, with no additional points being given for earning them in another credit, so there is no “double counting” conflict.

People are more likely to walk when a destination is within ¼ mile of their location, so this credit is well designed to encourage walking, biking, and the use of other public transit options (Transit Cooperative Research Program, 1995). Additionally, this credit allows for planned retail centers within the project boundary, therefore previous arguments on the discussion of walk distances do not apply. However, the requirement was strengthened when revised in 2009, so additional research will be needed to see any influence in this credit's utilization (USGBC, 2011a&b). At this time, I have no recommendations on improving this credit.

Table 29: Mixed-Use Neighborhood Centers Utilization

NPD Credit 3 (1-4)	Total	Percentage of Total	Mean Point Total
Mixed-Use Neighborhood Centers	87	93.5%	3.6

5.2.2.4 Mixed-Income Diverse Communities



This credit allows developers to: (1) earn a maximum three points by categorizing the number and type of housing units and then calculate the probability that any two randomly selected will be of a different type using the Simpson Diversity Index; (2) earn three points by providing a proportion of new housing, either as a rental or for sale, priced below the area mean income; and/or (3) earn a bonus point by scoring at least 2 points in both options (1) and (2) (USGBC, 2011a).

This credit was changed in 2009 by merging three old credits together and allowing for additional levels of points available (USGBC, 2011a&b). Almost 75% of participants utilized option 1, which was intended to encourage many different, denser, housing units, thereby also reducing urban sprawl (USGBC, 2011a). Slightly over 50% used option 2, which makes housing more affordable to low-income families, and fulfills the social equality tenet of sustainable building (WCED, 1987). As this option was expanded to allow for more participants, more research will be needed in the future to see its impact (USGBC, 2011a&b).

Achieving a certain number of points in this credit also earns credits in SLL Credit 1, Preferred Locations and SLL Credit 5, Housing and Jobs Proximity (USGBC, 2011a). As discussed, this form of double counting should be eliminated and this credit should be reevaluated and the available points possible to be earned should be increased.

Table 30: Mixed-Income Diverse Communities and Option Utilization

NPD Credit 4 (1-7)	Total	Percentage of Total	Mean Point Total
Mixed-Income Diverse Communities	74	80.0%	4.7
Option 1 (3)	69	74.2%	2.6
Option 2 (3)	48	51.6%	2.9
Option 3 (1)	35	37.6%	1.0

5.2.2.5 Reduced Parking Footprint



All new projects are required to locate new parking areas on the sides or rear of new nonresidential and multiunit residential buildings, designed to encourage walking; to conserve available land and increase compact development by using no more than 20% of the total developmental footprint for new parking lots, none larger than 2 acres; encourage bicycling by providing bicycle storage to new residential and nonresidential buildings; and to provide 10% of the available parking only to designated carpool and/or shared-use vehicles (USGBC, 2011a).

The bicycle storage option, as previously discussed, should be moved to NPD Credit 8, Transportation Demand Management, especially as the point value of this credit has been lowered by half in the 2009 revisions, the impact of which will require additional research as data becomes available (USGBC, 2011a&b). Otherwise, I have no recommendations on improving this option.

Table 31: Reduced Parking Footprint Utilization

NPD Credit 5 (1)	Total	Percentage of Total	Mean Point Total
Reduced Parking Footprint	66	71.0%	1.0

5.2.2.6 Street Network



Projects may earn up to 2 points by designing the street network with a high level of external and internal connections, a connection between over 90% of new internal cul-de-sacs, excluding those areas where a connection is physically impossible (USGBC, 2011a). This credit is an extension of both NPD Prerequisite 3 and SLL Credit 1, Option 2 (USGBC, 2011a). It acts as giving bonus points for achieving internal street connections, with additional caveats, therefore I do not consider it an example of double counting, especially as it allows the developer to create such intersections without the burden of not funding or developing them within the past 10

years (USGBC, 2011a). I have no recommendations on improving this credit, especially as it has been strengthened with the 2009 revisions; however, more research will be needed to determine if such strengthening has reduced its use in the certification program (USGBC, 2011a&b).

Table 32: Street Network Utilization

NPD Credit 6 (1-2)	Total	Percentage of Total	Mean Point Total
Street Network	80	86.0%	1.7

5.2.2.7 Transit Facilities

Amended in 2009, this credit requires that the developer coordinate with the local public transit authority to determine locations to install transit stops and other improvements within and immediately surrounding the project in order to encourage public transportation (USGBC, 2011a&b). Previously, it had required the developer do this themselves, which may indicate why less than 50% of all projects completed this credit (USGBC, 2011b). When more data is available, additional research will be needed to determine if the use of this credit increased with the amendments.

Table 33: Transit Facilities Utilization

NPD Credit 7 (1-2)	Total	Percentage of Total	Mean Point Total
Transit Facilities	45	48.4%	1.0

5.2.2.8 Transportation Demand Management

Intending to reduce personal automobile travel and encourage public transit, the transportation demand management credit is designed by in that one point can be earned for every two options completed, up to a maximum of two points (USGBC, 2011a).

This credit was amended in 2009 to require more options be completed to earn points, making it more difficult to achieve certification; the pilot program awarded 28 projects points, yet converting these scores to the 2009 revisions, only 11 would have received points (USGBC, 2011a&b). Yet, the amendments also added more options available to choose from (to five). When more data is available, additional research will indicate if these additions were incentives for more projects to earn points under this credit.

I recommend that, in order to provide more incentive, the current bicycle storage requirements contained in SLL Credit 4, Bicycle Network and Storage, and NPD Credit 5, Reduced Parking Footprint, be moved into this credit as an additional option, as well as allow a maximum of three points to be earned. Additionally, the requirement that a TDM program may not utilize the other options in the threshold calculations should be removed, but the threshold should also be raised to at least 25%.

Table 34: Transportation Demand Management and Option Utilization

NPD Credit 8 (1-2)	Total	Percentage of Total	Mean Point Total
Transportation Demand Management	11	11.8%	1.0
Option 1	3	3.2%	--
Option 2	6	6.5%	--
Option 3	6	6.5%	--
Option 4	--	--	--
Option 5	--	--	--

5.2.2.9 Access to Civic and Public Space



A point can be earned in this credit by locating and/or designing the project near civic or passive-use spaces within ¼ mile walking distance of 90% of planned and existing buildings (USGBC, 2011a). The size of the civic or passive use space is dependent on the size of the project (USGBC, 2011a). I have no recommendations on improving this credit.

Table 35: Access to Civic and Public Space Utilization

NPD Credit 9 (1)	Total	Percentage of Total	Mean Point Total
Access to Civic and Public Space	64	68.8%	1.0

5.2.2.10 Access to Recreation Facilities



This credit gives one point for locating and/or designing the projects near recreational facilities within ½ mile walk of 90% of planned and existing buildings (USGBC, 2011a). I have no recommendations for this credit.

Table 36: Access to Recreation Facilities Utilization

NPD Credit 10 (1)	Total	Percentage of Total	Mean Point Total
Access to Recreation Facilities	67	72.0%	1.0

5.2.2.11 Visitability and Universal Design



In order to fulfill the social equity tenet of sustainable building, this credit incorporates building code standards intended to improve the accessibility of buildings for people with disabilities. (ICC, 2013; USGBC, 2011a). This credit needs no improvements. However, due to the 2009 revisions, more research will be needed to see its utilization increased after more data becomes available.

Table 37: Visitability and Universal Design Utilization

NPD Credit 11 (1)	Total	Percentage of Total	Mean Point Total
Visitability and Universal Design	30	32.3%	1.0

5.2.2.12 Community Outreach and Involvement



Intended to promote the needs and desires of the surrounding community, this credit allows developers to earn points by holding community meetings to solicit input on the project's design throughout the entire process of planning and construction (USGBC, 2011a). It allows one point to be earned through basic community outreach and an additional point to be earned by also conducting a collaborative workshop of two days during the design process to solicit input on conceptual designs (USGBC, 2011a).

Community outreach is important, especially as it allows residents and businesses to learn about environmental issues a LEED-ND project is attempting to mitigate. I have no recommendations on improving this credit, although more research will be needed as data becomes available on how many projects utilize the additional 2009 revision point for a workshop (USGBC, 2011a&b).

Table 38: Community Outreach and Involvement Utilization

NPD Credit 12 (1-2)	Total	Percentage of Total	Mean Point Total
Community Outreach and Involvement	64	68.8%	1.0

5.2.2.13 Local Food Production

Growing a local source of produce has many environmental and social benefits, such as lowering the distance fresh food has to travel (USGBC, 2011a). This one-point credit can be earned by requiring that all projects establish CC&Rs, or other deed restrictions, which do not prohibit growing produce in the entire project area and fulfill one of three options to encourage local food production. (USGBC, 2011a).

There could be a legal conflict between the required CC&Rs and local codes which state that front yard gardens are illegal, which may explain partly why only about 13% of all projects utilized this credit (CBC News, 2012; Ewing, 2013; Hughes, 2011). I recommend that the requirement that CC&Rs be created to be modified to allow for placing prohibitions to comply with local codes.

Table 39: Local Food Production and Option Utilization

NPD Credit 13 (1)	Total	Percentage of Total	Mean Point Total
Local Food Production*	12	12.9%	1.0
Option 1	3	3.2%	1.0
Option 2	2	2.2%	1.0
Option 3	4	4.3%	1.0

* Not all projects reported the option utilized

5.2.2.14 Tree-Lined and Shaded Streets

New in the 2009 revisions, this credit is intended to complement GIB Credit 9, Heat Island Reduction, as well as provide an aesthetically pleasing walking experience for pedestrians (USGBC, 2011a). A project may earn up to two points by providing street trees to provide shade. (USGBC, 2011a). As data becomes available, more research will be needed to determine the number of projects utilizing this credit. I have no recommendations for this credit.

Table 40: Tree-Lined and Shaded Streets Utilization

NPD Credit 14 (1)	Total	Percentage of Total	Mean Point Total
Tree-Lined and Shaded Streets	--	--	--

5.2.2.15 Neighborhood Schools

Previously SLL Credit 7 in the pilot version, this credit requires projects to locate near schools in order to encourage schoolchildren to walk and bike to school (USGBC, 2011a). It requires that 50% of residences be located within a ½ mile walk of an existing or planned elementary or middle school or within 1 mile walk of an existing or planned high school (USGBC, 2011a). It also requires that new school campuses may not exceed a certain size, although any multiuse space may be deducted from this total if there is a formal joint-use agreement with another entity (USGBC, 2011a). I have no recommendations on improving this credit.

Table 41: Neighborhood Schools Utilization

NPD Credit 15 (1)	Total	Percentage of Total	Mean Point Total
Neighborhood Schools	68	73.1%	1.0

5.2.3 Green Infrastructure and Buildings

The Green Infrastructure and Building portion of LEED-ND focuses on minimizing environmental impacts in the construction and operation of buildings and infrastructure (USGBC, 2011a). This section is mainly intended to reduce GHG emissions, increase available water resources, reduce construction waste typically diverted to landfills, and improve upon the efficiency of existing infrastructure.

5.2.3.1 Certified Green Buildings

The first GIB credit is intended to reward projects for utilizing green building practices when designing, constructing, and renovating buildings in the project (USGBC, 2011a). It awards up to five points for projects utilizing one of two options, depending upon the size of the project: (1) projects with 10 or fewer habitable buildings may earn a point for every building which is certified by LEED or another, third party green certification program; or (2) projects of all sizes may earn a point for every 10% of building square footage certified by LEED or another third party (USGBC, 2011a). The buildings which fulfill the prerequisite are not to be used in these calculations (USGBC, 2011a).

As this credit was modified in 2009 to allow more points to be earned, more research would be needed to determine that impact on projects utilizing this credit. Based on a logical point conversion, only about 38% of the 2007 pilot projects would have received credit, compared to the 43% whom achieved it based on the 2007 requirements. Yet, the loss of utilization is outweighed by the new prerequisite which incorporates green construction practices into all projects. I have no recommendations on this credit, other than possibly lifting the cap on points available.

Table 42: Certified Green Buildings utilization

GIB Credit 1 (1-5)	Total	Percentage of Total	Mean Point Total
Certified Green Buildings	36	38.7%	3.4

5.2.3.2 Building Energy Efficiency

The Building Energy Efficiency credit expands on GIB Prerequisite 2, Building Energy Efficiency (USGBC, 2011a). If projects improve on the ANSI 90.1-2007 standard by 18% for new buildings and 14% for renovated buildings, they may earn one point; similarly, if new buildings achieve a 26% improvement and 22% for renovated buildings, they may earn two points (USGBC, 2011a). Additionally, all single-family residences must score a 75 on the Energy Star's Home Energy Rating System index (USGBC, 2011a).

This credit was modified in 2009 to increase percentages needs to earn the allotted points, as well as requiring that all projects meet a certain baseline (USGBC, 2011a). Once again, this possible loss in utilization is outweighed by the new prerequisite incorporating energy efficiency. I have no recommendations on this credit.

Table 43: Building Energy Efficiency Utilization

GIB Credit 2 (2)	Total	Percentage of Total	Mean Point Total
Building Energy Efficiency	44	47.3%	2.5

* Unable to convert to 2009 revisions

5.2.3.3 Building Water Efficiency



The Building Water Efficiency credit expands on GIB Prerequisite 3, Building Water Efficiency by allowing projects to earn a point if new buildings and renovations improve water efficiency by 40% of the baseline based on the requirements of the Energy Policy Act of 1992 and its subsequent amendments (USGBC, 2011a). Additionally, 90% of single-family homes and new multiunit residences under three stories must meet the requirements in the LEED for Homes 2008 Credit 3, Indoor Water Use that would earn 5 points (USGBC, 2011a).

This credit was modified in 2009 to increase percentages needed to earn the allotted point, as well as requiring that all projects meet a certain baseline (USGBC, 2011a). Once again, this possible loss in utilization is outweighed by the new prerequisite incorporating water efficiency. However, the modifications also lowered the points available, from two to one. More research will be needed as data becomes available to determine if fewer projects utilized this credit. I have no recommendations at this time.

Table 44: Building Water Efficiency Utilization

GIB Credit 3 (1)	Total	Percentage of Total	Mean Point Total
Building Water Efficiency	61	65.6%	1.75

* Unable to convert to 2009 revisions

5.2.3.4 Water-Efficient Landscaping



Intending to reduce the use of potable water, one point may be earned by reducing landscape water usage by 50% through various strategies such as xeriscaping or captured rainwater (USGBC, 2011a). This credit was modified in 2009, removing it from GIB Credit 3, Building Water Efficiency, as well as allowing projects which have no new or existing irrigation requirements to automatically meet the requirements of this credit (USGBC, 2011a&b). Most likely, this modification will allow a higher usage of this credit, although more research will be needed as data becomes available.

One of the strategies listed in this credit is that projects may use water “treated and conveyed by a public agency specifically for nonpotable uses” (USGBC, 2011a). Due to the previously discussed reasons in SLL Prerequisite 1, I recommend this credit be modified to additionally allow projects be served by privately owned water and wastewater plants.

Table 45: Water-Efficient Landscaping Utilization

GIB Credit 4 (1)	Total	Percentage of Total	Mean Point Total
Water-Efficient Landscaping	33	35.4%	1.0

5.2.3.5 Existing Building Refuse



This credit intends to conserve resources and reduce waste by reusing the existing building stock on the property (USGBC, 2011a). It requires that all projects calculate the amount of surface area of the existing buildings and, based on which is the greater amount, either: (1) reuse 50% of one building’s structure; or (2), reuse 20% of the entire project’s building stock (USGBC, 2011a). Additionally, projects may not demolish any historic buildings or alter cultural landscapes during construction, unless approval is given by a local historic preservation review board (USGBC, 2011a).

It is unclear as why only about 35% of all projects utilized this credit, as deconstruction costs are comparable to demolition costs, especially when disposal costs are high in an area (Kuykendall & Bennink, 2004). It possibly could be due to a difference between the types of existing building stock and the building stock intended to be used in construction. For example, in 2003 Gainesville Regional Utilities planned to expand their office complex (Guy & Williams, 2003). Although not a LEED project, they partnered with the Powell Center for Construction and Environment to deconstruct an abandoned house in the way of the planned expansion (Guy & Williams, 2003). According to Guy and Williams, the total amount of salvageable material in the abandoned home was 17,679 lbs, of which 8,082 lbs was incorporated into the new office building due to aesthetic and architectural reasons, or just over 45% (2003). This amount would not have earned this project a point under this credit. However, if they had utilized the recycling strategies described by Kuykendall and Bennink, all of the material salvaged could have been recycled or reintroduced into a commercial market (2004).

I recommend this credit be modified to allow points to be earned for certain benchmarks of landfill diversion rates, such as earning a point for diverting 50%, and two for 75%, of all salvageable building material from the landfill through recycling, reuse, and reintroducing it into the market, similar to a current requirement in GIB Credit 16, Solid Waste Management Infrastructure, which I will discuss later. Pilot projects utilized that method at a much higher rate of over 76%.

Table 46: Existing Building Refuse Utilization

GIB Credit 5 (1)	Total	Percentage of Total	Mean Point Total
Existing Building Refuse	32	34.4%	1.0

5.2.3.6 Historic Resource Preservation and Adaptive Use



This credit is only available for projects with a historic building or cultural landscape on its location and is earned by not demolishing or altering any portion of them unless authorized to do so by a local historic preservation review board (USGBC, 2011a). Additionally, if any historic building is to be renovated, they must adhere to the most restrictive local or federal standards for rehabilitation (USGBC, 2011a).

Due to the extensive social, educational, aesthetic, and economical benefits historical buildings and cultural landscapes can provide, this credit should be eliminated and become a NPD prerequisite (PlaceEconomics, 2011).

Table 47: Historic Resource Preservation and Adaptive Use Utilization

GIB Credit 6 (1)	Total	Percentage of Total	Mean Point Total
Historic Resource Preservation and Adaptive Use	20	21.5%	1.0

5.2.3.7 Minimized Site Disturbance in Design and Construction



This credit is intended to conserve existing native plants, trees, and pervious surfaces on the project's location (USGBC, 2011a). All projects must survey the site to classify each tree on the site and preserve a certain level of them by developing a plan to safeguard the trees during construction and protect them in perpetuity by establishing CC&Rs (USGBC, 2011a). Also, in order to preserve pervious surfaces, either: (1) the development footprint is located where the construction impact zone is on 100% previously developed land; or (2), leave a

certain percentage of the area left undisturbed, depending on the density of the project, and establish CC&Rs to protect such areas in perpetuity (USGBC, 2011a).

Over 80% of all projects utilized option 1, which is not surprising since nearly 90% were located on areas which were infill sites, as defined in SLL Prerequisite 1, Option 1 (USGBC, 2011a). Option 2, while only utilized by slightly over 4% of all projects, does not seem onerous. I have no recommendations on improving this option as it fulfills its stated goals.

Table 48: Minimized Site Disturbance in Design and Construction and Option Utilization

GIB Credit 7 (1)	Total	Percentage of Total	Mean Point Total
Minimized Site Disturbance in Design and Construction*	82	88.2%	1.0
Option 1	76	81.7%	1.0
Option 2	4	4.3%	1.0

* Not all projects reported utilized options

5.2.3.8 Stormwater Management



Managing stormwater runoff is important to protect water bodies from sedimentation, excess nutrients, and other hazardous materials (EPA, 2012d). This nonpoint source of pollution is also linked to many chronic and acute diseases through exposure from eating contaminated seafood and/or swimming, or other recreation, in polluted waters (Gaffield, Goo, Richards, & Jackson, 2003). This credit addresses these environmental and public health concerns by requiring that projects implement a stormwater management plan in which a certain percentage of rainfall is retained on-site (USGBC, 2011a). Projects may earn one point by retaining 80% of rainfall volume, with an additional point for every 5% increase, up to a total four points at 95% (USGBC, 2011a).

I fully support the intent of this credit. However, once again, LEED-ND double-counts previously used credits by awarding a bonus point if it has either: located on a previously developed site, a brownfield site, or if it has earned 2 points in NPD Credit 1, Walkable Streets, 2 points in NPD Credit 2, Compact Development, and 2 points in NPD Credit 3, Mixed-Use Neighborhood Centers (USGBC, 2011a). I recommend this bonus point be removed and other methods be employed to encourage the use of these differing credits.

Table 49: Stormwater Management Utilization

GIB Credit 8 (1-4)	Total	Percentage of Total	Mean Point Total
Stormwater Management*	54	58.1%	3.4

* Unable to Convert to 2009 Revisions

5.2.3.9 Heat Island Reduction



Anthropogenic energy consumption and solar heat radiation from roofs and other hardscapes increase the sensible heat flux, resulting in the urban heat-island effect (Kato & Yamaguchi, 2005). This causes the annual mean air temperature of a city to be 1-3°C warmer than the surrounding areas and increases summertime energy consumption, which leads to increased air pollution, greenhouse gas emissions, and risks to the health of the public (EPA, 2013). This credit addresses the solar heat radiation component of the heat island effect by: (1) using nonroof hardscape methods; (2) high-reflectance and vegetated roofs; or (3), a combination of the two (USGBC, 2011a).

Compact and dense new construction, planting trees and other vegetation to provide shade and absorb solar energy, and using materials with a high solar reflectance are all strategies recommended to reduce the heat island effect (Stone & Rodgers, 2001). As LEED-ND has addressed all of these options, I have no recommendations on this credit (USGBC, 2011a).

Table 50: Heat Island and Option Utilization

GIB Credit 9 (1)	Total	Percentage of Total	Mean Point Total
Heat Island Reduction*	64	68.8%	1.0
Option 1	33	35.5%	1.0
Option 2	25	26.9%	1.0
Option 3	--	--	--

* Not all projects reported utilized options

5.2.3.10 Solar Orientation

Intended to reduce energy costs and use, this credit can be earned by projects which orient their buildings towards the sun (USGBC, 2011a). It offers two options, both of which require that 75% of all buildings be facing, within 15°, of true north or south (USGBC, 2011a). The difference between the options is the allowable length-width ratio of the buildings: the first allows a 1:1 ratio, but the project must also have earned 2 points under NPD Credit 2, Compact Development; the second, for all other projects, requires a 1.5:1 length-width ratio (USGBC, 2011a). Unlike previously discussed credits which double-count, the first option of this credit is only designed to encourage another credit being utilized, a practice which should be incorporated into future LEED-ND revisions.

More research is needed to determine why only 8 projects utilized this credit, as 76 projects achieved at least 2 points under NPD Credit 2.

Table 51: Solar Orientation and Option Utilization

GIB Credit 10 (1)	Total	Percentage of Total	Mean Point Total
Solar Orientation*	8	8.6%	1.0
Option 1	5	5.4%	1.0
Option 2	0	0	--

* Not all projects reported utilized options

5.2.3.11 On-Site Renewable Energy Sources

Generating renewable energy on-site allows projects to earn points under this credit (USGBC, 2011a). Only 15 projects utilized this credit in the 2007 pilot program, which only allowed one point to be earned; however, the 2009 revisions allow for up to three points to be earned for meeting certain percentages of renewable energy being the source for the project's annual electrical and thermal energy usage (USGBC, 2011a&b). Due to this change, more research will be needed as data becomes available to determine if this increase encouraged more projects to utilize this credit.

In 2011, renewable energy, including hydropower, consisted of 13% of the total electricity generated in the United States (Energy Information Administration, 2012). Although the EIA projects this total is only expected to grow to 16% in 2040, a study by the National Renewable Energy Laboratory (NREL) indicates that renewable energy could supply up to 80% of electricity needs in the U.S. (Energy Information Administration, 2012; NREL, 2013). I recommend that this credit be modified to encourage this evolution in the electrical sector

by allowing points to be earned for a certain percentage of nonresidential buildings whose occupants' lease has a requirement that they utilize a renewable energy supplier.

Table 52: On-Site Renewable Energy Sources and Option Utilization

GIB Credit 11 (1-3)	Total	Percentage of Total	Mean Point Total
On-Site Renewable Energy Sources	15	16.1%	1.0

5.2.3.12 District Heating and Cooling



Providing energy efficient district heating and/or cooling systems for all new buildings, excluding single-family residences, which provides up to 80% of the project's heating and/or cooling needs can earn two points under this credit (USGBC, 2011a). This credit was modified in the 2009 revisions to increase the points allotted and, presumably, encourage its use (USGBC, 2011a&b). More research will be needed as data becomes available to determine if this credit's usage increased. I have no recommendations for GIB Credit 12.

Table 53: District Heating and Cooling Utilization

GIB Credit 12 (2)	Total	Percentage of Total	Mean Point Total
District Heating and Cooling	6	6.5%	2.0

5.2.3.13 Infrastructure Energy Efficiency



Replacing and/or installing new energy efficient infrastructure located within the project which reduces baseline energy use by 15% will earn one point under this credit. Only about 42% of all projects utilized this credit in the 2007 pilot, possibly because it didn't allow for a developer to work with the local municipality to install new infrastructure; yet the 2009 revisions modified the requirements to allow this use (USGBC, 2011b) (USGBC, 2011a). Due to this change, more research will be needed as data becomes available to determine if this encouraged more projects to utilize this credit. Until that research is conducted, I have no recommendation on improving this credit.

Table 54: Infrastructure Energy Efficiency Utilization

GIB Credit 13 (1)	Total	Percentage of Total	Mean Point Total
Infrastructure Energy Efficiency	39	41.9%	1.0

5.2.3.14 Wastewater Management



Reusing wastewater to replace potable water, such as for toilets and irrigation purposes, can earn a project up to two points (USGBC, 2011a). This credit was modified in 2009 to allow projects meet a 25% threshold for one point and 50% for two; the pilot program only allowed one point for the 50% threshold (USGBC, 2011b) (USGBC, 2011a). Due to this change, more research will be needed as data becomes available to determine if this encouraged more projects to utilize this credit. Until that research is conducted, I have no recommendation on improving this credit.

Table 55: Wastewater Management Utilization

GIB Credit 14 (1-2)	Total	Percentage of Total	Mean Point Total
Wastewater Management	7	7.5%	2.0

5.2.3.15 Recycled Content in Infrastructure



This credit requires that 50% of certain types of infrastructure used in the project, such as pavement, water retention tanks, and sewer, be recycled material (USGBC, 2011a). Due to the 2009 revisions, more research will be needed as data becomes available to determine if this encouraged more projects to utilize this credit. Until that research is conducted, I have no recommendation on improving this credit.

Table 56: Recycled Content in Infrastructure Utilization

GIB Credit 15 (1)	Total	Percentage of Total	Mean Point Total
Recycled Content in Infrastructure	37	39.8%	1.0

5.2.3.16 Solid Waste Management Infrastructure



This credit intends to divert waste from landfills through the use of recycling and the proper disposal of hazardous materials (USGBC, 2011a). The pilot program required that 50% of nonhazardous construction and demolition debris be diverted from a landfill, similar to my proposed GIB Credit 5, Existing Building Refuse (USGBC, 2011b). The 2009 revisions merged the pilot program's GIB Credit 19, Comprehensive Waste Management, into this credit (of which almost 70% of projects utilized), and requires that projects meet 4 out of 5 requirements, including the construction landfill diversion (USGBC, 2011a). These requirements include recycling stations, hazardous material drop-off locations, compost stations, and a curb-side recycling program (USGBC, 2011a). I recommend that the construction landfill diversion option be removed, as it is moved to GIB Credit 5 in my proposal, and that projects meet 3 out of 4 of the remaining options to earn a point under this credit.

Table 57: Solid Waste Management Infrastructure Utilization

GIB Credit 16 (1)*	Total	Percentage of Total	Mean Point Total
Solid Waste Management Infrastructure	71	76.3%	1.0

* Unable to convert to 2009 revisions

5.2.3.17 Light Pollution Reduction



This credit intends to reduce light pollution by requiring that external lights be automatically controlled with motion sensors and meet other stringent requirements (USGBC, 2011a). Approximately 30% of all projects utilized this credit, but as the requirements are not onerous I have no recommendations on how to improve this credit.

Table 58: Light Pollution Reduction Utilization

GIB Credit 17 (1)	Total	Percentage of Total	Mean Point Total
Light Pollution Reduction	28	30.1%	1.0

5.2.4 Innovation & Design Process

The Innovation and Design Process section gives credit opportunities for new and innovative ideas in Sustainable Development design, construction, and maintenance.

5.2.4.1 Innovation and Exemplary Performance

This credit of the LEED-ND rating system intends to give up to 3 bonus credits for extraordinary performance by exceeding high thresholds in 23 different credits, shown on table 59 (USGBC, 2011a). Alternatively, 5 bonus points can be awarded by demonstrating innovative practices which are not covered by the credits in LEED-ND (USGBC, 2011a). These two options can be combined to achieve a total of 5 points (USGBC, 2011a). This section was modified in the 2009 revisions and more research will be needed as data becomes available to determine the effects on utilization (United States Green Building Council, 2011) (USGBC, 2011a). I support the intent of this credit and have no recommendations on its improvement.

Table 59: Credits Available to Earn Exemplary Performance Bonus Points

Innovation and Exemplary Performance	
SLL Credit 1	Preferred Locations
SLL Credit 3	Locations with Reduced Automobile Dependence
SLL Credit 8	Restoration of Habitat or Wetlands and Water Bodies
NPD Credit 1	Walkable Streets
NPD Credit 3	Mixed-Use Neighborhood Centers
NPD Credit 4	Mixed-Income Diverse Communities
NPD Credit 11	Visitability and Universal Design
NPD Credit 13	Local Food Production
NPD Credit 14	Tree-Lined and Shaded Streets
GIB Credit 1	Certified Green Buildings
GIB Credit 2	Building Energy Efficiency
GIB Credit 3	Building Water Efficiency
GIB Credit 4	Water-Efficient Landscaping
GIB Credit 5	Existing Building Reuse
GIB Credit 6	Historic Resource Preservation and Adaptive Use
GIB Credit 8	Stormwater Management
GIB Credit 9	Heat Island Reduction
GIB Credit 10	Solar Orientation
GIB Credit 11	On-Site Renewable Energy Sources
GIB Credit 12	District Heating and Cooling
GIB Credit 13	Infrastructure Energy Efficiency
GIB Credit 14	Wastewater Management
GIB Credit 15	Recycled Content in Infrastructure
Innovative Practices	Various

5.2.4.2 LEED Accredited Professional

This credit gives one bonus point for using a LEED accredited professional as the principle project designer (USGBC, 2011a). I can appreciate that having a certified professional makes it easier for project teams and the LEED-ND certification teams communicate and streamline the application; however, not only is it a way for projects to buy a credit, it also is a way for USGBC to earn additional money (USGBC, 2011a & 2013a). This is ethically questionable and does not promote any sustainable development tenet. I recommend that this credit be removed.

Table 60: LEED Accredited Professional

ID Credit 2 (1)	Total	Percentage of Total	Mean Point Total
LEED Accredited Professional	89	95.7%	1.0

5.2.5 Regional Priority

New in the 2009 revisions, this section identifies six regions of the United States which have geographically specific environmental, social equity, and public health concerns (USGBC, 2011a). Projects located outside of the United States cannot earn this credit (USGBC, 2011a).

More research will be needed after data becomes available for the 2009 revisions to see how many projects utilized this credit. I suggest that projects outside of the United States be able to earn this credit if they are able to document that there is a regional importance for their projects' location.

Table 61: Credits Available to Regional Priority

RP Credit 1 (1-4)	Total	Percentage of Total	Mean Point Total
Regional Priority	--	--	--

6. SUMMARY OF RECOMMENDATIONS

No system is perfect. Only through self-correction can one improve without governmental regulation. The LEED-ND rating system can improve itself by:

- Redefining ‘publically owned water and wastewater infrastructure’ to allow for private or public/private partnerships.
- Allowing developers to have previously built roads connecting a project to meet LEED-ND prerequisites.
- Redefining ‘walk distance’, for the purposes of meeting LEED-ND requirements, to only require the connected pedestrian pathways to be within the project itself.
- Reevaluating ‘adjacent site’ and ‘previously developed’ properties to take into account local governmental decisions to regulate land-use.
- Complying with the more rigorous independent ICC codes instead of federally controlled FEMA and NFIP codes.
- Eliminating double counting of NPD Credit 4, Mixed Income Diverse Communities in SLL Credit 1, Preferred Locations and SLL Credit 5, Housing and Jobs Proximity and points awarded for meeting previously utilized credits in GIB Credit 8, Stormwater Management.
- Eliminating automatic points by meeting SLL Prerequisite 1, Smart Location in SLL Credit 3, Locations with Reduced Automobile Dependence.
- Strengthening SLL Prerequisite 3, Wetland and Water Body Conservation, SLL Credit 3, Locations with Reduced Automobile Dependence, NPD Credit 8, Transportation Demand Management, GIB Credit 5, Existing Building Refuse, GIB Credit 11, On-Site Renewable Energy Sources, and GIB Credit 16, Solid Waste Management Infrastructure by implementing my recommendations.
- Increasing points given for SLL Credit 7, Site Design for Habitat or Wetland and Water Body Conservation, SLL Credit 8, Restoration of Habitat or Wetlands and Water Bodies, NPD Credit 4, Mixed Income Diverse Communities, and GIB Credit 1, Certified Green Buildings.
- Modify CC&R requirements in NPD Credit 13, Local Food Production to be void if local codes do not allow gardens in their building and land-use codes.
- Making GIB Credit 6, Historic Resource Preservation and Adaptive Use a NPD Prerequisite.
- Eliminating the point available for using a LEED Certified Professional.

7. CONCLUSIONS

The Brundtland report identified seven requirements for the pursuit of sustainable development:

- A political system that secures effective citizen participation in decision making,
- An economic system that is able to generate surpluses and technical knowledge on a self-reliant and sustained basis,
- A social system that provides for solutions for the tensions arising from disharmonious development,
- A production system that respects the obligation to preserve the ecological base for development,
- A technological system that can search continuously for new solutions,
- An international system that fosters sustainable patterns of trade and finance, and
- An administrative system that is flexible and has the capacity for self-correction.

(WCED, 1987).

LEED-ND does promote citizen participation by allowing projects to earn points towards certification by coordinating and opening lines of communication with the surrounding neighborhood during the planning and construction phases of development. Also, as the USGBC is currently accepting public comment on its original LEED rating system, it promotes sustainable development within its own ranks (USGBC, 2013b).

Economically, it encourages mixed-use neighborhoods which cluster businesses and residences together. Although this can raise housing unit costs, it can also promote local tax growth, reduce house heating costs, reduce public service costs, increase personal incomes, and foster economic growth (Litman, 2011). LEED-ND promotes the economic requirement for sustainable development.

By providing many opportunities to earn social equity credits, it also provides for solutions from inequality. However, due to the way the rating system is designed, which double counts certain credits, it is clear that the number of opportunities LEED-ND claims to have for social equity is bloated; this is an area where LEED-ND fails to fully promote sustainable development principles due to the ethical questions arising from double counting.

Preserving the ecological base for development is one area that LEED-ND does excel in, although there are many areas which need improvement to make this program more all-inclusive for all areas of the country. Once again, LEED-ND fails to fully promote sustainable development principles, although its efforts to do so should be commended.

After the 2009 revisions, which identified regions of the United States which should have priority in redevelopment and more completely awards innovative solutions, it shows that LEED-ND can continuously search for new solutions, thereby fulfilling this tenet of sustainable development.

LEED-ND does not promote international trade or finance, nor should it be expected to as it is designed solely as a guide to green building. This facet of sustainable development is not applicable to LEED-ND.

Finally, as the rating system was revised in 2009, it shows that it does have the capacity for self-correction. However, it fails to fully promote this sustainable tenet due to its inflexible nature. There are many opportunities for improvement in this area, which, by self-correction, it can more fully promote this facet.

This study evaluated the LEED-ND rating system and asked if it truly promoted sustainable development practices. The answer can be both yes and no, however as no system is perfect, it is clear that LEED-ND does promote long-term sustainable development practices.

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APPENDIX 1: LEED-ND CONVERTED SCORECARDS

Table 63: Smart Location & Linkage Prerequisites

Project Name	City/State	Prerequisite 1	Prerequisite 2	Prerequisite 3	Prerequisite 4	Prerequisite 5
360 State Street	New Haven, CT	1	No Species	1	2	1
1812 North Moore Street	Rosslyn, VA	1	No Species	1	2	1
Alliance Town Center	Fort Worth, TX	4	No Species	1	2	1
Aspen Club Living	Aspen, CO	4	No Species	2	2	2
Barelas Homes	Albuquerque, NM	1	No Species	1	1	1
Beijing Olympic Village	Beijing, China	1	No Species	1	2	1
Chongqing Tiandi	Chongqing, China	1	No Species	1	1	1
City Creek Center	Salt Lake City, UT	1	No Species	1	2	1
City of Tuscon & Gadsen	Tucson, AZ	1	No Species	1	2	1
Constitution Square Phase I	Washington, DC	1	No Species	1	2	1
Cornfield Arroyo Seco	Los Angeles, CA	1	No Species	2	2	2
Crystal City Plan	Arlington, VA	1	No Species	1	2	1
Currie Barracks	Calgary, AB Canada	1	No Species	1	2	1
Decker Walk	Baltimore, MD	1	No Species	1	1	1
Delaware Addition	Santa Cruz, CA	1	No Species	2	1	1
Depot Walk	Orange, CA	1	No Species	1	2	1
Dockside Green	Victoria, BC Canada	1	No Species	2	1	1
East 54	Chapel Hill, NC	1	No Species	1	2	1
Edgewater	Oakmont, PA	1	No Species	2	2	2
Eliot Tower	Portland, OR	1	2	1	1	1
Emeryville Marketplace	Emeryville, CA	1	No Species	1	2	1
Ever Vail	Vail, CO	1	No Species	2	2	2
Excelsior & Grand	St. Louis Park, MN	1	2	1	2	1
Faubourg Boisbriand	Boisbriand, QC Canada	1	No Species	1	2	1
Flats East Bank Development	Cleveland, OH	1	No Species	2	2	1
Founder's Square	Arlington, VA	1	No Species	1	2	1
Garrison Crossing	Chilliwack, BC Canada	1	No Species	1	2	1
Georgia Commons	Washington, DC	1	No Species	1	2	1
Global Green USA Holy Cross	New Orleans, LA	1	No Species	1	2	1
Habitat for Humanity Edes B	Oakland, CA	1	No Species	1	2	2
Harbor Point	Stamford, CT	1	No Species	1	2	1
Hawaii Regional Housing	Kaneohe, HI	1	3	1	2	1
Helensview	Portland, OR	1	No Species	1	2	1
Hercules Bayfront	Hercules, CA	1	No Species	2	2	2
Horizon Uptown	Aurora, CO	5	No Species	1	1	1
Hoyt Yards	Portland, OR	1	No Species	1	2	1

Table 63 continued

Project Name	City/State	Prerequisite 1	Prerequisite 2	Prerequisite 3	Prerequisite 4	Prerequisite 5
Hunters View Redevelopment	San Francisco, CA	1	No Species	1	2	1
Jackson Square	Roxbury, MA	1	No Species	1	2	1
Ladd Tower	Portland, OR	1	No Species	1	2	1
Legends Park & University Place	Memphis, TN	1	No Species	1	2	1
Lincoln Park	Newark, NJ	1	No Species	1	2	1
Linked Hybrid	Beijing, China	1	No Species	1	1	1
MacArthur BART Transit Village	Oakland, CA	1	No Species	1	2	1
Meadow Ranch	Coeur D'Alene, ID	1	No Species	1	1	1
Melrose Commons	Bronx, NY	1	No Species	1	2	1
Metro Green	Stamford, CT	1	No Species	1	1	1
Midtown Crossing	Omaha, NE	1	No Species	1	1	1
Miraflores	Richmond, CA	1	No Species	1	2	1
Mosaic District	Fairfax, VA	1	No Species	1	2	1
Mueller	Austin, TX	1	No Species	1	2	2
Napa Pipe	Napa, CA	1	3	2	2	2
Navy Yard @ Noisette	North Charleston, SC	1	No Species	2	1	2
New Stapleton Waterfront	New York, NY	1	No Species	2	2	2
Newpark Town Center	Park City, UT	4	No Species	2	2	1
Park Avenue Redevelopment	Denver, CO	1	2	1	2	1
Parkside Mixed-Use Development	Washington, DC	1	No Species	1	1	1
Pointe Nord	Montreal, QC Canada	1	No Species	2	2	2
Prairie Crossing Station Village	Grayslake, IL	3	No Species	1	2	1
Preston Meadows	Cambridge, ON Canada	1	No Species	2	2	2
Quarry Falls	San Diego, CA	1	2	2	2	1
Silo City	Beijing, China	1	No Species	1	1	1
Simpson Wisser Fort Shafter	Honolulu, HI	4	No Species	1	2	1
Solea Condominiums	Washington, DC	1	No Species	1	2	1
South Chicago LEED ND Initiative	Chicago, IL	1	No Species	2	2	1
South Lake Union Urban Center	Seattle, WA	1	No Species	2	1	1
South Waterfront Central District	Portland, OR	1	3	2	1	2
Southeast False Creek	Vancouver, BC Canada	1	3	2	1	3
St. Luke's Neighborhood District	Cleveland, OH	1	No Species	1	2	1
Strathearn Masterplan	Edmonton AB, Canada	1	No Species	1	2	1
Sustainable Fellwood	Savannah, GA	1	No Species	1	1	1
Sweetwater	Hailey, ID	1	No Species	1	2	2
Syracuse ALT District	Syracuse, NY	1	No Species	2	1	2
Tassafaronga Village	Oakland, CA	1	No Species	1	2	2
Taylor Yard Transit Village	Los Angeles, CA	1	No Species	1	2	1

Table 63 continued

Project Name	City/State	Prerequisite 1	Prerequisite 2	Prerequisite 3	Prerequisite 4	Prerequisite 5
Technopole Angus	Montreal, QC Canada	1	2	1	2	1
The Arbors	Cincinnati, OH	4	No Species	1	2	1
The Gateway to Nashville	Nashville, TN	1	No Species	1	1	1
The Gulch	Nashville, TN	1	No Species	1	1	1
The Hills	Guangzhou (Canton), China	1	No Species	1	1	1
The Village at Griesbach, Stage 8	Edmonton AB, Canada	1	No Species	1	1	1
The Waterfront District	Bellingham, WA	1	No Species	2	1	2
The Yards	Washington, DC	3	No Species	2	2	2
Toronto Waterfront Area 1	Toronto, ON Canada	1	No Species	1	2	1
Town of Normal Uptown Renewal	Normal, IL	3	No Species	1	1	1
Twinbrook Station	Rockville, MD	1	No Species	1	2	1
Union Park	Las Vegas, NV	1	No Species	1	2	1
Uptown at Falls Park	Sioux Falls, SD	1	No Species	1	2	1
Washington Village	Boulder, CO	1	No Species	1	2	1
West Town Development	Atlanta, GA	1	No Species	2	2	1
Westfield UTC Revitalization	San Diego, CA	1	No Species	1	1	1
Whistler Crossing	Riverdale, IL	1	No Species	1	2	1
Willets Point	Flushing, NY	1	No Species	1	2	2
Wuhan Tiandi Mixed Use	Wuhan, China	1	No Species	1	2	1

Table 64: Neighborhood Pattern & Design Prerequisites

Project Name	City/State	Prerequisite 1	Prerequisite 2
360 State Street	New Haven, CT	Yes	Yes
1812 North Moore Street	Rosslyn, VA	Yes	Yes
Alliance Town Center	Fort Worth, TX	Yes	Yes
Aspen Club Living	Aspen, CO	Yes	Yes
Barelas Homes	Albuquerque, NM	Yes	Yes
Beijing Olympic Village	Beijing, China	Yes	Yes
Chongqing Tiandi	Chongqing, China	Yes	Yes
City Creek Center	Salt Lake City, UT	Yes	Yes
City of Tuscon & Gadsen	Tucson, AZ	Yes	Yes
Constitution Square Phase I	Washington, DC	Yes	Yes
Cornfield Arroyo Seco	Los Angeles, CA	Yes	Yes
Crystal City Plan	Arlington, VA	Yes	Yes
Currie Barracks	Calgary, AB Canada	Yes	Yes
Decker Walk	Baltimore, MD	Yes	Yes
Delaware Addition	Santa Cruz, CA	Yes	Yes
Depot Walk	Orange, CA	Yes	Yes
Dockside Green	Victoria, BC Canada	Yes	Yes
East 54	Chapel Hill, NC	Yes	Yes
Edgewater	Oakmont, PA	Yes	Yes
Eliot Tower	Portland, OR	Yes	Yes
Emeryville Marketplace	Emeryville, CA	Yes	Yes
Ever Vail	Vail, CO	Yes	Yes
Excelsior & Grand	St. Louis Park, MN	Yes	Yes
Faubourg Boisbriand	Boisbriand, QC Canada	Yes	Yes
Flats East Bank Development	Cleveland, OH	Yes	Yes
Founder's Square	Arlington, VA	Yes	Yes
Garrison Crossing	Chilliwack, BC Canada	Yes	Yes
Georgia Commons	Washington, DC	Yes	Yes
Global Green USA Holy Cross	New Orleans, LA	Yes	Yes
Habitat for Humanity Edes B	Oakland, CA	Yes	Yes
Harbor Point	Stamford, CT	Yes	Yes
Hawaii Regional Housing	Kaneohe, HI	Yes	Yes
Helensview	Portland, OR	Yes	Yes
Hercules Bayfront	Hercules, CA	Yes	Yes
Horizon Uptown	Aurora, CO	Yes	Yes
Hoyt Yards	Portland, OR	Yes	Yes
Hunters View Redevelopment	San Francisco, CA	Yes	Yes
Jackson Square	Roxbury, MA	Yes	Yes
Ladd Tower	Portland, OR	Yes	Yes
Legends Park & University Place	Memphis, TN	Yes	Yes
Lincoln Park	Newark, NJ	Yes	Yes
Linked Hybrid	Beijing, China	Yes	Yes
MacArthur BART Transit Village	Oakland, CA	Yes	Yes
Meadow Ranch	Coeur D'Alene, ID	Yes	Yes
Melrose Commons	Bronx, NY	Yes	Yes
Metro Green	Stamford, CT	Yes	Yes
Midtown Crossing	Omaha, NE	Yes	Yes
Miraflores	Richmond, CA	Yes	Yes
Mosaic District	Fairfax, VA	Yes	Yes
Mueller	Austin, TX	Yes	Yes
Napa Pipe	Napa, CA	Yes	Yes
Navy Yard @ Noisette	North Charleston, SC	Yes	Yes
New Stapleton Waterfront	New York, NY	Yes	Yes

Table 64 continued

Project Name	City/State	Prerequisite 1	Prerequisite 2
Newpark Town Center	Park City, UT	Yes	Yes
Park Avenue Redevelopment	Denver, CO	Yes	Yes
Parkside Mixed-Use Development	Washington, DC	Yes	Yes
Pointe Nord	Montreal, QC Canada	Yes	Yes
Prairie Crossing Station Village	Grayslake, IL	Yes	Yes
Preston Meadows	Cambridge, ON Canada	Yes	Yes
Quarry Falls	San Diego, CA	Yes	Yes
Silo City	Beijing, China	Yes	Yes
Simpson Wisser Fort Shafter	Honolulu, HI	Yes	Yes
Solea Condominiums	Washington, DC	Yes	Yes
South Chicago LEED ND Initiative	Chicago, IL	Yes	Yes
South Lake Union Urban Center	Seattle, WA	Yes	Yes
South Waterfront Central District	Portland, OR	Yes	Yes
Southeast False Creek	Vancouver, BC Canada	Yes	Yes
St. Luke's Neighborhood District	Cleveland, OH	Yes	Yes
Strathearn Masterplan	Edmonton AB, Canada	Yes	Yes
Sustainable Fellwood	Savannah, GA	Yes	Yes
Sweetwater	Hailey, ID	Yes	Yes
Syracuse ALT District	Syracuse, NY	Yes	Yes
Tassafaronga Village	Oakland, CA	Yes	Yes
Taylor Yard Transit Village	Los Angeles, CA	Yes	Yes
Technopole Angus	Montreal, QC Canada	Yes	Yes
The Arbors	Cincinnati, OH	Yes	Yes
The Gateway to Nashville	Nashville, TN	Yes	Yes
The Gulch	Nashville, TN	Yes	Yes
The Hills	Guangzhou (Canton), China	Yes	Yes
The Village at Griesbach, Stage 8	Edmonton AB, Canada	Yes	Yes
The Waterfront District	Bellingham, WA	Yes	Yes
The Yards	Washington, DC	Yes	Yes
Toronto Waterfront Area 1	Toronto, ON Canada	Yes	Yes
Town of Normal Uptown Renewal	Normal, IL	Yes	Yes
Twinbrook Station	Rockville, MD	Yes	Yes
Union Park	Las Vegas, NV	Yes	Yes
Uptown at Falls Park	Sioux Falls, SD	Yes	Yes
Washington Village	Boulder, CO	Yes	Yes
West Town Development	Atlanta, GA	Yes	Yes
Westfield UTC Revitalization	San Diego, CA	Yes	Yes
Whistler Crossing	Riverdale, IL	Yes	Yes
Willeys Point	Flushing, NY	Yes	Yes
Wuhan Tiandi Mixed Use	Wuhan, China	Yes	Yes

Table 65: Green Infrastructure and Buildings Prerequisites

Project Name	City/State	Prerequisite 1
360 State Street	New Haven, CT	Yes
1812 North Moore Street	Rosslyn, VA	Yes
Alliance Town Center	Fort Worth, TX	Yes
Aspen Club Living	Aspen, CO	Yes
Barelas Homes	Albuquerque, NM	Yes
Beijing Olympic Village	Beijing, China	Yes
Chongqing Tiandi	Chongqing, China	Yes
City Creek Center	Salt Lake City, UT	Yes
City of Tuscon & Gadsen	Tucson, AZ	Yes
Constitution Square Phase I	Washington, DC	Yes
Cornfield Arroyo Seco	Los Angeles, CA	Yes
Crystal City Plan	Arlington, VA	Yes
Currie Barracks	Calgary, AB Canada	Yes
Decker Walk	Baltimore, MD	Yes
Delaware Addition	Santa Cruz, CA	Yes
Depot Walk	Orange, CA	Yes
Dockside Green	Victoria, BC Canada	Yes
East 54	Chapel Hill, NC	Yes
Edgewater	Oakmont, PA	Yes
Eliot Tower	Portland, OR	Yes
Emeryville Marketplace	Emeryville, CA	Yes
Ever Vail	Vail, CO	Yes
Excelsior & Grand	St. Louis Park, MN	Yes
Faubourg Boisbriand	Boisbriand, QC Canada	Yes
Flats East Bank Development	Cleveland, OH	Yes
Founder's Square	Arlington, VA	Yes
Garrison Crossing	Chilliwack, BC Canada	Yes
Georgia Commons	Washington, DC	Yes
Global Green USA Holy Cross	New Orleans, LA	Yes
Habitat for Humanity Edes B	Oakland, CA	Yes
Harbor Point	Stamford, CT	Yes
Hawaii Regional Housing	Kaneohe, HI	Yes
Helensview	Portland, OR	Yes
Hercules Bayfront	Hercules, CA	Yes
Horizon Uptown	Aurora, CO	Yes
Hoyt Yards	Portland, OR	Yes
Hunters View Redevelopment	San Francisco, CA	Yes
Jackson Square	Roxbury, MA	Yes
Ladd Tower	Portland, OR	Yes
Legends Park & University Place	Memphis, TN	Yes
Lincoln Park	Newark, NJ	Yes
Linked Hybrid	Beijing, China	Yes
MacArthur BART Transit Village	Oakland, CA	Yes
Meadow Ranch	Coeur D'Alene, ID	Yes
Melrose Commons	Bronx, NY	Yes
Metro Green	Stamford, CT	Yes
Midtown Crossing	Omaha, NE	Yes
Miraflores	Richmond, CA	Yes
Mosaic District	Fairfax, VA	Yes
Mueller	Austin, TX	Yes
Napa Pipe	Napa, CA	Yes
Navy Yard @ Noisette	North Charleston, SC	Yes
New Stapleton Waterfront	New York, NY	Yes

Table 65 continued

Project Name	City/State	Prerequisite 1
Newpark Town Center	Park City, UT	Yes
Park Avenue Redevelopment	Denver, CO	Yes
Parkside Mixed-Use Development	Washington, DC	Yes
Pointe Nord	Montreal, QC Canada	Yes
Prairie Crossing Station Village	Grayslake, IL	Yes
Preston Meadows	Cambridge, ON Canada	Yes
Quarry Falls	San Diego, CA	Yes
Silo City	Beijing, China	Yes
Simpson Wisser Fort Shafter	Honolulu, HI	Yes
Solea Condominiums	Washington, DC	Yes
South Chicago LEED ND Initiative	Chicago, IL	Yes
South Lake Union Urban Center	Seattle, WA	Yes
South Waterfront Central District	Portland, OR	Yes
Southeast False Creek	Vancouver, BC Canada	Yes
St. Luke's Neighborhood District	Cleveland, OH	Yes
Strathearn Masterplan	Edmonton AB, Canada	Yes
Sustainable Fellwood	Savannah, GA	Yes
Sweetwater	Hailey, ID	Yes
Syracuse ALT District	Syracuse, NY	Yes
Tassafaronga Village	Oakland, CA	Yes
Taylor Yard Transit Village	Los Angeles, CA	Yes
Technopole Angus	Montreal, QC Canada	Yes
The Arbors	Cincinnati, OH	Yes
The Gateway to Nashville	Nashville, TN	Yes
The Gulch	Nashville, TN	Yes
The Hills	Guangzhou (Canton), China	Yes
The Village at Griesbach, Stage 8	Edmonton AB, Canada	Yes
The Waterfront District	Bellingham, WA	Yes
The Yards	Washington, DC	Yes
Toronto Waterfront Area 1	Toronto, ON Canada	Yes
Town of Normal Uptown Renewal	Normal, IL	Yes
Twinbrook Station	Rockville, MD	Yes
Union Park	Las Vegas, NV	Yes
Uptown at Falls Park	Sioux Falls, SD	Yes
Washington Village	Boulder, CO	Yes
West Town Development	Atlanta, GA	Yes
Westfield UTC Revitalization	San Diego, CA	Yes
Whistler Crossing	Riverdale, IL	Yes
Willets Point	Flushing, NY	Yes
Wuhan Tiandi Mixed Use	Wuhan, China	Yes

Table 66: Smart Location & Linkage Credits 1-5

Project Name	City/State	Credit 1	Credit 2	Credit 3	Credit 4	Credit 5
360 State Street	New Haven, CT	8	3	8	1	3
1812 North Moore Street	Rosslyn, VA	8	2	7		3
Alliance Town Center	Fort Worth, TX			4	1	
Aspen Club Living	Aspen, CO	6		1		3
Barelas Homes	Albuquerque, NM	9		2		3
Beijing Olympic Village	Beijing, China	6		7	1	2
Chongqing Tiandi	Chongqing, China	8	2	8		
City Creek Center	Salt Lake City, UT	7		7		3
City of Tuscon & Gadsen	Tucson, AZ	8	3	5	1	3
Constitution Square Phase I	Washington, DC	9	3	7	1	1
Cornfield Arroyo Seco	Los Angeles, CA	8	3		1	3
Crystal City Plan	Arlington, VA	9		6		3
Currie Barracks	Calgary, AB Canada	9	3	4	1	3
Decker Walk	Baltimore, MD	10		7		3
Delaware Addition	Santa Cruz, CA	6		2	1	3
Depot Walk	Orange, CA	8		2		3
Dockside Green	Victoria, BC Canada	8	3	6		3
East 54	Chapel Hill, NC	7	2	5	1	3
Edgewater	Oakmont, PA	8	2	4		3
Eliot Tower	Portland, OR	9		7	1	3
Emeryville Marketplace	Emeryville, CA	8	2	7	1	3
Ever Vail	Vail, CO	9	2	5	1	3
Excelsior & Grand	St. Louis Park, MN	8		4	1	3
Faubourg Boisbriand	Boisbriand, QC Canada	7	3	4	1	3
Flats East Bank Development	Cleveland, OH	8	2	3	1	3
Founder's Square	Arlington, VA	8	2	7	1	3
Garrison Crossing	Chilliwack, BC Canada	8	2	2	1	
Georgia Commons	Washington, DC	10		8		3
Global Green USA Holy Cross	New Orleans, LA		3	8		3
Habitat for Humanity Edes B	Oakland, CA	7	2			3
Harbor Point	Stamford, CT	8	3	6	1	3
Hawaii Regional Housing	Kaneohe, HI	7	2			3
Helensview	Portland, OR	7		4	1	3
Hercules Bayfront	Hercules, CA	8		3	1	3
Horizon Uptown	Aurora, CO				1	
Hoyt Yards	Portland, OR	9	2	6	1	3
Hunters View Redevelopment	San Francisco, CA	8		4		
Jackson Square	Roxbury, MA	7	3	7		3
Ladd Tower	Portland, OR	10	2	8	1	3
Legends Park & University Place	Memphis, TN	8	3	5		3
Lincoln Park	Newark, NJ	8	3	7		3
Linked Hybrid	Beijing, China	7		7		3
MacArthur BART Transit Village	Oakland, CA	9	3	8	1	3
Meadow Ranch	Coeur D'Alene, ID	5		2		3
Melrose Commons	Bronx, NY	8	3	7	1	3
Metro Green	Stamford, CT	8	2	7		3
Midtown Crossing	Omaha, NE	8	2	5		3
Miraflores	Richmond, CA	8	3	1	1	3
Mosaic District	Fairfax, VA	7	2	3	1	3
Mueller	Austin, TX	8	2	3		
Napa Pipe	Napa, CA	6	2	2	1	3

Table 66 continued

Project Name	City/State	Credit 1	Credit 2	Credit 3	Credit 4	Credit 5
Navy Yard @ Noisette	North Charleston, SC	8	3			3
New Stapleton Waterfront	New York, NY	8	3	7	1	3
Newpark Town Center	Park City, UT	3		2	1	3
Park Avenue Redevelopment	Denver, CO	9		7		3
Parkside Mixed-Use Development	Washington, DC	9		7	1	3
Pointe Nord	Montreal, QC Canada	7		4	1	3
Prairie Crossing Station Village	Grayslake, IL	2		2	1	3
Preston Meadows	Cambridge, ON Canada	7	2	3		3
Quarry Falls	San Diego, CA	9			1	3
Silo City	Beijing, China	7		6		
Simpson Wisser Fort Shafter	Honolulu, HI	4	2			3
Solea Condominiums	Washington, DC	10		8		3
South Chicago LEED ND Initiative	Chicago, IL	9	3	4		
South Lake Union Urban Center	Seattle, WA	10	2	5		3
South Waterfront Central District	Portland, OR	9	2	7		
Southeast False Creek	Vancouver, BC Canada	9	3	7	1	3
St. Luke's Neighborhood District	Cleveland, OH	8	3	7		3
Strathearn Masterplan	Edmonton AB, Canada	10		3	1	
Sustainable Fellwood	Savannah, GA	7		2		3
Sweetwater	Hailey, ID	6		2	1	
Syracuse ALT District	Syracuse, NY	8		4		3
Tassafaronga Village	Oakland, CA	8	3	5		3
Taylor Yard Transit Village	Los Angeles, CA	8	3	7		
Technopole Angus	Montreal, QC Canada	10	3	4	1	
The Arbors	Cincinnati, OH	5		3		3
The Gateway to Nashville	Nashville, TN	9		7		3
The Gulch	Nashville, TN	9	2	7		3
The Hills	Guangzhou (Canton), China	5		7		3
The Village at Griesbach, Stage 8	Edmonton AB, Canada	8	2	7		3
The Waterfront District	Bellingham, WA	9	3		1	3
The Yards	Washington, DC	9	3	7	1	3
Toronto Waterfront Area 1	Toronto, ON Canada	9	3	7	1	3
Town of Normal Uptown Renewal	Normal, IL	7	2	5	1	3
Twinbrook Station	Rockville, MD	8		7		3
Union Park	Las Vegas, NV	8	2	7		3
Uptown at Falls Park	Sioux Falls, SD	8	2	2		3
Washington Village	Boulder, CO	8		4		3
West Town Development	Atlanta, GA	7	2	3		3
Westfield UTC Revitalization	San Diego, CA	7		7		3
Whistler Crossing	Riverdale, IL	8		2		3
Willets Point	Flushing, NY	8	2	7	1	
Wuhan Tiandi Mixed Use	Wuhan, China	8		7	1	3
	Count	90	55	85	44	79
	Sum	703	136	441	44	234
	MEAN	7.81111	2.472727	5.18824	1	2.96203

Table 67: Smart Location & Linkage Credits 6-10

Project Name	City/State	Credit 6	Credit 7	Credit 8	Credit 9	Credit 10
360 State Street	New Haven, CT	2	1	2	1	1
1812 North Moore Street	Rosslyn, VA	1			1	1
Alliance Town Center	Fort Worth, TX	2			1	1
Aspen Club Living	Aspen, CO		1	1	1	1
Barelas Homes	Albuquerque, NM	1				1
Beijing Olympic Village	Beijing, China				1	1
Chongqing Tiandi	Chongqing, China	2	1	1	1	
City Creek Center	Salt Lake City, UT	2	1			
City of Tuscon & Gadsen	Tucson, AZ	2	1			1
Constitution Square Phase I	Washington, DC	1	1			1
Cornfield Arroyo Seco	Los Angeles, CA	1	1			
Crystal City Plan	Arlington, VA	1				
Currie Barracks	Calgary, AB Canada	2	1		1	1
Decker Walk	Baltimore, MD	2			1	1
Delaware Addition	Santa Cruz, CA	2	1		1	1
Depot Walk	Orange, CA	1	1		1	
Dockside Green	Victoria, BC Canada	2	1	1	1	1
East 54	Chapel Hill, NC		1	1	1	1
Edgewater	Oakmont, PA	2			1	
Eliot Tower	Portland, OR	2			1	1
Emeryville Marketplace	Emeryville, CA	2	1	2	1	1
Ever Vail	Vail, CO	2	1	1	1	1
Excelsior & Grand	St. Louis Park, MN	1			1	1
Faubourg Boisbriand	Boisbriand, QC Canada	2	1	1	1	1
Flats East Bank Development	Cleveland, OH	1	1			
Founder's Square	Arlington, VA	1		1	1	1
Garrison Crossing	Chilliwack, BC Canada	2	1		1	1
Georgia Commons	Washington, DC	2			1	1
Global Green USA Holy Cross	New Orleans, LA	1				1
Habitat for Humanity Edes B	Oakland, CA				1	
Harbor Point	Stamford, CT	2		1	1	1
Hawaii Regional Housing	Kaneohe, HI	2			1	1
Helensview	Portland, OR	2		1	1	
Hercules Bayfront	Hercules, CA	2	1	1	1	1
Horizon Uptown	Aurora, CO	2	1	1	1	1
Hoyt Yards	Portland, OR	1	1	1	1	1
Hunters View Redevelopment	San Francisco, CA	2				
Jackson Square	Roxbury, MA	2				1
Ladd Tower	Portland, OR	2	1		1	1
Legends Park & University Place	Memphis, TN	2			1	
Lincoln Park	Newark, NJ	1				
Linked Hybrid	Beijing, China	1			1	
MacArthur BART Transit Village	Oakland, CA	2	1	1		1
Meadow Ranch	Coeur D'Alene, ID	2				
Melrose Commons	Bronx, NY	2				
Metro Green	Stamford, CT	1	1		1	
Midtown Crossing	Omaha, NE				1	1
Miraflores	Richmond, CA				1	1
Mosaic District	Fairfax, VA	1		1	1	
Mueller	Austin, TX	2			1	1
Napa Pipe	Napa, CA	2	1		1	1
Navy Yard @ Noisette	North Charleston, SC	1		1		

Table 67 continued

Project Name	City/State	Credit 6	Credit 7	Credit 8	Credit 9	Credit 10
New Stapleton Waterfront	New York, NY		1		1	
Newpark Town Center	Park City, UT	2	1	1	1	1
Park Avenue Redevelopment	Denver, CO	2			1	1
Parkside Mixed-Use Development	Washington, DC	2			1	1
Pointe Nord	Montreal, QC Canada	2			1	1
Prairie Crossing Station Village	Grayslake, IL	2			1	1
Preston Meadows	Cambridge, ON Canada	2				1
Quarry Falls	San Diego, CA	2	1	2	1	1
Silo City	Beijing, China	2			1	
Simpson Wisser Fort Shafter	Honolulu, HI					1
Solea Condominiums	Washington, DC	2			1	1
South Chicago LEED ND Initiative	Chicago, IL	2				1
South Lake Union Urban Center	Seattle, WA	2				1
South Waterfront Central District	Portland, OR	2				1
Southeast False Creek	Vancouver, BC Canada	2	1	1	1	1
St. Luke's Neighborhood District	Cleveland, OH	2	1		1	
Strathearn Masterplan	Edmonton AB, Canada	2	1		1	
Sustainable Fellwood	Savannah, GA	1	1		1	1
Sweetwater	Hailey, ID	2	1		1	1
Syracuse ALT District	Syracuse, NY	2	1		1	1
Tassafaronga Village	Oakland, CA	2			1	1
Taylor Yard Transit Village	Los Angeles, CA		1			1
Technopole Angus	Montreal, QC Canada	1	1	1	1	1
The Arbors	Cincinnati, OH	1				
The Gateway to Nashville	Nashville, TN		1			
The Gulch	Nashville, TN	1				1
The Hills	Guangzhou (Canton), China			1	1	1
The Village at Griesbach, Stage 8	Edmonton AB, Canada	2				1
The Waterfront District	Bellingham, WA	2	1		1	1
The Yards	Washington, DC	1				1
Toronto Waterfront Area 1	Toronto, ON Canada		1			1
Town of Normal Uptown Renewal	Normal, IL	1	1		1	1
Twinbrook Station	Rockville, MD	2	1	1		1
Union Park	Las Vegas, NV	1	1		1	1
Uptown at Falls Park	Sioux Falls, SD	1			1	1
Washington Village	Boulder, CO	1	1		1	1
West Town Development	Atlanta, GA	2	1		1	
Westfield UTC Revitalization	San Diego, CA		1	1	1	1
Whistler Crossing	Riverdale, IL	2				
Willets Point	Flushing, NY	2			1	1
Wuhan Tiandi Mixed Use	Wuhan, China	2	1	1	1	1
	Count	80	45	25	64	67
	Sum	135	45	28	64	67
	MEAN	1.6875	1	1.12	1	1
	Participate	0.860215	0.483871	0.268817	0.688172	0.72043

Table 68: Neighborhood Pattern & Design Credits 1-5

Project Name	City/State	Credit 1	Credit 2	Credit 3	Credit 4	Credit 5
360 State Street	New Haven, CT	12	7	4	3	1
1812 North Moore Street	Rosslyn, VA	7	7			1
Alliance Town Center	Fort Worth, TX	7	2	4	7	1
Aspen Club Living	Aspen, CO		2	2	6	
Barelas Homes	Albuquerque, NM	7	1	2	6	1
Beijing Olympic Village	Beijing, China	2	4	4		1
Chongqing Tiandi	Chongqing, China		5	4	3	1
City Creek Center	Salt Lake City, UT	3	4	4		1
City of Tuscon & Gadsen	Tucson, AZ	3	5	4	7	1
Constitution Square Phase I	Washington, DC	7	7	4	1	1
Cornfield Arroyo Seco	Los Angeles, CA		1	4	3	
Crystal City Plan	Arlington, VA		7	4		1
Currie Barracks	Calgary, AB Canada		3	4	7	1
Decker Walk	Baltimore, MD	3	5	4		
Delaware Addition	Santa Cruz, CA		3	1	3	1
Depot Walk	Orange, CA	3	2	3	2	
Dockside Green	Victoria, BC Canada	7	6	4	6	1
East 54	Chapel Hill, NC	10	3	4	6	1
Edgewater	Oakmont, PA	10		4	2	1
Eliot Tower	Portland, OR	3	7	4		1
Emeryville Marketplace	Emeryville, CA	10	5	4	6	1
Ever Vail	Vail, CO	12	7	4	3	1
Excelsior & Grand	St. Louis Park, MN	3	4	4		1
Faubourg Boisbriand	Boisbriand, QC Canada	3	4	3	7	
Flats East Bank Development	Cleveland, OH	3	7	3		
Founder's Square	Arlington, VA	7	7	4		1
Garrison Crossing	Chilliwack, BC Canada		1	4	7	
Georgia Commons	Washington, DC	7	7	4	4	1
Global Green USA Holy Cross	New Orleans, LA		2	1	6	
Habitat for Humanity Edes B	Oakland, CA		1	3	3	1
Harbor Point	Stamford, CT	2	5	4	2	1
Hawaii Regional Housing	Kaneohe, HI	3	1	2		1
Helensview	Portland, OR	3	2	4	5	1
Hercules Bayfront	Hercules, CA	10	4	4	3	1
Horizon Uptown	Aurora, CO			4	7	
Hoyt Yards	Portland, OR	10	7	4	7	1
Hunters View Redevelopment	San Francisco, CA	7	5	4	7	1
Jackson Square	Roxbury, MA		5	4	7	1
Ladd Tower	Portland, OR	7	7	4	3	1
Legends Park & University Place	Memphis, TN		1	3	7	1
Lincoln Park	Newark, NJ	3	5	4	7	1
Linked Hybrid	Beijing, China	2	6	4		1
MacArthur BART Transit Village	Oakland, CA		6	4	7	1
Meadow Ranch	Coeur D'Alene, ID		2	4	3	
Melrose Commons	Bronx, NY	10	7	3	3	1
Metro Green	Stamford, CT	3	7	4	7	1
Midtown Crossing	Omaha, NE	3	3	4		
Miraflores	Richmond, CA	3	6	1	4	
Mosaic District	Fairfax, VA	7	5	4	1	
Mueller	Austin, TX		1	4	6	
Napa Pipe	Napa, CA	10	4	4	6	1
Navy Yard @ Noisette	North Charleston, SC		5			

Table 68 continued

Project Name	City/State	Credit 1	Credit 2	Credit 3	Credit 4	Credit 5
New Stapleton Waterfront	New York, NY	7	2	4		
Newpark Town Center	Park City, UT			4	6	1
Park Avenue Redevelopment	Denver, CO	7	7	4	6	1
Parkside Mixed-Use Development	Washington, DC		7	4	6	1
Pointe Nord	Montreal, QC Canada	7	7	3	2	1
Prairie Crossing Station Village	Grayslake, IL	10		2		1
Preston Meadows	Cambridge, ON Canada		2	4	6	
Quarry Falls	San Diego, CA	2	4	4	3	1
Silo City	Beijing, China	2	7	4		1
Simpson Wisser Fort Shafter	Honolulu, HI			4		
Solea Condominiums	Washington, DC	7	7	4	5	1
South Chicago LEED ND Initiative	Chicago, IL		2	2	6	
South Lake Union Urban Center	Seattle, WA		4		7	
South Waterfront Central District	Portland, OR	7	7	4	4	1
Southeast False Creek	Vancouver, BC Canada	2	7	4	7	1
St. Luke's Neighborhood District	Cleveland, OH		1		7	1
Strathearn Masterplan	Edmonton AB, Canada	7	7	4	3	1
Sustainable Fellwood	Savannah, GA		2	4	6	1
Sweetwater	Hailey, ID	7	2	2	2	1
Syracuse ALT District	Syracuse, NY		1	4	7	
Tassafaronga Village	Oakland, CA		3	4	7	1
Taylor Yard Transit Village	Los Angeles, CA	2	3	3	6	
Technopole Angus	Montreal, QC Canada	3	4		3	1
The Arbors	Cincinnati, OH	7	1	4	3	
The Gateway to Nashville	Nashville, TN	10	4	4	3	1
The Gulch	Nashville, TN	12	6	4	2	
The Hills	Guangzhou (Canton), China	3	2	4	2	
The Village at Griesbach, Stage 8	Edmonton AB, Canada	7	1	4	3	1
The Waterfront District	Bellingham, WA	7	5	4	6	1
The Yards	Washington, DC	7	5	4	6	1
Toronto Waterfront Area 1	Toronto, ON Canada	3	7	4	3	1
Town of Normal Uptown Renewal	Normal, IL	7	6		1	1
Twinbrook Station	Rockville, MD	7	7	4	6	1
Union Park	Las Vegas, NV	10	7	4	3	
Uptown at Falls Park	Sioux Falls, SD	3	3	4	3	1
Washington Village	Boulder, CO	2	1	4	7	1
West Town Development	Atlanta, GA		5	1	6	1
Westfield UTC Revitalization	San Diego, CA	2	2	4		
Whistler Crossing	Riverdale, IL	10	2	3	3	1
Willets Point	Flushing, NY	7	7	1		1
Wuhan Tiandi Mixed Use	Wuhan, China	3	7	4	2	1
	Count	66	88	87	74	66
	Sum	389	384	312	348	66
	MEAN	5.893939	4.363636	3.586207	4.708703	1.0
	Participate	.709677	.946236	.935483	.795699	.709677

Table 69: Neighborhood Pattern & Design Credits 6-10

Project Name	City/State	Credit 1	Credit 2	Credit 3	Credit 4	Credit 5
360 State Street	New Haven, CT	2	1	2	1	1
1812 North Moore Street	Rosslyn, VA	1			1	1
Alliance Town Center	Fort Worth, TX	2			1	1
Aspen Club Living	Aspen, CO		1	1	1	1
Barelas Homes	Albuquerque, NM	1				1
Beijing Olympic Village	Beijing, China				1	1
Chongqing Tiandi	Chongqing, China	2	1	1	1	
City Creek Center	Salt Lake City, UT	2	1			
City of Tuscon & Gadsen	Tucson, AZ	2	1			1
Constitution Square Phase I	Washington, DC	1	1			1
Cornfield Arroyo Seco	Los Angeles, CA	1	1			
Crystal City Plan	Arlington, VA	1				
Currie Barracks	Calgary, AB Canada	2	1		1	1
Decker Walk	Baltimore, MD	2			1	1
Delaware Addition	Santa Cruz, CA	2	1		1	1
Depot Walk	Orange, CA	1	1		1	
Dockside Green	Victoria, BC Canada	2	1	1	1	1
East 54	Chapel Hill, NC		1	1	1	1
Edgewater	Oakmont, PA	2			1	
Eliot Tower	Portland, OR	2			1	1
Emeryville Marketplace	Emeryville, CA	2	1	2	1	1
Ever Vail	Vail, CO	2	1	1	1	1
Excelsior & Grand	St. Louis Park, MN	1			1	1
Faubourg Boisbriand	Boisbriand, QC Canada	2	1	1	1	1
Flats East Bank Development	Cleveland, OH	1	1			
Founder's Square	Arlington, VA	1		1	1	1
Garrison Crossing	Chilliwack, BC Canada	2	1		1	1
Georgia Commons	Washington, DC	2			1	1
Global Green USA Holy Cross	New Orleans, LA	1				1
Habitat for Humanity Edes B	Oakland, CA				1	
Harbor Point	Stamford, CT	2		1	1	1
Hawaii Regional Housing	Kaneohe, HI	2			1	1
Helensview	Portland, OR	2		1	1	
Hercules Bayfront	Hercules, CA	2	1	1	1	1
Horizon Uptown	Aurora, CO	2	1	1	1	1
Hoyt Yards	Portland, OR	1	1	1	1	1
Hunters View Redevelopment	San Francisco, CA	2				
Jackson Square	Roxbury, MA	2				1
Ladd Tower	Portland, OR	2	1		1	1
Legends Park & University Place	Memphis, TN	2			1	
Lincoln Park	Newark, NJ	1				
Linked Hybrid	Beijing, China	1			1	
MacArthur BART Transit Village	Oakland, CA	2	1	1		1
Meadow Ranch	Coeur D'Alene, ID	2				
Melrose Commons	Bronx, NY	2				
Metro Green	Stamford, CT	1	1		1	
Midtown Crossing	Omaha, NE				1	1
Miraflores	Richmond, CA				1	1
Mosaic District	Fairfax, VA	1		1	1	
Mueller	Austin, TX	2			1	1
Napa Pipe	Napa, CA	2	1		1	1
Navy Yard @ Noisette	North Charleston, SC	1		1		

Table 69 continued

Project Name	City/State	Credit 1	Credit 2	Credit 3	Credit 4	Credit 5
New Stapleton Waterfront	New York, NY		1		1	
Newpark Town Center	Park City, UT	2	1	1	1	1
Park Avenue Redevelopment	Denver, CO	2			1	1
Parkside Mixed-Use Development	Washington, DC	2			1	1
Pointe Nord	Montreal, QC Canada	2			1	1
Prairie Crossing Station Village	Grayslake, IL	2			1	1
Preston Meadows	Cambridge, ON Canada	2				1
Quarry Falls	San Diego, CA	2	1	2	1	1
Silo City	Beijing, China	2			1	
Simpson Wisser Fort Shafter	Honolulu, HI					1
Solea Condominiums	Washington, DC	2			1	1
South Chicago LEED ND Initiative	Chicago, IL	2				1
South Lake Union Urban Center	Seattle, WA	2				1
South Waterfront Central District	Portland, OR	2				1
Southeast False Creek	Vancouver, BC Canada	2	1	1	1	1
St. Luke's Neighborhood District	Cleveland, OH	2	1		1	
Strathearn Masterplan	Edmonton AB, Canada	2	1		1	
Sustainable Fellwood	Savannah, GA	1	1		1	1
Sweetwater	Hailey, ID	2	1		1	1
Syracuse ALT District	Syracuse, NY	2	1		1	1
Tassafaronga Village	Oakland, CA	2			1	1
Taylor Yard Transit Village	Los Angeles, CA		1			1
Technopole Angus	Montreal, QC Canada	1	1	1	1	1
The Arbors	Cincinnati, OH	1				
The Gateway to Nashville	Nashville, TN		1			
The Gulch	Nashville, TN	1				1
The Hills	Guangzhou (Canton), China			1	1	1
The Village at Griesbach, Stage 8	Edmonton AB, Canada	2				1
The Waterfront District	Bellingham, WA	2	1		1	1
The Yards	Washington, DC	1				1
Toronto Waterfront Area 1	Toronto, ON Canada		1			1
Town of Normal Uptown Renewal	Normal, IL	1	1		1	1
Twinbrook Station	Rockville, MD	2	1	1		1
Union Park	Las Vegas, NV	1	1		1	1
Uptown at Falls Park	Sioux Falls, SD	1			1	1
Washington Village	Boulder, CO	1	1		1	1
West Town Development	Atlanta, GA	2	1		1	
Westfield UTC Revitalization	San Diego, CA		1	1	1	1
Whistler Crossing	Riverdale, IL	2				
Willets Point	Flushing, NY	2			1	1
Wuhan Tiandi Mixed Use	Wuhan, China	2	1	1	1	1
	Count	80	45	25	64	67
	Sum	135	45	28	64	67
	MEAN	1.6875	1	1.12	1	1
	Participate	0.860215	0.483871	0.268817	0.688172	0.72043

Table 70: Neighborhood Pattern & Design Credits 11-15

Project Name	City/State	Credit 11	Credit 12	Credit 13	Credit 14	Credit 15
360 State Street	New Haven, CT	1	1	1		1
1812 North Moore Street	Rosslyn, VA		1			
Alliance Town Center	Fort Worth, TX			1		1
Aspen Club Living	Aspen, CO	1				
Barelas Homes	Albuquerque, NM		1			1
Beijing Olympic Village	Beijing, China					
Chongqing Tiandi	Chongqing, China		1			1
City Creek Center	Salt Lake City, UT					1
City of Tucson & Gadsen	Tucson, AZ	1				1
Constitution Square Phase I	Washington, DC					1
Cornfield Arroyo Seco	Los Angeles, CA		1			1
Crystal City Plan	Arlington, VA		1			1
Currie Barracks	Calgary, AB Canada		1			1
Decker Walk	Baltimore, MD					1
Delaware Addition	Santa Cruz, CA		1			1
Depot Walk	Orange, CA		1			
Dockside Green	Victoria, BC Canada		1			1
East 54	Chapel Hill, NC	1				1
Edgewater	Oakmont, PA		1			
Eliot Tower	Portland, OR		1	1		1
Emeryville Marketplace	Emeryville, CA	1	1			1
Ever Vail	Vail, CO	1	1			
Excelsior & Grand	St. Louis Park, MN		1			1
Faubourg Boisbriand	Boisbriand, QC Canada			1		
Flats East Bank Development	Cleveland, OH		1			
Founder's Square	Arlington, VA	1				1
Garrison Crossing	Chilliwack, BC Canada					1
Georgia Commons	Washington, DC					1
Global Green USA Holy Cross	New Orleans, LA		1			
Habitat for Humanity Edes B	Oakland, CA		1			1
Harbor Point	Stamford, CT		1			1
Hawaii Regional Housing	Kaneohe, HI					1
Helensview	Portland, OR		1			1
Hercules Bayfront	Hercules, CA	1	1			1
Horizon Uptown	Aurora, CO		1	1		1
Hoyt Yards	Portland, OR	1	1			1
Hunters View Redevelopment	San Francisco, CA		1			1
Jackson Square	Roxbury, MA		1			1
Ladd Tower	Portland, OR	1		1		1
Legends Park & University Place	Memphis, TN	1	1			

Table 70 continued

Project Name	City/State	Credit 11	Credit 12	Credit 13	Credit 14	Credit 15
Lincoln Park	Newark, NJ		1	1		1
Linked Hybrid	Beijing, China					1
MacArthur BART Transit Village	Oakland, CA		1			1
Meadow Ranch	Coeur D'Alene, ID					1
Melrose Commons	Bronx, NY	1	1			1
Metro Green	Stamford, CT	1				
Midtown Crossing	Omaha, NE	1	1			1
Miraflores	Richmond, CA	1	1	1		1
Mosaic District	Fairfax, VA	1	1			1
Mueller	Austin, TX		1			
Napa Pipe	Napa, CA		1			
Navy Yard @ Noisette	North Charleston, SC		1			
New Stapleton Waterfront	New York, NY		1			
Newpark Town Center	Park City, UT		1			1
Park Avenue Redevelopment	Denver, CO		1			1
Parkside Mixed-Use Development	Washington, DC	1	1			1
Pointe Nord	Montreal, QC Canada					
Prairie Crossing Station Village	Grayslake, IL		1	1		1
Preston Meadows	Cambridge, ON Canada		1			1
Quarry Falls	San Diego, CA		1			1
Silo City	Beijing, China					1
Simpson Wisser Fort Shafter	Honolulu, HI		1			
Solea Condominiums	Washington, DC	1	1	1		1
South Chicago LEED ND Initiative	Chicago, IL	1				1
South Lake Union Urban Center	Seattle, WA		1			
South Waterfront Central District	Portland, OR	1				1
Southeast False Creek	Vancouver, BC Canada	1	1			1
St. Luke's Neighborhood District	Cleveland, OH		1			1
Strathearn Masterplan	Edmonton AB, Canada		1			1
Sustainable Fellwood	Savannah, GA		1			
Sweetwater	Hailey, ID		1			
Syracuse ALT District	Syracuse, NY		1	1		1
Tassafaronga Village	Oakland, CA		1			1
Taylor Yard Transit Village	Los Angeles, CA		1			
Technopole Angus	Montreal, QC Canada	1	1			
The Arbors	Cincinnati, OH					1
The Gateway to Nashville	Nashville, TN	1				1
The Gulch	Nashville, TN	1	1			1

Table 70 continued

Project Name	City/State	Credit 11	Credit 12	Credit 13	Credit 14	Credit 15
The Hills	Guangzhou (Canton), China	1				1
The Village at Griesbach, Stage 8	Edmonton AB, Canada		1			1
The Waterfront District	Bellingham, WA		1	1		1
The Yards	Washington, DC		1			
Toronto Waterfront Area 1	Toronto, ON Canada		1			1
Town of Normal Uptown Renewal	Normal, IL		1			
Twinbrook Station	Rockville, MD	1	1			1
Union Park	Las Vegas, NV	1				1
Uptown at Falls Park	Sioux Falls, SD					1
Washington Village	Boulder, CO		1			1
West Town Development	Atlanta, GA					
Westfield UTC Revitalization	San Diego, CA	1	1			1
Whistler Crossing	Riverdale, IL	1	1			1
Willets Point	Flushing, NY	1				1
Wuhan Tiandi Mixed Use	Wuhan, China					1
	Count	30	64	12	--	68
	Sum	30	64	12	--	68
	MEAN	1	1	1	--	1
	Participate	0.322581	0.688172	0.129032	--	0.731183

Table 71: Green Infrastructure and Buildings Credits 1-5

Project Name	City/State	Credit 1	Credit 2	Credit 3	Credit 4	Credit 5
360 State Street	New Haven, CT		3	1		
1812 North Moore Street	Rosslyn, VA		3	2	1	
Alliance Town Center	Fort Worth, TX			2	1	
Aspen Club Living	Aspen, CO		3	1		1
Barelas Homes	Albuquerque, NM					
Beijing Olympic Village	Beijing, China	3	3	2	1	
Chongqing Tiandi	Chongqing, China			2		
City Creek Center	Salt Lake City, UT	3	1	2		
City of Tucson & Gadsen	Tucson, AZ	3		1	1	
Constitution Square Phase I	Washington, DC	1			1	
Cornfield Arroyo Seco	Los Angeles, CA		1	2		1
Crystal City Plan	Arlington, VA					
Currie Barracks	Calgary, AB Canada			2		1
Decker Walk	Baltimore, MD		3			1
Delaware Addition	Santa Cruz, CA			2	1	
Depot Walk	Orange, CA		3	1	1	
Dockside Green	Victoria, BC Canada	4	3	2	1	
East 54	Chapel Hill, NC	4	2	2	1	
Edgewater	Oakmont, PA					
Eliot Tower	Portland, OR					
Emeryville Marketplace	Emeryville, CA	4	2	1	1	1
Ever Vail	Vail, CO	4	3	2	1	
Excelsior & Grand	St. Louis Park, MN					
Faubourg Boisbriand	Boisbriand, QC Canada	2	2	2	1	
Flats East Bank Development	Cleveland, OH	3				
Founder's Square	Arlington, VA	4	3	1		
Garrison Crossing	Chilliwack, BC Canada					1
Georgia Commons	Washington, DC			1	1	
Global Green USA Holy Cross	New Orleans, LA	4	3	2	1	
Habitat for Humanity Edes B	Oakland, CA					1
Harbor Point	Stamford, CT		1	1		1
Hawaii Regional Housing	Kaneohe, HI		2			
Helensview	Portland, OR	4	2	2		1
Hercules Bayfront	Hercules, CA					1
Horizon Uptown	Aurora, CO	4		2		
Hoyt Yards	Portland, OR		3	2	1	
Hunters View Redevelopment	San Francisco, CA		2			
Jackson Square	Roxbury, MA			1		1
Ladd Tower	Portland, OR		3	2		1
Legends Park & University Place	Memphis, TN			1		
Lincoln Park	Newark, NJ		3	2	1	1
Linked Hybrid	Beijing, China			2	1	
MacArthur BART Transit Village	Oakland, CA			1		
Meadow Ranch	Coeur D'Alene, ID	4	2	2		1
Melrose Commons	Bronx, NY				1	1
Metro Green	Stamford, CT	1	2	2	1	
Midtown Crossing	Omaha, NE					
Miraflores	Richmond, CA		3	2	1	1
Mosaic District	Fairfax, VA		2	1		
Mueller	Austin, TX					1
Napa Pipe	Napa, CA			2	1	
Navy Yard @ Noisette	North Charleston, SC	4		2		1
New Stapleton Waterfront	New York, NY	4		1	1	

Table 71 continued

Project Name	City/State	Credit 1	Credit 2	Credit 3	Credit 4	Credit 5
Newpark Town Center	Park City, UT	4				
Park Avenue Redevelopment	Denver, CO					
Parkside Mixed-Use Development	Washington, DC		2	2		
Pointe Nord	Montreal, QC Canada		2	2	1	
Prairie Crossing Station Village	Grayslake, IL		3		1	
Preston Meadows	Cambridge, ON Canada		3	2		
Quarry Falls	San Diego, CA	4	2	2	1	
Silo City	Beijing, China			2		
Simpson Wisser Fort Shafter	Honolulu, HI	4	3	2	1	
Solea Condominiums	Washington, DC				1	
South Chicago LEED ND Initiative	Chicago, IL	4				
South Lake Union Urban Center	Seattle, WA	3				
South Waterfront Central District	Portland, OR	4	3	2		
Southeast False Creek	Vancouver, BC Canada	2	3	2	1	1
St. Luke's Neighborhood District	Cleveland, OH	3				1
Strathearn Masterplan	Edmonton AB, Canada			2		
Sustainable Fellwood	Savannah, GA	4	3	2		
Sweetwater	Hailey, ID					
Syracuse ALT District	Syracuse, NY	2	3	2		1
Tassafaronga Village	Oakland, CA	4	3	2		1
Taylor Yard Transit Village	Los Angeles, CA					
Technopole Angus	Montreal, QC Canada	4		2	1	1
The Arbors	Cincinnati, OH	4	3	2	1	
The Gateway to Nashville	Nashville, TN		3	2		1
The Gulch	Nashville, TN					1
The Hills	Guangzhou (Canton), China					
The Village at Griesbach, Stage 8	Edmonton AB, Canada			2		1
The Waterfront District	Bellingham, WA					
The Yards	Washington, DC	2		2		1
Toronto Waterfront Area 1	Toronto, ON Canada	4				
Town of Normal Uptown Renewal	Normal, IL		3		1	
Twinbrook Station	Rockville, MD	4		2		
Union Park	Las Vegas, NV	4				
Uptown at Falls Park	Sioux Falls, SD			2		1
Washington Village	Boulder, CO		3	1		1
West Town Development	Atlanta, GA		1	1		
Westfield UTC Revitalization	San Diego, CA		3	2	1	1
Whistler Crossing	Riverdale, IL					1
Willets Point	Flushing, NY	4	2	2	1	
Wuhan Tiandi Mixed Use	Wuhan, China			2		1
	Count	36	44	61	33	32
	Sum	124	111	107	33	32
	MEAN	3.444444	2.52273	1.754098	1	1
	Participate	0.387097	0.47312	0.655914	0.35484	0.34409

Table 72: Green Infrastructure and Buildings Credits 6-10

Project Name	City/State	Credit 6	Credit 7	Credit 8	Credit 9	Credit 10
360 State Street	New Haven, CT		1	5	1	
1812 North Moore Street	Rosslyn, VA		1	1	1	
Alliance Town Center	Fort Worth, TX			4	1	
Aspen Club Living	Aspen, CO		1	2	1	
Barelas Homes	Albuquerque, NM		1			
Beijing Olympic Village	Beijing, China		1	5	1	1
Chongqing Tiandi	Chongqing, China	1	1	4	1	
City Creek Center	Salt Lake City, UT		1		1	1
City of Tucson & Gadsen	Tucson, AZ		1	3	1	
Constitution Square Phase I	Washington, DC		1	5	1	
Cornfield Arroyo Seco	Los Angeles, CA	1	1	5	1	
Crystal City Plan	Arlington, VA		1		1	
Currie Barracks	Calgary, AB Canada	1	1	5		
Decker Walk	Baltimore, MD		1	2	1	
Delaware Addition	Santa Cruz, CA			1	1	
Depot Walk	Orange, CA		1		1	
Dockside Green	Victoria, BC Canada		1	5	1	
East 54	Chapel Hill, NC		1	1	1	
Edgewater	Oakmont, PA		1			
Eliot Tower	Portland, OR		1			
Emeryville Marketplace	Emeryville, CA		1	5	1	
Ever Vail	Vail, CO		1	2	1	
Excelsior & Grand	St. Louis Park, MN		1			
Faubourg Boisbriand	Boisbriand, QC Canada		1	3	1	
Flats East Bank Development	Cleveland, OH		1			
Founder's Square	Arlington, VA		1			
Garrison Crossing	Chilliwack, BC Canada		1	5		
Georgia Commons	Washington, DC		1	5	1	
Global Green USA Holy Cross	New Orleans, LA		1	5	1	
Habitat for Humanity Edes B	Oakland, CA		1	4		
Harbor Point	Stamford, CT	1	1		1	
Hawaii Regional Housing	Kaneohe, HI		1		1	
Helensview	Portland, OR		1	5		1
Hercules Bayfront	Hercules, CA	1	1	1	1	
Horizon Uptown	Aurora, CO			3	1	
Hoyt Yards	Portland, OR		1	5	1	1
Hunters View Redevelopment	San Francisco, CA				1	
Jackson Square	Roxbury, MA		1		1	
Ladd Tower	Portland, OR	1	1	1	1	
Legends Park & University Place	Memphis, TN		1			
Lincoln Park	Newark, NJ	1	1			
Linked Hybrid	Beijing, China		1		1	
MacArthur BART Transit Village	Oakland, CA		1	2	1	
Meadow Ranch	Coeur D'Alene, ID			4		
Melrose Commons	Bronx, NY		1			
Metro Green	Stamford, CT		1		1	
Midtown Crossing	Omaha, NE		1		1	
Miraflores	Richmond, CA	1	1	4	1	
Mosaic District	Fairfax, VA		1		1	
Mueller	Austin, TX		1	5	1	

Table 72 continued

Project Name	City/State	Credit 6	Credit 7	Credit 8	Credit 9	Credit 10
Napa Pipe	Napa, CA		1	1	1	1
Navy Yard @ Noisette	North Charleston, SC	1	1		1	
New Stapleton Waterfront	New York, NY		1		1	
Newpark Town Center	Park City, UT			5	1	
Park Avenue Redevelopment	Denver, CO		1		1	
Parkside Mixed-Use Development	Washington, DC		1		1	
Pointe Nord	Montreal, QC Canada			2	1	
Prairie Crossing Station Village	Grayslake, IL		1	2		
Preston Meadows	Cambridge, ON Canada		1			
Quarry Falls	San Diego, CA		1	2	1	
Silo City	Beijing, China		1		1	
Simpson Wisser Fort Shafter	Honolulu, HI		1	3	1	
Solea Condominiums	Washington, DC		1			
South Chicago LEED ND Initiative	Chicago, IL		1	1		
South Lake Union Urban Center	Seattle, WA	1	1			
South Waterfront Central District	Portland, OR		1	5	1	1
Southeast False Creek	Vancouver, BC Canada	1	1	5	1	
St. Luke's Neighborhood District	Cleveland, OH	1	1			
Strathearn Masterplan	Edmonton AB, Canada		1	2	1	
Sustainable Fellwood	Savannah, GA		1			
Sweetwater	Hailey, ID			5	1	
Syracuse ALT District	Syracuse, NY		1	5	1	
Tassafaronga Village	Oakland, CA		1	2	1	
Taylor Yard Transit Village	Los Angeles, CA		1			
Technopole Angus	Montreal, QC Canada	1	1	2	1	1
The Arbors	Cincinnati, OH			5	1	
The Gateway to Nashville	Nashville, TN	1	1		1	
The Gulch	Nashville, TN	1	1			
The Hills	Guangzhou (Canton), China			5		
The Village at Griesbach, Stage 8	Edmonton AB, Canada		1	5		
The Waterfront District	Bellingham, WA		1			
The Yards	Washington, DC	1	1		1	
Toronto Waterfront Area 1	Toronto, ON Canada	1	1			
Town of Normal Uptown Renewal	Normal, IL		1	3	1	
Twinbrook Station	Rockville, MD		1		1	
Union Park	Las Vegas, NV		1		1	1
Uptown at Falls Park	Sioux Falls, SD	1	1		1	
Washington Village	Boulder, CO		1	2		
West Town Development	Atlanta, GA			3	1	
Westfield UTC Revitalization	San Diego, CA		1	2	1	
Whistler Crossing	Riverdale, IL	1	1	3		
Willetts Point	Flushing, NY		1	5	1	
Wuhan Tiandi Mixed Use	Wuhan, China	1	1	4	1	
	Count	20	82	54	64	8
	Sum	20	82	186	64	8
	MEAN	1	1	3.44444	1	1
	Participate	0.21505	0.88172	0.58065	0.688172	0.086022

Table 73: Green Infrastructure and Buildings Credits 11-15

Project Name	City/State	Credit 11	Credit 12	Credit 13	Credit 14	Credit 15
360 State Street	New Haven, CT	1				1
1812 North Moore Street	Rosslyn, VA					1
Alliance Town Center	Fort Worth, TX			1		1
Aspen Club Living	Aspen, CO			1		1
Barelas Homes	Albuquerque, NM					
Beijing Olympic Village	Beijing, China					1
Chongqing Tiandi	Chongqing, China			1		1
City Creek Center	Salt Lake City, UT					
City of Tucson & Gadsen	Tucson, AZ			1		1
Constitution Square Phase I	Washington, DC					
Cornfield Arroyo Seco	Los Angeles, CA					
Crystal City Plan	Arlington, VA					
Currie Barracks	Calgary, AB Canada			1		
Decker Walk	Baltimore, MD					
Delaware Addition	Santa Cruz, CA	1		1		1
Depot Walk	Orange, CA					1
Dockside Green	Victoria, BC Canada	1		1	2	1
East 54	Chapel Hill, NC			1		
Edgewater	Oakmont, PA					1
Eliot Tower	Portland, OR					
Emeryville Marketplace	Emeryville, CA	1		1	2	1
Ever Vail	Vail, CO	1	2	1	2	1
Excelsior & Grand	St. Louis Park, MN					
Faubourg Boisbriand	Boisbriand, QC Canada			1		
Flats East Bank Development	Cleveland, OH					
Founder's Square	Arlington, VA					
Garrison Crossing	Chilliwack, BC Canada					
Georgia Commons	Washington, DC					
Global Green USA Holy Cross	New Orleans, LA	1				1
Habitat for Humanity Edes B	Oakland, CA	1		1		1
Harbor Point	Stamford, CT			1		
Hawaii Regional Housing	Kaneohe, HI			1		
Helensview	Portland, OR					
Hercules Bayfront	Hercules, CA	1		1		1
Horizon Uptown	Aurora, CO	1		1	2	1
Hoyt Yards	Portland, OR	1	2	1	2	1
Hunters View Redevelopment	San Francisco, CA					1
Jackson Square	Roxbury, MA					
Ladd Tower	Portland, OR					
Legends Park & University Place	Memphis, TN					

Table 73 continued

Project Name	City/State	Credit 11	Credit 12	Credit 13	Credit 14	Credit 15
Lincoln Park	Newark, NJ					
Linked Hybrid	Beijing, China			1	2	
MacArthur BART Transit Village	Oakland, CA					
Meadow Ranch	Coeur D'Alene, ID			1		1
Melrose Commons	Bronx, NY					
Metro Green	Stamford, CT			1		
Midtown Crossing	Omaha, NE					
Miraflores	Richmond, CA	1		1		1
Mosaic District	Fairfax, VA					1
Mueller	Austin, TX	1				
Napa Pipe	Napa, CA			1		
Navy Yard @ Noisette	North Charleston, SC		2			1
New Stapleton Waterfront	New York, NY					
Newpark Town Center	Park City, UT			1		
Park Avenue Redevelopment	Denver, CO					
Parkside Mixed-Use Development	Washington, DC					
Pointe Nord	Montreal, QC Canada			1		1
Prairie Crossing Station Village	Grayslake, IL					
Preston Meadows	Cambridge, ON Canada			1		1
Quarry Falls	San Diego, CA			1	2	1
Silo City	Beijing, China			1		
Simpson Wisser Fort Shafter	Honolulu, HI	1		1		
Solea Condominiums	Washington, DC					
South Chicago LEED ND Initiative	Chicago, IL					
South Lake Union Urban Center	Seattle, WA					
South Waterfront Central District	Portland, OR					
Southeast False Creek	Vancouver, BC Canada		2	1		
St. Luke's Neighborhood District	Cleveland, OH					
Strathearn Masterplan	Edmonton AB, Canada					
Sustainable Fellwood	Savannah, GA					1
Sweetwater	Hailey, ID			1		
Syracuse ALT District	Syracuse, NY			1		1
Tassafaronga Village	Oakland, CA					1
Taylor Yard Transit Village	Los Angeles, CA					
Technopole Angus	Montreal, QC Canada			1		
The Arbors	Cincinnati, OH					
The Gateway to Nashville	Nashville, TN					1
The Gulch	Nashville, TN			1		
The Hills	Guangzhou (Canton), China					1

Table 73 continued

Project Name	City/State	Credit 11	Credit 12	Credit 13	Credit 14	Credit 15
The Village at Griesbach, Stage 8	Edmonton AB, Canada					1
The Waterfront District	Bellingham, WA	1		1		
The Yards	Washington, DC					
Toronto Waterfront Area 1	Toronto, ON Canada		2			
Town of Normal Uptown Renewal	Normal, IL					
Twinbrook Station	Rockville, MD					
Union Park	Las Vegas, NV					
Uptown at Falls Park	Sioux Falls, SD			1		1
Washington Village	Boulder, CO					
West Town Development	Atlanta, GA			1		1
Westfield UTC Revitalization	San Diego, CA	1	2	1		1
Whistler Crossing	Riverdale, IL					
Willels Point	Flushing, NY			1		1
Wuhan Tiandi Mixed Use	Wuhan, China			1		1
	Count	15	6	39	7	37
	Sum	15	12	39	14	37
	MEAN	1	2	1	2	1
	Participate	0.16129	0.064516	0.419355	0.075269	0.397849

Table 74: Green Infrastructure and Buildings Credits 16-17

Project Name	City/State	Credit 16	Credit 17
360 State Street	New Haven, CT	1	
1812 North Moore Street	Rosslyn, VA	1	
Alliance Town Center	Fort Worth, TX	1	1
Aspen Club Living	Aspen, CO	1	1
Barelas Homes	Albuquerque, NM		
Beijing Olympic Village	Beijing, China	1	
Chongqing Tiandi	Chongqing, China	1	
City Creek Center	Salt Lake City, UT	1	
City of Tucson & Gadsen	Tucson, AZ	1	1
Constitution Square Phase I	Washington, DC	1	
Cornfield Arroyo Seco	Los Angeles, CA	1	
Crystal City Plan	Arlington, VA		
Currie Barracks	Calgary, AB Canada	1	1
Decker Walk	Baltimore, MD		
Delaware Addition	Santa Cruz, CA	1	1
Depot Walk	Orange, CA	1	1
Dockside Green	Victoria, BC Canada	1	1
East 54	Chapel Hill, NC	1	1
Edgewater	Oakmont, PA	1	1
Eliot Tower	Portland, OR	1	
Emeryville Marketplace	Emeryville, CA	1	1
Ever Vail	Vail, CO	1	1
Excelsior & Grand	St. Louis Park, MN		
Faubourg Boisbriand	Boisbriand, QC Canada	1	1
Flats East Bank Development	Cleveland, OH	1	
Founder's Square	Arlington, VA	1	
Garrison Crossing	Chilliwack, BC Canada	1	
Georgia Commons	Washington, DC	1	1
Global Green USA Holy Cross	New Orleans, LA	1	1
Habitat for Humanity Edes B	Oakland, CA	1	
Harbor Point	Stamford, CT	1	
Hawaii Regional Housing	Kaneohe, HI		
Helensview	Portland, OR	1	
Hercules Bayfront	Hercules, CA	1	1
Horizon Uptown	Aurora, CO	1	
Hoyt Yards	Portland, OR	1	
Hunters View Redevelopment	San Francisco, CA	1	
Jackson Square	Roxbury, MA	1	
Ladd Tower	Portland, OR	1	1
Legends Park & University Place	Memphis, TN		
Lincoln Park	Newark, NJ	1	
Linked Hybrid	Beijing, China	1	
MacArthur BART Transit Village	Oakland, CA	1	
Meadow Ranch	Coeur D'Alene, ID	1	1
Melrose Commons	Bronx, NY		
Metro Green	Stamford, CT		
Midtown Crossing	Omaha, NE	1	
Miraflores	Richmond, CA	1	1
Mosaic District	Fairfax, VA	1	
Mueller	Austin, TX	1	
Napa Pipe	Napa, CA	1	1
Navy Yard @ Noisette	North Charleston, SC	1	
New Stapleton Waterfront	New York, NY		

Table 74 continued

Project Name	City/State	Credit 16	Credit 17
Newpark Town Center	Park City, UT	1	
Park Avenue Redevelopment	Denver, CO		
Parkside Mixed-Use Development	Washington, DC	1	1
Pointe Nord	Montreal, QC Canada	1	1
Prairie Crossing Station Village	Grayslake, IL		
Preston Meadows	Cambridge, ON Canada	1	
Quarry Falls	San Diego, CA	1	
Silo City	Beijing, China	1	
Simpson Wisser Fort Shafter	Honolulu, HI	1	1
Solea Condominiums	Washington, DC		
South Chicago LEED ND Initiative	Chicago, IL	1	
South Lake Union Urban Center	Seattle, WA		
South Waterfront Central District	Portland, OR		
Southeast False Creek	Vancouver, BC Canada	1	1
St. Luke's Neighborhood District	Cleveland, OH		
Strathearn Masterplan	Edmonton AB, Canada		1
Sustainable Fellwood	Savannah, GA	1	
Sweetwater	Hailey, ID	1	1
Syracuse ALT District	Syracuse, NY	1	
Tassafaronga Village	Oakland, CA	1	
Taylor Yard Transit Village	Los Angeles, CA		
Technopole Angus	Montreal, QC Canada	1	1
The Arbors	Cincinnati, OH	1	
The Gateway to Nashville	Nashville, TN	1	
The Gulch	Nashville, TN		
The Hills	Guangzhou (Canton), China	1	
The Village at Griesbach, Stage 8	Edmonton AB, Canada	1	
The Waterfront District	Bellingham, WA	1	
The Yards	Washington, DC		
Toronto Waterfront Area 1	Toronto, ON Canada	1	
Town of Normal Uptown Renewal	Normal, IL		
Twinbrook Station	Rockville, MD	1	
Union Park	Las Vegas, NV	1	
Uptown at Falls Park	Sioux Falls, SD	1	1
Washington Village	Boulder, CO	1	
West Town Development	Atlanta, GA		1
Westfield UTC Revitalization	San Diego, CA	1	
Whistler Crossing	Riverdale, IL		
Willets Point	Flushing, NY	1	
Wuhan Tiandi Mixed Use	Wuhan, China	1	
	Count	71	28
	Sum	71	28
	MEAN	1	1
	Participate	0.763441	0.30108

APPENDIX 2: SUSTAINABLE DEVELOPMENT GOALS

Table 75: Total Possible Earned Points (USGBC, 2011a)

	Smart Location	Sensitive Lands Protection	Site and Transportation Design	Public Health	Social Equity	Energy and Climate Protection	Water Resource Efficiency	Infrastructure Efficiency	Total Possible Points
Smart Location and Linkage									
Prerequisite 1, Smart Location	X		X	X	X	X		X	--
Prerequisite 2, Imperiled Species and Ecological Communities Conservation		X							--
Prerequisite 3, Wetland and Water Body Conservation		X					X		--
Prerequisite 4, Agricultural Land Conservation		X							--
Prerequisite 5, Floodplain Avoidance		X							--
Credit 1, Preferred Locations	2.5			2.5	2.5	2.5			10
Credit 2, Brownfields Redevelopment	.67				.67	.67			2
Credit 3, Locations With Reduced Automobile Dependence	1.4		1.4	1.4	1.4	1.4			7
Credit 4, Bicycle Network and Storage	.2		.2	.2	.2	.2			1
Credit 5, Housing and Jobs Proximity	1				1	1			3
Credit 6, Steep Slope Protection		1							1
Credit 7, Site Design for Habitat or Wetland and Water Body Conservation		.33	.33				.33		1
Credit 8, Restoration of Habitat or Wetlands and Water Bodies		.5					.5		1
Credit 9, Long-Term Conservation Management of Habitat or Wetlands and Water Bodies		.5					.5		1
Neighborhood Pattern and Design									
Prerequisite 1, Walkable Streets	X		X	X	X	X			--
Prerequisite 2, Compact Development			X	X	X	X		X	--
Prerequisite 3, Connected and Open Community	X		X	X	X	X			--
Credit 1, Walkable Streets			4	4	4	4			12
Credit 2, Compact Development			1.2	1.2	1.2	1.2		1.2	6
Credit 3, Mixed Use Neighborhood Centers			.8	.8	.8	.8		.8	4
Credit 4, Mixed-Income Diverse Communities					7				7
Credit 5, Reduced Parking Footprint			.5			.5			1
Credit 6, Street Network			.4	.4	.4	.4		.4	2
Credit 7, Transit Facilities			.67		.67	.67			2
Credit 8, Transportation Demand Management			1			1			2
Credit 9, Access to Civic and Public Space			.25	.25	.25	.25			1
Credit 10, Access to Recreation Facilities			.25	.25	.25	.25			1
Credit 11, Visitability and Universal Design			.5		.5				1
Credit 12, Community Outreach and Involvement				1	1				2
Credit 13, Local Food Production			.33	.33	.33				1
Credit 14, Tree-Lined and Shaded Streets			.5			.5			1
Credit 15, Neighborhood Schools			.33	.33	.33				1

Table 75 continued (USGBC, 2011a)

	Smart Location	Sensitive Lands Protection	Site and Transportation Design	Public Health	Social Equity	Energy and Climate Protection	Water Resource Efficiency	Infrastructure Efficiency	Total Possible Points
Green Infrastructure and Buildings									
Prerequisite 1, Certified Green Building						X			--
Prerequisite 2, Minimum Building Energy Efficiency						X			--
Prerequisite 3, Minimum Building Water Efficiency						X	X		--
Prerequisite 4, Connected and Open Community		X	X					X	--
Credit 1, Certified Green Buildings						5			5
Credit 2, Building Energy Efficiency						2			2
Credit 3, Building Water Efficiency						.5	.5		1
Credit 4, Water-Efficient Landscaping						.5	.5		1
Credit 5, Existing Building Reuse			.5			.5			1
Credit 6, Historic Resource Preservation and Adaptive use			.5		.5				1
Credit 7, Minimized Site Disturbance in Design and Construction		1							1
Credit 8, Stormwater Management							2	2	4
Credit 9, Heat Island Reduction						1			1
Credit 10, Solar Orientation						1			1
Credit 11, On-Site Renewable Energy Sources						1.5		1.5	3
Credit 12, District Heating and Cooling						1		1	2
Credit 13, Infrastructure Energy Efficiency						.5		.5	1
Credit 14, Wastewater Management								2	2
Credit 15, Recycled Content in Infrastructure						.5		.5	1
Credit 16, Solid Waste Management Infrastructure						.5		.5	1
Credit 17, Light Pollution Reduction			1						1
Total Possible Points	5.77	3.33	14.16	12.66	23.00	30.44	4.33	10.40	
Total Required	3	5	5	4	4	7	2	3	

Table 75: Total Median Earned Points (USGBC, 2011a)

	Smart Location	Sensitive Lands Protection	Site and Transportation Design	Public Health	Social Equity	Energy and Climate Protection	Water Resource Efficiency	Infrastructure Efficiency	Total Median Earned Points
Smart Location and Linkage									
Prerequisite 1, Smart Location	R		R	R	R	R		R	--
Prerequisite 2, Imperiled Species and Ecological Communities Conservation		R							--
Prerequisite 3, Wetland and Water Body Conservation		R					R		--
Prerequisite 4, Agricultural Land Conservation		R							--
Prerequisite 5, Floodplain Avoidance		R							--
Credit 1, Preferred Locations	1.95			1.95	1.95	1.95			7.8
Credit 2, Brownfields Redevelopment	.83				.83	.83			2.5*
Credit 3, Locations With Reduced Automobile Dependence	1.04		1.04	1.04	1.04	1.04			5.2
Credit 4, Bicycle Network and Storage	.2		.2	.2	.2	.2			1
Credit 5, Housing and Jobs Proximity	1				1	1			3
Credit 6, Steep Slope Protection		1							1
Credit 7, Site Design for Habitat or Wetland and Water Body Conservation		.33	.33				.33		1
Credit 8, Restoration of Habitat or Wetlands and Water Bodies		.5					.5		1
Credit 9, Long-Term Conservation Management of Habitat or Wetlands and Water Bodies		.5					.5		1
Neighborhood Pattern and Design									
Prerequisite 1, Walkable Streets	R		R	R	R	R			--
Prerequisite 2, Compact Development			R	R	R	R		R	--
Prerequisite 3, Connected and Open Community	R		R	R	R	R			--
Credit 1, Walkable Streets			1.4	1.4	1.4	1.4			5.6
Credit 2, Compact Development			.88	.88	.88	.88		.88	4.4
Credit 3, Mixed Use Neighborhood Centers			.72	.72	.72	.72		.72	3.6
Credit 4, Mixed-Income Diverse Communities					4.7				4.7
Credit 5, Reduced Parking Footprint			.5			.5			1
Credit 6, Street Network			.34	.34	.34	.34		.34	1.7
Credit 7, Transit Facilities			.33		.33	.33			1
Credit 8, Transportation Demand Management			.5			.5			1
Credit 9, Access to Civic and Public Space			.25	.25	.25	.25			1
Credit 10, Access to Recreation Facilities			.25	.25	.25	.25			1
Credit 11, Visitability and Universal Design			.5		.5				1
Credit 12, Community Outreach and Involvement				.5	.5				1
Credit 13, Local Food Production			.33	.33	.33				1
Credit 14, Tree-Lined and Shaded Streets			0			0			0
Credit 15, Neighborhood Schools			.33	.33	.33				1

Table 75 continued (USGBC, 2011a)

	Smart Location	Sensitive Lands Protection	Site and Transportation Design	Public Health	Social Equity	Energy and Climate Protection	Water Resource Efficiency	Infrastructure Efficiency	Total Median Earned Points
Green Infrastructure and Buildings									
Prerequisite 1, Certified Green Building						R			--
Prerequisite 2, Minimum Building Energy Efficiency						R			--
Prerequisite 3, Minimum Building Water Efficiency						R	R		--
Prerequisite 4, Construction Activity Pollution Prevention		R	R					R	--
Credit 1, Certified Green Buildings						3.4			3.4
Credit 2, Building Energy Efficiency						2.5			2.5*
Credit 3, Building Water Efficiency						.875	.875		1.75*
Credit 4, Water-Efficient Landscaping						.5	.5		1
Credit 5, Existing Building Reuse			.5			.5			1
Credit 6, Historic Resource Preservation and Adaptive use			.5		.5				1
Credit 7, Minimized Site Disturbance in Design and Construction		1							1
Credit 8, Stormwater Management							1.7	1.7	3.4
Credit 9, Heat Island Reduction						1			1
Credit 10, Solar Orientation						1			1
Credit 11, On-Site Renewable Energy Sources						1.5		1.5	3
Credit 12, District Heating and Cooling						1		1	2
Credit 13, Infrastructure Energy Efficiency						.5		.5	1
Credit 14, Wastewater Management								2	2
Credit 15, Recycled Content in Infrastructure						.5		.5	1
Credit 16, Solid Waste Management Infrastructure						.5		.5	1
Credit 17, Light Pollution Reduction			1						1
Total Possible Points	5.77	3.33	14.16	12.66	23.00	30.44	4.33	10.40	
Total Median Earned Points*	5.02	3.33	9.9	8.19	16.09	23.965	4.405	9.64	
Total Required	3	5	5	4	4	7	2	3	

APPENDIX 3: COMBINED LEED PREREQUISITE LIST

Table 76: Summary of Prerequisites

Prerequisites	Total	Percentage of Total
SLL 1: Smart Location	93	100%
Option 1	84	90.3%
Option 2	--	--
Option 3	3	3.2%
Option 4	5	5.4%
*Not all options reported		
SLL 2: Imperiled Species	93	100%
Option 1	84	90.3%
Option 2	5	5.4%
Option 3	4	4.3%
SLL 3: Wetland Conservation	93	100%
Option 1	70	75.3%
Option 2	23	24.7%
SLL 4: Agricultural Land Conservation	93	100%
Option 1*	--	--
Option 2	67	72.0%
Option 3*	--	--
Option 4	0	0%
Option 5*	--	--
* New in 2009		
SLL 5: Floodplain Avoidance	93	100%
Option 1	73	78.5%
Option 2	19	20.4%
Option 3	1	1.1%
NPD 1: Walkable Streets	--	--
NPD 2: Compact Development	93	100%
Option 1*	--	--
Option 2*	--	--
* New in 2009		
NPD 3: Connected and Open Community	93	100%
Option 1*	--	--
* New in 2009		
GPD 1: Certified Green Building	--	--
GPD 2: Minimum Building Energy Efficiency	--	--
GPD 3: Minimum Building Water Efficiency	--	--
GPD 4: Construction Activity Pollution Prevention	--	--

APPENDIX 4: COMBINED LEED CREDIT LIST

Table 77: Summary of SLL Credits

SLL Credit 1 (1-10)	Total	Percentage of Total	Mean Point Total
Preferred Locations	90	96.8%	7.8
SLL Credit 2 (1-2)			
Brownfields Redevelopment	55	59.1%	2.5
Option 1	29	31.2%	2
Option 2	26	27.9%	3
SLL Credit 3 (1-7)			
Locations with Reduced Automobile Dependence*	85	91.4%	5.2
Option 1	78	83.9%	5.1
Option 2	1	1.1%	4.0
Option 3	15	16.1%	1.0
* Not all projects reported the option utilized			
SLL Credit 4 (1)			
Bicycle Network and Storage	44	47.3%	1
SLL Credit 5 (1-3)			
Housing and Jobs Proximity*	79	85.0%	3.0
Option 1	--	--	--
Option 2	72	77.4%	3.0
Option 3	4	4.3%	3.0
* Not all projects reported the option utilized			
SLL Credit 6 (1)			
Steep Slope Protection*	60	64.5%	1.0
Option 1	49	52.7%	1.0
Option 2	8	8.6%	1.0
Option 3	1	1.1%	1.0
* Not all projects reported the option utilized			
SLL Credit 7 (1)			
Site Design for Habitat or Wetland and Water Body Conservation	1	31.2%	1.0
Option 1*	--	--	--
Option 2	1	1.1%	1.0
Option 3	0	0	0
* New in 2009 Revisions			
SLL Credit 8 (1)			
Restoration of Habitat or Wetlands and Water Bodies	9	9.7%	1.0
SLL Credit 9 (1)			
Long-Term Conservation Management of Habitat or Wetlands and Water Bodies	14	15.0%	1.0

Table 78: Summary of NPD Credits

NPD Credit 1 (1-12)	Total	Percentage of Total	Mean Point Total
Walkable Streets	66	71.0%	5.6*
* Unable to convert to 2009 revisions			
NPD Credit 2 (1-6)			
Compact Development	88	94.6%	4.4
NPD Credit 3 (1-4)			
Mixed-Use Neighborhood Centers	87	93.5%	3.6
NPD Credit 4 (1-7)			
Mixed-Income Diverse Communities	74	80.0%	4.7
Option 1 (3)	69	74.2%	2.6
Option 2 (3)	48	51.6%	2.9
Option 3 (1)	35	37.6%	1.0
NPD Credit 5 (1)			
Reduced Parking Footprint	66	71.0%	1.0
NPD Credit 6 (1-2)			
Street Network	80	86.0%	1.7
NPD Credit 7 (1-2)			
Transit Facilities	45	48.4%	1.0
NPD Credit 8 (1-2)			
Transportation Demand Management	11	11.8%	1.0
Option 1	3	3.2%	--
Option 2	6	6.5%	--
Option 3	6	6.5%	--
Option 4	--	--	--
Option 5	--	--	--
NPD Credit 9 (1)			
Access to Civic and Public Space	64	68.8%	1.0
NPD Credit 10 (1)			
Access to Recreation Facilities	67	72.0%	1.0
NPD Credit 11 (1)			
Visitability and Universal Design	30	32.3%	1.0
NPD Credit 12 (1-2)			
Community Outreach and Involvement	64	68.8%	1.0
NPD Credit 13 (1)			
Local Food Production*	12	12.9%	1.0
Option 1	3	3.2%	1.0
Option 2	2	2.2%	1.0
Option 3	4	4.3%	1.0
* Not all projects reported the option utilized			
NPD Credit 14 (1)			
Tree-Lined and Shaded Streets	--	--	--
NPD Credit 15 (1)			
Neighborhood Schools	68	73.1%	1.0

Table 79: Summary of GIB Credits

GIB Credit 1 (1-5)	Total	Percentage of Total	Mean Point Total
Certified Green Buildings	36	38.7%	3.4
GIB Credit 2 (2)			
Building Energy Efficiency	44	47.3%	2.5*
* Unable to Convert to 2009 revisions			
GIB Credit 3 (1)			
Building Water Efficiency*	61	65.6%	1.75
* Unable to Convert to 2009 Revisions			
GIB Credit 4 (1)			
Water-Efficient Landscaping	33	35.4%	1.0
GIB Credit 5 (1)			
Existing Building Refuse	32	34.4%	1.0
GIB Credit 6 (1)			
Historic Resource Preservation and Adaptive Use	20	21.5%	1.0
GIB Credit 7 (1)			
Minimized Site Disturbance in Design and Construction *	82	88.2%	1.0
Option 1	76	81.7%	1.0
Option 2	4	4.3%	1.0
* Not all projects reported utilized options			
GIB Credit 8 (1-4)			
Stormwater Management*	54	58.1%	3.4
* Unable to Convert to 2009 Revisions			
GIB Credit 9 (1)			
Heat Island Reduction *	64	68.8%	1.0
Option 1	33	35.5%	1.0
Option 2	25	26.9%	1.0
Option 3	--	--	--
* Not all projects reported utilized options			
GIB Credit 10 (1)			
Solar Orientation *	8	8.6%	1.0
Option 1	5	5.4%	1.0
Option 2	0	0	--
* Not all projects reported utilized options			
GIB Credit 11 (1-3)			
On-Site Renewable Energy Sources	15	16.1%	1.0
GIB Credit 12 (2)			
District Heating and Cooling	6	6.5%	2.0
GIB Credit 13 (1)			
Infrastructure Energy Efficiency	39	41.9%	1.0
GIB Credit 14 (1-2)			
Wastewater Management	7	7.5%	2.0
GIB Credit 15 (1)			
Recycled Content in Infrastructure	37	39.8%	1.0
GIB Credit 16 (1)*			
Solid Waste Management Infrastructure	71	76.3%	1.0
* Unable to convert to 2009 revisions			
GIB Credit 17 (1)			
Light Pollution Reduction	28	30.1%	1.0

Table 80: Ranking of Credit Utilization

	Total	Percentage of Total	Mean Point Total
SLL Credit 1 (1-10): Preferred Locations	90	96.8%	7.8
NPD Credit 2 (1-6): Compact Development	88	94.6%	4.4
NPD Credit 3 (1-4): Mixed-Use Neighborhood Centers	87	93.5%	3.6
SLL Credit 3 (1-7): Locations with Reduced Automobile Dependence	85	91.4%	5.2
GIB Credit 7 (1): Minimized Site Disturbance in Design and Construction	82	88.2%	1.0
NPD Credit 6 (1-2): Street Network	80	86.0%	1.7
SLL Credit 5 (1-3): Housing and Jobs Proximity	79	85.0%	3.0
NPD Credit 4 (1-7): Mixed-Income Diverse Communities	74	80.0%	4.7
GIB Credit 16 (1): Solid Waste Management Infrastructure	71	76.3%	1.0
NPD Credit 15 (1): Neighborhood Schools	68	73.1%	1.0
NPD Credit 10 (1): Access to Recreation Facilities	67	72.0%	1.0
NPD Credit 1 (1-12): Walkable Streets	66	71.0%	5.6
NPD Credit 5 (1): Reduced Parking Footprint	66	71.0%	1.0
NPD Credit 9 (1): Access to Civic and Public Space	64	68.8%	1.0
NPD Credit 12 (1-2): Community Outreach and Involvement	64	68.8%	1.0
GIB Credit 9 (1): Heat Island Reduction	64	68.8%	1.0
GIB Credit 3 (1): Building Water Efficiency	61	65.6%	1.75
SLL Credit 6 (1): Steep Slope Protection	60	64.5%	1.0
SLL Credit 2 (1-2): Brownfields Redevelopment	55	59.1%	2.5
GIB Credit 8 (1-4): Stormwater Management	54	58.1%	3.4
NPD Credit 7 (1-2): Transit Facilities	45	48.4%	1.0
SLL Credit 4 (1): Bicycle Network and Storage	44	47.3%	1.0
GIB Credit 2 (2): Building Energy Efficiency	44	47.3%	2.5
GIB Credit 13 (1): Infrastructure Energy Efficiency	39	41.9%	1.0
GIB Credit 15 (1): Recycled Content in Infrastructure	37	39.8%	1.0
GIB Credit 1 (1-5): Certified Green Buildings	36	38.7%	3.4
GIB Credit 4 (1): Water-Efficient Landscaping	33	35.4%	1.0
GIB Credit 5 (1): Existing Building Refuse	32	34.4%	1.0
NPD Credit 11 (1): Visitability and Universal Design	30	32.3%	1.0
SLL Credit 7 (1): Site Design for Habitat or Wetland and Water Body Conservation	1	31.2%	1.0
GIB Credit 17 (1): Light Pollution Reduction	28	30.1%	1.0
GIB Credit 6 (1): Historic Resource Preservation and Adaptive Use	20	21.5%	1.0
GIB Credit 11 (1-3): On-Site Renewable Energy Sources	15	16.1%	1.0
SLL Credit 9 (1): Long-Term Conservation Management of Habitat or Wetlands and Water Bodies	14	15.0%	1.0
NPD Credit 13 (1): Local Food Production	12	12.9%	1.0
NPD Credit 8 (1-2): Transportation Demand Management	11	11.8%	1.0
SLL Credit 8 (1): Restoration of Habitat or Wetlands and Water Bodies	9	9.7%	1.0
GIB Credit 10 (1): Solar Orientation	8	8.6%	1.0
GIB Credit 14 (1-2): Wastewater Management	7	7.5%	2.0
GIB Credit 12 (2): District Heating and Cooling	6	6.5%	2.0
NPD Credit 14 (1): Tree-Lined and Shaded Streets	--	--	--

VITA

Christopher is the only son of Jeffrey and Lois Loser, was born in Pennsylvania, and raised in Maryland. He graduated summa cum laude from the University of Maryland University College in 2010 with a B.S. in Environmental Management. Christopher came to the Department of Environmental Sciences at LSU in the fall of 2011 to pursue a Master's degree in Environmental Science. He plans to continue his education in the future; however he plans to first spend time with his family and stepchildren.